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# Brown Iron Ores as Cavity Fillings

By Edwin C. Eckel*

*SYNOPSIS—In a Virginia limestone quarry, caves and fissures were encountered in which brown iron ores were being deposited by surface waters percolating through shales carrying some iron. The dissolved iron was reprecipitated in the open cavities of the limestone.*

⁂

Virginia Limestone Quarry, in Which Brown Iron Ores Were Filling Cavities

Rock masses of any type or kind may contain cavities of greater or less extent, even if nothing more than spaces widened out by solution along joint-planes. Limestone, however, is peculiarly subject to attack by even slightly acid waters, and by far the majority of large open cavities or caves occur in limestone. Waters penetrating from the surface, and charged with carbon dioxide or other acid agent, readily dissolve out channels and chambers in the rock.

So much being accepted, it is obviously conceivable that other waters, carrying iron carbonate or other iron salt in solution, might refill such solution cavities with a deposit of iron ore; and this possible mode of origin has been given consideration in various published discussions on the formation of brown iron-ore deposits. Evidence in its favor is, of course, afforded by the frequent occurrence in brown-ore deposits of stalactites and other curiously shaped masses of brown ore, which could hardly have assumed these particular forms except in an open space of some kind.

In my opinion it is easily possible to lay too much stress upon this particular mode of brown-ore origin. It is undoubtedly true that brown-ore deposits can originate in this way; it is also true that in almost all our brown-ore deposits a certain amount of such cavity filling has taken place; but it is highly improbable that any large deposit at present worked has originated entirely or principally in this way. Replacement has been a far more important method.

In spite of frequent discussion of cavity filling as a mode of genesis, no published accounts of the actual formation of iron ores in caves have ever come to my attention. Under these circumstances, the following account of a small ore deposit still in progress of formation may be of interest. It is prepared from notes made at various intervals some years ago, while engaged in development work in the iron region lying along the Chesapeake & Ohio Ry. in Virginia.

The old fluxing quarry of the Lowmoor Iron Co., near Lowmoor station, is located in flat-lying limestone beds, belonging to the upper portion of the Helderberg or Lewistown series. It was worked in great rooms or chambers, carried up to a roof of Oriskany sandstone, which in turn is overlain by black Devonian shales. The sandstone is firm, but fairly porous; the shales contain a rather high percentage of iron, in the form of carbonate nodules, of pyrite, and of oxide.

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*Mining geologist, 725 Munsey Bldg., Washington, D. C.

During operation the quarry rooms at several points broke into old water channels and caves, varying greatly in size. One of these was, at the time of my study of the district, filling with a deposit of brown iron ore. The deposited material was derived from infiltrating waters, which had become charged with iron carbonate during their downward passage through the black shales above the quarry.

Water enters this particular cave at several points, either percolating through the strata or flowing through small channels dissolved out of the limestone. This water carries various materials, some in solution and some in suspension, and the different products of deposition are of interest.

One of the larger channels, for example, brought into the cave a large quantity of fine clayey material, carrying it, of course, entirely in suspension. This clay was spread out as an even deposit over the floor of the cavity. Samples which I took were analyzed by J. H. Gibboney, with the results shown in the table.

ANALYSES OF DEPOSITS IN LIMESTONE CAVITIES

| | Clay | Precipitated deposits | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| | % | % | % | % |
| Silica | 55.64 | 5.40 | 6.29 | 24.46 |
| Alumina | 23.80 | 11.87 | 5.45 | 9.10 |
| Ferric oxide | 6.18 | .... | .... | .. |
| Titanic oxide | 0.10 | .... | .... | .... |
| Lime | 0.52 | 0.24 | 0.16 | 0.20 |
| Magnesia | 0.54 | 0.24 | 0.33 | 1.28 |
| Soda | 0.51 | .... | .... | .... |
| Potash | 5.20 | .... | .... | .... |
| Metallic iron | .... | 46.88 | 54.56 | 29.84 |
| Metallic manganese | .... | 1.12 | 0.49 | 4.16 |
| Sulphur | .... | 0.05 | 0.03 | 0.06 |

This analysis corresponds quite closely with a number of analyses of the unaltered black shale; and the cave clay has probably been subjected to relatively little change during its transportation and deposition.

The waters seeping through the strata, having been filtered fairly free from all suspended matter, give deposits of strikingly different character from the clay just mentioned. The seepage waters carry iron carbonate in solution and this is deposited where the waters encounter air and free space on entering the cave. The deposition takes place in two distinct forms: (1) as an ocherous powder or mud, sometimes aggregated into hard lumps, on the cave floor, and (2) as iron stalactites hanging from the roof of the cave. Samples of these iron deposits were also analyzed by Mr. Gibboney with results as shown.

Of these, No. 1 represents the composition of the iron stalactites hanging from the cave roof; and No. 2 is the average of several lumps of the hard ocher formed by deposition on the floor of the cave. Both of these, it will be noted, are good brown ores, far above the average commercial ore of that district, and comparing favorably with any of the better class of eastern or southern brown ores.

Sample No. 3 is of fine ocher mixed with the cave clay and might perhaps be accepted as representing the average of the material with which the cave would finally be filled, provided the two classes of deposits should keep coming in at about their existing rate.

Certain irregularities in the analyses may be noted, i.e., the high manganese determination in No. 3 and the high alumina value in No. 1. The first of these requires little comment, for the presence of even a small nodule of manganese oxide in the sample would account for it. The high alumina of No. 1, however, is more noteworthy, for if confirmed it implies that the stalactites contain, in addition to brown ore, bauxite or some related aluminum hydroxide.

⁂

# Variation in Hoist Design

The Newport Mining Co., of Bessemer, Mich., on the Gogebic range has under construction by the Nordberg Manufacturing Co., three large hoists, interesting for the fact that while two of them are corliss engines of highly economical design, the other is a simple slide-valve engine.

The two former are for the Anvil and Palm shafts. They are twin-tandem condensing corliss hoists, having cylinders 20 and 37 by 66 in. Each hoist weighs 550,000 lb. and has two drums 10 ft. in diameter to carry 2700 ft. of 1¼-in. steel rope, one drum being clutched on the shaft to permit hoisting in balance from different depths. The design is for a load of six long tons of ore, making with the skip, a total of 13,440 lb. on each drum to be hoisted ultimately from a depth of 2700 ft. at 2400 ft. per min., with a steam pressure of 150 lb., condensing. It is estimated that at the start these hoists will probably be operated from a depth of 1700 ft., making 62 trips per hr., thus giving a capacity of 372 tons of ore per hour.

The condensing apparatus for each hoist is a Nordberg special counter-current jet condenser with corliss air pump and plunger circulating pump. The design of these condensers calls for a large condensing drum to accommodate a large volume of water and maintain a vacuum during the period of heavy load in which acceleration goes on. It is expected, when operating at the capacity noted, 62 trips per hr., from 1700 ft., that a shaft-horsepower can be developed on 28 lb. of steam delivered to the hoist; the term shaft-horsepower being taken to mean the net work due to handling the load and including all losses, such as friction in the engines, ropes, skips, etc. The hoists are to be used for much greater depths than any hitherto used in the Michigan iron country.

The third hoist is to be used at the *D* shaft of the company at Ironwood and is a simple duplex machine weighing 525,000 lb., with 34x72-in. cylinders and two drums 12 ft. in diameter, to carry 3500 ft. of 1⅜-in. steel rope. One drum is keyed to the shaft, the other furnished with a clutch. The load for this hoist will be 17,920 lb., including the skip, to be hoisted in balance from a depth of 3500 ft. at 2000 ft. per min. under 120 lb. of steam, noncondensing. At the start, the regular hoisting depth will be about 2500 ft., from which depth 40 trips per hr. will be made and 320 tons of ore per hr. hoisted.

This latter is the largest hoist in the iron country. Its relatively simple design, as against the corliss, compound, condensing type, is due to the fact that it is to replace some old hoists; to utilize the exhaust steam from these, an exhaust-steam turbine was installed about two years ago, and it was desired to continue the turbine in use.

# The Gold Road Cyanide Mill, Arizona

By Herbert A. Megraw

*SYNOPSIS—An Arizona cyanide plant which has lasted many years and passed through the era of numerous metallurgical processes. Treatment is by the all-slime method, using Pachuca tanks for agitation. The most notable feature is the recent replacement of vacuum filtration by continuous decantation. Zinc dust is used as a precipitant and the precipitate is roasted and melted.*

⁂

The mill of the Gold Road Mines Co. is situated at Gold Road, about 20 miles from the town of Kingman in western Arizona. Railroad communication is established at Kingman and connection with the mine is by wagon road over which freight is hauled by horses, and passengers by automobile stage. The region is arid, water is scarce and has to be conserved with care.

Local ores have gold as the principal valuable constituent, the metal being finely divided and distributed through a gangue consisting of quartz and some calcite in a country of andesitic rock. There is no great quantity of sulphides, the gold being free and principally fine. On account of the fineness and wide distribution of the gold, a rather high degree of crushing is required and the total-sliming process is followed.

Looking Toward the Crushing Plant — Upper Side View

Gold Road Mill, Gold Road, Ariz.

The mill is not an original construction, but rather a development; the remnants of machinery used in various processes, now relinquished, remain as reminders of the older systems of metallurgy. This changing of systems has also resulted in a scattering of the reduction plant over a good deal of territory, a fact which may be seen by a study of the accompanying photographs. Notwithstanding this circumstance, a plant of exceedingly good metallurgical performance is now in operation, the details of which are explained in this paper.

## Preliminary Crushing at Mine

Installed at the mine is a No. 5 Gates gyratory crusher where the ore receives its preliminary breaking. From the crusher it is trammed to the mill, where it is delivered into a 1540-ton bin which supplies the mill as required. During the preliminary breaking at the mine, the required portion of lime is added to the ore so that by the time the material has passed through the bin and entered the stamp-crushing department, the lime has performed a great deal of its essential work, neutralizing the developed acidity and becoming more or less slaked and ready to offset the acids which may be formed later in the course of its treatment. This method of lime addition is advocated by many operators because of the advantages enumerated above, and further, because the lump form is progressively crushed as is the ore, and develops alkaline conditions, when the addition is at the appropriate rate, just as the ore develops acidity. Others advocate the powdered form of lime, sometimes previously slaked, and make additions at the point where and time when acidity develops. No doubt a greater percentage of CaO can be dissolved by careful slaking under favorable conditions, but whether the highest ultimate economy and efficiency are reached by so doing, is a question which will have to be solved for each individual problem.

## Stamps Followed by Tube Mills

From the bin, Challenge feeders deliver the ore into a battery of forty 1050-lb. stamps, making 104 drops per min. through 7 in. The stamp crushing is done in solution. Screens of 4-mesh are used on the batteries, the stamp duty being about nine tons per stamp per day, or a total of 360 tons daily for the mill.

Pulp from the stamps is led to two distributing cones, one 4 ft. and one 6 ft. in diameter, from which it goes to six duplex Dorr classifiers, where the overflow slime is removed and the sand dewatered and delivered to the tube mills for regrinding.

There are four tube mills, each 5x22 ft., used in closed circuit with the classifiers, the delivery from the tube mills being elevated with 10x54-in. Frenier pumps and returned to the classifiers where any sand not sufficiently fine for treatment by agitation, is removed and returned to the tube mill for further grinding. El Oro linings are used in these mills and are said to be entirely satisfactory, each lining lasting a year before it is replaced.

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Note—This is the seventeenth of a series of articles by Mr. Megraw on American cyanide practice. Previous articles appeared Nov. 2, Nov. 23, Dec. 14, Dec. 21, Dec. 28, 1912; Jan. 4, Feb. 8, Feb. 15, Feb. 22, Mar. 1, Mar. 8, Mar. 29, Apr. 5, Apr. 26, May 17 and June 14, 1913. The next article will deal with "Two Arizona Cyanide Plants," and will appear on Aug. 2, 1913.

Imported pebbles are used in the mills, the consumption being 4 lb. per ton crushed.

It has been practically found unnecessary to grind this ore through a 200-mesh screen, the product passing a 100-mesh screen giving as good extraction results. In practice, the pulp delivered to the agitation treatment contains about 86 to 87% which will pass a 150-mesh screen. The specific gravity of the dry slime has been determined and is stated to be 2.63, a figure denoting about medium weight.

### PULP THICKENED AND AGITATED IN PACHUCA TANK

The entire pulp from the grinding system is received in two 30x10-ft. Dorr thickeners, the overflow solution going to clarifying tanks and the underflow of thickened pulp being taken to the agitation system. This agitation installation consists of three 17x44-ft. Pachuca tanks which were used in series, but, having found that so long a time for agitation was not necessary to secure highest extraction, this, together with the inherent inconveniences of this kind of tank, resulted in cutting out two of them and the using of only one.

With the pulp of the grade and character customary at Gold Road, it is somewhat difficult to prevent settling of a portion of the solids, and in such cases the Pachuca tank has often been found unsatisfactory. Here the settlement became so great that the time of agitation was reduced to practically nothing. It is stated that the settlement was so hard and solid that one could step over the edge into the tank and walk about, keeping away from the center, without any inconvenience.

AGITATION AND FILTRATION PLANT

THICKENERS AND SOLUTION TANKS

GOLD ROAD MILL, GOLD ROAD, ARIZ.

Thickened pulp, that coming from the thickeners into the agitation department, has the dilution ratio of about 1 to 1, and retains this consistency until after finishing the agitation treatment. Contact between the ore and cyanide solution was 36 to 48 hr. in the mill, counting from its first pulping at the cones, to its discharge. Owing to a change in the metallurgical system, this time of contact may have become somewhat protracted, but not because of any necessity of increasing the percentage of extraction. The greater part of the extraction is secured before the agitation treatment, and practically none after it.

### THICKENERS FOLLOWING PACHUCA TANKS

Issuing from the agitation system in the Pachuca tanks, the pulp is delivered to a series of thickeners where the pulp is successively dewatered and rediluted, thus washing out the dissolved metal in the pulp.

This treatment is not that which has been generally followed at the Gold Road mill. The former method, followed until a few months ago, involved delivering the slime from the agitation system into a slime-storage tank whence it was taken by a 120-leaf Butters filter installation and handled in the usual way. After the cake had been dropped from the filter leaves, it was mixed thoroughly in a tank containing mechanical agitators and discharged by gravity after passing an automatic mechanical sampler.

For many reasons, this system has been dispensed with and the pulp from the agitation system is delivered to two thickeners.

### REPLACEMENT OF FILTRATION BY DECANTATION

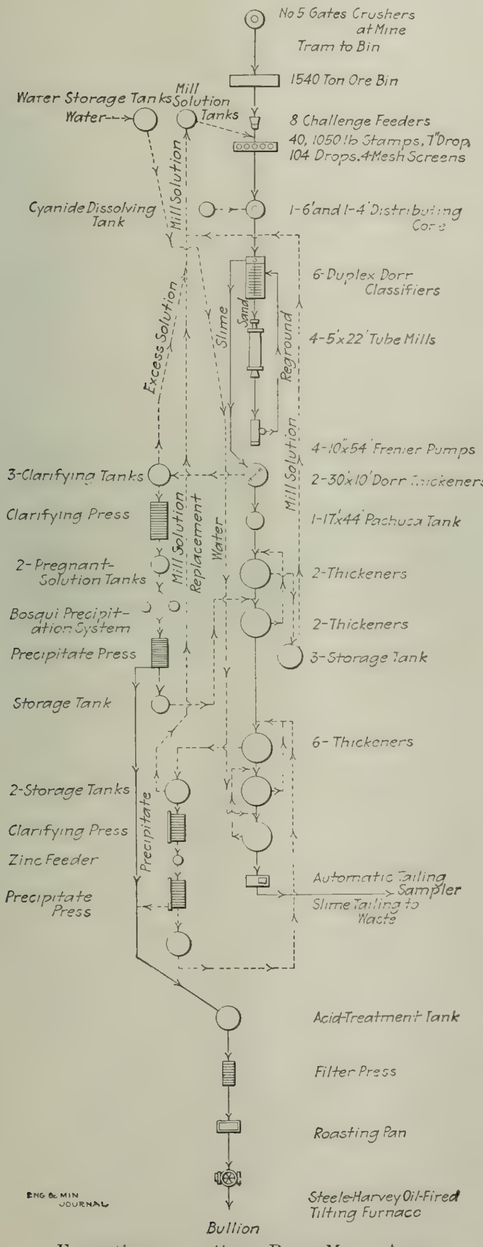
The solution overflow from these thickeners is pumped back to the head of the mill and used as mill solution, while the thickened underflow goes to two more thickeners, before reaching which, however, it is diluted with solution previously precipitated. The solution overflow from this second pair of thickeners is sent back to dilute the pulp entering the first pair of thickeners. This solution, overflowing from the first pair of thickeners, does not require immediate precipitation as it consists largely of precipitated solution as has been shown. The first solution for precipitation is taken from the overflow of the Dorr thickener, through which the pulp passes before reaching the agitation system in the Pachuca tanks.

### A SECOND THICKENING SYSTEM

As a final result, then, the pulp from the agitation system going into the first thickening unit, consisting of two pairs of thickeners, issues from it in form of a thick pulp of about the same consistency at which it entered, having been meantime diluted with barren solution, and twice thickened. The barren solution has passed through the pulp, diluted the metal-bearing solution, and carried most of its value to the mill solution circulation. From this circulation a great proportion of the solution passes to precipitation from the first Dorr thickener, which follows the tube mills, avoiding any extensive building up of value in solution.

Underflowing from the first thickening system, the thick pulp goes to a second system, which consists of three pairs of thickening tanks. In this unit the pulp is repeatedly thickened and washed, water in this case being the washing medium. The counter-current system is followed, water entering at the final thickener and progressing backward to the first of the series, the solids taking the opposite direction.

There is provided a separate precipitation circuit to accompany this washing unit, with facilities for diverting the solution either into the mill-solution circuit, before precipitation, or into the washing circuit itself after precipitation. The precipitate joins the bulk of that from the main precipitation system, which is carried to the refining department. The movement of pulp and solution is graphically shown in the accompanying flow sheet.



Flow Sheet of Gold Road Mill, Ariz.

### An Example of Preference for Decantation

Undoubtedly, the adoption of this system will be regarded with interest by everyone connected with the process. Not merely is it interesting as an example of continuous counter-current decantation, noteworthy as it is from that point of view, but more particularly because that system has supplanted a large, modern, vacuum-filter installation with results, according to statement of the operators, better than those obtained under former method of operation.

There is food for considerable serious thought in this change, but there is danger of falling into popular form of error, and regarding the procedure as a reversion to a system already discarded, or, in other words, a step backward. A little thought, however, will make clear the fact that it is nothing of the kind, but rather a refinement of an earlier process, than which no change can be more progressive. It is clear to the most casual observer that the system used at the Gold Road mill is not applicable to all mills, although it may, as in the present instance, be applied occasionally with favorable results both as to percentage of recovery and cost of operation. It is applicable in its present form only where solutions carrying low cyanide percentages can be used and where the amount of metal in solution is comparatively small, conditions which are manifestly present when low or medium-grade gold ores are treated. Where high-grade solutions are used, it would be impossible to use the system in this form because a large loss of cyanide would be entailed, but by following up the decantation with a form of continuous filtration which would reduce the moisture content of the residue to about 25%, the system is not only feasible, but advantageous. To steer clear of generalities is necessary for the intelligent consideration of any innovation, so that in estimating the value of this one, it must not be considered revolutionary nor reactionary, nor anything more than a simple, clear application of a newly developed system to a particular case.

### Precipitation Is by Zinc Dust

Solutions of both circuits are precipitated with zinc dust, the special feeders and presses being provided in each case, as is shown in the flowsheet. Square-frame presses are used, and not the triangular form usually found in Merrill installations. A variation of the general filter-press practice is the use of three filter coverings for each plate. The layer next the cake of precipitate is of filter paper, the intermediate one of light muslin, and the outer one of the usual canvas. The paper is removed and burned with each precipitate cake, the intermediate sheet lasts for several clean-ups, while the canvas, by careful cleaning, is made to last indefinitely.

The method of precipitating and also of adding zinc dust to the solution is the Bosqui system, controlled by the Merrill Metallurgical Co. and, as is usual, the Trent agitator is used for emulsifying. The consumption of zinc dust amounts to about 0.4 lb. per ton of solution precipitated. Precipitate is handled in the usual way. Formerly acid treatment was not resorted to, but at present a preliminary acid "cutting-down" is made and the mass of precipitate is then roasted. The dry product of the roasting pan is fluxed and melted in a Steele-Harvey oil-fired furnace.

Experience at this plant has been such as to demonstrate that solutions containing exceptionally low percentages of cyanide can be precipitated successfully when the percentage of lime carried is sufficiently high. Solutions containing as little as 2c. to 15c. in gold and very weak in cyanide, solutions from washing systems, are successfully precipitated by carrying high alkalinity.

As has already been mentioned, the lime is added at the mine crushing plant. The consumption amounts to about 0.65 lb. per ton treated. Treatment solutions usually carry 2 to 2½ lb. CaO, per ton of solution.

### CYANIDE ADDED IN TUBE MILL

The regular addition of cyanide for keeping up the strength of mill solutions, is at the tube mill. This is often considered an excellent point for addition of cyanide, as it is immediately crushed and put into solution; besides, the energetic agitation in the mill, together with the somewhat elevated temperature, gives the best opportunity for dissolving the greatest possible quantity of metal.

Solutions, at the Gold Road mill, are carried at about 2 to 2½ lb. KCN per ton, only one strength being in use. The consumption is about 0.4 lb. per ton of ore treated.

Extraction of gold is usually about 91% or more, and is calculated by using the combined content of bullion produced and tailing discharged as the content of the ore milled. Recognizing the limitations of this system, careful duplication and check samples are taken continuously in various parts of the mill.

The total milling process requires 530 hp. for its operation and 20 men are employed continuously, two of these being repair men.

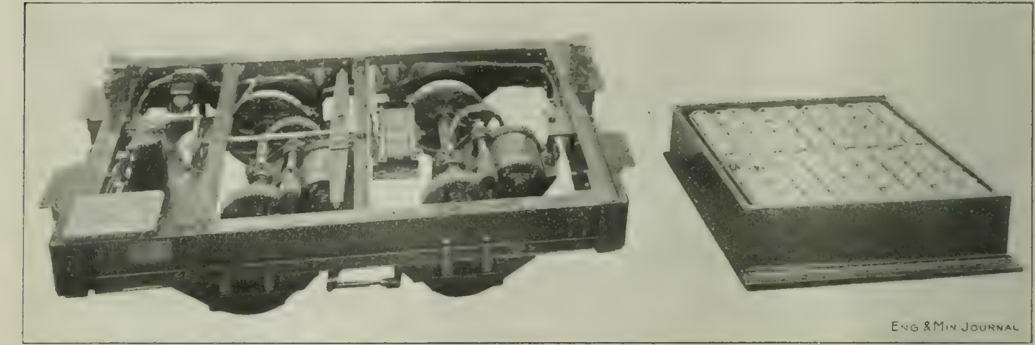
Detailed cost data on this installation would be exceedingly interesting, but unfortunately the policy of the company is adverse to such publication, and for that reason no figures can be given. It may, however, be said that the expenses are altogether reasonable and in conformity with those found satisfactory in the best installations of its kind.

# Storage-Battery Locomotive for Gathering Work

One of the latest applications of the storage-battery locomotive is for gathering work in coal mines. One of these locomotives was recently installed in the Glendower colliery, of the Philadelphia & Reading Coal & Iron Co., for this service.

The locomotive is equipped with two 85-volt motors and controller, and type A-8 Edison 70-cell batteries, having a 300-amp. capacity with a discharge rate of 60 amp. for five hours. The cells are grouped in 18 trays and mounted on top of the locomotive frame in a wooden case. The rated drawbar pull is 1000 lb., and the speed 3½ miles per hour. At the full rated drawbar pull and speed, one charge of the batteries is sufficient for nine miles. Assuming a car and track friction of 30 lb. per ton on level track, this rating is equivalent to 300 ton-miles on one charge.

The frame of the locomotive consists of steel channel sides and steel plate ends held together rigidly by bolts and steel angles. The end plates are faced with wooden bumpers to which suitable couplings are attached.



STORAGE-BATTERY LOCOMOTIVE USED FOR GATHERING AT GLENDOWER COLLIERY

The motors are series wound, totally inclosed and are of the automobile type. One motor is mounted on each axle in a cast-steel suspension cradle. The motors drive the axles through double-reduction gearing. The illustration shows the truck and battery arrangement.

⁂

# Occurrence of Pyrrhotite in Wisconsin

What appears to be the first reported occurrence of pyrrhotite in the state of Wisconsin is described by Rupert Mather Bragg (*Econ. Geol.*, June, 1913). It occurs near the town of Mountain in the northeastern part of the state. The mineral mass is found in a gabbro dike traversing pre-Cambrian granite. The nature of its occurrence indicates that it was a magmatic separation out of the gabbro, since it is fresh near the surface and shows no secondary enrichment; merges into the gabbro along indefinite lines, and shows a spheroidal shelly structure near the outcrop. Its shape and size have not been well defined. It shows no nickel on analysis.

⁂

**The Broken Hill Proprietary Co.** in the half year ended Nov. 30, 1912, produced 1367 tons of spelter and 212 tons of blue powder

# Milling in Southeastern Missouri—III

By Claude T. Rice

*SYNOPSIS—At the Federal mill, described in detail, 4000 tons per day are treated, an average recovery of 85% being made. The ore is crushed by Symons gyratories, Symons disk machines and rolls to a maximum of 10 mm. The oversize of 1¼-mm. trommels is treated on Hancock jigs, especial care being taken to produce a clean concentrate. The middlings product is treated on other Hancock jigs. Drag classifiers, in conjunction with hydraulic classifiers, provide an excellent feed for concentration on Wilfleys and vanners. Magnetic-separator and canvas plants add to the extraction.*

⁂

In this article will be described the milling practice of the Federal Lead Co., Flat River, Mo. At this mill I believe the best work in the district is being done at present, for the mill is in no way crowded as to tonnage. The ore is accurately sampled and weighed so that the recovery can be ascertained with certainty. This recovery averages about 85 per cent.

Federal Mill and Tailings Pile, Flat River, Mo.

(Method of distributing tailings by launders from top of pile is shown.)

### Excellent Results Obtained

The excellence of this milling work is largely due to the method of keeping the slime out of the table feed. Moreover, more attention is paid to the recovery of the slime than at some of the other plants in the district. One of the greatest contributing factors toward the excellence of the recovery is the high standard of the Hancock-jig practice. Also, great care is exercised to obtain a thoroughly mixed ore for feeding to the different concentrating devices. A notable feature of the mill is its completeness. Not only are the fine sizes of galena followed about as far as possible, commercially, but the concentrates and middlings are re-treated until, finally, the pyrite and chalcopyrite are taken out of the middlings concentrates by a preliminary roast and magnetic separation. The tailings from the magnetic separator are sent back to the mill where the galena and blende in them are separated.

Mechanically, the mill is not so interesting as the Doe Run No. 3 mill. There is a separate breaker house connected by a belt conveyor to the fine-ore bin at the head of the mill building proper. In the design of the mill building the ordinary lines of construction were followed with launder feed to tables, overhead drive and overhead distribution of wash water.

The mill has two terraces and four floors. On the bottom floor are carried the main settling tanks and the vanners. Above is the main table floor, which is carried by the structural-steel frame at the same height as the second terrace. On the second terrace are the foundations for the fine-ore bin, the rolls for recrushing middlings from the jigs as well as the elevator pits and settling tanks for gathering together the coarse concentrates. On the floor above are placed the jigs. In a sort of gallery floor, still higher, are carried the drag classifiers, while even with the top of the fine-ore bin is the trommel floor. To aid in getting from one floor to another a man elevator of the ordinary belt-and-handle type is put in near the sampling plant. The canvas plant is in a separate building.

Most of the ore comes to the mill from No. 1 shaft, where it is handled in skips. This dumping into the skip pockets underground followed by dumping into the receiving pockets at the surface and the further transferring by pan conveyor to the mine bins results in a thorough preliminary mixing. At the other shaft of the Federal company the ore is hoisted in cars, and dumped into mine bins. The ore is hauled to the bins of the crusher house from the different shafts in 45-ton side-dump railroad cars over the tracks of the company. The ore is discharged into two small sloping-bottom bins, a bin being provided for each of the two sections of the crusher house.

### Ore Broken by Symons Gyratory Crushers

The ore is fed through a bin gate of the upward-working slide type, operated by compressed air. These gates can be opened or closed quickly, so that if a boulder gets caught under the gate the valve on the cylinder is quickly reversed, the gate raised slightly, and closed again as soon as the boulder has slid past. The ore goes directly to the Symons 7½ C gyratory crusher used in each section. The feature of the Symons coarse crusher is the fact that the crusher head itself does not rotate, but is pushed straight in and out by an eccentric sleeve that is carried on the rigid shaft of the crusher head. Owing to the fact that the eccentric causes the movement of the head through direct contact with it, the movement of the crusher head is as much at the top as at the bottom. Consequently, there is a better gripping of boulders and a quicker breaking of them with this gyratory when they approximate the maximum feed for the crusher than in the case of the gyratory-shaft type.

An important feature in the Symons crusher is the great saving in height made possible by the form of the eccentric. This amounts to a saving of about 5 ft. in the case of the 7½ C size, and largely decided Mr. Guess in its favor, as he had only a limited amount of head room at his disposal. There is also a saving of about 40% in the weight. On the crushers at this mill manganese-steel crusher heads are used. These are slightly corrugated to aid in the crushing. The capacity of these crushers was much more than the rated capacity, which necessitated intermittent feeding at first. To enable the attendant to feed them in this way without excessive power consumption a Bristol recording ammeter was installed at the loading platform. The necessity of intermittent feeding was remedied by cutting down the throw of the eccentric so as to reduce the movement on the crusher head.

The ore from each of these crushers drops to a belt conveyor and is taken past two electromagnets to the launder which feeds the Symons disk crushers. This double precaution to insure the removal of iron from the feed is necessary because of the trouble it would give in the disk machines.

### SYMONS DISK MACHINES FOR INTERMEDIATE CRUSHING

In the design of the Symons disk machine, a rather new combination of crushing principle is used. It is the combination of a nip such as is obtained in the Blake crusher, with the spreading of the feed each time that it is broken, so that centrifugal force can discharge the undersize material as fast as it is formed. There is no grinding action in the crusher such as characterizes other types of disk machine, for the two disks rotate in the same direction at the same speed. Since the undersize is thrown out by centrifugal force as soon as formed, the ore is crushed in one operation from 4 in. to ¾ in., without any marked production of slime. Owing to the loose bed in the crushing zone, the Symons disk machine can be started when full of ore without any excessive torque.

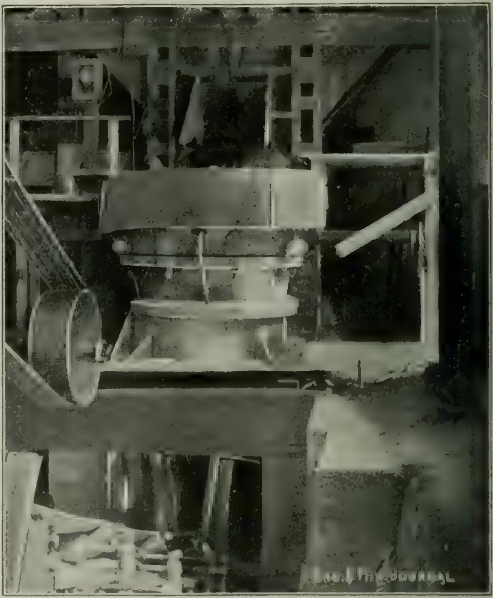
One of these 48-in. disk machines will crush 50 to 60 tons an hour, requiring 60 to 65 hp. to run it. The costs of upkeep and attendance are small. From the experience at this mill it is judged that the cost for repairs and maintenance is 0.2c. per ton of feed. The Symons disk machine seems destined to make a field for itself in the crushing of ores. It must be remembered, however, that it is not a fine crusher, but an intermediate one, and the manufacturers do not like to make machines for crushing much finer than ⅝ in. In fact, experience has shown that the disk machine works best when crushing to a size not less than twice the movement of the disk jaws. In finer crushing, especially noticeable at about ⅜ in. size and under, there is a tendency for a sort of grind to develop. This is because of the small movement that can be allowed the jaws without the production of a large amount of oversize.

At the Federal mill the ore is elevated from the disk crushers to 48x144-in. trommels having 10-mm. screens punched from No. 10 gage sheets. These screens last about three weeks. On the bucket elevators the cups are only 14 in. wide, while the belt is 28 in., the cups being spaced 9 in. apart and staggered, so as to load the belt more uniformly. On all the dry elevators, the buckets are staggered in this way.

### ROLLS FOR FINE CRUSHING

From the trommels the oversize goes to 24x18-in. rolls, the product from which is elevated to trommels with 10-mm. screens similar in every way to the previous set. These return their oversize to the rolls that feed them. The undersize from all these trommels is taken by a 24-in. Robins belt conveyor up past the sampling mill to the 24-in. conveyors and traveling tripper that beds it in the bin. The progress of the ore through the sampling plant is shown in the accompanying flow sheet. A sample amounting to $^1/_{1600}$ of the whole is taken, and in order to allow the ore coming from each mine to be sampled separately, if desired, a sample bin is provided with eight compartments, into any of which the samples can be run.

The old crushing system used at this plant included a Blake and three sets of rolls in each of the two sections of the crushing plant. While a great improvement has resulted as to the fines in the mill feed, the advantage has come from increased simplicity, allowing fewer crushing devices to be used, with an increased capacity of 1000 tons per day and a decreased power consumption of 100 horsepower.



SYMONS COARSE CRUSHER, SHOWING RECORDING AMMETER

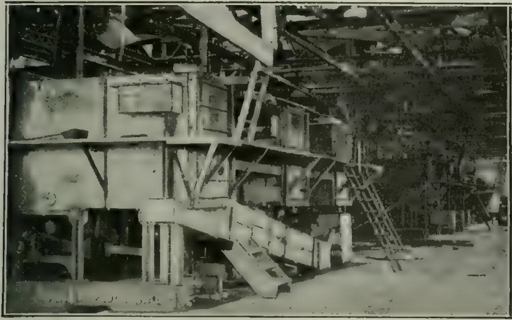
The ore from each fine-ore bin goes to a shaking chute fitted with springs, so as to put it in tension. Owing to these springs, although the chutes are about 15 ft. long, no trouble is experienced. There are three double sections in the mill proper, and a shaking chute is placed at the head of each single section. The shaking chute discharges to a bucket elevator, which takes the ore to the top of the mill building where water is added before the ore is sent to the trommels. On these trommels 1¼-mm. screens are used, which are finer than those used in the other mills of the district.

Mr. Guess does not believe in using Harz jigs on these low-grade lead ores, except in handling a small product like the chalcopyrite-galena-pyrite middlings that he gets from the Hancock jigs. What is too fine for treatment on the Hancock jig he thinks should go to tables. Owing to the fineness of these screens, they are subjected to great wear, but as they are punched from No. 18-gage steel they last about 15 days. This makes the cost about 0.5c. per ton of ore milled. Owing to the fact that the tough limestone tends to break into chunky fragments and not into needle-shaped chips, like the chert does at Joplin for instance, there is practically no trouble from blinding of the screen. An important aid in keeping the screen from blinding is the use of a strong jet of water, which is kept playing on the sides of the screen just above the point where the bed of pulp rides in the trommel. This jet generally knocks any fragments of rock out of the holes of the screen before they are fairly caught in them.

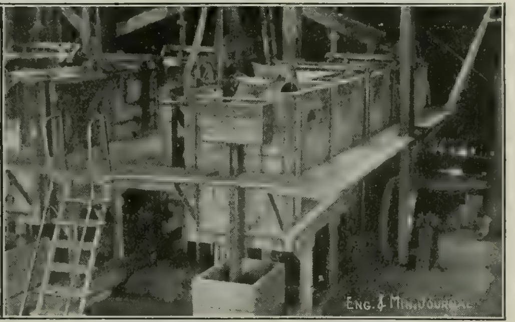
### Drag Classifiers Do Good Work

The oversize from the 1¼-mm. trommel goes to the Hancock jigs, while the undersize goes to a sloughing-off box that removes some of the water and finest slime, sending it to the slime spitzkasten. The underflow from this sloughing-off box goes to an Esperanza-Federal drag classifier, which was described in the Journal of Sept. 28, 1912. This apparatus works admirably in eliminating the troublesome slime water that ordinarily is present in tabling; apparently, far better than any other method so far devised for this purpose in connection with the bottom-discharging classifiers of the ordinary type. Indeed, prior to this, one of the few instances where any attempt was made on a large scale to get rid of the slime at the start of milling operations and to send it to the department where it belonged before being excessively diluted, was in the design of the present Washoe concentrator at Anaconda, Mont., where a sloughing-off spitzkasten is used to float off the slime.

The sending of pulps to the place where they belong just as soon as possible in the treatment is a principle of milling that is not appreciated enough. It is a mistake to let slime and the finer sand reach the classifying compartments of a hydraulic classifier; especially one of the present standard types, in which the coarser sizes are drawn off first and the finer sizes last. If the slime is removed before the classifier is reached the type of classifier does not matter so much, but if not, there will always be dirty table water coming off every fine table fed from these classifiers. The method of removing slime in the Overstrom system will be described in the next article of this series, but where the bottom-discharging classifiers are used, there does not seem to be any better way of getting rid of the slime than by the use of drag classifiers.

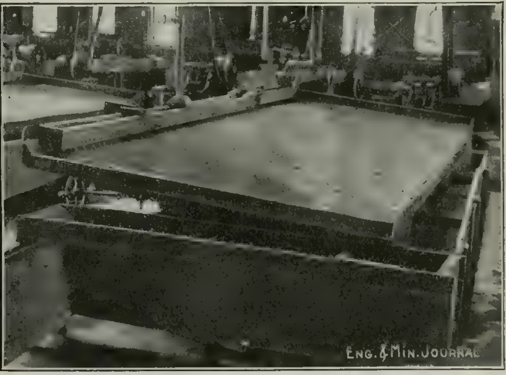


Hancock Jig Floor, Federal Mill



Shovel Discharging Jig Tailings

One of the Wilfley Tables Handling First-Spigot Pulp



One of the Middlings Tables, Showing Improved Riffling

The cost of upkeep on the drag classifiers is not great, and they make an excellent separation of sand and slime. While the accompanying screen analysis shows the nature of the slime overflow from the machine, the test of the freedom of the overflow from sand contamination is best shown by the comparative absence after weeks of running of any sand bed on the vanner belt between the feed box and the wash-water drips. This condition of the separating field of the vanners is an excellent test of the efficiency of previous classification. It is of importance that this fact should be considered, for it is doubtful whether good work on vanners can be done when the slime concentrate has to be dragged up through such an interfering field of irregularly classified sand.

### Good Work from Hancock Jigs

We have now come to the Hancock jig. The jigging practice here is probably the best in the country where Hancock jigs are used, since the tendency of free galena to get into the middling compartment is carefully guarded against by the use of a special middlings jig. By this method, good results are not so dependent upon the constant watchfulness of the attendant, as at the Doe Run mill. Moreover, a clean concentrate is obtained from the lead hutches of all the jigs. In most mills in the district, there is a disposition to save the galena in a somewhat coarser condition, so as to avoid sending heavy coarse concentrate to the rolls along with the middling. But at the Federal it is thought better to make a clean concentrate since it is believed that there is little real sliming of the galena resulting from passing it through regrinding rolls. The saving of the extra cost of railroad haul and smelting because of the smaller tonnage of concentrates to be treated is deemed sufficient to warrant this procedure.

In order to obtain clean concentrates from the jigs, it is necessary to maintain a fixed bed all the time. The more even grade of the ore coming to the Hancock jigs at the Federal mill through the excellent mixing and bedding which the ore gets, aids greatly, I believe, in the maintenance of the jigging beds. Mr. Guess, however, does not think that the evenness of the grade plays any especially important rôle in obtaining high-grade concentrates from these jigs. Of course, the most important factor in determining the thickness and maintenance of the bed is the mesh size of the sieves.

### Precautions to Maintain Jig Bed

Mr. Guess uses finer screens over the concentrate hutches than those used on the Doe Run Hancock jigs, although he crushes to 9 mm. as they do. Over the first hutch, Mr. Guess uses a 5-mesh, No. 16 brass-wire screen, and on the second and third a 4-mesh screen, having the same size brass wire. On the fourth compartment he uses No. 10 gage iron, having 10-mm. holes punched in it, and over the fifth, or last, hutch, the same gage is placed, with 9-mm. holes. In this way the concentrates are kept from working through the sieves so fast that the bed will get thin, and, therefore, what concentrates do work through are as clean as with other types of jigs, where the maintenance of a cleaning thickness of concentrates is more assured. As a further precaution, the space between the first two slats of the tray is blocked, so that the rush of the feeding current will not stir up the bed, and cause unclean concentrates to work their way through the screen into the hutch. Iron slugs are also added, to help form the bed, especially on the fourth and fifth sections of the tray. The only drawback to the use of a fine screen on the Hancock jig is that more of the coarse galena is thrown into the middling, but after the crushing of this ore most of the galena is fairly fine. The question of what size screen to use on the Hancock jigs is the important point to decide in practice, when treating an easily slimed material like galena ore. As coarse a screen should be used as consistent with cleaning the concentrate properly.

The Hancock jigs in the Federal mill run at 195 reciprocations per minute. The upward movement of the stroke is ½ in., and the forward and back movements, ¾ in. A strong bump is used. The Hancock jigs are of wood, and are set directly upon the concrete floor, so that they are carried rigidly. The jigs are built along standard lines, except that the company buys the iron work from the licensees, the Allis-Chalmers Manufacturing Co., and supplies its own lumber, thus obtaining a somewhat better box and tray at approximately the same cost. The tray supports are all cast steel. All the jigs in a unit are driven from a line shaft, which also drives the drag classifiers and the trommels.

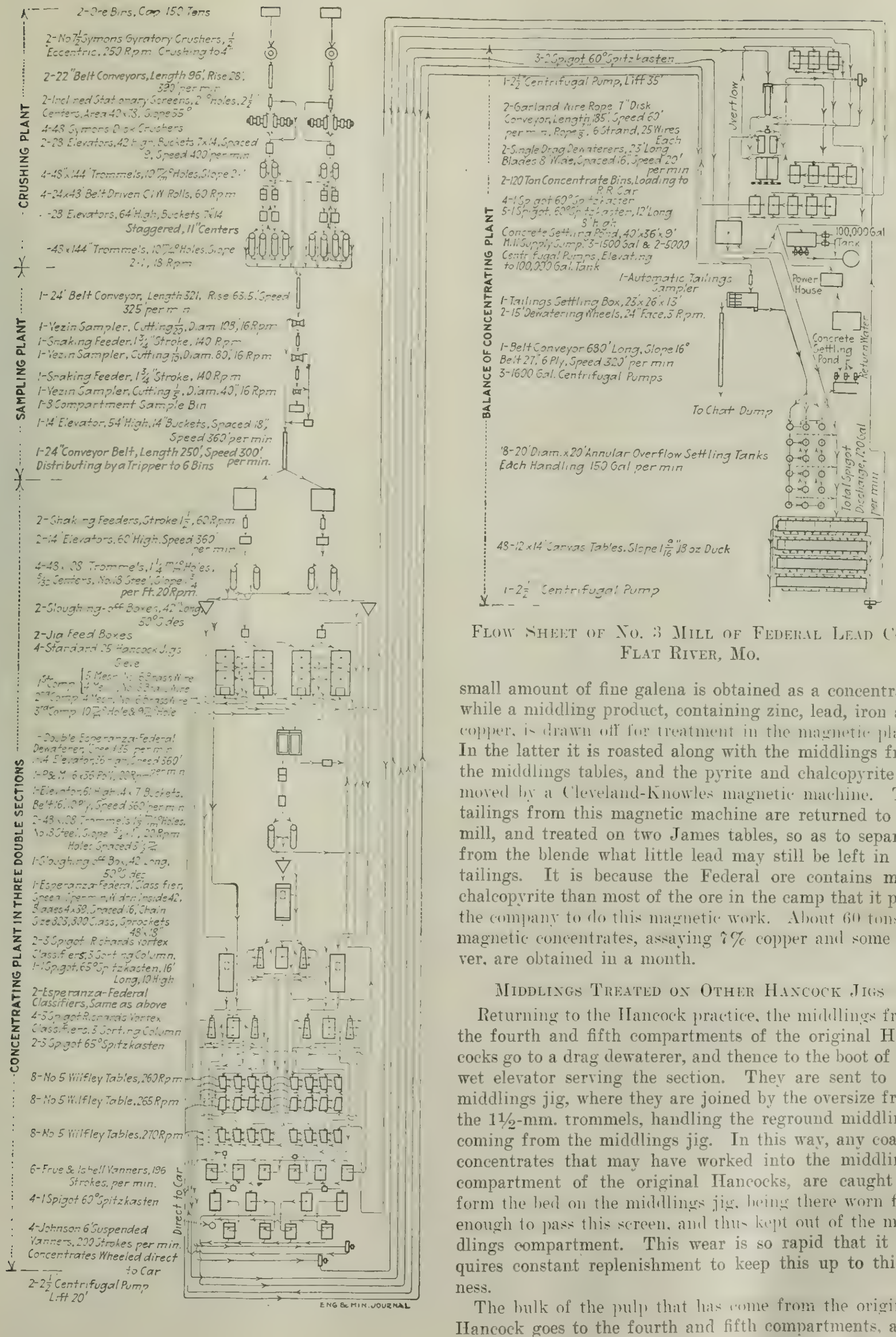
Lug Concentrates Conveyor at Federal Mill

The feed to a Hancock jig is about 350 tons of original feed, with about 200 tons of middling feed. These Hancock jigs make concentrates on their first three compartments. The concentrates of the first two hutches on a jig are clean galena, while those from the third hutch contain pyrite and chalcopyrite with a little blende. The concentrates from the first hutch assay about 77½%, those from the second, 71½%, while those from the third assay 60% lead.

### Concentrates from Third Hutch Re-treated

The concentrates from the third hutch are sent to a dewaterer, the thickened product flowing to a 2-mm. trommel. The oversize is practically clean galena, which is sent to the concentrates bin; for, owing to the greater friability of pyrite and chalcopyrite, and the finer particles in which they occur in the ore, these minerals, as well as the blende, tend to go into the finer sizes when the ore is crushed. Indeed, the oversize from the 2-mm. screen averages 70% lead, and the undersize only 35% lead. The undersize from the 2-mm. screen goes to a two-compartment Harz jig having a 5-mesh, No. 16 brass-wire screen on both compartments, and a heavy bed of coarse concentrates obtained from the Hancock jigs, and replenished each morning.

The tails from the Harz jig go to a centrifugal pump and are raised to a Wilfley table, by means of which the


CRUSHING PLANT
2-Ore Bins, Cap. 150 Tons
2-No 7½ Symons Gyratory Crushers, ½" Eccentric, 250 Rpm. Crushing to 4"
2-22" Belt Conveyors, Length 96', Rise 28', 390' per min
2-Inclined Stationary Screens, 2" Holes, 2½" Centers, Area 40x78, Slope 55°
4-48 Symons Disk Crushers
2-28 Elevators, 42' High, Buckets 7x14, Spaced 9, Speed 400' per min
4-48"x144" Trommels, 10 mm Holes, Slope 2:1
4-24x48 Belt Driven C.I.W. Rolls, 60 Rpm
-28 Elevators, 64' High, Buckets 7x14 Staggered, 11" Centers
-48x144" Trommels, 10 mm Holes, Slope 2:1, 18 Rpm
SAMPLING PLANT
1-24" Belt Conveyor, Length 321, Rise 63.5', Speed 325' per min
1-Vezin Sampler, Cutting 1/20, Diam. 108", 16 Rpm
1-Shaking Feeder, 1¾" Stroke, 140 Rpm
1-Vezin Sampler, Cutting 1/15, Diam. 80", 16 Rpm
1-Shaking Feeder, 1¾" Stroke, 140 Rpm
1-Vezin Sampler, Cutting 1/5, Diam. 40", 16 Rpm
1-3 Compartment Sample Bin
1-14" Elevator, 54' High, 14" Buckets, Spaced 18", Speed 360' per min
1-24" Conveyor Belt, Length 250', Speed 300' per min. Distributing by a Tripper to 6 Bins
CONCENTRATING PLANT IN THREE DOUBLE SECTIONS
2-Shaking Feeders, Stroke 1½", 60 Rpm
2-14" Elevators, 60' High, Speed 360' per min
4-48x108 Trommels, 1¼ mm Holes, 5/32 Centers, No. 18 Steel, Slope ¾ per Ft. 20 Rpm.
2-Sloughing-off Boxes, 42" Long, 50° Sides
2-Jig Feed Boxes
4-Standard 25 Hancock Jigs
Sieve
1st Comp. 5 Mesh No. 6 Brass Wire; 4 Mesh No. 6 Brass Wire
2nd Comp. 4 Mesh No. 6 Brass Wire
3rd Comp. 10 mm Hole & 9 mm Hole
-Double Esperanza-Federal Dewaterer, Speed 35' per min
-14 Elevator, 36' High, Speed 360' per min
1-P.& M. 16x36 Roll, 20 Rpm
1-Elevator, 61' High, 14x7 Buckets, Belt 16", 10 Ply, Speed 360' per min
2-48x108 Trommels 1½ mm Holes, No. 18 Steel, Slope ¾:1, 20 Rpm, Holes Spaced 5½ mm
1-Sloughing-off Box, 42" Long, 50° Sides
1-Esperanza-Federal Classifier, Speed 1' per min, Width inside 42", Blades 4x39, Spaced 16", Chain Size 825, 800 Class, Sprockets 48"x18"
2-3 Spigot Richards Vortex Classifiers, 3 Sorting Column.
1-1 Spigot, 65° Spitzkasten, 16' Long, 10 High
2-Esperanza-Federal Classifiers, Same as above
4-3 Spigot Richards Vortex Classifiers, 3 Sorting Column
2-3 Spigot 65° Spitzkasten
8-No 5 Wilfley Tables, 260 Rpm
8-No 5 Wilfley Table, 265 Rpm
8-No 5 Wilfley Tables, 270 Rpm
6-Frue & Isbell Vanners, 196 Strokes, per min.
4-1 Spigot 60° Spitzkasten
Direct to Car
4-Johnson 6' Suspended Vanners, 200 Strokes per min. Concentrates Wheeled direct to Car
2-2½ Centrifugal Pump Lift 20'
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BALANCE OF CONCENTRATING PLANT
3-2 Spigot 60° Spitzkasten
1-2½ Centrifugal Pump, Lift 35'
2-Garland Wire Rope 7" Disk Conveyor, Length 185', Speed 60' per min, Rope ⅝", 6 Strand, 25 Wires Each
2-Single Drag Dewaterers, 23' Long Blades 8" Wide, Spaced 16", Speed 20' per min
2-120 Ton Concentrate Bins, Loading to R.R. Car
4-1 Spigot 60° Spitzkasten
5-1 Spigot, 60° Spitzkasten, 12' Long 8' High
Concrete Settling Pond, 40'x36'x9'
M. H. Supply Sump. 3-1500 Gal & 2-5000 Centrifugal Pumps, Elevating to 100,000 Gal. Tank
Overflow
100,000 Gal Tank
1-Automatic Tailings Sampler
Power House
1-Tailings Settling Box, 23'x26'x13'
2-15' Dewatering Wheels, 24" Face, 3 Rpm.
Concrete Settling Pond
Return Water
1-Belt Conveyor 680' Long, Slope 16° Belt 27", 6 Ply, Speed 320' per min
3-1600 Gal. Centrifugal Pumps
To Chat Dump
8-20' Diam. x 20' Annular Overflow Settling Tanks Each Handling 150 Gal per min
Total Spigot Discharge, 1200 Gal per min
48-12x14' Canvas Tables, Slope 1 9/16" 18 oz Duck
1-2½ Centrifugal Pump

Flow Sheet of No. 3 Mill of Federal Lead Co., Flat River, Mo.

small amount of fine galena is obtained as a concentrate, while a middling product, containing zinc, lead, iron and copper, is drawn off for treatment in the magnetic plant. In the latter it is roasted along with the middlings from the middlings tables, and the pyrite and chalcopyrite removed by a Cleveland-Knowles magnetic machine. The tailings from this magnetic machine are returned to the mill, and treated on two James tables, so as to separate from the blende what little lead may still be left in the tailings. It is because the Federal ore contains more chalcopyrite than most of the ore in the camp that it pays the company to do this magnetic work. About 60 tons of magnetic concentrates, assaying 7% copper and some silver, are obtained in a month.

## Middlings Treated on Other Hancock Jigs

Returning to the Hancock practice, the middlings from the fourth and fifth compartments of the original Hancocks go to a drag dewaterer, and thence to the boot of the wet elevator serving the section. They are sent to the middlings jig, where they are joined by the oversize from the 1½-mm. trommels, handling the reground middlings coming from the middlings jig. In this way, any coarse concentrates that may have worked into the middlings compartment of the original Hancocks, are caught to form the bed on the middlings jig, being there worn fine enough to pass this screen, and thus kept out of the middlings compartment. This wear is so rapid that it requires constant replenishment to keep this up to thickness.

The bulk of the pulp that has come from the original Hancock goes to the fourth and fifth compartments, and is drawn through and sent to drag dewaterers, which are somewhat shorter, and have a steeper angle to the draining bottom, than those handling the original feed. In this way, the water in them is greatly reduced, and the fines are floated off and taken to the slimes department. The thickened pulp is sent to 16x36-in. rolls, which discharge to the wet elevator that feeds 1½-mm. trommels. The oversize from these trommels goes to the middlings Hancock jigs, thus completing the middlings circuit.

Before leaving the subject of Hancock jigging, I wish to call attention to the great improvement that has been made at the Federal mill in discharging the tailings from the jig. This is accomplished by the use of a drag belt. The tailings are thus discharged in a practically dewatered condition. In an accompanying halftone is shown the dewatering wheel which was used on some of the jigs until the drag belt was found to be better. The tailings are shoveled out where they can be readily seen by the attendant, thus enabling him to keep better track of the work of the jigs.

On some of the jigs an arrangement is also installed for drawing middlings from the top of the screen at about the end of the third hutch compartment. The coarse middlings, too large to go through the screen, that are drawn off in this manner, drop down into the fourth hutch through an opening at the bottom of the screen. This is an innovation that was copied from one of the mills of the Federal Mining & Smelting Co. in the Cœur d'Alene district.

POWER DATA, MILL OF FEDERAL LEAD CO., FLAT RIVER, MO.

| Motor List | Number | Hp | Total Hp | Hp.-Operating Ave. |
|---|---|---|---|---|
| Crushing plant | 2 | 250 | 500 | 490 |
| | 2 | 10 | 20 | 18 |
| Conveyor and sampling plant | 1 | 50 | 50 | 20 |
| | 1 | 3 | 3 | 1.5 |
| Conveyor over bins | 1 | 20 | 20 | 12 |
| Jig room | 3 | 50 | 150 | 102 |
| Elevators and screens | 3 | 50 | 150 | 106 |
| Regrind rolls | 3 | 50 | 150 | 80 |
| Table room | 6 | 20 | 120 | 78 |
| Concentrates conveyor | 1 | 10 | 10 | 9 |
| | 1 | 3 | 3 | 2.5 |
| Chat dewaterers (1-motor reserve) | 2 | 25 | 50 | 12 |
| Chat conveyor and pump | 3 | 50 | 150 | 106 |
| | 1 | 20 | 20 | |
| Concentrates pumps | 5 | 10 | 50 | 35 |
| Mill supply pumps | 2 | 250 | 500 | 170 |
| Mill supply pumps | 3 | 75 | 225 | 50 |
| Mill supply pump | 1 | 50 | 50 | 27 |
| Return-water pump | 1 | 85 | 85 | 82 |
| Return-water pumps | 2 | 40 | 80 | |
| Canvas plant | 2 | 20 | 40 | 31 |
| Canvas plant | 1 | 10 | 10 | 7 |
| Magnetic plant | 1 | 25 | 25 | 18 |
| Magnetic plant | 1 | 20 | 20 | 9 |
| Magnetic plant | 1 | 10 | 10 | 8 |
| Total | | | 2491 | 1474 |

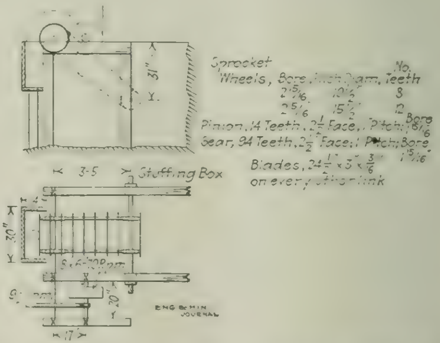
HANCOCK JIG OPERATING DATA

Having reviewed the principal points in the Hancock jigging practice it may be well now to take up the operating data. Each 25-ft. Hancock jig, in the opinion of Mr. Guess, will handle 350 to 400 tons of original feed without crowding. It will treat feed down to 1 mm. size fairly well, but the fines are not handled so efficiently as the coarser sizes. It takes 5 hp. to drive one of these jigs. The life of the screens is from six to eight months. The upkeep, exclusive of screens, is about $8 per jig per month, or 0.1c. per ton of original feed. Before shovel wheels were installed on the jigs, the amount of water required per jig was 300 gal. per minute, or about 1 gal. per ton of feed to the jigs. With the shovel wheel the amount of water required is 200 gal. per minute per jig, or ⅔ gal. per ton of feed. With the drag belt probably about ½ gal. per minute per ton of ore is required.

The grade of the Hancock concentrates is about 75% lead, although at times they have averaged as high as 77%. Approximately 58% of the concentrates recovered at the mill comes from the jigs. The average assay of the Hancock jig heads is 3.5% lead by wet assay, while the tailings assay about 0.65% lead. The accompanying table, giving analyses and assays of the different sizes, shows that with this ore there is little more lead in the larger sizes than in the smaller sizes. Table tailings assay about 0.2% lead. It is not thought that finer grinding of the tailings would pay on this ore. Only in the fine sizes coming off with the jig water is there any notable increase in the grade of the different sizes. When the increase does come, the proportion of that size by weight to the total amount of tailings is small. With this ore there can be no question but that the Hancock jig has an evident field, especially when the question of cost is considered. At this mill it is only 3c. per ton of total mill feed, 75% of which is treated on Hancock jigs.

HYDRAULIC AS WELL AS DRAG CLASSIFIERS USED

Classification at the time of my visit was mainly done with Richards vortex devices, but in some sections the type of classifiers used in two of the concentrating plants of the Cœur d'Alene district of Idaho is used, and it is possible that in the improvements being made in the mill this type of classifier will in time be installed in all sections. This Bunker Hill & Sullivan classifier is similar in principle to the Yeatman slot type illustrated in Richards' "Ore Dressing." The whole principle of this classifier is the use of a slot by which the hydraulic water is introduced in a broad band. The hydraulic water is fed into a large pressure compartment, so as to insure the discharge from it of an even upward current.


Sprocket Wheels, Bore, Pitch Diam., No. Teeth
2 5/16
10½
8
2 5/16
15½
12
Pinion, 14 Teeth, 2½ Face, Pitch; Bore 8/16
Gear, 94 Teeth, 2½ Face, Pitch; Bore 1 5/16
Blades, 24½ × 3 × 3/16 on every other link
3-5
Stuffing Box
31"
30"
20"
17
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DRAG DEWATERER ON HANCOCK JIG AT FEDERAL MILL

The sand from each drag classifier goes to two three-spigot hydraulic classifiers. The overflow from these joins the overflow from the drag classifiers and the sloughing-off cones ahead of them, and goes to spitzkastens for settlement prior to treatment on tables and vanners. The first-spigot product of each of the classifiers treating original feed assays about 15% lead.

COARSE JIG TAILING TREATED ON WILFLEYS

The first-spigot product from both of the original-feed classifiers in a single section of the mill goes to four Wilfley tables. The smooth cleaning portions of the decks of these tables are almost completely covered with concentrates, yet the tailings assay only 0.2% lead by wet assay. On these tables there is about 8 or 9 ft. of almost clean water coming off along the tailings side which, were it not for the drag classifiers, would on the finer sizes be a slimy water. The second-spigot product from each hydraulic classifier goes to a single table. This feed assays 5% lead, and the tailings 0.2%. The third-spigot products from both classifiers are united, and go to one Wilfley table. The heads assay 5% and the tailings 0.4% lead.

The undersize from the trommels handling the reground middlings, goes to a sloughing-off cone that feeds the underflow to a drag classifier, which in turn feeds the dewatered pulp to two hydraulic classifiers; the middlings from two single sections are kept separate from the original feed. The pulp coming from the first spigot of these classifiers is not nearly so rich as that coming from the corresponding spigot of the classifiers receiving original feed, as it only assays about 6% lead. The first-spigot product of the two classifiers is taken by a common launder to one Wilfley table. The tails from this table assay about 0.25% lead. The pulp from the second spigots of these classifiers goes to one Wilfley, the heads assaying 4% and the tails 0.25 per cent. The third-spigot products unite and go to one Wilfley table, the tailings assaying about 0.4% lead.

SCREEN ANALYSES, FEDERAL MILL

(Symons Disk Crusher Product)

| | % |
|---|---|
| + 1 in. | 36 |
| + ¾ in. | 35 |
| + 10 mm. | 16 |
| + ¾ mm | 11 |
| — ¾ mm. | 2 |
| | 100 |

FEED TO CONCENTRATING MILL

| | % |
|---|---|
| + 7 mm. | 13 |
| + 4 mm. | 34 |
| + 2 mm. | 22 |
| + 1¼ mm. | 10 |
| + ¾ mm. | 4 |
| + 80 mesh. | 7 |
| — 80 mesh | 10 |
| | 100 |

The overflowing pulp from the hydraulic classifiers treating original feed, goes, as I have said, along with the drag-classifier slime to a spitzkasten. From this, three different pulps are drawn off at the bottom. The first spigot, in each instance, feeds a Wilfley table, the tailings product from which is then thickened in a spitzkasten and passed for second treatment over a vanner.

VARIOUS SCREEN ANALYSES AND ASSAYS AT FEDERAL MILL,

HANCOCK JIG FEED*

| | Weight % | Assay % Pb. | Lb. Pb. in 100 | Value % |
|---|---|---|---|---|
| + 1 mm. | 93.3 | 2.81 | 2.622 | 75.9 |
| + ¾ | 3.2 | 12.00 | 0.384 | 11.1 |
| + 60 mesh. | 1.9 | 14.70 | 0.279 | 8.1 |
| — 60. | 1.6 | 10.5 | 0.168 | 4.9 |
| | 100.0 | | 3.453 | 100.0 |

* Oversize of trommels having 1-mm. screens instead of 1¼-mm., as at present.

The second spigot of each feeds a vanner, while the third-spigot products from the two spitzkasten are united and taken to one vanner. In all instances, the tailings from the first vanners after thickening go to a second vanner to be reconcentrated, before they are settled and sent to the canvas plant.

These vanner feeds average about 5% lead, the tailings from the first vanners average about 2.8%, while the tailings from the second set of vanners, which go to the canvas plant for final treatment, along with the other slime, assay about 2.2% lead. The riffling of the middlings tables is different from that of the tables handling original feed, for the pulp resulting from the recrushing of the Hancock middlings contains a large amount of chalcopyrite and pyrite, with some blende, as these minerals in the recrushing, go into the fines. The riffles are carried out beyond the ordinary line of termination, so as to begin to spread the concentrates well up on the smooth cleaning plane of the table. In this way, a broad banding is obtained, and the minor sulphides can be cut out as a middling product without much trouble, and sent to the magnetic plant for further treatment.

HANCOCK JIG TAILING

| | Weight % | Assay % Pb. | Lb. Pb. in 100 | Value % |
|---|---|---|---|---|
| + 9 mm. | 3.9 | 1.46 | 0.057 | 8.3 |
| + 8. | 4.6 | 0.70 | 0.032 | 4.7 |
| + 7 | 6.0 | 0.48 | 0.029 | 4.2 |
| + 6 | 11.3 | 0.78 | 0.088 | 12.8 |
| + 4. | 31.3 | 0.80 | 0.250 | 36.5 |
| + 2 | 23.1 | 0.37 | 0.085 | 12.4 |
| + 70 mesh. | 18.8 | 0.33 | 0.062 | 9.1 |
| — 70 | 1.0 | 8.35 | 0.082 | 12.0 |
| | 100.0 | | 0.685 | 100.0 |

ESPERANZA-FEDERAL DRAG CLASSIFIER FEED

| | Weight % | Assay % Pb. | Lb. Pb. in 100 | Value % |
|---|---|---|---|---|
| + ¾ mm. | 4.4 | 13.50 | 0.594 | 5.3 |
| + 70 mesh. | 23.5 | 15.75 | 3.701 | 32.8 |
| + 150. | 8.1 | 18.50 | 1.498 | 13.3 |
| Sand — 150. | 31.7 | 12.00 | 3.804 | 33.7 |
| Slime — 150. | 32.3 | 5.20 | 1.680 | 14.9 |
| | 100.0 | | 11.277 | 100.0 |

The top riffles extend to about 3 ft. of the end of the table, while the bottom riffle comes to about 3 in. of the edge. The intermediate riffles are cut off and the slanting line determined by these two riffles.

Both on the tables treating original feed, and on those treating the reground middlings, a true middlings product is cut out and is taken back to the drag dewaterer feeding the rolls, and in this way is returned to the system to be run through again. The tailings from jigs and tables go to a settling tank. The tailings are discharged from this tank at about 12% moisture by two 13-ft. shovel wheels to a 27-in. troughed conveyor belt that carries them up a slope of 29 ft. to 100 to the top of the tailings pile. Water is pumped to the top of the pile and added to the tailings as they drop off the belt, so that they can be distributed in all directions by means of launders. From 400 to 500 gal. per minute are pumped to the top of the pile for this purpose, when treating about 3500 tons of ore per day. The tailings pile now contains more than 2,000,000 tons, and has been built up close to 200 ft. in the air. An accompanying halftone shows the manner of distributing the tailings from the the top of the pile, and shows the approximate inclinations of the launders.

ESPERANZA-FEDERAL DRAG CLASSIFIER SAND DISCHARGE

| | Weight % | Assay % Pb. | Lb. Pb. in 100 | Value % |
|---|---|---|---|---|
| + ¾ mm. | 9.1 | 5.52 | 0.502 | 4.1 |
| + 70 mesh | 33.5 | 7.40 | 2.479 | 20.1 |
| +150 | 16.0 | 17.10 | 2.736 | 22.2 |
| Sand— 150 | 35.5 | 16.90 | 6.000 | 48.7 |
| Slime — 150 | 5.9 | 10.00 | 0.590 | 4.9 |
| | 100.0 | | 12.307 | 100.0 |

ESPERANZA-FEDERAL DRAG CLASSIFIER SLIME OVERFLOW

| | Weight % | Assay % Pb. | Lb. Pb. in 100 | Value % |
|---|---|---|---|---|
| + 150 mesh. | 0.4 | 5.00 | 0.020 | 0.4 |
| Sand — 150 | 31.6 | 7.00 | 2.212 | 40.0 |
| Slime — 150. | 68.0 | 4.85 | 3.298 | 59.6 |
| | 100.0 | | 5.530 | 100.0 |

The tailings belt is made up of several sections, the first one is 200 ft. center to center, the next 300 ft., the last 100 ft. It takes 55 hp. to operate these stackers, while the centrifugal pumps for elevating the water to the top of the pile, require 30 hp. The cost of handling the tailings in this way is not high, as only three men are required on the pile, and the belt will last about eight months. The total cost is approximately 2c. per ton of tailings, 1c. of which is for maintenance.

The tailings from the vanners, and the overflow from the different settling tanks, all go to a concrete settling pond alongside the mill, that is 40 ft. long, 36 ft. wide and 9 ft. deep. The clear water overflow from this tank is elevated by centrifugal pumps to the 100,000-gal. tank at the head of the mill. The settled pulp, and the overflow from the shovel-wheel tank go to 18 settling tanks, 20 ft. in diameter and 20 ft. deep, that send a total of 720 gal. of thickened pulp per minute to the canvas plant, while the overflowing water is pumped back to the mill.

RICHARDS CLASSIFIER

First Spigot

| | Weight % | Assay % Pb | Lb Pb. in 100 | Value % |
|---|---|---|---|---|
| + ¾ mm ... | 18.7 | 15.30 | 2.861 | 16.5 |
| + 70 mesh | 57.0 | 16.10 | 9.177 | 52.9 |
| + 150 | 15.1 | 22.20 | 3.352 | 19.3 |
| Sand — 150 | 7.0 | 25.00 | 1.750 | 10.1 |
| Slime — 150 | 2.2 | 9.10 | 0.200 | 1.2 |
| | 100.0 | | 17.340 | 100.0 |

Second Spigot

| | Weight % | Assay % Pb | Lb Pb. in 100 | Value % |
|---|---|---|---|---|
| + 70 mesh. | 16.9 | 0.75 | 0.127 | 2.3 |
| + 150 | 45.8 | 1.75 | 0.801 | 14.3 |
| Sand — 150 | 34.3 | 13.20 | 4.528 | 81.0 |
| Slime — 150 | 3.0 | 4.35 | 0.130 | 2.4 |
| | 100.0 | | 5.586 | 100.0 |

## CANVAS PLANT HAS 18 TABLES

In the canvas plant are 18 tables, 12 ft. wide by 14 ft. long, covered with 18-oz. duck. The slope of these tables is 1 1/16 in. per ft. Four boys, under the supervision of a foreman, wash off these tables every 20 minutes. The boys work barefooted on the tables all the year around. These tables are arranged six in a row, the tables in each double row being placed back to back. There are two double rows on the top and two double rows on the bottom floor of the canvas plant. The canvas lasts about five months. During the first weeks, when the canvas still has more fuzz to its fibers, it catches the concentrates better than when it becomes worn.

The heads to this plant assay about 3% lead, and the tailings 1.8%, showing an extraction of about 40%. The concentrates assay from 15 to 16% lead. They are pumped back to the main mill, where they are treated on two Wilfley tables; the slime and middlings from these tables go to a vanner. Only a lead concentrate is made on the table and the vanner from this canvas-plant concentrate. It assays about 70% lead.

The manner of handling the concentrates is a nice one. The coarse concentrates from the jigs go to a settling box, and are scraped out of this box and up two long V-shaped launders, lined with a semicircular bottom of cast iron, by a **Garland wire-rope conveyor.** The latter has 7-in. cast-iron disks attached to the rope. The rope is 7/8 in. in diameter, and is made of six strands having 25 wires each, so that it will be highly flexible. This rope is run at a speed of 60 ft. per minute, by a gripping sprocket wheel that catches the lugs. This is a standard make of conveyor, put on the market by the Jeffrey company, and has been found highly satisfactory for handling the coarse concentrates. The upkeep of the conveyor is not over $150 per year, and it handles about 130 tons of concentrates per day. The power required is only 3 hp. for each conveyor, so the cost of handling the coarse concentrates is extremely low.

These conveyors feed the concentrates into one of two steel tanks, where what little water is left in the concentrates drains off at the top, and goes to the settling tanks that are used to dewater the table concentrates. The concentrates from the steel tanks contain about 5% moisture as loaded into railroad cars in which they are sent to the smeltery.

The table concentrates go to a series of settling tanks, the spigot products of which are elevated by centrifugal pumps to one of two large V-boxes, from which they are discharged by a chain scraper into the concentrate bin that is then receiving the concentrate. The overflow from these different concentrate settlers in the basement is pumped back into the mill circulation, and used as feed water on the tables.

Frue vanners and one Isbell vanner are used. The Isbell is liked much better than the older type, for the one which was in use at the time of my visit had given no trouble during the year it had been in operation. The only upkeep cost was that of lubrication. The belt on it had not been adjusted once in the year.

A total of 96 men on the three shifts is required in the operation of the whole plant. In milling 3600 tons per day, 7000 gal. of water are used per minute, or about 2 gal. per min. per ton of ore milled. Of this, 1500 gal. is new water added to the system. In the operation of the plant, 1500 hp. are used.

TAILINGS-BELT FEED

(Coarse Tailings Only)

| | | | | |
|---|---|---|---|---|
| + 9 mm......... | 1.0 | 1.00 | 0.010 | 1.5 |
| + 8 ......... | 1.9 | 0.98 | 0.011 | 1.6 |
| + 7 ......... | 5.8 | 0.91 | 0.058 | 8.8 |
| + 6 ......... | 14.4 | 0.85 | 0.181 | 27.2 |
| + 4 ......... | 34.2 | 0.50 | 0.171 | 25.7 |
| + 2 ......... | 28.8 | 0.50 | 0.144 | 21.6 |
| + ¾ ......... | 11.8 | 0.51 | 0.060 | 9.0 |
| + 80 mesh. | 1.4 | 1.00 | 0.014 | 2.1 |
| + 150 | 0.5 | 1.47 | 0.007 | 1.1 |
| — 150 | 0.2 | 4.37 | 0.009 | 1.4 |
| | 100.0 | | 0.665 | 100.0 |

Included in the Federal mill building is a testing plant where carload shipments from the different Guggenheim properties can be tested, under the direction of Mr. Guess. The Federal plant indirectly benefits from this testing work, for when any question of milling work comes up, there is a crew of men available to put on the working out of the problem; an advantage which is not possessed by the ordinary mill, where the mill men and the superintendent are generally too crowded with routine operations to engage in experimental work

*(To be concluded)*

# Shannon Copper Co.

The report of the Shannon Copper Co. for the first quarter of 1913 shows that 70,472 tons of ore from the Shannon group, and 13,208 tons from the company's outside properties were treated and produced 3,649,564 lb. copper, 724 oz. gold and 33,695 oz. silver. The cost of copper per pound was 12.856c. in January; 13.809c. in February and 12.699c. in March.

The average price received was 15.354c. per lb. Net profit for the three months was $75,847. The railway earned $5956 over bond interest. Actual cash and copper on hand Mar. 31, amounted to $248,182.

# The Kedabeg Copper-Smelting Works

*SYNOPSIS—Description of a profitable smelting plant in the Caucasus, handling low-grade ore. Ore is hand-sorted, producing a grade above 5% Cu, which is smelted and a grade about 3% Cu, which is leached. Ore for leaching is roasted sometimes two or three months and leached for from 10 to to 12 years. Precipitation is on iron shavings.*

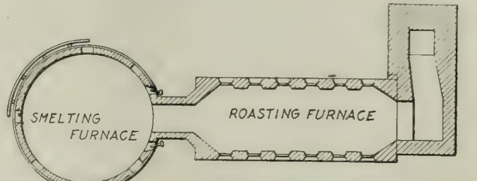
⁂

The Kedabeg Copper Works is the property of Siemens Bros., and is situated 46 miles southwest of Yelisavetpol, a station of the Transcaucasian railroad in the Little Caucasus Mountains, about 4490 ft. above the level of the Black Sea. The mine belonging to the works is situated on the cone-shaped Mis-Dag (copper hill), one mile distant. The ore occurs in numerous disconnected bodies and is composed of chalcopyrite, iron pyrite and pyrrhotite frequently intermixed with sphalerite. The ore is mined through tunnels. It is roughly sorted underground and dressed by hand on the surface where two classes are made; rich ore, with more than 5% Cu, and that with less than 5% Cu, called poor ore. The annual output of the mine averages about 50,000 tons. Reduction is performed both by the dry and wet methods, the rich ores being subjected to the first, while the poor ores, averaging about 3% Cu, are treated by wet process.

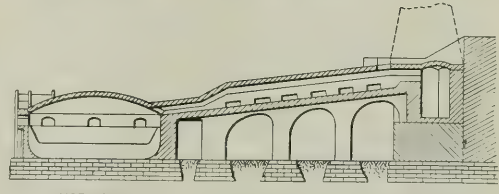
### Ore Is Hand Sorted and Screened

At the ore station of the smelting works, at the foot of the Mis-Dag, the ore is sorted by hand into rich ore, poor ore and waste, and both classes of ore are divided into coarse and fine. The fine portion of the rich ore is still further separated, by means of bumping screens, into screening (under ½ in. diameter) and ore of nut size.

The sorting is performed by boys who have to look especially to the removal of barite and sphalerite which would be detrimental to the subsequent smelting process. The quantity of coarse ore is estimated at 40% of the total, that of the fine about the same and that of nut size, at 20%. As fuel, wood and charcoal (both from deciduous trees), anthracite from the Don country and crude naphtha are used. Wood and charcoal are hauled 19 miles to the smelting works on a narrow-gage railroad from a leased forest which furnishes about 85,000 cu.m. of timber annually. The locomotives are of 50 to 60 hp. and draw four or five cars of 6.5 tons each. One pood (36.11 lb.) of anthracite, hauled by ox-team, costs on an average of 41 kopecks (22.5c.), and 1 pood of charcoal, 24 kopecks (13.2c.). Since 1 pood anthracite corresponds in calorific value to 2 poods of charcoal, the difference in cost of each fuel is not of great moment. The transportation of crude naphtha, of which 20,000 tons annually are consumed, is effected from a station called Dolljar on the Transcaucasian railroad by a pipe line 28 miles long. About halfway, near the village of Tscherdachly, at a height of 4149 ft. above the level of the Black Sea, there is an intermediate station. At Dolljar station where the naphtha arrives in tank cars, as well as at Tscherdachly, there are two steam pumps in operation. The first part of the pipe line consists of seamless steel pipe tested for a pressure of 300 atmospheres; the actual pressure is in summer 100 to 115 atmospheres, in winter about 120 atmospheres. The second part consists of welded wrought-iron pipe tested for 120 atmospheres pressure. The actual pressure obtaining in the pipe is about 40 atmospheres. To protect the pipe line against the influence of temperature, expansion joints, bent similar to a figure 8, are inserted at intervals. The pipe line raises the cost per pood of naphtha only by 1.5 to 2 kopecks. The naphtha is used in roasting and smelting the ores, in refining the copper and for steam generation. All materials needed about the smelting works are made on the ground in the shops of the company. There is a plant for making firebrick which is burned by naphtha, two stamp mills for crushing quartz and other fire-resisting material, a brick yard with a wood-fired kiln that holds 80,000 bricks and a modern machine shop.



VERTICAL SECTION



HORIZONTAL SECTION THROUGH THE SMELTING AND ROASTING FURNACE

Fig. 1

### Method of Roasting Depends on Physical Character

The ore is roasted in three different ways, according to the size of the material. Lump ore is roasted in kilns and after that, twice in heaps on a bed of wood. Each of the eight kilns has a cross-section of 7 ft. by 7 ft. 1 in. and a height of 10 ft. 5 in. They are operated without intermission and need fuel only when starting. In 24 hr., up to 15 tons of ore are put through, yielding about 10 tons of well roasted product and about five tons incompletely roasted. The latter is added again to the crude ore. The roast contains about 8% S and is piled on wood soaked in naphtha in heaps of 80 to 115 tons. The roasting operation takes about three weeks. Hence there are required from seven to eight weeks for two fires. After the second fire the ore still contains from 5 to 6% S.

The nut-size ore is roasted in a long-hearth furnace which is placed between the smelting hearth and the chimney, as shown in Fig. 1. The temperature of this furnace, which is provided with an inclined floor and is heated by the waste gases of the smelting hearth, is high, so that only the part nearest the chimney can be used for roasting purposes. The ore is charged through an

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Note—Translated by O. H. Hahn from the article by Golwatschew and Lange, in "Glückauf," May 10, 1913.

opening in the roof near the end of the furnace and is rabbled by hand, being moved to the hotter part of the furnace and discharged through the lower working doors. The labor required per 24 hr. is four men; the yield of roasted product in the same time is from 8 to 13 tons. If the temperature is too high so that there is danger of sintering, a small quantity of slightly roasted ore is added. The roasting of the fine ore is performed in Gerstenhöfer furnaces which have a cross-section of 7 ft. 4 in. by 1 ft. 9 in. and are 24 ft. 5 in. high from the furnace bottom to the arch. In the arch there are four charge-holes operated mechanically, under which 14 rows of bearers, made of brick, are arranged. One row contains 10 bearers, 7 in. in width. Under the bearers of the furnace front there are two heating arrangements using naphtha. The works contain 14 furnaces of this type arranged in pairs and provided with dust-chambers. The yield of a furnace per 24 hr. amounts to 11 tons of fine ore and the consumption of naphtha to 573 lb. The roasted ore retains on the average 3% S. The flue dust from the chambers assays up to 5% Cu, which is principally in the form of sulphate and is consigned to the copper-leaching plant. At each furnace two men are employed per shift.

### Roasted Ore Smelted in Reverberatory Furnaces

Smelting of the roasted ore is performed in circular reverberatory furnaces, designed by F. Siemens, with naphtha as a fuel. There are eight of these furnaces like that shown in Fig. 1. The interior diameter of a furnace is 19 ft. 7 in., the depth of the hearth 25 in., the distance from the arch to the level of the supporting wall 33½ in. and the entire height of the arch above the floor of the hearth 6 ft. 3 in. The walls of the furnace are constructed of firebrick and are 14 in. thick at the charge doors. At a height of 5 ft. above the furnace floor there is a cast-iron ring resting in part on the walls of the furnace and in part on iron bearers, which serves as a base for the firebrick arch. The floor of the hearth is tamped with crushed quartz. On the outside, the furnace is encased in iron plates which are held in place by rails. The latter stand with their lower ends in the foundation of the furnace while the upper ends are held by a broad steel band.

### Furnace Fired with Naphtha Burners

The furnace has seven working openings closed by doors and is heated with naphtha by means of two burners, arranged one at each side of the flue. The construction of the burners, called "Foresunken," reminds one of the gas burners used in laboratories with compressed air. The burner, which is made of phosphor-bronze, has an annular opening and rests in a cylindrical tuyere through which compressed air is blown. The naphtha enters the burner under ordinary pressure and is atomized by steam coming out of a small central pipe under a pressure of 4 or 5 atmospheres. The combustion of the naphtha is almost perfect at a distance of one foot. The axes of the two burners converge at an angle of 60°. Originally burners were applied without using blast, but the temperature attained thus was insufficient, especially for ores already pretty well desulphurized. The consumption of naphtha depends upon the degree of roasting and amounts to from 20 to 25% of the weight of the ore. The smelting mixture for a furnace is composed of 1000 kg. lump ore, 500 kg. nut-sized ore, 1000 kg. screenings and 200 kg. flux. As a flux, an igneous rock with high silica content, called trachyte, which is found in the vicinity, is used. If the slag should be rich in Cu, 150 to 250 kg. of basic slag from black-copper smelting is added. The working method is as follows: At equal intervals during 48 hours, 20 charges are placed into the hot furnace. After the last charge has been melted, the slag is skimmed and during the next 24 hours, 10 more charges are put in. After the slag has been skimmed again, copper matte is tapped. Matte and slag are run into two separate sand beds of 27 ft. 10 in. length by 10 to 13 ft. width. If, after drawing off the molten masses, congealed crusts of iron should form, which is frequently the case with too-well roasted ores, slightly roasted rich ore or unroasted copper matte is added. At the smelting furnaces, one foreman and five helpers are employed on contract in each 12-hr. shift. A furnace campaign lasts one year or more. The copper matte contains 35 to 45% Cu. A single tapping yields 12 tons on an average. Matte with more than 45% Cu is not desirable, because then the copper content of the slag will rise. The slag contains 0.4 to 0.6% Cu and is composed as follows: $SiO_2$, 23.87%; FeO, 50.52; $Al_2O_3$, 0.27; CaO, 5.02; MgO, 0.78; ZnO, 1.50; $Cu_2O$, 0.58; As, 0.12; $BaSO_4$, 16.15; S, 1.13%; total, 99.94%. If the slag should contain more than 30% $SiO_2$, it is used as a flux in smelting for black copper; ordinarily it is used for building purposes and for ballasting roads. The excess goes over the dump.

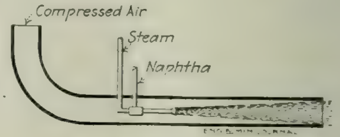


Fig. 2. Naphtha Burner

### Copper Matte Roasted Like Lump Ore

The copper matte broken to small size is roasted in the same manner as lump ore, viz., once in kilns and twice in heaps, on a bed of wood. The yield of one of the seven kilns amounts to five tons of well roasted and 2.5 tons poorly roasted copper matte in 24 hr. The poorly roasted matte is roasted again in the same kiln as the raw matte. The large amount of poorly roasted matte might be considered a detriment if it were not for the fact that its addition to the crude matte is necessary to prevent sintering of the latter. The roasted copper matte contains 8 to 10% S and is burned in heaps of 200 to 250 tons. A heap will burn about two weeks.

### Black Copper Melted in Cupolas

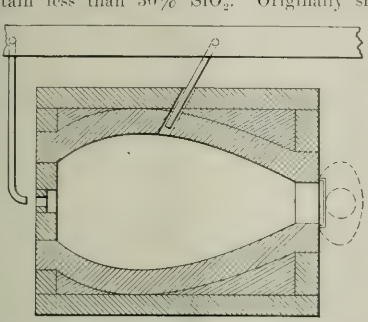
The smelting for black copper is performed in cupolas or shaft furnaces of trapezoidal section, 11 ft. 6 in. high. The length of the back wall is 3 ft. 5 in., that of the forewall 2 ft. 7 in. and the distance between the two 3 ft. 11 in. The furnace has four tuyeres which are placed in the back wall 2 ft. 3¼ in. above the bottom of the furnace. The latter is tamped with ground quartz and the walls are lined with firebrick. The arrangement of the hearth is peculiar. A forehearth which is filled once in 24 hr. by tapping the copper, communicates with the interior hearth by a slot about 20 in. high by 2¾ in. wide. During the smelting, the forehearth as well as the slot is closed with a mixture of red clay and powdered charcoal, leaving only a small hole in the latter for tapping the slag from the interior hearth when it is full. Previous to tapping the metal, the hole in the slot is closed and an excavation of about 16 in. in diameter is scooped out to the depth of the furnace bottom. After that the composition in the slot is broken out altogether.

There are four cupolas in the plant which make campaigns of a year or more. The smelting mixture is made up as shown in the accompanying table.

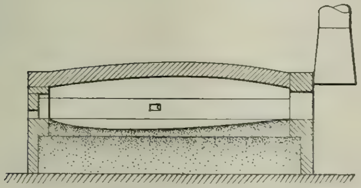
SMELTING MIXTURE

| | Kg. | % |
|---|---|---|
| Roasted copper matte | 8,350 | 56.7 |
| Slag from refining copper | 1,475 | 10.0 |
| Foul cupola slag | 3,275 | 22.2 |
| Flux (trachyte) | 1,640 | 11.1 |
| Total | 14,740 | 100.0 |

This is the task of one furnace in 24 hr. The trachyte may be replaced by slag from the smelting when it does not contain less than 30% $SiO_2$. Originally smelting for black copper was done with charcoal, by charging the smelting mixture and the coal in two separate perpendicular columns. On account of the high cost of charcoal, anthracite was substituted, whereby the consumption of fuel was reduced one-half. At the same time the number of tuyeres was reduced to three, the old style of half-conical tuyere was replaced by water-cooled conical ones and the charging was done in horizontal layers. By this method it was observed, however, that the black copper instead of coming out 93 to 94% fine in Cu, assayed only 88% fine. To remedy this evil, both kinds of fuel were mixed in suitable proportions to produce the best results. In the 12-hr. shift, three men are employed, working on contract. For generating blast, four different kinds of blowers are used.



VERTICAL SECTION



HORIZONTAL SECTION THROUGH THE REFINING FURNACE

FIG. 3

### Copper Contains Many Other Elements

The furnace is tapped for metal once in 24 hr., yielding on an average 3300 kg. black copper. The latter is removed from the forehearth in cakes by means of hooks. The black copper has this composition: Cu, 93%; Fe, 2.50; Zn, 1.50; Ni + Co, 0.05; As + Sn, 1.70; Pb, 0.75; Sb + Bi, traces; Ag, 0.08; Au, 0.0049%. In all probability it also contains sulphur which has, however, not been determined. As the roasted copper matte contains from 1.5 to 2% of sulphur, there is also a matte with 50 to 60% Cu formed aside from the black copper. With the furnace in good condition it should not exceed 3 to 4% of the weight of the copper matte charged; however, frequently as much as 10 to 15% is obtained. This matte differs from the black copper by the absence of precious metals and by a smaller amount of undesirable admixtures. It is roasted along with the ordinary copper matte and resmelted. The resulting slag contains on an average 0.6% Cu. Its exact composition is as follows: $SiO_2$, 22.86%; FeO, 23; CaO, 1.34; $Al_2O_3$, 3.2; MgO, 1.4; As + Sb, 0.2; ZnO, 4.81; S, 1.59; $BaSO_4$, 0.3%.

Refining of the copper is carried out in reverberatory furnaces, of the type shown in Fig. 3. The arch and the walls of the furnace proper are constructed of firebrick; the thickness of the roof is one brick and that of the walls 1½ bricks. The hearth is tamped in its lower part, the upper part, cut out basin-shaped, is filled in with a grouting of finely crushed and washed quartz and 14% fire clay. The opening for charging the black copper is at the small end of the furnace below the chimney. At the opposite side there is the opening for skimming through which also the blast is admitted. The furnace is heated with naphtha, using the burner previously described. In this case the atomizing of the naphtha is not effected by steam, but by air under a pressure of 1¼ in. mercury. The consumption of naphtha in 24 hr. is 1310 kg. The burner is placed in one of the long walls at an angle of 60° toward the axis of the furnace. The two furnaces are placed so that the discharge openings are directly opposite one another. In 24 hr., 2450 kg. black copper are inserted from two to three times. The refining process consists in melting down, blowing, oxidizing, poling, blowing again, and poling tough. The slag is drawn three times or more. The first slag drawn after melting down contains about 12% Cu, while the one skimmed last shows Cu as high as 70%. The labor required is one foreman, one overseer, and five laborers who are, however, required only when charging and discharging the furnace. The refined copper is cast in bars of 8 and 16 kg. The yield is 80 to 83% of the black copper charged. The composition of the refined copper is the following: Ag + Au, 0.09%; Cu, 99.57; Pb, 0.027; As, 0.038; Sb, 0.06; Ni + Co, 0.031; Fe, 0.009; O, 0.089; Bi + S, trace; total, 99.91%. From one charge about 650 kg. refinery slag with 35 to 50% Cu is obtained. It is resmelted with the roasted copper matte for black copper.

### Wet-Treated Ores Average 3% Cu

Ores assaying less than 4% Cu are treated by wet process. On an average they assay only 3%. They are first roasted to form sulphates and oxides and to loosen the whole mass. It has been mentioned already that the Kedabeg ores furnish much fine material and it is especially the poor ores which crumble up as soon as the air acts upon them for any length of time because they contain much pyrite and pyrrhotite. If such an ore is roasted and water poured upon it, it falls by itself into pieces from pea size down to fine sand. This property of the ores is of great commercial importance, for the cost of crushing it by machinery might be the factor which would make impossible the profitable treatment of 3% ore.

### Heaps Roasted 2½ to 3 Months

The poor copper ores are separated on bumping screens into an oversize (30 to 40%) and undersize. Formerly the oversize ores were first roasted in kilns and afterward in heaps. This practice was, however, discontinued because it was found more economical to roast in heaps, as the slow burning and the longer action of the heat favors that formation of sulphates. The coarse ores are now burned only once in heaps of 100 to 165 tons. As soon as the heap is on fire, it is covered over with crude fine ore in order to prolong the time of roasting, which takes from 2½ to 3 months. The heap is then soaked with water or mother liquor for several days whereby the lumps break up to powder. The liquor running off contains now considerable quantities of Cu as sulphate and is, therefore, subjected to precipitation (also called cementation). The heap itself is shoveled over, exposed to the action of the atmosphere for some time and then conveyed to the leaching yard.

The undersize is roasted in Gerstenhöfer furnaces. Their smaller consumption of naphtha (359 lb. in 24 hr.) is due to the fact that in this roasting the desulphurization is not required to be so close as for the reduction by the dry way. The roasted fine ore retains about 8 to 10% S. Water or mother liquor is poured over the ore while still hot.

### Ore Leached in Heaps

The roasted ores so prepared are now shoveled up into a large heap holding 1000 to 160 tons on a plane having an inclination of 5° to 8° and exposed to atmospheric action and that of the mother liquor which contains considerable quantities of sulphates of iron. The oxides and the sulphides of copper and iron in the ore are gradually converted into sulphates which go into solution. To allow the air to penetrate the interior of the heap, channels made of loosely built-up slag bricks are provided in it before the ore is piled on. Perpendicular channels are carried up to the surface from the points of crossing of the horizontal ones. The floors of the roast heaps were formerly made of asphalt which soon proved to be unsatisfactory; they are now made by simple tamping. Through the action of the hydrated oxide of iron and the basic iron salts of the mother liquor, the floors become firm, smooth and impermeable in a short time. On the surface of the heaps which form frustums of pyramids 6 to 10 ft. high, shallow basins are scooped out which are filled by means of movable launders, at first with mother liquor, then with liquors of less strength. This operation is only carried on in the warm season from the middle of March to the middle of November. After the lapse of a year the heap is shoveled over at the beginning of winter in such a way that the upper layers of the old pile will form the center of the new one. The progress of leaching is watched by analyzing the liquor running off from time to time. On an average, the process is finished at the expiration of 10 or 12 years. A large portion of the Cu, about [illegible] of the total, is leached out in the first year. The exhausted heaps, which still contain 0.7 to 0.9% Cu, are conveyed to the waste dump. Rains of short duration will not harm the process; the liquor running off will show even a higher copper content because the rain leaches also the sides of the heap which are exposed more to the air, but are less touched by the liquor. Rains of long duration which are of rare occurrence at Kedabeg, would, of course, greatly impair the work.

In order to hasten the decomposition of the copper sulphide and also with a view to obtaining a higher yield of copper, experiments were made using an $SO_2$ solution, made from the waste gases of the Gerstenhöfer furnaces, instead of the regular liquor. But the solution proved to be too weak for successful work. After that, experiments were made roasting the ores with 10 to 12% of sea salt in the Gerstenhöfer furnace and leaching them with an aqueous solution of the waste gases. The results were excellent, but the method proved to be too expensive on account of the high price of the salt. Therefore, it had to be abandoned.

### Copper Precipitated on Iron Shavings

The liquor running off from the heaps is conducted by a canal to a reservoir of 60 to 70 cu.ft. capacity in which particles of ore carried off mechanically will settle. From here the solution is run into tanks divided into four compartments which communicate with each other, as shown in Fig. 4. They are filled with iron shavings. After passing two or three of these tanks, the liquor leaves the last one barren. The barren liquor of several precipitation tanks is collected in a pit and by means of a pump and wooden launders distributed over the roast heaps again. The precipitate adhering to the iron shavings is washed in the trough over a 16-mesh screen. After the copper has settled, the liquor is drained off and the washing is repeated over a 64-mesh screen. The copper sinks to the bottom of the trough while the iron shavings remain on the screen. The washed precipitate contains 60 to 70% pure Cu and is melted at once without drying. Its principal impurities are the hydrates of iron and their basic insoluble salts. The consumption of iron shavings amounts to ¾ kg. for 1 kg. Cu precipitate. Aside from the copper precipitate from the roasted ores, the plant recovers in the same manner about 100 to 130 tons of copper precipitate from the cupriferous mine water.

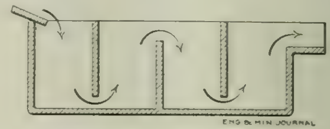


Fig. 4. Precipitation Box

### One Charge Melted per Day

Refining is done in the same furnace used for black-copper melting. The charge amounts to about three tons of raw precipitate, two tons of which are charged in the beginning. After the charge is melted, a quantity of slag is skimmed off and the remaining one ton is charged. Prior to charging, about 5 or 6% pulverized anthracite is added to the precipitate in order to reduce any $Cu_2O$. The further manipulations are the same as in the refining of black copper. Since the melting of the fine precipitate proceeds very slowly, only one charge is worked to a finish in the 24 hr. The precipitate is always refined by itself without any black copper and the yield is about 45% of pure copper on the charge. The products of the operation are the same as with black copper, only more refinery slag is produced, which contains on an average 25% Cu. The slag from the first and second melting of the copper precipitate is poor, the copper content varying between 5 and 10%. This is added to the ore charge in smelting. The content in precious metals of the copper from the precipitate is lower than that from the black copper refining.

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## Brakpan Mines

The report of the Brakpan Mines for 1912 shows that 637,523 tons were milled for a recovery of 31s. 1d. per ton, working costs being 17s. 3.9d. per ton. The total working profit was £444,117; 17,348 ft. of development work was done, of this 12,619 ft. were on reef which averaged 9.36 dwt. over 37.67 in. The ore reserves are estimated at 2,457,000 tons of a value of 6.74 dwt., with a stoping width of 58 in. The unpayable ore developed to date is 1,806,000 tons, valued at 2.27 dwt., or 34%; 23 claims out of 1150 have been exhausted to date; 57% of the tonnage milled was broken by large machines, 34% by small 2½- to 2¾-in. machines, and 9% came from development rock. The stamp duty from 160 stamps and eight tubes was 13.74 tons. The recovery was 95.2%. This mine is working at a depth of between 3000 and 4000 ft. from two seven-compartment shafts and mining a reef dipping 7 to 15°. Working conditions are trying in the deeper areas owing to heat and humidity. Details of costs are as follows:

| | |
|---|---|
| Stoping | 4 s. 7.6 d. |
| Timbering and packing | 1 s. 0.8 d. |
| Handling dump rock | 0.25 d. |
| Shoveling in stopes and tramming | 2 s. 8.8 d. |
| Underground transport | 5.8 d. |
| Surface transport | 0.6 d. |
| Winding | 10.25 d. |
| Pumping | 8.01 d. |
| Other costs | 8.37 d. |
| Development | 1 s. 6.00 d. |
| Sorting and crushing | 4.58 d. |
| Stamping | 10.36 d. |
| Tube milling | 8.48 d. |
| Sand | 8.14 d. |
| Slime | 7.04 d. |
| Recovery charge | 4.66 d. |
| Miscellaneous | 1 s. 0.16 d. |
| Total | 17 s. 3.9 d |

It will be noted that reduction costs are low, 3s. 7.25d. per ton. This is partly due to the use of Butters filters and an excellent conveyor of tailings.

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**The Mineral Resources of Barbados** are reported on by Consul Chester W. Martin. The report, with maps, will be loaned by the Bureau of Foreign and Domestic Commerce, and deals chiefly with manjak and oil prospects.

## North Butte Mining Company

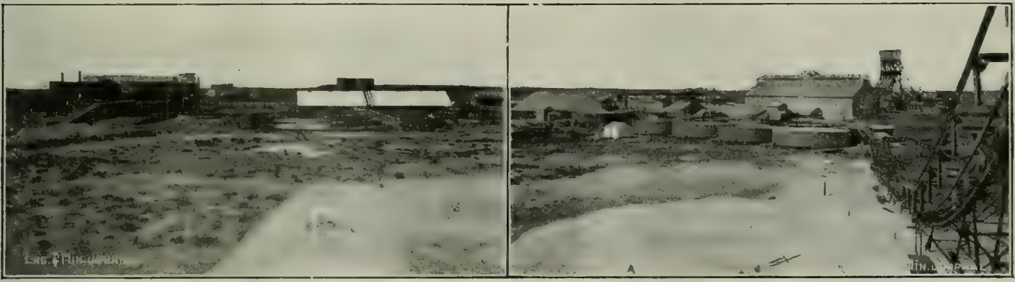
The production of the North Butte Mining Co., for the year ended Dec. 31, 1912, as shown by the official report, was 425,248 tons of ore and 49 tons of precipitates, from which 26,480,123 lb. of copper, 1,377,468 oz. of silver and 1367 oz. of gold were obtained. In 1912, four dividends aggregating $697,000 were paid.

Development work for the year amounted to 18,140 ft. divided as follows: Shaft sinking, 868 ft.; crosscuts, 8508 ft.; drifts, 6882 ft.; raises, 1777 ft.; stations, 82 ft.; winzes, 23 ft. The Granite Mountain shaft is now 50 ft. below the 2200 station, and stations were cut upon the 1800 and 2000 levels and 7 ft. of the station was cut on the 2200 level. This work will be continued until connections have been made with the lowest level of the Speculator shaft.

The principal feature of development work, in addition to finding the eastern extension of the ore on the Snowball vein, was the discovery of a body of ore on the Edith May vein on the 2400 level comparable with the ore disclosed in this vein on the upper levels, thus giving promise that this vein has again resumed its position as one of the principal ore-producing veins. The ore reserves were largely increased during the year and stand at a higher figure than at any previous time in the history of the company. This ore in reserve is estimated to average 4.5% copper and 4.5 oz. silver per ton.

The mine was in operation 342 days, the average number of men employed being 902½ and the average number of tons hoisted per day, 1270. All of the lower levels down to the 2800 were connected with the upper levels by raises and this, together with the system of ventilating fans in operation, has secured comfortable working conditions in practically all portions of the mine.

During the year electric haulage was installed on all of the levels of the mine below the 1600 and materially decreased the cost of handling material. The installation of a new Ingersoll-Rand air compressor with a capacity of 4000 cu.ft. of free air per min. was completed. It is the intention of the company to install a complete plant at the Granite Mountain shaft, including an electric hoist of sufficient capacity to operate to a depth of 5000 ft. The company acquired a three-quarter interest in the Sunset claim, which adjoins the John Emmit claim on the east, and also secured title by United States patent to the Henry claim, which adjoins the Leaf claim on the west.



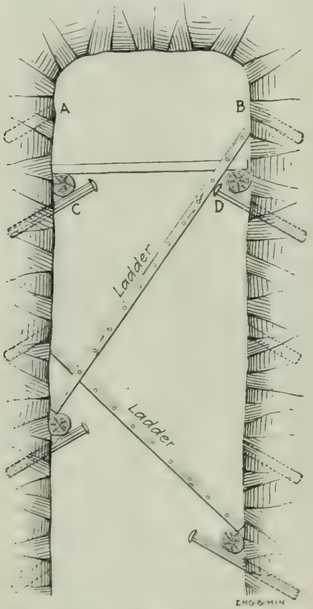
SHAFT AND MILL, BRAKPAN MINES, SOUTH AFRICA

# DETAILS OF PRACTICAL MINING

## Scaffolding in an Untimbered Raise

By Frank C. Rork*

The accompanying drawing shows a method of scaffolding applicable in driving an untimbered raise. The usual method is to cut a stull the right length and wedge it in; this is not an easy thing to do, working from a ladder, and more or less time is consumed in finding and cutting the timber, in measuring and in wedging the timber in place.



Raise Scaffold and Ladders Supported on Drill Steels

By the method here illustrated, when the round is finished, four holes are drilled, two at *A* and two at *B*, near the corners of the raise. The depth of these holes should be about 10 in., depending on the nature of the rock. They should be placed the height of one cut above *C* and *D* and will then be in the proper position to hold the scaffold after the round is fired.

The scaffold can be quickly erected on two stulls, resting on four pieces of steel inserted in the holes. As the raise progresses, the lower holes can be used to secure the ladders in the manner illustrated.

The shallow holes can be drilled rapidly and easily with all the equipment at hand and the drill steel consumed would probably be lost or wasted if not thus utilized.

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*Mine superintendent, Moose Mountain, Ltd., Sellwood, Ont.

## Safety Rules—Conveyances in the Shaft*

(1) The hoisting or lowering of men through a vertical shaft should be permitted only in an iron-bonneted safety cage, except in shafts in process of sinking or repair.

(2) All man cages should be constructed as follows: There should be a bonnet of steel plate $\frac{3}{16}$ in. thick, sloping toward each side and so arranged that it may be readily pushed upward to afford egress from the cage to persons therein; it should cover the cage so as to protect those on the cage from objects falling in the shaft; there should be a sheet-iron or steel side-casing, not less than ⅛ in. thick, or a netting composed of wire not less than ⅛ in. in diameter; there should be doors made of suitable material which shall extend at least 5 ft. above the bottom of the cage and should be closed when lowering or hoisting men, except timbermen riding on the cage to attend to timbers thereon; there should be overhead bars of such arrangement as to give every man on the cage an easy and secure handhold; there should be a safety catch of sufficient strength to hold the cage or skip with its maximum load at any point in the shaft in the event that the hoisting cable should break.

(3) Safety catches should be kept well oiled and in good working condition.

(4) Cages should be inspected daily by some competent person appointed by the superintendent and the safety catches should be tested once each month.

(5) Where hoisting of men is done by skips or cages from two or more levels, a man should be employed to have charge of the loading and unloading of such cage or skip and to give all signals to the hoisting engineer.

(6) No open hook should be used with a bucket in hoisting. Safety hooks, with opening between point and shank closed, should be employed.

(7) All shafts from which hoisting is done by means of a bucket should be provided with suitable guides, put in accurately to gage, by a template made for the special purpose and always kept on hand.

(8) The bucket should be equipped with a crosshead to travel upon guides. The height of the crosshead should be at least two-thirds of its width. If it be a type not secured to the hoisting rope, a stopper should be securely and rigidly fastened to the hoisting rope at least 7 ft. above the rim of the bucket. It should have a clearance at right angles to the wide face of the runners not less than 1 in., nor greater than 1½ in., and in the other direction not less than ½ in. nor greater than ¾ inch.

(9) Riding on skips and on top of cages should be strictly prohibited, except when absolutely necessary and in emergency cases.

(10) No person should get off or on the bucket or cage while it is in motion.

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*From Inland Steel Co.'s book of rules

(11) No person should ride upon any cage, skip or bucket loaded with tools, timber, powder or other material, except for the purpose of assisting in passing such material through the shaft and then only after a special signal has been given.

(12) When tools, timber and other materials are to be lowered or hoisted, their ends, if projecting above the top of the conveyance, should be securely fastened to the hoisting ropes or to the upper part of the vehicle.

(13) In no case should a conveyance be lowered directly to the bottom of the shaft when men are working there, but it should be stopped at least 15 ft. above the bottom of the shaft until the signal to lower further has been given the hoisting engineer by one of the men at the bottom of the shaft, provided, however, that this rule shall not apply to shafts less than 50 ft. deep.

(14) When cleaning skip pits or doing other work immediately under skips or buckets, timbers should be placed across the shaft and the skip or bucket rested there while the work is being done and not removed until it is completed.

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# Comparative Strengths of Blasting Explosives

In the course of its investigations of blasting explosives, the U. S. Bureau of Mines (*Bull.* 48) has made tests to determine the potential energy, the disruptive effect and the propulsive effect of some of the explosives in common use. The potential energy was measured by means of the bomb calorimeter in water. The disruptive effect was measured, using the Mettegang recorder, detonating fuse, Trauzl lead blocks and small lead blocks. The propulsive effect was measured in the Bichel pressure gage and by means of the ballistic pendulum. The tabulated results are given herewith, together with the approximate composition of typical examples of the various explosives. The percentages figured are rated against the effect of 40% straight nitroglycerin dynamite taken at 100 per cent.

TYPICAL ANALYSES AND STRENGTHS OF COMMON BLASTING EXPLOSIVES

| | Percentage Composition | | | | | | | | | Percentage Strength | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nitro-glycerin | Combustible Material | $NaNO_3$ | ZnO $CaCO_3$ $MgCO_3$ | Nitro-substitution Compounds | $NH_4NO_3$ | Nitro-cellulose | S | C | Potential Energy | Disruptive Effect | Propulsive Effect |
| Straight nitroglycerin dynamite, 30% | 30 | a17 | 52 | 1 | .. | .. | . | | | 93 1 | 84 1 | 96.8 |
| Straight nitroglycerin dynamite, 40% | 40 | b15 | 44 | 1 | .. | .. | .. | . | | 100 0 | 100 0 | 100 0 |
| Straight nitroglycerin dynamite, 50% | 50 | b14 | 35 | 1 | .. | .. | . | .. | . | 111 0 | 109.2 | 107.4 |
| Straight nitroglycerin dynamite, 60% | 60 | b16 | 23 | 1 | . | .. | .. | .. | .. | 104 0 | 119.8 | 114 9 |
| Low-freezing dynamite, 40% | 30 | b15 | 44 | 1 | 10 | .. | .. | . | . | | | |
| Low-freezing dynamite, 60% | 45 | b16 | 23 | 1 | 15 | .. | .. | . | | 60 2 | 93.5 | 91 2 |
| Ammonia dynamite, 40% | 22 | a15 | 42 | 1 | .. | 20 | .. | .. | .. | 101 8 | 67 9 | 99.1 |
| Gelatin dynamite, 40% | 33 | a13 | 52 | 1 | .. | .. | 1 | .. | . | 105.7 | 78.4 | 95 8 |
| Granulated nitroglycerin powder, 5% | 5 | c35 | 60 | .. | .. | .. | . | | | 67.6 | 21.6 | 53.3 |
| Black blasting powder | .. | ... | 73 | .. | .. | ... | .. | 11 | 16 | 71.6 | 6.8 | 58.6 |

*a* Wood pulp, flour and sulphur.
*b* Wood pulp only.
*c* Sulphur, coal and resin.

The figures are fairly consistent with general practice, and it is believed that the classification will serve as a useful guide for comparing the practical value of explosives. It is worthy of note that the potential energy of 40% strength ammonia dynamite and of 40% strength gelatin dynamite, that is, the theoretical maximum work that these explosives can accomplish, is higher than that of 40% straight nitroglycerin dynamite, but that the disruptive and propulsive effects, which represent the useful work done as shown by actual tests, are less. Accordingly, straight nitroglycerin dynamite is more economical for general use in blasting operations if the conditions and character of the work are such as to permit its use; nevertheless, the ammonia dynamite and the gelatin dynamite are more efficient and economical for certain kinds of work that require explosives having a large propulsive effect and a comparatively small disruptive effect. For example, in blasting soft rock, 40% straight nitroglycerin dynamite, which has a very high percussive force, may be too quick in action, whereas the ammonia dynamite or the gelatin dynamite having practically the same heaving and pushing action and less percussive force will be more suitable. The tests also show that 60% strength low-freezing dynamite is not quite equivalent to the 40% straight nitroglycerin dynamite. It is worthy of note that black blasting powder has little disruptive effect, only about one-third that of granulated nitroglycerin powder.

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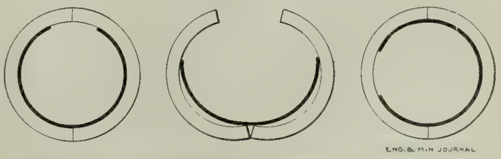
# Inserting Rock-Drill Piston Rings

It is surprising how little care is generally exercised in placing the piston rings and springs in a rock drill. In many cases a ring and spring placed in an incorrect position will bring the same result as if no spring were included.

In the accompanying sketch, says J. R. McFarland, in *Mine and Quarry,* April, 1913, the spring on the right is shown in this incorrect position. The ring has the grip of a full half circle on the spring. This grip, when accompanied by sufficient adhesion, both results in the failure of the spring and ring to expand. The sketch on the left shows the spring in the correct position. When released, the spring and ring cannot fail to spread as in the central figure.



GOOD AND BAD METHOD OF INSERTING ROCK-DRILL PISTON-RING SPRINGS

In the three-piece piston ring, the sections of the ring are so small that no section can secure a sufficient grip on the spring to cause it to stick.

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**Fifty-one men were killed in mining operations** in St. Louis County, Minnesota, during the year ended June 30, 1912, according to the Minnesota Bureau of Labor, as quoted in an "Inland Steel Safety Bulletin." Of these 51 deaths, 19 occurred underground, and 32 in open pits. Of the underground deaths, 10 were due to falls of ground and cave-ins, two to blasting, two to haulage accidents, and two were attributed to skips and cages. It will be noticed that the proportion of deaths due to falls of ground, etc., is even larger than ordinary.

# DETAILS OF METALLURGICAL PRACTICE

## Williams' Amalgamation Process

A new metallurgical process has been devised by Sidney Williams, of San Francisco, Calif., for which he has been granted U. S. pat. No. 1,056,311. It is an attempt to provide a cheap and efficient process for extracting precious metals, such as gold, silver, platinum and others, by a variation of the well known amalgamation process. The novelty of the device consists in agitating the ground or pulverized material with a solution consisting of potassium sulphate and superphosphate dissolved in water. The potassium sulphate and superphosphate are mixed together in powdered or solid form, and the mixture is dissolved in a suitable quantity of water preparatory to mixing it with the ore. The superphosphate may be a single superphosphate containing substantially 18% of $P_2O_5$, or it may be a double superphosphate containing substantially 42% of $P_2O_5$. When single superphosphate is used, the ingredients are mixed in the proportion of one part of potassium sulphate and two parts of single superphosphate, and when the double superphosphate is used, the mixture is in a proportion of one part of potassium sulphate and one part of double superphosphate. These chemicals are mixed with the ore in the presence of mercury or amalgamated copper plates, the amalgamation proceeding with added rapidity on account of the efficiency of the solution in maintaining the mercury in a bright, active state, and of freeing the gold and increasing its affinity for the mercury.

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## Doubly Burned Dolomite for Furnace Work

The preparation of dolomite for use in furnace work by burning in a cupola and then in a rotary kiln is covered by U. S. pat. 1,063,102, issued to John E. Baker, of York, Penn. The material thus prepared is stated to be greatly shrunk, and to be free from unvolatilized carbon-dioxide, thus making it a much more desirable material than the singly burned dolomite for furnace work, and to be less easily hydrated, making it a more desirable material to store and ship.

## Large Reinforced-Concrete Launder

By Claude T. Rice

A launder of reinforced concrete is used at the Baltic mill to carry away the overflow after dewatering the tailings for transportation on the belt conveyor. As the water is clear, it does not erode the concrete.

The launder is 36 in. wide and 18 in. deep, inside measurement, and is made in 16-ft. sections that are designed to carry a total load of five tons each. Its entire length is 400 ft. The joints are for taking care of expansion due to changes of temperature. They are filled with strips of wood ¼ in. wide, so as to be watertight. As in time the launder is to be buried by the tailings, it is covered with 2½-in. reinforced-concrete slabs.

The sections were cast in the mill building where sand was handy. Three sizes of material were used, consisting of three parts of ⅝-in. tailings from the jigs, three parts of ordinary mill tailings, running from ¼ in. to 10 mesh in size, one part of fine sand from the regrinders, and one part of cement. Strands of old hoisting cable were used for reinforcement and the cost of the launders was only about $0.75 per ft., while an iron pipe of equivalent capacity would have cost $2.40 per foot.

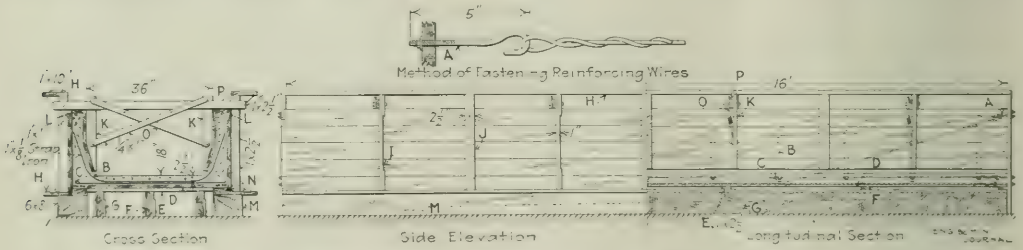


Fig. 1. Arrangement of Wood Forms for Concrete Launder

Sections of the launder (Fig. 1) show the method of reinforcing. The main longitudinal reinforcement consisted of ½-in. strands of rope, obtained by unlaying pieces of old 1¼-in. hoisting cable. Along the top, to take care of unusual tension that might result from handling during installing, a single strand was put in, while at the bottom of each side of the launder were two double strands. These were wrapped with wire about five feet from their ends, and two single strands, one for each pair, were taken up to the top of the side, while the other two were taken straight along to the end of the launder, thus caring for shearing stresses.

Before putting in the rope reinforcement, hooks *A*, Fig. 1, made of ⅜-in. rodding, threaded at one end, were fastened to the ends of each strand, the latter were heated to draw the temper, and the wires bent back and twisted around themselves so as to form loops to which the hooks could be fastened. The threaded ends of the hooks were placed in auger holes through the ends of the forms with washers between the nuts and the wood, and the whole reinforcement tightened up so that the strands would sing when struck. In this way the stretch was taken out of the rope and with the reinforcement drawn tight, there was no danger of its being displaced during the pouring of the concrete.

To reinforce against shear between the sides and bottom of the launder, pieces of 1x1/8-in. strap iron *B* from the scrap pile, were put in at intervals of 18 in., running up both sides and across the bottom of the launder in continuous strips and to about every other one of these straps, to help reinforce the bottom of the launder, an extra piece *C* was added, running across the bottom only with a slight turn-up at each end for anchorage.

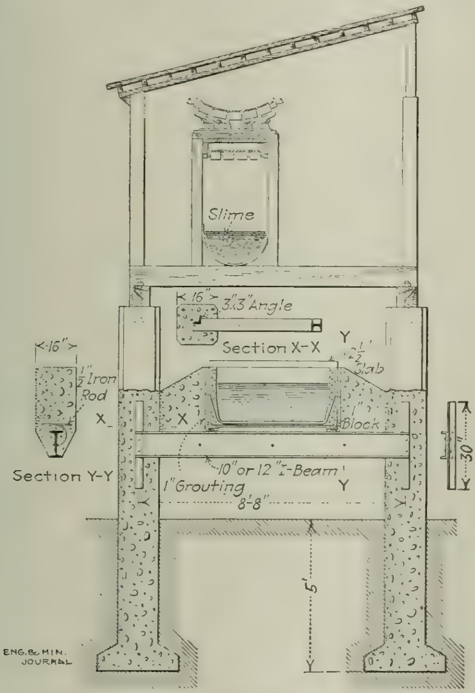


Fig. 2. Supporting the Erected Launder

Longitudinal reinforcement of the bottom was obtained by three single ½-in. strands above the straps. The bottom was cast 2½ in. thick and the sides 3 in. increasing to about 5½ in. near the bottom; along the bottom of the sides there was carried a ridge 4 in. wide and 1 in. deep, on which the main weight of the launder rested when set in its supports. The top slabs for covering the launder were made in 4-ft. lengths, 2½ in. thick, reinforced with three single ½-in. strands running longitudinally and short pieces of the same rope running crosswise at intervals of about 2 ft. A 1x1-in. jog was made in the inside top corner of the sides for the slabs to rest in.

With the forms constructed as they were, it was possible to take the side forms off in 24 hr., and so only two sets of side-forms were necessary for making the 25 sections. However, it was not thought advisable to disturb the launders in the least until they had set some time, so about five bottom forms were required. These were simple panels and were not expensive.

The forms were built up from the floor of the mill as shown in Fig. 1. The bottom panel of 1-in planks *D*, held together by 1x2½-in. nailing strips *E*, about three feet apart, rested upon three wedges *F*, 16 ft. long, made by ripping diagonally a 2x10-in. hardwood plank. To keep the top wedge from slipping sidewise off the under one, three or four pairs of vertical cleats *G* were nailed to the sides of the under wedge to act as guides. To allow of these wedges being knocked out without disturbing the concrete, the sliding face between the two was greased. By removing the wedges, the panel was allowed to fall clear of the bottom of the launder.

There were two inside and two outside panels for the side forms. The outside panel was in the form of a channel, the vertical portion was built of 1-in. shiplap, cleated with 1x2½-in. pieces at 1½-ft. centers, nailed alternately with the 1-in. side *I*, and the 2½-in. side *J* against the panel; the top and bottom flanges *H* were of 1x10-in. shiplap fastened by triangular pieces to alternate cleats. The inside panels of the 1-in. shiplap had similar alternating stiffeners *K* and nailing strips but no flanges, since 1x2½-in. cross braces *P* connected each set of stiffeners of the four panels, being bolted to them. Along the inside face of the inside panel was nailed a 1x1-in. strip *L*, to form the recess for the top slabs. The forms were made as light as possible so that they could be put in place by one man, although to remove the sides at the end of 24 hours, it was thought wiser to use two men.

The outside panels were set on 6x8-in. timbers *M*, on top of which 2x4-in. pieces *N* were laid inside the side panels, to form the bottom of the ridge along the bottom of the launder. By means of the wedges, the height of the bottom panel was regulated so that the tops of the planks were just an inch higher than the tops of these 2x4-in. pieces. After the bottom forms were properly adjusted, the outside panels were secured against spreading by toe-nailing them to the 6x8-in. pieces, the nails being driven only part way so that they could be pulled without disturbing the concrete.

The spreading of the inside forms was prevented by braces of ¼x1-in. iron *O* bolted to the stiffeners of the inside panels at their bottom ends and to the cross-braces above. At their upper ends were two holes; with the bolts in the upper of these, the side panels were in their proper place; when it came time to lift off the side forms, the upper bolts were taken out, the inside panels swung in and the bolts put in the lower of the top holes, thus preventing the side panels from swinging and possibly battering the sides of the launder while being lifted off. It took about ¾ hr. to pour one section.

The completed launder was carried by the columns of reinforced concrete that supported the conveyor house. These were spaced at 16-ft. intervals, and were 16x16 in. in section, their corners slightly beveled, as shown in Fig. 2. They were reinforced with a ½-in. strand of wire rope in each corner, and rested on a concrete pedestal buried about five feet in the ground. These columns were from about 7 to 24 ft. high above the ground.

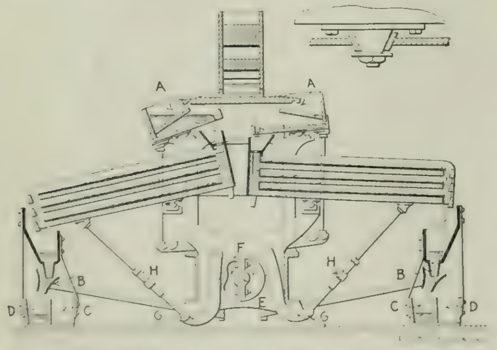
The cross-saddles for carrying the launders were put in to grade, allowing an inch in height for lining in.

These saddles were built up from a 10- or a 12-in. I-beam, according to what could be found in the scrap pile. The beams were anchored in the column by riveting to 3-in. angles set vertically in the column, the flanges on one side of the beam being sawed away to allow the web to lie flat against the angle as shown. The conveyor house was 10 ft. wide and the distance between post centers 8½ ft. A good deal of concrete was therefore necessary to fill in between the posts on top of the beam so as to grip the launders. About 2 in. of side play was allowed for. This filling of concrete was made to flare from the bottom of the I-beam so as to attain a width of 16 in., and was carried high enough to come even with the top of the covering slab. In order to anchor this concrete securely to the I-beam, three holes were bored through the beam and through each of these was threaded a ½-in. rod bent into the shape shown in the cross-section of the saddle. The sections were butted against one another in the saddle and set to grade by means of level pieces. Then a grouting of one part of cement to one part sand was poured in around them, securely binding them to the supports. This concrete launder was devised by W. H. Schacht, assistant manager of the Champion Copper Co., at that time in charge of the Baltic mill.

⁂

## Wilfley Tilting Concentrator

A new multiple-deck tilting concentrator has been invented by Arthur R. Wilfley (U. S. pat. 1,056,388). The cross-section shows the general arrangement. The concentrating operation is intermittent and the two halves, consisting of three decks each, alternate in their sequence of operations. The feed launder *A* discharges on its section of the table while the latter is in a horizontal or slightly inclined position, shown in the right half of the drawing. The table is then tilted somewhat and the wash water admitted to dress the material deposited on the decks, the launder meanwhile having been tilted backward so as to shut off the pulp feed. During this period, the tailings are discharged through the spout *B* to the launder *C*. When the washing is completed, the deck is inclined more steeply to the position shown in the left half of the operation and the accumulated concentrates are washed off through the spout *B*, which has been swung to discharge into the launder *D*. When cleaned, the decks resume their original position and the cycle is repeated.



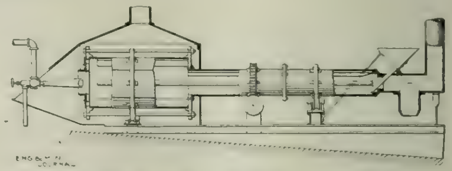
Multiple-Deck Intermittent Tilting Concentrator

The shaft *E* and the cam *F*, connected to the decks through the lever arms *G* and the rods ***H***, accomplish the various motions. Similar devices regulate the tilting of the feed launders *A* and the swinging of the spouts *B*. The shaft *E* is given an extremely slow motion by means of successive reductions.

⁂

## Magnetic Separation of Zinc and Iron, Campbell Process

Magnetic concentration is applied to the separation of pyrite or pyritiferous minerals from other nonmagnetic metals or mixtures, so that iron and iron pyrites may be separated from zinc and copper minerals. All iron-sulphide compounds may be so treated as to acquire magnetic properties. The Campbell process consists in roasting non-magnetic pyrite to a magnetic-iron product. The roasting process is brief and is performed in such a way as to prohibit, as far as possible, the entrance of air or oxygen into the ore mixture, by this means avoiding oxidation of the mineral and consequent loss of some of its constituents.



Roasting Furnace for Iron Ores

The improved furnace used in the Campbell process, a type invented and patented by J. B. Etherington, is shown in the accompanying illustration, and consists essentially of a cylindrical furnace proper, connected to an additional extension of tubular shape, ending at a stack or flue. The material to be put into magnetic condition is introduced near the end of the tubular extension in the vicinity of the flue. In its progress down the tube, the material is dried and warmed so that on its entrance into the larger cylinder comprising the furnace proper, the completion of the process requires only a few minutes. The roasting cylinder is covered, as shown, by a hood which serves to exclude the air, only sufficient being admitted to support the combustion in the oil burner.

Oxidation is objectionable in the process because it results in the volatilization of the zinc and sulphur and consequent loss of these elements. Preservation of sulphur in the ore increases the commercial value of both zinc and iron sulphides after their separation.

A point of importance is the evenness of the roast given the material. If each particle is acted upon in the same way and to the same extent, less roasting will be required, a superficial transformation being enough to magnetize the particle sufficiently for separation purposes, and at the same time a clean separation is secured, much more so than in cases where higher heat is used and only a part of the material effectively acted upon.

The Campbell process, which is said satisfactorily to accomplish these desired results, is in operation at Cuba City, Wis., where a 75-ton plant is in commission, and also at the plant of the Linden Zinc Co., at Linden, Wisconsin.

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22,640—PIPE—Strength of Drain Pipe A O Anderson. (Eng and Min. Journ., June 7, 1913; 1¼ pp.) 20c.

22,641—SAND-LIME BRICK—The Production of Sand-Lime Brick in 1912. (Advance Chapter from Mineral Resources of the U S., 1912; 7 pp.)

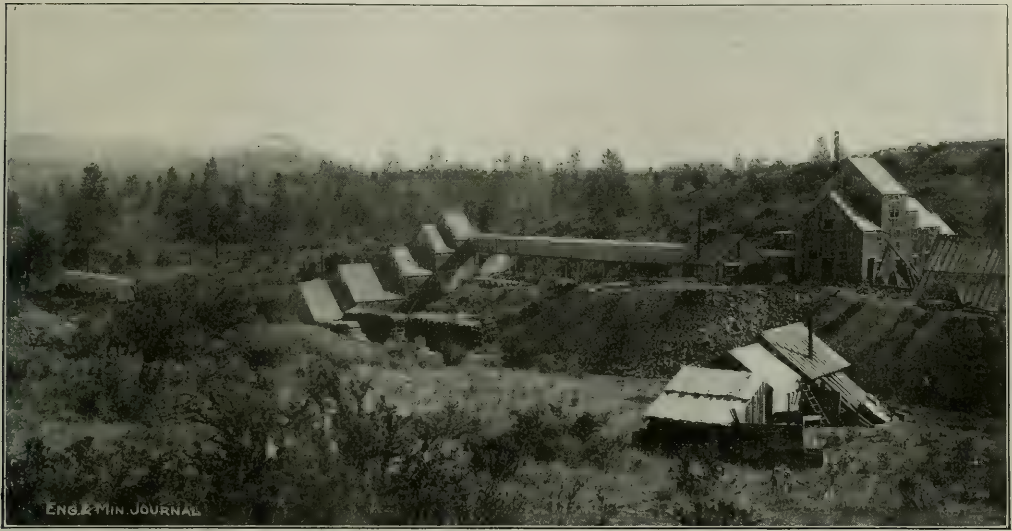
22,642—SMOKE—The Causes and Nuisance of Smoke Wilbur A Nelson (Resources of Tenn., Apr., 1913; 9 pp.) Discussion of the subject with special reference to the chemical properties of Tennessee coal

22,643—SMOKE ABATEMENT—The Problem of Smoke Abatement William A Hoffman. (Journ Assn. Eng. Soc., June, 1913; 27 pp., illus.)

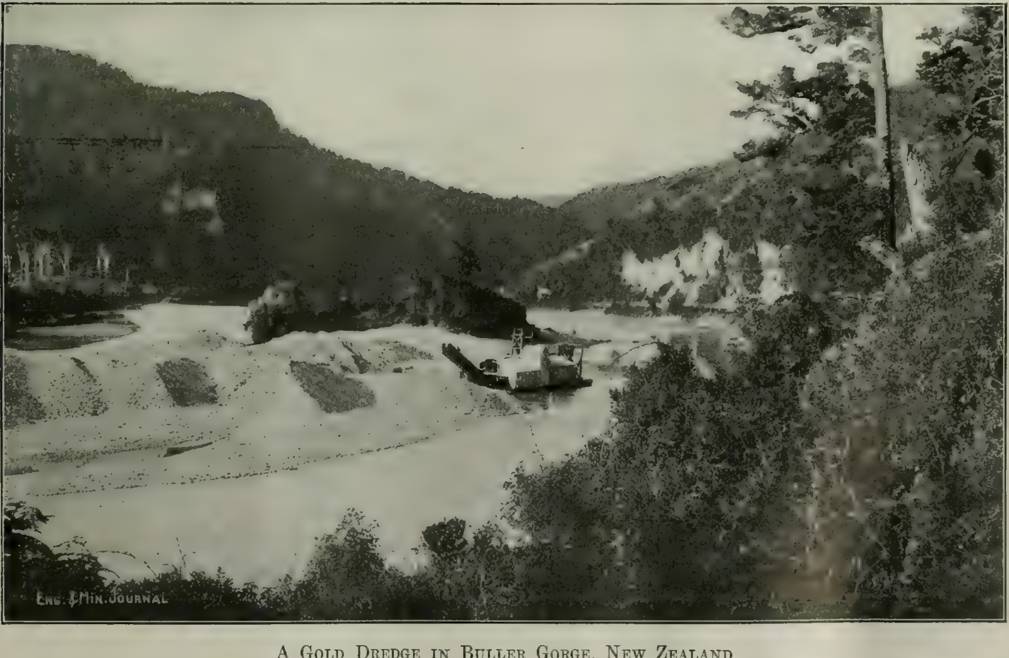
22,644—TIMBER PRESERVATION—The Baltimore & Ohio Railroad Timber-Treating Plant F J Angier (Can Engr., June 5, 1913, and Eng Rec., May 24, 1913, 2 pp., illus.) 20c.

22,646—WATER CLARIFICATION and "Mammoth" Dredgers. (Iron and Coal Tr. Rev., Apr 4, 1913, 1 p., illus. 40c.

# PHOTOGRAPHS FROM THE FIELD



THE GEM MINE AND MILL BUILDINGS OF THE CONSOLIDATED GOLD MINING CO. IN BAKER COUNTY, OREGON. THE MINE IS OPENED TO THE 650-FT. LEVEL



A GOLD DREDGE IN BULLER GORGE, NEW ZEALAND

The gold dredge originated in New Zealand from which field it was introduced and brought to perfection in California.

## Hollinger Gold Mines, Ltd.

The report of the Hollinger Gold Mines, Ltd., Porcupine, Ont., for the year ended Dec. 31, 1912, shows that the total operating profit during the year amounted to $600,664. This amount was divided into dividends Nos. 1, 2 and 3 of $90,000 each, a total of $270,000; amount written off plants, $106,223; amount written off development, $102,639; and the balance carried forward, $101,801. Profits of $250,000 received from the sale of 50,000 treasury shares were applied to the retirement of indebtedness incurred in completing the mill, this being in keeping with the policy outlined in the manager's report of last year.

Work in the mines included 3280 ft. of drifts, 1381 ft. of crosscuts, 324 ft. of winzes, 150 ft. of raises and 66 ft. of shaft. Stoping produced 30,740 tons of ore, 23,973 tons of which came from the 100-ft. level and the balance from the 200-ft. level. The total advance of workings amounted to 5201 ft., the underground workings now totaling 8918 ft. Some prospecting was done by means of the diamond drill with beneficial results, a total of 1466 ft. having been drilled.

The total ore reserves amount to 644,540 tons, valued at $11,271,400. The value estimated in reserves at the beginning of 1912 was $10,230,000, and during the year there were milled $970,304 worth from those reserves. The presence of ore to a depth of 300 ft. has been assured, and there is no known reason why it should not be found at a considerably greater depth, although no allowance in ore reserve has been made more than 50 ft. below the deepest working already arranged.

The ore hoisted during the year amounted to 36,446 tons. All of this, together with some ore previously placed on the dumps, was milled, the total amounting to 45,195 tons, and containing $970,304 of which $933,681 were recovered. In the total value recovered, silver amounted to $6546 and gold to $927,134. The average value of all ore treated was $21.44 per ton, including low-grade ore sent to the mill at the commencement of milling operations, and that milled during the strike. Cyaniding was begun in July, and up to November a steady progress was made toward increasing both tonnage and value of ore treated. Since that time operation has been made difficult on account of labor conditions.

Mining costs for the four weeks ended Feb. 25, 1913, are for labor, $22,133; for material, $11,014; total, $33,147, making the mining cost per ton $3.58. Milling costs are for labor, $6700; for stores, $7099; total, $13,799; and per ton of ore milled, $1.493. These milling costs do not include expenditures for extraordinary purposes, such as plant alterations, which raised the total cost per ton milled to $1.693.

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## New Nevada Mining Regulations

Some additions and ammendments have been made to the Nevada law regulating the operation of mines. Chapter 125 provides that all machine-drilling underground must be done with some dust-preventing device such as a water spray and imposes a penalty for nonobservance, not only on the mine operator but on the drill runner himself, a step in the right direction. Chapter 215 requires the sprinkling of dust, ore and rock passing through chutes or ore houses, with the provision that the mine inspector may exempt properties where the installation of such devices would be impracticable.

Chapter 224 amends Section 22 of the previous mining act so as to forbid the use of gasoline underground except in cases of gas engines of 8 hp. or under, operated not more than 100 ft. below the surface and exhausting into a pipe which extends to the surface, or operating not more than 250 ft. below the surface and exhausting into a pipe equipped with a suction fan to discharge into the outer air.

Chapter 285 requires all persons employed underground or handling explosives to be able to speak and read the English language. This is a drastic provision. Its ostensible object is to promote safety by prohibiting the employment of men unable to read printed safety rules. It will be interesting to see whether it is enforced and how it will work out.

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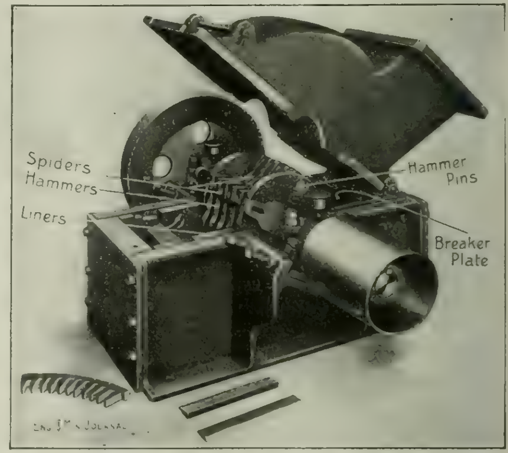
## Jeffrey Swing-Hammer Pulverizer

The swing-hammer pulverizer shown in the accompanying engraving is manufactured by the Jeffrey Manufacturing Co., Columbus, Ohio, especially for laboratory use in reducing ore and coal to a fine uniform product. It is particularly useful for sampling purposes since the sample is not only reduced to a comparatively fine powder, but is thoroughly mixed into a homogeneous mass.



JEFFREY SWING-HAMMER PULVERIZER

The device comprises a set of 20 hammers, which are made of manganese steel, tool steel or carbon steel, as conditions demand. These hammers are pivoted to the arms of the four spiders. The spiders are keyed to the shaft which revolves at about 1200 r.p.m.; the direction of rotation is clockwise in the view shown. The sides of the machine are provided with replaceable liners to take the wear. The ore is kept within the crushing zone until fine enough to pass the grizzly bars which make up the bottom of the pulverizer. An average of 7 hp. is required to operate the machine.

While any high-speed machinery is better for being placed on a solid concrete foundation it is stated that this machine is built so as to give good service when mounted on timbers on an ordinary wood floor.

# CORRESPONDENCE AND DISCUSSION

## Milling in Southeastern Missouri

I was interested in Claude T. Rice's article, "Milling in Southeast Missouri," in the JOURNAL of June 21, but there are a few things which I think should be explained. He speaks of coarse crushing as having first been introduced in the Leadwood mill. I think he is mistaken in this, for on my first visit to Mine La Motte, in 1887, I believe crushing to 9 mm. was practiced, and believe that this was always the practice. At the Central Lead Co. mill, which was started in the spring of 1894, 12-mm. screens were used and this was the practice as long as the mill was operated by the Central Lead Co. Is it true that belt weighers cannot be used where there is dust?

ARTHUR THACHER.

St. Louis, Mo., June 24, 1913.

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## Microscopy in Economic Geology

The valuable article of Professor Beck, translated in the JOURNAL of May 31, 1913, ends as follows: "From this review the conclusion is inevitable that microscopic petrography must have a place in the curriculum of technical schools and especially of mining schools. Such mining and geological engineers as wish to train themselves for consulting work, or such as wish to participate as pioneers in the mining development of new regions, and above all, such as are striving to take an active part in the scientific part of practical geology, must unquestionably familiarize themselves with the fundamental methods of microscopy."

The above remarks of Professor Beck are certainly true, but it is to be feared that the average reader in this country will look upon them as new and strange. As one of the pioneers in microscopical petrography in America, I have used the petrographical microscope for nearly 40 years, hand in hand with other means, in the study of mineralogy, and general and economic or mining geology and have always regarded it as a most efficient aid, particularly in the study of ore deposits. Many other Americans have done the same, like Kemp, of Columbia.

It was my good fortune to teach the first course in microscopical petrography ever taught in this country, so far as known, at Harvard University, in 1877, and to lay the foundations of the present excellent department, which that university enjoys. It was then taught by me mainly for its use in general and mining geology.

In 1887, when in charge of the Michigan College of Mines, microscopical petrography was introduced and was required of all the students from 1889 on. The college was well equipped with about 40 petrographical microscopes and other accessory apparatus, including some 800 microscopic sections. There is but little doubt that the thorough training the students then received in mineralogy, petrography and geology has been an important factor in their success in metal mining throughout the world.

Microscopical petrography was introduced into that technical school and taught at that time for the very reasons given by Professor Beck and because I believed, then as now, that no mining man could thoroughly understand economic (mining) geology without a good knowledge of petrography. For the same reasons I introduced microscopical petrography into the curriculum of the School of Mines of the Pennsylvania State College in 1901 and procured a fair equipment for the work.

For the same reasons when I was reorganizing the School of Mines of the University of Pittsburgh in 1908 and subsequently, some 35 elective courses were made available for undergraduates and some 27 for graduates in microscopical petrography and there was procured one of the best equipments for instruction in that subject ever obtained by any university in this country.

It certainly does not appear that in ideas, efforts or intent that some, at least, of the mining schools of United States have been behind the celebrated Freiberg one. Further, the American petrographers and metallographers have not been lax in the application of the microscope to mining geology or to the generally opaque minerals, as, for instance, Baird Halberstadt, Campbell or Rogers.

M. E. WADSWORTH.

Pittsburgh, Penn., May 31, 1913.

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## Calculation of Extraction in Cyanide Plants

An article, by Herbert A. Megraw, in the JOURNAL of Mar. 8, on "Silver Cyanidation at Tonopah—III," has just come to my notice and I am somewhat surprised to learn that the method of calculation of extraction referred to is in use in any of our "up-to-the-minute-in-efficiency" milling plants, and I am inclined to at once agree with Mr. Megraw that the question of such method should be discussed. The estimation of mill-head contents by adding bullion content to tailing content and dividing by tonnage, is not a method worthy of a metallurgist, and, as Mr. Megraw so fittingly puts it, is certainly "a method of solving a problem by means of which any answer is the right one."

Such methods are not, I believe, in general use, but are being mostly used by operators for stock companies. There are two classes of mining shareholders: those holding shares as an income-gaining investment, and those holding them for the purpose of speculation. Dividend-receiving shareholders do not exact highest efficiency. They are glad to get a dividend instead of an assessment and seldom question the methods. Those holding shares for stock operating are not interested. If the mine is paying its way, with an occasional dividend, declared at the right time to stimulate a dull market, nothing more is expected or wanted. However, from an engineer's standpoint, or from a business man's standpoint, the system leaves much to be desired.

Not only is the system referred to the source of inaccurate statements and fictitious results, but it is unscientific and unbusinesslike, and tends to show a lack of moral courage on the part of the well paid specialists in charge of operations. Advocates of the system will claim that they are continually watching results and working toward better extractions, and that they get everything possible out of the ore anyway, so why undertake additional work which would result in no benefit and only confuse the records. How do they know they are getting everything possible out of the ore, if they do not know what the ore contains to start with? They tell by the tailing assays; if these are low they assume results to be correct. How do they know that the bullion recovered is the true difference between head and tail content? Tailing content may be low and still the bullion produced may not represent what should have been recovered from the ore, or perhaps what really was extracted. Losses may occur through carelessness, faulty treatment, or dishonesty. These losses, which may amount to much, are entirely unguarded under such a system.

If an operator is afraid of his mill head, why is he not afraid of his mill tailing? He probably is not afraid of either alone, but does not care to meet both together, particularly when he is standing between them with the "brick." There is no reason why the tailing sample or assay should be more reliable than the head sample or assay. In many cases, it is much less reliable. Who ever heard of a correct tailing sample during the time anything was going wrong in the mill, especially when there was no record of heads? How can tonnage represented by tailing samples be as accurately established as tonnage represented by head samples? In cases where sand and slime are treated separately, the calculation of proportionate tonnage increases such inaccuracy.

When the head content is known, an efficient system of solution sampling will check both bullion and tailing, but when the head is unknown, this will only check the bullion. It is true that bullion plus tailing content is equal to the head content if no losses or errors occur, but they do occur, and hence the formula instead of being $B + T = H$, should be written $B + T + L = H$. But $H$ and $L$ being both unknown quantities, "any answer is the right one."

By having the head assay, precipitation record from solution assays, tailing assays and correct tonnage record, results are positive and any discrepancy represents loss or error, the two most important things the metallurgist is paid to guard against. He is not necessarily careless or incompetent when such discrepancies occur, but displays his ability when he finds and removes the causes for such losses or errors. Having no head assay, it requires no ability on the part of the metallurgist to keep his records free from discrepancies except that he must be able to add correctly.

By one method the treatment is controlled or regulated by a knowledge, before treatment, of what is being treated. By the other method the treatment is controlled or regulated by a knowledge, after treatment, of what was treated. By one method the operator is able to arrange his treatment so as to secure the best results, by the other he makes a guess and then, after treatment is finished, he determines how far he was off and makes his answer [illegible] by fitting his original problem to it. He never does know what per cent. extraction is being made (a \$2 tailing may be the result of better per cent. extraction than a \$1 tailing), not that it makes any material difference, as the actual amount of bullion is the main thing, but he reports his percentages just the same; how?

The method is also unfair to the mine. The mill keeps its record clean and all contained values that come to it are accounted for and reported either in bullion or tailing, but the mine must stand its own losses as well as those of the mill. The mine may be sending \$20 ore to the mill, but the $B + T$ system may only show \$18 as mill head, which is all the mill will acknowledge receiving. What becomes of the \$2? Where is it charged? Who loses it? It flutters about unaccounted for, for a time, and then finally settles unowned and unnoticed in the little nest of "shrinkage of previously estimated ore reserves," shown in no report, a most convenient hiding place for inaccuracies, losses and results of the inefficient method of "calculation of extractions." If a careful investigation were made into the cause of discrepancies in mill results, on account of which this "any-answer-is-the-right-one" method has been adopted, it will be found that an incorrect tonnage record is a greater factor in the matter than will be generally conceded.

A. SIDNEY ADDITON.

San Francisco, Calif., June 14, 1913.

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# Rare Minerals at Broken Hill, Rhodesia

By the comment made by George D. Hubbard, in the article in the JOURNAL of June 28, 1913, that deposits of rare minerals, pseudomorphs after bone, may be even now forming, I am reminded that in the Morenci district, Arizona, any old bones left lying on the surface of the ground soon became of a greenish-blue tint, and in some of these bones I found as much as 2% of copper.

Whether the fumes from the furnaces took any part in this change, or whether the surface waters alone were involved, I was never able to satisfy myself.

I suppose the reaction was

$3\,CuSO_4 + Ca_3(PO_4)_2 = 3\,CaSO_4 + Cu_3(PO_4)_2$

making two insoluble compounds grow where only one did before.

DONALD M. LIDDELL.

Elizabeth, N. J., June 30, 1913.

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# Melting Furnace at Rio Plata Mill

In some of the sketches (Figs. 2, 3 and 4) accompanying the article "Melting Furnace at Rio Plata Mill," in the JOURNAL of Mar. 15, 1913, the draftsman made some changes in the design of the doors, representing them all as hinged doors. In my opinion, hinged or swinging doors are not to be recommended if a chain block and overhead traveler are used in handling the crucible, as is done at Rio Plata. It is often necessary to move the crucible in the longitudinal direction of the furnace and counterweight connections on the doors would interfere with such movement. The under-side of furnace doors are extremely hot, and when thrown back the operator is needlessly subjected to a high heat when pouring.

ALVIN R. KENNER.

Guazapares, Chihuahua, Mexico, Apr. 28, 1913

# EDITORIALS

## Butte & Superior

If the Butte & Superior company issues to the press the statistics that appear from time to time, as we imagine it does, we suggest to it that it be more specific and conform more strictly to the customs of the zinc business. For example, a recent report read that during the second 10 days of June, its mill treated 5743 tons of ore, averaging 20.3% Zn, and yielded 2,033,281 lb. of zinc, an extraction of 92.05%.

Now this company does not sell zinc directly, but rather blende concentrates, and it is paid per ton of such concentrates. It may be argued that the public knows nothing about the value of that kind of material, but the statement of how many pounds of zinc were produced is no more illuminating in that respect.

In fact, a given quantity of zinc fetches less in the form of a concentrate, assaying 48% zinc than if 50% zinc. Indeed, the difference is rather startling to persons not initiated in the zinc business. We believe that the Butte & Superior concentrates are running about 48% Zn at present. On that assumption, the tonnage of concentrates during the period in question, was about 2118, and the ratio of concentration about 2.7 : 1. In the case of this company the improvement in the grade of its concentrates is more important than a little improvement in mill extraction.

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## The Hall Process

Ever since the smoke complaints arose to bother smelters, the obviation of the sulphur nuisance has been a problem engaging the attention of chemists and metallurgists. Of course, they knew that they could make sulphuric acid out of their sulphur as is commonly done in Europe, but in the United States such manufacture has been commercially profitable, i.e., possible, only in a few favored regions, e.g., Tennessee and the zinc-smelting districts of Illinois. The smelter making sulphuric acid at Anaconda, Salt Lake City and in Shasta County, California, would not have known what to do with his product, in spite of the recommendation of a certain government official (of whom the story may be apocryphal), that the Anaconda company should pipe it to the Pacific Ocean and there pour it away.

Recognizing the real conditions, it has long been a dream of metallurgists to isolate the sulphur of sulphide ores in its elemental form, so that it could be shipped to distances barred by freight rates to sulphuric acid; or so that, at the worst, it might be piled up in such a way that it would be no harm to anybody.

Such an isolation of the sulphur is the theme of the ingenious and novel process which its inventor, William A. Hall, has described in this issue of the JOURNAL. We shall not at this time undertake to discuss the chemistry of his process. We shall confine ourselves merely to informing our readers of the auspices under which it has been developed. Mr. Hall himself is a chemist of sound professional training and of distinguished achievement in the field of invention. His present process has been studied by Prof. C. F. Chandler and Prof. A. L. Walker, of Columbia, who have reported favorably about it. Some distinguished engineers have joined in the promotion of it. It has been witnessed in experimental operation by many experienced metallurgists, of whom all that we know have expressed favorable opinions. A great metallurgical company stood ready to spend $150,000 on its further development, but failed to come to terms. It is actually to be tried at the Balaklala works, in California.

It is to be borne in mind that the experimental work done so far has been on a small scale and that there will no doubt be much tedious and costly work in making a commercial process out of it. The great metallurgical company to which we referred estimated that its necessary experimentation would cost $150,000. Process development is almost always costly. In this case, however, it is not unreasonable to hope that we may in the course of a few years see a solution of the sulphur smoke problem. If such a solution does really come to pass, the brimstone market of the world will incidentally be revolutionized.

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## Testing Rock Drills

The manager of an ordinary small mine has neither time nor money to test thoroughly the drills he uses underground. He tries usually two or three of the best-known makes and types and selects the one that shows most favorable results after a rather haphazard investigation. Previous experience may often guide him to a choice substantially correct, but in too many cases prejudice is allowed to outweigh obvious defects or advantages. Larger companies, in which the cost of drilling reaches a greater absolute figure, devote much attention to the machines used underground and in addition to a record of the performance of individual machines in the stopes and in the shops, engage in more or less exhaustive preliminary tests before buying any quantity of a certain make. The results of such tests are often as surprising as they are illuminating. The number and the range of the variables contributing to a machine-drill's performance, would open the eyes of the average superintendent.

Probably no other American company pays more attention to this matter than does the New Jersey Zinc Co., at its Franklin Furnace mine. A series of tests begun here some six or seven years ago and still in progress, has resulted in greatly increasing the efficiency of the company's drilling and in bringing out some curious points in the performance of rock drills, intelligible in some cases, and in others largely inexplicable.

Every machine under consideration by the company is taken underground and its air consumption and drilling rate measured, this being done in a certain crosscut where the rock is uniform. The number of perforations in the back here bears eloquent testimony to the extent of these tests. The holes are drilled for the most part vertically in calcite, since here, as elsewhere, experience is relegating the piston machine to a secondary position. The rate of drilling is naturally high and the absolute figures would not be instructive to a hard-rock miner. The comparative figures, however, among different makes and types of machines, would prove most instructive if the company were willing to publish them.

The air pressure used is between 95 and 100 lb., and remains fairly constant for any one test. The temperature also is constant. Air consumption is measured by a system involving a pair of displacement tanks, similar to those described in the JOURNAL, July 6, 1912. A certain number of displacements, corresponding to a certain amount of air, are run through, the time noted, and the number of inches drilled, measured. The criterion on which the comparison of machines is made is a figure derived by dividing the number of inches drilled per minuate by the air consumption per inch, thus taking into consideration both the speed and the air consumption. No machine is accepted for further trial unless it drills at least 7½ in. per min. on 60 cu.ft. of free air or less. A side light on the progress of drill design and manufacture is shown by the fact that for the machines of one manufacturer, the criterion mentioned has increased in some five years from about 0.2 to about 1.5, a remarkable difference.

This test is, so to speak, only an elimination trial. The results are comparable to an engine indicator-card, taken to determine mechanical efficiency. The important factors of convenience, repair expense, retention of original efficiency under wear, steel breakage, etc., are determind by further tests in the harder formation of the stopes. If a drill is purchased, its probation is not yet over. All machines in use are numbered and a careful record is kept of their performance during their whole life. They are, in effect, on the mine payroll, the number of shifts they work is credited to them and the repairs are charged. It would appear that after a few years of this, the New Jersey Zinc Co. should know something about machine drills.

One anomaly developed in the tests, is the fact that a machine will often drill along as well or better with one wing of the cross bit broken off. More curious still are the contradictory results obtained with the same machine under apparently identical conditions. Thus a hole may be collared and a test run made; then, with no further change than a new piece of steel, a second run continuing the same hole may give a rate of drilling much higher. The calcite is too uniform to permit explaining this by a change in the rock quality. Mr. Ca lin, however, suggests a very plausible theory. He conceives the blow of the hammer and anvil block on the steel to be transmitted through the latter as a wave. Such a wave will be reflected when the bit transmits it to the rock in the hole bottom and in its return may oppose or may coincide with the next blow of the hammer. When conditions are such that these rebounds reinforce the successive hammer blows, the maximum drilling effect is attained. If the rebound and new blow oppose each other exactly, then the drilling power is appreciably cut down. The actual conditions will be a varying degree of interference, giving varying results. An attempt to analyze and control the phenomenon, however, disclosed that too many variables existed, of which the chief are the length of the steel and its resiliency. That great variations of resiliency obtain, is shown by dropping the same steel ball on different pieces of steel and noting the number and height of the rebounds. The differences developed are extensive. Evidently in the field of rock drills, drill steel, rock and their inter-relations, there are more things than our philosophers have yet dreamed of.

Another anomaly concerns not the machine drills, but their manufacturers. One special machine was obtained for test from a certain manufacturer, which drilled at the enormously high speed of 32 in. per min. No other results comparable to this were obtained. The machine was sent back to the factory and was never returned; nor could the company ever get a duplicate made.

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## Progress in Tariff Making

A remarkable feature of this year has been the complacency with which the coming tariff reductions are regarded in all quarters. Even more remarkable has been the action of the Senate in taking some steps further than the House. In so far as the metal industries are concerned, but few producers took the trouble to file briefs protesting against reductions. The iron and steel people recognized that they could stand them and the lead and zinc people appreciated that prices are made by something besides a tariff. Altogether, it has been a poor year for the tariff calamity howler. Apropos of this it was remarked recently in the *Evening Post*:

> Trade reaction in the United States is progressing slowly. The tariff revising Congress has been in session now for 11 weeks, yet the silent mills and smokeless factory chimneys which were dolefully predicted in April remain to be seen. Reasons have been plentifully supplied; the following illustration gives a new angle to one of them: A New England manufacturer of cheap blankets whose mills are working at capacity in spite of the contemplated changes in wool and cotton tariffs, says that he will not curtail operations until demand for his product falls off. That will come, he says, when labor through the country becomes idle and cannot longer buy. But labor, he feels, will go on buying blankets until it is made idle by the shutting down of other mills and factories. If the manufacturer is typical, and continues waiting upon labor to bring about reaction, and if labor in turn continues waiting upon the manufacturer, it is quite in point to ask under whose auspices the predicted trade reaction can come.

So long as the present conditions prevail in the lead market, it is certain that no lead miner or smelter will have to suspend operations, while as for the zinc business, things probably cannot become much worse than they are anyway, and it is well understood that the present unsatisfactory state of affairs came about through overproduction, not prospective changes in the tariff.

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The arrangement of a foreign loan by the Huerta government in Mexico was thought to provide funds for the inauguration of military activity against the revolutionists in the north. A forward movement was indeed begun. The flotation of the French portion of this loan met, however, with a chilly reception from the French public and it is not certain that the Mexican government will get much more than the money required to relieve the necessities of the National railway. Apparently the bankers attached conditions to their promise of the money which enable them to keep the negotiated loans in a state of suspended animation until events in Mexico take a favorable turn.

# The Hall Ore Desulphurizing Process

By William A. Hall*

*SYNOPSIS—The Hall ore-desulphurizing process consists in roasting ore in a reducing or neutral atmosphere containing some hydrocarbon gas and steam. All the sulphur distills in elemental form, the metal being left as oxide. The sulphur fumes are then readily collected in water.*

The Hall process of desulphurizing sulphide ores with eradication of noxious smeltery fumes, is entirely novel and based upon new principles that have not heretofore been described in any chemistry or metallurgical work or old patents, so far as I have been able to ascertain, as it is based upon the principle of removing the "fixed" sulphur atom of a sulphide by distillation and without permitting any considerable portion of the sulphur thus discharged to pass into any combined forms, such as $SO_2$ or $SO_3$.

### The Fixed-Sulphur Atom Distilled Directly

The sulphur existing in the ore as a sulphide is removed and discharged from the ore in the elemental condition and when the furnace operation is properly adjusted, there is substantially no discharge from the furnace of combined sulphur, either as $SO_2$, $SO_3$, $H_2S$ or COS. Small mechanically rabbled reverberatory furnaces and multiple-hearth furnaces have been operated with the entire fumes discharged into a small room and no odor of these gases was discernible, even when the operation was continued for many hours.

The distillation of both fixed and free sulphur as such constitutes the advantage this plant has over the other sulphur-recovery processes. Eliminating the sulphur as oxide with subsequent reduction means that a large amount of free oxygen must be taken care of before the sulphur-reduction begins, which requires extra expense for reducing agents, while the fuel expense of removing oxygen combined with sulphur from such association is greater than the fuel expense of direct distillation.

Many tests and demonstrations of the process have been made in France, England and America, and under the direction of several metallurgical engineers and chemists, gas analyses having been made of the fumes discharged. These analyses have been made over continuous runs of several hours, and the total amount of combined sulphurous gas of any condition has been found to average under 0.25% by volume without the admixture of any extraneous air.

A set of careful analyses were made in New York this winter, under the direction of Prof. Arthur L. Walker and Dr. C. F. Chandler, of Columbia University, the analyses showing the following:

| Time | $SO_2$ |
|---|---|
| First hour | 0.025% |
| Second hour | 0.028 " |
| Third hour | 0.023 " |
| Average | 0.0253% |

and during the entire period the amount of sulphuretted hydrogen evolved was simply a trace; a quantity too small to be analytically determined.

In this demonstration the rate of decomposition was equivalent to that in treating 50 tons of ore per day in an 18-ft. six-hearth McDougall furnace, when roasting said ore down from 40.5% sulphur to 3.5% sulphur. The rate of decomposition in the Hall process when conducted in multiple-hearth furnaces appears to be from 100 to 125 lb. of ore per sq.ft. of hearth area each 24 hours, which makes it compare favorably with the capacity obtained in the best conducted roasting furnace. The action will be even more rapid if the desulphurizing is not carried down to so sweet a roast, and if the operation is stopped at a point where there is some 7 to 9% total sulphur remaining, sufficient for matte formation. The cinder discharged is in excellent condition, comparing favorably with the best obtained in the roasting process.

### Sulphur Distillation May Be Complete

Tests have been made abroad to determine how complete a desulphurizing could be produced in this process, and many analyses show percentages of total sulphur remaining in the cinder of less than 1%. The distillation is obtained by the direct application to the ore of a burning-gas flame of slightly reducing or, at least, nonoxidizing character, accompanied by sufficient $H_2O$, either in the shape of water of formation (from the combustion of hydrogen) or by the addition of small amounts of extraneous water in the shape of steam. This $H_2O$, whether derived from formation water or from extraneous steam, is decomposed by the hot ore; the nascent oxygen going to the metal and the nascent hydrogen combining with any free oxygen that may enter the furnace through the atomizer through which the gases are admitted, thus creating a sort of cycle of $H_2O$ decomposition and water formation from the combustion of the hydrogen so derived. It appears that nascent hydrogen has more affinity for oxygen than it has for sulphur.

When the burners on the furnace are properly adjusted, the final discharge of hydrogen appears to be all in the shape of water vapor, i.e., complete balances are easily maintained whereby there is substantially neither $SO_2$ nor $H_2S$ in the discharge, the tests being made on samples taken within a distance of 6 in. from the furnace.

A large variety of ores have been experimented with, including pyrites, various pyrrhotites, copper concentrates, crude blende, zinc concentrates, and even chemically pure FeS, the action appearing to be the same on each and the only difference being in the amount of sulphur discharged, according to the amount contained. In order to prove that the "fixed" atom is removed by distillation, the furnace has been operated on chemically pure FeS, which, of course, contains no feeble or free atom and no $SO_2$ or $H_2S$ was discernible in the discharge, but only yellow elemental sulphur vapor.

The analyses of the cinder show it to be a mixture of $Fe_2O_3$ and $Fe_3O_4$. The oxidation of the metal (after any feeble atom has been removed), is due to the nascent oxygen from the decomposed $H_2O$, it apparently being proven that nascent O has much greater affinity for the metal that decomposes it, than it has for the S element.

If producer gas is used as a fuel, a larger amount of extraneous water is found necessary than when a gas is used that is high in hydrogen, such as water gas and particularly oil gas. Gasified fuel oil appears to be an ideal fuel, containing substantially no N, having extremely high thermal values (gasified oil having a B.t.u. of over 1[illegible] per cu.ft.). When high-grade fuel oil is used, there is a much smaller volume of fumes to be handled in the subsequent sulphur extraction. Where a gas is used that is high in CO, a certain amount of COS is formed, as CO has a greater affinity for S at elevated temperatures, but it has been found that when COS and water vapor pass to a lower temperature, say, less than 400° C., there is a mutual decomposition with a formation of $H_2S$ and $CO_2$.

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*Chemists' Club Building, 50 E. 41st St., New York.

### WORKING TEMPERATURE RANGE ABOUT 200° C.

The temperature maintained in the furnace must be slightly above 700° C., as that is about the distilling point of the S of a metallic sulphide, and it must be maintained below 900° C., the fusing point, but the latitude of 200° C. gives a large margin of safety in the operation.

Although undoubtedly the reaction is somewhat exothermic, no allowance has been made for the same in the fuel calculations, fuel required being calculated as if the reaction were entirely endothermic; and on such a basis, allowing amply for radiation and for the largest factors of safety, the amount of coal fuel required (gasified) is calculated at less than 10% of the weight of the ore. These fuel requirements have been calculated by numerous engineers.

The process was first demonstrated in France and later in England, extending over a period of a year, during which it was examined there by over 20 foreign and American engineers, and the demonstrations have been observed by more than that number in this country.

A European company, known as the British Sulphur Co., was formed and took over the foreign rights, that company being composed mostly of metallurgical and mining engineers and capitalists largely interested in copper mining. An American company has taken over the American rights.

The calculation of the cost of producing sulphur by this method in American smelting works is placed at from \$3 to \$5 per ton of the crude sulphur derived. These calculations have been made by some eminent American engineers.

### CHARACTER OF THE FUME

The fumes coming from the smelter are of a heavy yellow appearance with no appreciable odor, other than that of hot elemental sulphur vapor. The sulphur is extracted from the fumes by simply washing, it being found that this finely divided elemental sulphur has great physical affinity for water, due, presumably, to surface tension, and when the fumes are agitated with water, the atmosphere is almost instantly clarified, the sulphur settling to the bottom of the apparatus.

Any of the well known gas-washing apparatus, such as the Theisen or the Feld system, is considered as well adapted for the purpose, and tests have already been made with these. Some of these washers are made with a capacity of [illegible],000,000 cu.ft. per 24 hours.

The fumes have also been run through the Cottrell electrical dust collector, which completely precipitated the sulphur therefrom. The solids precipitated from the fumes by washing have been analyzed several times and found to run from 98 to 99½% S; the impurities being flue dust or lead or zinc sulphides. The refined sulphur has been found to be over 99½% soluble in $CS_2$ and is of the octothedral and prismatic types.

So far the process has been developed principally with the view of its attachment to multiple-hearth roasters, but it is understood that experiments have been made in its adaption to blast furnaces, and which appear to be promising.

[It is understood that one or more of the larger Western smelters will shortly install this process on an extensive scale.—EDITOR.]

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## California Oil in May

The net production of oil in California in May in all fields was 7,639,144 bbl., an increase in total over April of 126,448 bbl., but a decrease in daily average owing to May having one more day. Total shipments in May were 7,857,406 bbl., an increase over April shipments of 512,426 bbl. The losses in May were 96,088, making the total outgo 7,953,494, an increase over April of 503,630. Stocks on hand at the end of May amounted to 47,905,506 bbl., a decrease of 314,306 bbl. from the April stocks. Field records showed 35 new rigs, 51 completed wells, 365 wells drilling, 384 wells on which drilling was suspended, 6048 wells producing, 946 wells capable of producing but idle, 29 wells abandoned.

| Districts | Bbl. |
|---|---|
| Fresno County: | |
| Coalinga | 1,595,882 |
| Kern County: | |
| Midway | 2,405,170 |
| Kern River | 779,048 |
| Lost Hills-Belridge | 455,713 |
| Maricopa | 450,175 |
| McKittrick | 368,968 |
| Total, Kern County | 4,459,074 |
| Santa Barbara County: | |
| Santa Maria-Lompoc-Cat Cañon | 427,743 |
| Summerland | 4,200 |
| Total, Santa Barbara County | 431,943 |
| Southern Fields: | |
| Olinda-Brea-Puente | 526,172 |
| Salt Lake-Sherman | 231,251 |
| Coyotes-La Habra | 224,896 |
| Ventura | 71,910 |
| Whittier | 56,704 |
| Los Angeles | 31,957 |
| Newhall | 9,355 |
| | 1,152,245 |
| Total, all fields | 7,639,144 |

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## Miners' Strike in Upper Silesia

The miners' strike, in Upper Silesia, which commenced on Apr. 25, came to an untimely end on Whit Monday, May 12. It came very near turning out an involuntary "hunger strike." The strike fund must have been at a low ebb, for the weekly allowance to each unmarried man was fixed at \$0.75 and that of married men at \$1.25. Needless to say, no human being could subsist on such a pittance. The lot of the Upper Silesian miner seems to be a deplorable one to judge by the wages paid them and the cost of living. The average annual wage in 1912 has been \$250, and the cost of living modestly, calculated for a family of four, at the towns of Beuthen, Gleiwitz, Kattowitz and Königshütte, respectively, would be \$296, \$303, \$310 and \$278, for the same period. It is no wonder that disease and inebriety get the best of these men.

## Mining Dividends in June

Mining dividends paid in June by 34 United States companies making public reports, amounted to $7,331,706; by holding and smelting companies and allied industries, $12,956,644; and by 13 Canadian, Mexican and Central American companies, $1,287,645.

With the entrance of Chino and Ray into the dividend-paying stage, all of the big "porphyries" are represented there. As to the rest of the coppers, Quincy, Tennessee and Calumet & Hecla have had to begin reflecting the lower copper market by reduced dividends.

| United States Mining Companies | Situation | Per Share | Total |
|---|---|---|---|
| Bunker Hill & Sullivan, l.s. | Ida. | $0.20 | $65,400 |
| Bunker Hill Con., g. | Calif. | 0.05 | 10,000 |
| Butte-Alex Scott, c. | Mont. | 0.50 | 37,000 |
| Calumet & Arizona, c. | Ariz. | 1.25 | 745,441 |
| Calumet & Hecla, c. | Mich. | 10.00 | 1,000,000 |
| Champion, c. | Mich. | 1.00 | 100,000 |
| Chino, c. | N. M. | 0.75 | 583,194 |
| Colo. Gold Dredging, g. | Colo. | 0.25 | 25,000 |
| Con. Mercur, g. | Utah | 0.03 | 30,000 |
| Crawhall, z. | Wis. | .... | 28,500 |
| Daly-Judge, s.l. | Utah | 0.15 | 45,000 |
| Federal Min. & Sm., pfd. | Ida. | 1.50 | 179,792 |
| Fremont, g. | Calif. | 0.02 | 4,000 |
| Frontier, z. | Wis. | 2.00 | 2,500 |
| Golden Cycle, g. | Colo. | 0.02 | 30,000 |
| Hecla, l.s. | Ida. | 0.05 | 50,000 |
| Homestake, g. | S. D. | 0.65 | 163,254 |
| Nevada Con., c. | Nev. | 0.37½ | 749,790 |
| New Idria, q. | Calif. | 0.10 | 10,000 |
| North Star, g. | Calif. | 0.20 | 50,000 |
| Pittsburgh-Silver Peak, g. | Nev. | 0.02 | 55,800 |
| Quincy, c. | Mich. | 1.25 | 137,500 |
| Ray Con., c. | Ariz. | 0.37½ | 542,757 |
| Stewart, l.s. | Ida. | 0.10 | 123,826 |
| Superior & Pittsburgh, c. | Ariz. | 0.38 | 569,922 |
| Tennessee, c. | Tenn. | 0.75 | 150,000 |
| Tomboy, g. | Colo. | 0.48 | 75,330 |
| Tom Reed, g. | Ariz. | 0.06 | 54,573 |
| United, c. | Wash. | 0.01 | 10,000 |
| United Verde | Ariz. | 0.75 | 225,000 |
| Utah, c. | Utah | 0.75 | 1,186,627 |
| Wasp, g. | S. D. | 0.02 | 10,000 |
| Yellow Pine, l.z.s | Neb. | 0.02 | 19,000 |
| Yukon, g. | Alas. | 0.07½ | 262,500 |

| Iron, Industrial and Holding Companies | Situation | Per Share | Total |
|---|---|---|---|
| Amer. Sm. & Ref. Co., com. | U. S. | $1.75 | $875,000 |
| Amer. Sm. & Ref. Co., pfd. | Mex. | 1.00 | 500,000 |
| Crucible Steel, pfd. | U. S. | 1.75 | 427,638 |
| General Asphalt, pfd. | U. S. | 1.25 | 164,120 |
| General Chemical, com. | U. S. | 1.50 | 128,382 |
| General Development | U. S., Mex. | 1.50 | 39,000 |
| International Nickel, com. | U. S., Can. | 3.00 | 1,137,760 |
| Lackawanna Steel, pfd. | N. Y. | 1.75 | 612,115 |
| National Lead, com. | U. S. | 0.75 | 154,915 |
| National Lead, pfd. | U. S. | 1.75 | 426,433 |
| Phelps Dodge | U. S., Mex. | 4.50 | 2,025,000 |
| Pittsburgh Steel, pfd. | Penn. | 1.75 | 112,500 |
| U. S. Steel, com. | U. S. | 1.25 | 6,353,781 |

| Canadian, Mexican and Central American Companies | Situation | Per Share | Total |
|---|---|---|---|
| Chontalpan, g.s.l.z. | Mex. | $0.50 | $3,500 |
| Crown Reserve, s. | Ont. | 0.05 | 88,441 |
| Dos Estrellas, s. | Mex. | 1.25 | 375,000 |
| Granby Con., c.g.s. | B. C. | 1.50 | 222,721 |
| Hedley, g. | B. C. | 0.50 | 60,000 |
| Hollinger, g. | Ont. | 0.15 | 90,000 |
| Kerr Lake, s. | Ont. | 0.25 | 150,000 |
| Lucky Tiger, g. | Mex. | 0.05 | 35,767 |
| New York & Hond. Rosario, g. | C. A. | 0.20 | 40,000 |
| Peñoles, l.s. | Mex. | 1.25 | 150,000 |
| Seneca-Superior, s. | Ont. | 0.10 | 47,683 |
| Temiskaming & Hudson Bay, s. | Ont. | 3.00 | 23,173 |
| Victoria | Mex. | 0.50 | 1,250 |

Five Mexican companies paid in June, but the general tone of the distracted country is distinctly shown in the dividend column.

For the first half year, United States mining companies making public reports have paid $38,216,193; iron-smelting, industrial and holding companies have paid $59,650,232, and Canadian, Mexican and Central American companies, $10,781,767.

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## Chronology of Mining for June, 1913

*June 2*—Shaft house at the War Eagle mine, Rossland, B. C., destroyed by fire.—Skidoo Mines stamp mill, in Inyo County, Calif., destroyed by fire.

*June 4*—First trial trip made under electric power on Butte, Anaconda & Pacific R.R.

*June 6*—Strike at the smelting plant of the United States Zinc Co., at Blende, near Pueblo, Colo., the men demanding higher wages.—Two men killed by cave-in at the Morris mine of the Giroux company, at Ely, Nevada.

*June 7*—President John P. White and 18 other officials of the United Mine Workers of America indicted in the federal court under charge of violating the Sherman anti-trust law, by alleged conspiracy with the coal operators of western Pennsylvania, Ohio, Indiana and Illinois, to raise wages in the West Virginia coal fields so as to prevent its competition with the other four states in the western market.

*June 10*—Senate investigation of miners' conditions in New River coal field of West Virginia begun.

*June 12*—Strike at Nichols copper refinery, Laurel Hill, N. Y.

*June 14*—Sintering plant at the smelting works of the St. Joseph Lead Co., at Herculaneum, Mo., destroyed by fire.—Midwest Oil Co. wins suit brought against it by the government, claiming illegal occupancy of public lands.

*June 24*—American Zinc, Lead and Smelting Co. began milling at Mascot, Tennessee.

*June 25*—Official call made by the union for a strike of coal miners in the New River field, West Virginia, where about 15,000 miners are employed.

*June 28*—Settlement of strike at Nichols refinery.

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## Chontalpan y Anexas

The report of the Compañia Minera Chontalpan y Anexas, S. A., for the year ended Apr. 30, 1913, shows that the total profit of 163,131 pesos was earned by the operations of the year. This profit will be divided as follows: 10% to the reserve fund; 10% to the board of directors; 1% to the commissario; 67,000 pesos for the building of the new mill; 21,000 for dividends; 20,000 for unforeseen expenses; 20,000 for deterioration and 15,375 pesos for surplus.

Ore in reserve is sufficient to supply the mill during four years at the rate of 30 tons daily, at which capacity the new mill will be operated.

Work has been much interrupted by the revolutionary activity, principally by the Zapatistas, who have assaulted the property, carrying off horses, arms and much personal property of the manager and others, and, in addition, destroying most of the assay-office equipment.

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## Hydraulic Prospecting at Cobalt

The illustration appearing in "Photographs from the Field," in the JOURNAL of June 21, 1913, showing hydraulic prospecting at Cobalt, should have been credited as copyrighted by A. A. Cole. This was inadvertently omitted when the photograph was published and this opportunity is taken to extend the proper credit.

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The case of A. Chester Beatty vs. the Guggenheim Exploration Co. and others, in which the plaintiff made claims for a large sum of money on account of the organization of the Yukon Gold Co., has been decided in favor of the Guggenheims.

## PERSONALS

[illegible] is at Yerington, Nev., on professional business.

[illegible] H. Tod recently left San Francisco for Juneau, Alaska.

Forest B. Caldwell recently left San Francisco for Candelaria, Mexico.

C. Earl Rodgers has been placed in charge of the refinery at the Dome Mines Co.'s mill at Porcupine.

Dwight E. Woodbridge, of Duluth, Minn., has been at Salt Lake City and Butte on professional business.

D. M. Riordan, who is still in California, had the misfortune to break his leg. It is mending satisfactorily.

President William G. Rice, of the Superior & Boston Co., left Globe, Ariz., June 16, for Houghton, Mich., with the remains of his brother, the late Carl Rice.

E. B. Quigley, for three years past superintendent of the Herman mine at Westville, Calif., has assumed the management of the Black Cañon mine in the same district.

W. S. Thyng has concluded his services as secretary of the Northwest Bureau of Mines, Spokane, Wash., and has opened an office for the general practice of mining engineering.

C. A. Coffin has resigned as president of the General Electric Co., and has been made chairman of the board of directors. E. W. Rice, Jr., former senior vice-president, is president.

E. H. Coxe, general superintendent of mines for the Tennessee Coal, Iron & R.R. Co., has accepted the position of general manager of the LaFollette Coal & Iron Co., of LaFollette, Tennessee.

Harry J. Wolf, of Denver, has completed the investigation of copper prospects in Mineral and Lyon counties, Nev., and has gone West to examine gold properties in Calaveras County, California.

Dr. Lauro Muller, minister of foreign affairs of the Republic of Brazil, who is making an extended visit to the United States, inspected the works of the Bethlehem Steel Co., at South Bethlehem, Penn., recently.

J. B. Carrington has been elected president of the Woodstock Iron Co., Anniston, Ala., to succeed Earnest Williams. Mr. Carrington has been connected with the Woodstock Co. for several years, and only recently organized another large iron and steel company at Anniston, which will begin operations soon. M. H. Maury was elected to succeed F. S. Kirkpatrick as vice-president, and M. B. Wellborn to succeed W. C. Ivey as director.

George H. Abeel, Ironwood, Wis., the oldest of the Gogebic mine managers, has resigned his position with Oglebay, Norton & Co., Cleveland, after 26 years of service. He had supervision of iron-ore mining properties of the Montreal Mining Co. in the Gogebic, Wis., district, mines at Buhl on the Mesabi range and properties of the Castile Mining Co., at Wakefield, Mich. Frank B. Goodman succeeds to the managership of the Montreal company's properties, Percy S. Williams to the Castile mines and A. Angst to the Buhl mines.

## OBITUARY

Howard H. Dickey died at Cumberland, Md., June 25. He was a graduate of the University of Pennsylvania and had been engaged in the iron trade for many years. With his father he organized the Cumberland Steel & Tinplate Co., which built and operated a rolling mill; and later he was president of the Cumberland Rail Co., which had a mill for rerolling rails.

## SOCIETIES

**Canadian Electrical Association**—The 23d annual convention of the association was held at Toronto, Ont., June 25-27, with [illegible] 300 members in attendance. President W. L. Bird [illegible] chair. A large number of important technical papers [illegible] presented, special prominence being given to the [illegible] use of electricity as a motive power for vehicles. [illegible] secretary's report showed a total membership of 619. D. A. Street, of Ottawa, was elected president; A. L. Mudge, Toronto, first vice-president; B. H. McDougall, Toronto, second vice-president; W. Maclachlan, Trenton, Ont., third vice-president; H. T. Martin, Toronto, secretary-treasurer.

**American Society for Testing Materials**—The sixteenth annual meeting began at Atlantic City, N. J., June 24. At the opening session, Captain Robert W. Hunt delivered the presidential address in which he spoke chiefly of the application of specifications and the necessity of using judgment in carrying them out. He directed attention to the difficulty that necessarily must be experienced in formulating international specifications and stated that for many years to come most countries will demand specifications which will best apply to their own circumstances, either of production or use.

The society was reported in a flourishing condition, having 1574 members. The following officers were chosen: President, Arthur N. Talbot; second vice-president, Richard Moldenke; members of the executive committee, William H. Bixby, John Brunner, F. H. Clark and Albert Sauveur. President-elect Talbot is professor of municipal and sanitary engineering in the University of Illinois, Urbana, Ill. He has made a number of important contributions to the "Proceedings" of the society.

Wednesday was devoted to iron and steel, there being morning and evening sessions, while Wednesday afternoon was reserved for recreation. Cement and concrete tests were subjects for Thursday; ceramics and road materials for Friday morning and nonferrous metals for Friday afternoon. The final session, Saturday morning, was given to papers on testing and miscellaneous subjects.

## INDUSTRIAL NEWS

Among recent orders received by the Hardinge Conical Mill Co., 50 Church St., New York, is one from the W. A. Clark interests at Butte, Mont., for five of their largest-size mills.

The chancery court of Rhea County, Tenn., has appointed H. T. Noyes receiver of the Dayton Coal & Iron Co., at Dayton, Tenn. He is directed to continue the operation of the plant, of which he has been superintendent for some time. The stock of the company is nearly all owned by James Watson & Sons, of Glasgow, Scotland, and the present trouble is due to the recent failure of that firm.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

AMALGAMATOR. Eugene E. Thibault, Butte, Mont. (U. S. No. 1,065,563; June 24, 1913.)

DRY BLAST—Improvements in the Obtainment of Dry Air for Use in Blast Furnaces and Other Like Furnaces. Chemische Fabrik Griesheim Elktron, Frankfort-on-Maine, Germany. (Brit. No. 13,050 of 1912.)

IRON-ORE REDUCTION—Process of Producing Metals. Sven Emil Sieurin, Höganäs, Sweden. (U. S. No. 1,065.890; June 24, 1913.)

URANIUM, RADIUM AND VANADIUM—Process of Extracting Values from Ores. Warren F Bleecker, Canonsburg, Penn., assignor to the Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,065,581; June 24, 1912.)

VANADIUM—Process of Purifying Vanadium. Warren F. Bleecker, Canonsburg, Penn., assignor to The Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,065,581, June 24, 1913.)

CARTRIDGE—Lime Cartridge for Mining Purposes. Herbert Lushington Storey and Joseph Parkinson, Lancaster, England. (U. S. No. 1,065,261, June 17, 1913.)

DRILL STEEL—Pin-Pulling Machine for Use in Forging the Shank Ends of Drill Steel. John Q. Grant, Denver, Colo. (U. S. No. 1,065,125, June 17, 1913.)

MINE-CAR APPLIANCE. William H. Walker, Johnstown, Penn. (U. S. No. 1,064,795, June 17, 1913.)

ROCK DRILL—James A Thompson and Edwin M Mackie, Chicago, Ill., assignors to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,065,007; June 17, 1913.)

CONCENTRATOR. William W. Whitton, Goldfield, Nev. (U. S. No. 1,065,288, June 17, 1913.)

SEPARATION—Apparatus for Separation by the Action of Centrifugal Force. William John Gee, Tulse Hill, London, England. (U. S. No 1,065,519, June 24, 1913.)

SEPARATORS—Improvements in Electro-Magnetic Ore Separators. G. Rietkotterm, Hagen, Germany, and P. Claes, Brussels, Belgium. (Brit. No 21,135 of 1912.)

SETTLING CONE—William Main, Piermont, N. Y. (U. S. No. 1,065,542; June 24, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—June 26

**The Resignation of M'Nab,** U. S. district attorney, followed immediately the postponement of the trial of directors of the Western Fuel Co. by the Department of Justice, together with the postponement of a notorious criminal case. The Western Fuel Co. directors were charged, upon grand jury indictments, with selling 60,000 tons of coal more than their books show was shipped by them into this country. They are charged with maintaining fraudulent scales, corrupting the customs officers and bribing engineers of the Japanese fleet. The attorney general had passed on the evidence and declared it sufficient to put all the defendants on trial. The defendants demanded a short continuance on the ground that their attorney had important business in Washington. Five days later Mr. M'Nab was ordered by wire from the attorney-general to refrain from certain prosecutions in these cases. Mr. M'Nab stated that if compelled to postpone these cases, or refrain from prosecutions, such act would be the last that he would perform as district attorney for the northern district of California.

**Ownership of the Town of Forbestown,** in Butte County, under mineral patent, is claimed by A. J. Batt, a merchant in the town. The claim is made not only of the land occupied by the town, but the buildings as well. Mr. Batt has not attempted to evict any of the householders who are in possession, but has taken formal possession of all vacant houses, and has denied the owners of houses occupied or unoccupied permission to remove them. The town was settled about 50 years ago, but at that time a survey was either deemed unnecessary, or was neglected through carelessness. In the early mining days at Forbestown the placers furnished all the gold, and like many other mining camps in California, the miners considered their occupancy as only temporary. When quartz mining was undertaken, prior to the working out of the placers, Forbestown became one of the most thriving and productive camps in the state; there was serious talk of surveying a townsite and undertaking the establishment of an organized municipality. This was not done. The failure of Hayward, Lane, Ralston, and Stowe, the pioneer quartz miners, to realize the permanency of the orebodies in the Shakespear, Mexican, Gold Bank and Golden Queen, and the cessation of active mining, rather discouraged the idea of the establishment of a permanent town. The topographical situation and climate of the Forbestown district combine to render it attractive for residence, and many of the early householders have retained their residences regardless of the mining possibilities of the camp. During the last two years the quartz mines have been extensively developed, particularly the Gold Bank-Golden Queen and the Burlington mines, and several smaller old properties have been reopened and some new properties have been prospected. In the present year a 20-stamp mill and 75-ton cyanide plant have been built at the Gold Bank, which are now in operation. The future of the camp is at the present encouraging. The mines lie chiefly north and south of the town. There are evidences that the ore-bearing formations strike through and under the town. Evidently Mr. Batt has realized the present importance of the camp and desires to maintain whatever rights he may possess. The householders of the town have organized the Forbestown Townsite Association for the purpose of carrying the matter to the U. S. Land Office, and have recently had a survey made. It is believed that the only rights that Mr. Batt will be able to maintain will be the mineral rights, the right to locate and develop mining claims within the townsite, but that he can take possession of the surface and surface improvements is doubtful.

### DENVER—June 27

**Hearing of the Colorado Coal Rate Case** between the Consumers' League and the Burlington, Union Pacific and Colorado & Southern railways has been postponed until Aug. 25.

**Four Cripple Creek Mergers** are under way. First, the one that includes the El Paso, of Beacon Hill, and the Golden Cycle, called the Colorado Railways, Mines & Utilities Corporation (this is the company of which Allen Burris is president, who is now in London negotiating the deal); second is the Raven Hill Consolidated, with the Joe Dandy for a nucleus, taking in the acreage between the Elkton and the Cresson mines; the Gold Hill merger, just commenced, takes in the Moon-Anchor, Anchoria-Leland and Conundrum on Gold Hill; the fourth is on Mineral Hill, including the placers and several lode claims, but of this no details are yet at hand.

### SALT LAKE CITY—June 27

**The U. S. Assay Office** has moved from Post Office Place to the fourth floor of the recently enlarged Federal Building. The new quarters are more convenient, and the most uptodate equipment for the assay of gold and silver bullion has been installed. The Salt Lake office receives bullion from Utah, Nevada, Idaho and adjoining states, having averaged about $100,000 per month since its establishment in February 1909.

**The Bingham & Garfield R.R.** filed an amendment to its articles of incorporation with the secretary of state June 11, increasing the capital stock from $2,500,000 to $6,000,000. The road is said to have cost about $5,500,000, of which $3,000,000 was in bonds. The stock retains its par value of $100 per share. The reasons for the increase in capitalization have not been given, but it is probably for taking up the bonds. Arrangements to attach a special sight-seeing car to the trains between Salt Lake City and Bingham are to be made. The large concentrating mills at Garfield are passed en route, and a fine view of Salt Lake Valley from the Oquirrh to the Wasatch mountains is obtained.

### BUTTE—June 25

**An Interesting Judicial Decision** was that made June 24 in the district court at Helena, by Judge J. Miller Smith, in settling the estate of John D. Allport. He signed a decree of partial distribution by which the Anaconda Copper Mining Co. comes into the possession of an undivided quarter interest in the Minnie Healy quartz lode claim in the Butte district. The administrator of the estate is directed in the decree to collect from the Anaconda company and pay to the county treasurer $908, the inheritance tax.

**A New Use for Waste Products** from the Anaconda concentrator has been found. A proportion of two parts sand and one of slime is molded into tile in a new machine recently installed in the brickyard. Although still in the experimental stage, it is believed that the material can be successfully used, as good brick has been made from it. The tile is to be used in draining the Norton and Parrott ranches, consisting of about 1000 acres of land, acquired by the company as an addition to the model farm situated near Anaconda, which has been operated by it for several years, primarily for the purposes of demonstrations in the smoke suit. The tile will be made in sections 2 ft. long by 12 in. diameter, and will be laid in parallel rows from 6 to 9 ft. under the surface, east and west across the area, the drainage to flow into an 18-in. cement drain on the eastern border. It is calculated that about 50,000 linear feet of tile will be used, and already 11,500 ft. of other kinds of tile have been laid. If the new composition is found effective, tile made from it will be largely used in the remainder of the work. On parts of the farm where tile has been laid the effect is apparent, the grain being green and luxuriant, in marked contrast to parts where water still lies near the surface, where the growth has a yellow appearance.

### HOUGHTON—June 28

**Operations at the Onondaga** property in Ontonagon County are confined practically to diamond drilling and to general surface geological exploration. This company was organized and financed a year ago and the exploration work now under way is preliminary to a more elaborate development campaign which will follow. Two diamond drills are in use in making a cross-section examination of a formation which has been found to be commercially valuable at property in that immediate vicinity, notably the White Pine, which is now operating under the direction and management of the Calumet & Hecla. That is about all that can be said of the Onondaga. It takes a long time to develop virgin mineral territory in this region, particularly territory concerning which there is little accurate information. The company was cleanly financed, and is capably managed. R. C. Pryor, the president, owned the land and took no cash for it, putting it in on a stock basis. His record in other properties, particularly in the development of properties formerly of doubtful value, has been without a failure. His geological knowledge brought this section to his attention, and he is convinced that there is good copper ground in the property. It is being explored economically and conservatively. While the management is unwilling to give out any information whatever regarding the results of the drilling so far attained, there is general knowledge that commercial copper has been opened in at least one of the holes.

**Important Developments at the Indiana** property at present are reported at the 600- and 1150-ft. levels. On the 600-ft. level commercial copper continues to be opened and the results are of a most satisfactory nature in every way. The most peculiar thing about the formation opened at this point, and it is true also of the class of rock which has been opened at the 1150-ft. level, is the large amount of mass copper that has been encountered with practically no fine copper at all. In this the lode differs from the ordinary amygdaloid lode. In one spot in the 600-ft. opening two tons of mass copper was found. The failure of the drills to find again the No. 2 drill-core showing of copper at 1400 ft. is, frankly discouraging to the management. As the old Cornish miner said, "Where she is, there she is, and sometimes not." The No. 2 drill core showing was beyond a doubt the richest ever made in any exploratory work in the Lake Superior district. It caused a great sensation here and in the East Indiana stock was selling at $40 per share. According to the calculations this formation should have been cut by the shaft shortly before reaching a depth of 1400 ft. It was not found in the shaft, and six diamond-drill holes were drilled horizontally from the bottom. Some of these went in 200 ft., and some as far as 500 ft. None has as yet cut the formation. This seems to be conclusive evidence that there was a decided change in dip in the formation in the immediate vicinity of the core as taken from the hole, for the shaft went down parallel with the drill hole. At the same time there is no reason for pessimism as to the inability to locate the rich lode which the drill core showed to be in that vicinity. It will be found eventually, although it is discouraging, that the opening of this formation should be thus prolonged. A winze will be sunk from the 1150-ft. level, and this will give better opportunity for further opening in the closer proximity to the supposed location of the lode. There is no immediate danger of an assessment on Indiana stock. This company has enough money to operate at the present rate for about five months.

### DULUTH—June 28

**Stripping on the Cuyuna** range is being done at low costs. Several weeks ago it was announced that the Tod-Stambaugh company was stripping the Pennington mine at Crosby for 8c. per yd., and this is easily believable when it is announced that two minutes only was required to load a 28-yd. car with a 5-yd. dipper. Not only that, but within the two minutes the next empty car was spotted for loading. A good record is being made also at the Pittsburg Steel Ore Co. mine at Riverton on the Cuyuna range, where sand suckers are used. For stripping on the Mesabi range, 25c. to 40c. per yard has long been commanded, but the difference in cost between the Cuyuna and the Mesabi is found in the material comprising the overburden. On the Cuyuna it is sand and on the Mesabi, clay, boulders and sand. The cheapness of stripping on the Cuyuna is going to be an incentive to deep stripping.

**Revenue from Iron Mines** to the state of Minnesota is beginning to loom large. It is estimated that the revenue this year will amount to not less than $1,000,000. Minnesota owns 25 mines that have been developed to the shipping stage. 48 of the 165 state mining leases have developed merchantable ore. All of these developed mines are on the Mesabi range except the Thompson (Inland Steel) at Crosby, on the Cuyuna range. The state gets 25c per ton royalty for its ores. There is one state lease on which the operating company pays $1.25 per ton royalty. The state gets 25c., and two men divide the dollar. One of the biggest properties owned by the state is the Scranton, once known as the Elizabeth, near Hibbing. This mine has a large tonnage, and the state will in the course of time derive several million dollars in royalties from it. Pickands, Mather & Co. control the Scranton.

**The Lake Deposits Decision** recently made by the courts, holds that the state of Minnesota has no real ownership over the bottoms of meandered lakes except as a sovereign to protect for the common good. It will be interesting to note how many [illegible] and how much ore will be found under such waters. The issue was evidently considered a large one for the state made a strong fight to establish its ownership of such ores, but the courts held that the riparian owners control any such ore. Undoubtedly much ore exists under numerous lakes of the Mesabi range. This suggests that the waters of the Embarrass River will some day be temporarily diverted to enable the production of the Syracuse mine ore, and of ore on the other side of the river. The Syracuse has been partially developed by a shaft, but the work has been suspended on account of quicksand and water. This property is controlled by Pickands, Mather & Co., and eventually this orebody will be developed from the east side of the river where the company has other land to be developed. A large engineering problem, to overcome quicksand and water, is involved.

### FAIRBANKS, ALASKA—May 22

**The Sluicing Season Opened** the last of April, a little later than usual. The breakup of the ice in the Tanana River occurred May 11, but there was not the usual heavy run of ice and only an insignificant rise of water. The outlook is for a prosperous season for the placer mines. The banks of Fairbanks estimate the probable output of the entire Tanana Valley at $5,000,000, a falling off of $500,000 from the figures of 1912. About $4,000,000 of this will come from the Fairbanks district proper, the rest from Hot Springs, Tenderfoot and other outlying camps. As has been the case for several years, the bulk of the production from the creeks adjacent to Fairbanks will come from Goldstream, Ester, Cleary, Dome, Engineer, Little Eldorado and Fairbanks Creeks. The most important result of the winter's prospecting was the discovery of rich pay in what appears to be an entirely new channel on the Niggerhead claim at the mouth of Dome Creek. The locating of the continuation of the Crane Gulch pay on Fairbanks Creek, and the discovery by churn-drilling of good pay in the thawed ground of Cripple Creek, were other important events of the winter. Smallwood Creek was prospected, and several small outfits will be at work there during the summer.

On Fairbanks Creek, more men will be at work than last season, and it is thought that the output will be correspondingly swelled. Upper Cleary will not be lively, but the flats at the mouth of the creek will be the scene of great activity. Keys & Rettig, the largest operators will work from two shafts and expect to strip 100,000 sq.ft. of bedrock. On Dome Creek, as on Cleary, the greatest activity will be on the flats where the creek joins the valley of the Chatanika River. Some large cleanups are expected from the Meyer & Paulson pay on the Niggerhead claim, one of $16,000 having already been made. The output of Little Eldorado will probably show a decrease, although several outfits are working near the head of the creek. Goldstream and its tributaries will again take first place in point of production among the creeks of the camp. On upper Goldstream there will be the usual large amount of open-cut work by scrapers. On lower Goldstream the pay has been traced farther downstream than before, and a large output is expected from that section. Engineer Creek, formerly one of the most important, will witness little activity in a mining way. Ester, with its rich tributary, Eva, will probably show a slight increase in production. A cleanup of $30,000 was recently made on the Happy Home association claim on Eva Creek. The latest advices are to the effect that another attempt will be made to operate the dredge of the Alaska Exploration Co. on upper Fairbanks Creek. So far, the dredge has been a failure, partly because it is antiquated and of a type unsuited to the work to be done, and partly because of the limited amount of dredging ground available.

### SUDBURY—June 26

**A Department of Safety** in charge of E. Corkill; formerly Chief Inspector of Mines for Ontario, has been established by the Canadian Copper Co. at Copper Cliff. This company has experienced a large number of accidents lately and this step is considered in its best interests. Mr. Corkill has had extensive experience in this class of work and in his new position, will be given full power to introduce measures that are conducive to the safety of the workers.

### TORONTO—June 28

**Silver Thefts in Cobalt** have caused the police to endeavor to unearth the people engaged in the manufacture of silver rings, crosses, charms and other articles from silver supposed to have been stolen. On June 21 they arrested two Polish miners, John Borock and Joseph Matiazuik, and seized about 10 lb. of silver, some of which had been manufactured into various trinkets. Later a house was raided and three women arrested, several pounds of silver being found, together with a furnace and tools used in the manufacture. The women were afterward discharged. The men are under arrest, and other suspected persons are being looked for.

# THE MINING NEWS

The items in this department are classified by states and counties. Whenever it can be done conveniently the post office address of each company or mine that is mentioned is given in brackets immediately after the name of the mine or company.

## ALASKA

IN THE CIRCLE DISTRICT several dredges and several hydraulic outfits are being operated, as well as a large number of small quartz claims. The output, it is thought, will be about the same as last year. The many dumps taken out during the winter have been sluiced, but no accurate estimate is possible as to the amount of gold recovered. It is reported that Deadwood Creek will be unusually active during the summer, as there are many men at work from 50 Below to 50 Above.

GOOD PAY HAS BEEN DISCOVERED in several places on Bear Creek, in the Tuluksak district. On 3A, upper discovery, Sanderson & Thorns are said to have found good prospects with their drill. Discovery claims have been purchased by Manley & Co., of the Iditarod district. A 40-hp. boiler, a three-drum hoist, and a Baggerly scraper have been freighted to the claims, and will be used in opencut work. Several smaller outfits are at work on Bear Creek and its tributaries. All the creeks are shallow, and are said to be dredgible.

FREQUENT RAINS in the Fairbanks district during the last two weeks of May have prevented the water famine that often follows the floods from the melting of the winter snow. All of the placer operators, according to report, are doing well. Nearly all of the dumps taken out during the winter have been sluiced, with results that have, in the main, been satisfactory. With the exception of opencut work, where the ground is left for the sun to thaw, the season's operations are in full swing. O. B. Mallison, on No. 4, Goldstream, who plans to strip about 100,000 sq.ft. of bedrock by scrapers, expected to start sluicing about June 15, and it is probable that the other operators using scrapers will not be far behind.

RHOADS-HALL (Fairbanks)—It is reported that the vein has been picked up at a depth of 315 ft. It was lost at a fault between the 240- and 315-ft. levels and has only been recovered after several months of diligent prospecting.

ALASKA EXPLORATION CO. (Fairbanks)—It is reported from London that the dredge of this company, on upper Fairbanks Creek, will resume operations as soon as a mining engineer can reach Fairbanks from London to take charge.

NEWSBOY (Fairbanks)—It is reported that the vein has been picked up in the east drift of the 215-ft. level, beyond the fault. The vein there is 30 in. wide, and careful panning tests have shown the ore to carry about $40 per ton in free gold. As soon as sufficient ore is blocked out the mill on upper Cleary Creek will be started.

AMERICAN EAGLE No. 2 (Fairbanks)—This property is in litigation between William McDonough and Frederick Fey. A lease has been let for a period of five years, the royalties to be held by the American Bank of Alaska pending the settlement of the litigation. A working shaft has been started on good ore, and it is planned to install the boiler, hoist and the headframe formerly in use on the Pennsylvania claim.

SILVER KING (Koyukuk, via Fairbanks)—This company owns a group of silver-lead claims on which development work will be done this summer. A small boat of the side-wheel type has been built at Fairbanks for transporting supplies to the mine and for delivering the ore to the larger freighters of the Yukon. The boat is equipped with a removable boiler, a steam engine, and an auxiliary gasoline engine. The boiler will be removed when desired for use in mining work.

KEYES & RETTIG (Fairbanks)—The first cleanup of the season from this lease on the Doctor bench claim, lying in the Chatanika flats at the mouth of Cleary Creek, yielded $9000, being a satisfactory figure, as it shows the ground to average about 25c. per wheelbarrow-load. The operators have over 100,000 sq.ft. of pay blocked out by the tunnels, and have not yet reached the limits of the paystreak. It is thought that the ground as a whole will average better than $1 per square foot.

## ARIZONA

### Gila County

GIBSON (Globe)—Sultan & Wayne, who recently leased this mine, are contemplating treating all the ores left in the old stopes and in the dumps by flotation. This introduction of the flotation method into the district is looked upon with much interest.

### Mohave County

BOUNDARY CONE (Oatman)—Plans are being made for a 10-stamp mill and cyanide plant.

BIG EYE (Yuma)—On account of a breakdown in the gasoline engine the mill has been shut down for a few days. Work continues in the mine and good ore is being opened up.

RAINBOW (Chloride)—It is said that this mine is shipping three carloads of ore per week to the Needles smelting works, the average value of which, in gold, silver and lead, is more than $40 per ton.

WHITE ELEPHANT (Cerbat)—A 5-ft. vein of ore of good grade has recently been opened up in this mine and two carloads have already been shipped to the Needles plant. The property is in charge of W. E. Dunlap.

NEVADA-ARIZONA (Kingman)—H. L. Stewart and John Phillips, directors, have been in Kingman making arrangements for the resumption of work on the company's property in the Music Mountains.

GOLCONDA (Golconda)—The hoisting equipment on this property is being overhauled and the shaft straightened and repaired. It is said to be the intention of the management to install a skip and hoist of greater capacity.

WILLIAM'S TUNGSTEN—A road has almost been completed from the Big Sandy road to this Aquarius Range mine and it is expected that a mill will be built. Much development work has been done on the property during the last year and there is a large tonnage of tungsten ore in sight.

COPPER GIANT (Hackberry)—This property has recently been taken under bond and lease for W. A. Clark. A force of men has been working on the mine for the last two weeks and this force will probably soon be increased to 30 or 50. The old shaft has already been sunk to a depth of 200 ft. It is stated that the siliceous ore of the mine was originally intended to be used for converter lining, the copper content being about 4%. At 200 ft. in depth, however, ore containing about 8% copper has been encountered, and is now rapidly being developed.

### Pinal County

MOHAWK (Mammoth)—More than two carloads of high-grade zinc ore have been taken out of the large opencut on the crest of the hill. As soon as the wagon road to the mine can be completed the ore will be shipped.

### Pima County

ISABELLE (Casa Grande)—The new owners are continuing shipments at the rate of a carload per week. Hoist, pumps and other mining equipment is soon to be installed.

SPOKANE-ARIZONA (Tucson)—Work on the new shaft has been suspended temporarily. The property was examined recently by A. L. Flagg, of Tucson, who is preparing a geological report on the district.

### Santa Cruz County

GROSS—The shaft is 100 ft. deep, and drifting has been begun. Good ore is opened up. The company is negotiating for the Kohler claims, which adjoin its property with a view of developing the two groups simultaneously.

RED MOUNTAIN—The new camp is well established, several new buildings including a larger store and assay office having been built. A well has been sunk and equipped with a pump to supply the camp with all the water needed. The lowest tunnel has reached the orebody, and it is now proposed to drive still another crosscut 140 ft. lower than the new tunnel.

### Yavapai County

GRUBSTAKE (Walker)—This property was sold recently by Jasper Scrivens to Pittsburgh men, who have started two shafts, one to be 300 ft., the other 500 ft. deep.

GOLD KING (Crown King)—The new management has started a long crosscut to the Swastika vein from the Muldoon gulch. A large oreshoot has already been developed on the Swastika above the 500-ft. level and the new crosscut will cut it at a depth of 600 feet.

SARATOGA—The five-stamp mill on the Lucky Star mine near Yeager Siding has been purchased for the Saratoga and is being moved to its new site. Alters & Kohlen, who have recently leased the Saratoga estimate that they have about 250,000 tons of mill ore available in the mine and on the dumps.

## CALIFORNIA

### Amador County

DEFENDER—Rolls will be installed to increase the capacity of the 10-stamp mill.

### Calaveras County

FOUR METALS MINING CO. (Keeler)—It is reported that the bondholders have accepted the decision of the referee appointed by the superior court at San José, and will accept $17 on the $100 of value of the bonds for the $250,000 worth. The property is being worked by Louis D. Gordon, who agrees to resell to the company upon the payment of $200,000 debts.

UTICA MINING CO. (Angels Camp)—A miner sustained a broken leg and other injuries while riding on a skip loaded with drills, going down the Cross shaft, June 12. At the 900-ft. level some of the drills caught in the side of the shaft, and the signal to stop was evidently not given in time. Three other men were riding in the skip, but were only slightly injured.

### Eldorado County

CARPENDAR (Placerville)—The tunnel has been advanced to the 1100-ft. point east from the shaft and has reached the gravel.

SUNSHINE (Placerville)—A tunnel will be driven to cut the main channel at an estimated distance of about 2000 ft. Scarcity of water has hampered sluicing.

FORT JIM (Placerville)—The tunnel is in 1100 ft., the last 950 ft. being in the gravel. No water has been encountered. Dr. J. W. Hyatt is operating the property on a bond and lease.

### Humboldt County

HORSE MOUNTAIN (Eureka)—Preparations are being made for [illegible] the concentrates and sorted ore with a Knox tractor.

HUMBOLDT PLACER MINING CO.—Notice has been published that an assessment of 3c. per share was levied upon the capital stock payable on or before June 16, 1913.

### Inyo County

SKIDOO (Skidoo)—The greater part of the 15-stamp mill was destroyed by fire of unknown origin June 2. One battery of five stamps was saved. The mill had been idle since January on account of repairs on the 21-mile pipe line. It was ready to begin crushing when the fire occurred. The loss is reported at $50,000. The mill had not been idle since its installation in May, 1908, until the pipe line was damaged by the cold weather of last winter. Several hundred tons of ore had been mined ready for milling and cyaniding.

### Kern County

KING SOLOMON (Havilah)—The headframe for the new 20-hp. hoist at the King Solomon shaft is completed. The shaft is down 250 ft. A crosscut will be driven south to connect with the large orebody in the ground worked by Teagle-Lamberson and Walton-Wickard-Jensen, whose leases expired June 15. The vein has been developed to a depth of 180 ft. There are three veins in the mine.

### Lassen County

CALIFORNIA-DENVER MINING CO. (Doyle)—A small stamp mill has been installed and high-grade ore is being crushed. A larger mill is contemplated.

CALIFORNIA-UTAH MINING CO. (Doyle)—High-grade copper ore has been developed in the shaft at a depth of 13 ft. During the last 30 days several claims have been located in the vicinity of this mine in the belief that the copper-bearing formation is extensive.

### Mariposa County

DUSEL (Whitlock)—This mine, which has been idle for a long time, has been bonded to George R. Dalton. The five-stamp mill is being put in order.

COPPER CLAIMS a few miles east of Mariposa have been bonded by Thomas Rodgers and W. M. Eubanks, and several claims have been located. The presence of copper east and southeast of Mariposa has long been known. Some development has been done. The vein lies east of the Mother Lode and strikes northwest and southeast. The ore is a green carbonate on top and blue sulphide below; there is some native copper. The country has not been sufficiently developed to decide if there is copper in commercial quantity.

### Modoc County

SUNSHINE-HIGHGRADE (Highgrade)—Nine sacks of ore shipped to San Francisco last season for exhibition purposes have been treated by the Selby smeltery, and reported to have yielded $417 per ton. The sacks contained 664 lb. of ore.

HESS (Alturas)—This mine, 30 miles southwest of Alturas, has been sold to Harvey & Keegle and others. It has been worked for several months under a purchase bond and lease. The mine is equipped with a 10-stamp mill and cyanide plant. The mine is developed by a 200-ft. shaft and drifts at three levels. In the last season's run of about seven months $18,000 was recovered.

### Nevada County

GOLDEN CENTER (Grass Valley)—Development work on this mine in the center of the town was begun June 20. There are nearly 100 acres of mineral rights in the holding.

GOLDEN ORIOLE (North Columbia)—The operation of this drift gravel mine at the head of Shady Creek has been undertaken on a bond and lease by Frank Phillips, of San Francisco. A tunnel will be driven to tap the gravel. The channel is believed to be an extension of the North Bloomfield channel.

### Placer County

BELLEVUE (Newcastle)—This is an old producing mine being reopened. A crosscut is being run from the shaft at the 400-ft. point to cut the vein disclosed in the Bullion claim adjoining. The drift at the 100-ft. level in the Bullion encountered water 80 ft. from the shaft, which flooded the mine to a point 40 ft. below the collar and threatened three miners. The Bullion will be unwatered with an air-driven pump. Electric power will be substituted for steam for drills and hoist. The lessees contemplate the installation of a modern stamp mill. The dump of the old workings will be milled.

### Plumas County

JAMISON (Johnsville)—Work has been resumed after a shutdown during the winter on account of shortage of water for power and milling. Forty men are employed and all 20 stamps are dropping. This was the first stop in the operation of the mine in the last 20 years. The mine is in the Plumas-Eureka district.

### Shasta County

ASBESTOS CLAIMS have been located on Mears Creek near the Trinity County line by L. V. Stevens and H. E. Stock, of Hazel Creek.

STRODE (Stella)—A new stamp mill is to be built at this mine. The mill will be erected on Mad Ox Creek near the site of the old Mad Ox mill. A road has been built from the mine to the millsite and the Mad Ox road has been improved. [illegible] Strode is manager.

DELTA CONSOLIDATED GOLD MINES CO. (Bayles)—The following directors were elected at the annual meeting at Redding recently: E. Sanders, Dr. S. T. White, Frederick [illegible], [illegible] Tillotson, S. D. Furber, Carlos Furber, T. [illegible] [illegible] and E. E. Morris. The company owns [illegible] claims on [illegible] Creek, west of Delta, which are being surveyed [illegible].

## COLORADO

### Eagle County

AT EAGLE the mining boom is still on with new discoveries being reported daily. B. M. White has leased the Dakota to a Colorado mining company. The Dakota Extension and the North Dakota Extension have been leased to John Harvey, of Leadville. The North Dakota has been leased to Marion Henry and Charles Cravens. Oscar Kempf the discoverer of the Lady Belle, has given a lease on the Little Mary to Mr. Hoffman, who is said to be backed by the American National Bank interests of Leadville. The Lady Belle is now working 30 men. Leadville appears to be specially interested in this new silver district.

### Lake County—Leadville

NEW MONARCH (Leadville)—Two electric hoists have been ordered for this mine from the Colorado Power Co.

EMMET (Leadville)—The lessees of the Emmet shaft on Carbonate Hill, are about to install a 112-hp. electric hoist.

LITTLE JONNY (Leadville)—Ore that assays 3 oz. gold per ton was opened in No. 4 shaft by Bertonilla, lessee, and shipments will be commenced.

DINERO (Leadville)—This mine has the largest body of ore yet found in the Sugar Loaf section and of good grade. The monthly shipments are to be increased.

FAIRPLAY (Leadville)—A large body of low-grade ore has been opened, the manager stating that he has enough ore blocked out to keep a mill running for several years; he is contemplating the erection of a cyanide plant.

DISCOVERY (Leadville)—In this mine on Fryer Hill, lessees on the Doublecheck shaft have opened oreshoots in two drifts, one being 3 ft. wide and the ore assays 51% lead and 10 oz. silver per ton. The other is 3 ft. wide assaying 33% iron, 17% manganese, 1.6% lead and 5 oz. silver per ton.

ADELAIDE (Leadville)—Ore said to contain 20% lead and 22 oz. silver per ton has been opened in a shaft 150 ft. west of the old Adelaide shaft by George Ward & Co. lessees. The first carload has already been shipped to a smelter and others will follow. H. S. Beaner & Co., sublessees, are also shipping ore from the 300-ft. level.

### Park County—Alma

MORNING STAR (Alma)—A 50-ton cyanide plant, the first in the district, is being built by this company.

### Summit County

WELLINGTON MINES CO. (Breckenridge)—About 65 tons of excellent grade lead-silver concentrates have been shipped to the local branch sampler of the Chamberlain-Dillingham Ore Co. The concentrates were made in the new magnetic separator mill. All needed repair work will be made while the wet-process, 100-ton capacity concentrator is idle, pending a better price for blende or a reasonable freight rate from the railroad company, which arbitrarily increased the freight rate to $3 per ton from a former rate of $1.75 per ton.

ST. JOHNS MINES, LTD. (Montezuma)—This company was formed in February, 1913, and commenced operations about one month ago. The mine produced substantially within the last two years under another company, shipping about $10,000 worth of concentrate in that period. All the proceeds went into development and, possibly, ill-advised, mill construction, but only internal dissentions brought the company's operations to an end. There are about two miles of workings in the mine, and approximately 500,000 tons of ore is in sight, a considerable proportion of which is already mined. This was back filled in stopes in the early days after hand-sorting the high-grade silver ore, the only material then shipped, and local official records show that ore worth about $6,500,000 was shipped under such conditions.

### Teller County

SCHOOL SECTION (Cameron)—Ore is being shipped chiefly from the 650-ft. level where the stope is 250 ft. long by 6 ft. wide; screenings only are shipped.

EL ORO MINING & MILLING CO. (Elkton)—The company has installed a hoist and is running its own compressor. Crushing and cyanide machinery is to be purchased.

PIKES PEAK PLACER (Cripple Creek)—Two dredges are to be installed on this Mineral Hill placer ground. It is stated that in the early days of the district about $80,000 was taken from this ground in nuggets, the water for washing the gold being hauled from Anaconda in barrels.

PORTLAND (Independence)—A new system is being tried with the lessees. They are to receive half of the amount of the check and the company will furnish air and explosives and hoist the ore. It is estimated that the company in this way will receive about 20% net royalty, 30% covering costs. It is stated that the 1600-ft. level is in rich ore and that the mine is in better physical condition than it has been for several years.

## IDAHO

### Idaho County

DEL RIO (Elk City)—This property, consisting of the Mascot, St. Lawrence, and Del Rio claims, is under lease to Massam Bros.

NATIONAL COPPER MINING CO. (Mullan)—Official announcement has been made of the company's intention to build a 500-ton mill at the mouth of Deadham Gulch, 1½ miles east of Mullan. Men have already been put to work clearing the site for the concentrator and other buildings. The plant will be so built that additional units can be added as required. Electric power will be used, and water for milling will be obtained from the South Fork and Deadman Creeks. A mile-long aerial tram, with a capacity of 70 tons of ore per hour, will connect the mill and the mine. Mill and tram are to be ready for operation Mar. 1, 1914. A contract is soon to be let for a 600-ft. raise on the oreshoot from the tunnel level.

## MICHIGAN

### Copper

LAKE (Lake Mine)—In a recent shareholders' meeting the president stated that the company was in no immediate need of additional funds, but that a little later, possibly in two or three months, an assessment of $1 would be levied, making the first assessment the stockholders have been called upon to pay.

WYANDOT (Winona)—Drifting from the bottom of the winze, which was sunk on the lode cut by the crosscut from the exploratory shaft, continues opening ground that is satisfactory. A distance of about 225 ft. has been driven and the formation is well charged, carrying large quantities of heavy copper.

LA SALLE (Calumet)—Railroad connections will soon be completed into this property so that rock shipments will be started in the near future. The two shafts have been fitted out with new surface equipment and the underground openings are sufficient to maintain regular shipments as soon as the railroad is connected.

VICTORIA (Victoria)—Operations at this property are concentrated at No. 2 shaft, which is being sunk below the 24th level. Drifts, east from eight levels are developing ground that is very encouraging, and improvement has been noted with depth. Drifting is also going on at the 13th level west, in commercial ground.

AHMEEK (Kearsarge)—The equipment at the new shafts Nos. 3 and 4 will be ready to go into commission about Sept. 1. Ground has been broken for the erection of the addition to the stamp mill and the steel will be delivered about Aug. 1. Contracts for most of the machinery have been let. The order includes a 2000-kw., low-pressure, turbine, generating set, which will utilize the exhaust steam from the stamps and will furnish the electrical power to operate the mill machinery.

### Iron

OLIVER IRON MINING CO.—Lake Superior officials of this subsidiary of the U. S. Steel Corporation have been inspecting safety devices and methods at the Gary steel plant and at the South Chicago furnaces of the Illinois Steel Co.

IMPERIAL (Michigamme)—The Cleveland-Cliffs Iron Co. has completed a new steel headframe and crushing plant at this limonite mine. Active mining operations are being delayed until more orders are received for this class of ore.

MINERAL MINING CO. (Iron River)—Both the James and Konwinski mines, sometimes called the Osana and Wauseca, are active; the new steam shovel recently purchased is used at the stockpile. A new concrete brick change house is nearly completed.

OHIO (Michigamme)—The new crushing and hand-picking plant being erected by the Rogers-Brown interests to treat Portland and Ohio limonite ores is nearly completed. It is expected that a good-sized shipment of Portland ore will be made this season.

CASCADE MINING CO. (Palmer)—This company is installing steel ladders with angle-iron sides in the new Isabella shaft that is now being sunk. The ladders are made by W. T. Cole, of Ishpeming. Shaft sinking and equipping of surface plant continue at the Isabella.

PICKANDS, MATHER & CO.—It is announced that after the overburden is stripped from the new Alpha mine, at Mastodon, in the Crystal Falls district, the ore will be mined by "milling." Sinking of shafts and driving of haulage drifts will soon be started. The stripping contract is to be let and the work hurried.

## MINNESOTA

STATE IRON LANDS WILL PRODUCE, according to state auditor S. G. Iverson, of Minnesota, in a recent address at Crookston, Minn., 3,000,000 tons of iron ore and $1,000,000 in royalties will be received therefrom. He estimates that existing leases on the state's lands will eventually produce $150,000,000 in royalties.

CUYUNA-DULUTH (Ironton)—The new shaft entered the orebody June 23.

IRON MOUNTAIN MINING CO. (Manganese)—The new three-compartment shaft is within 15 ft. of the orebody. The shaft will be ready for hoisting within a month.

CUYUNA-MILLE LACS (Crosby)—Shipments amount to 5 to 7 cars of manganiferous iron ore daily. This ore is going forward all-rail to consumers, some going as far as Chicago, a distance of about 700 miles. The high-manganese content of this ore permits this long all-rail haul at a profit to the producers. After Aug. 15 this tonnage will go to the Northern Pacific dock at Allouez, Wis.

CUYUNA DOCK CO.—This subsidiary of its Northern Pacific Ry. Co. reports that the new dock at Allouez, Wis., will be ready by Aug. 15. Ore shipments from the Barrows mine (Barrows) and the Cuyuna-Mille Lacs mine (Ironton) will go over this dock. This will mark the Northern Pacific's entry into the ore-carrying trade between mines and upper lake ports.

ROGERS-BROWN ORE CO.—This company has shipped 150,000 tons from its Cuyuna Range properties so far this season. It controls the Kennedy mine (Cuyuna), Armour No. 1 and Armour No. 2 (Crosby). The Kennedy is hoisting 1000 tons daily, the Armour No. 1, 650 tons and No. 2 about 800. In addition, some ore is being loaded from stockpile, making a total of about 100 cars per day, all going to dock at Superior, Wis., via the Soo Line.

DELL DEVELOPMENT CO. (Duluth)—This company was recently organized and is now preparing to move the Jones step-process furnace from Republic, Mich., to some place on the Cuyuna Range, probably Crosby. The Jones furnace was but a partial success on low-grade iron ores, and it is hoped to make a better showing on the low-iron, high-manganese ores of the Cuyuna north range. Officers of the Dell Development Co. are: E. M. Hatton, Neenah, Wis., president; A. G. Jones, Iron Mountain, Mich., vice-president, and Albert Parent, Duluth, secretary and treasurer.

PITTSBURGH STEEL ORE CO. (Riverton)—This company is hydraulicking the overburden from its manganiferous iron-ore deposit and removed 2000 cu.yd. of surface in 12 hr., June 19. The surface is ideal for hydraulic operations, being fine sand, some gravel and few small boulders. Similar surface is being removed by steamshovel at the Pennington pit (Crosby) near-by, at a cost of 8c. per yard. The Pittsburgh Steel Ore Co. has not announced any costs, as its operation is just now getting down to normal. The Soo Line Ry. is constructing a spur toward the property and the new town of Riverton close by.

## MONTANA

### Deer Lodge County

HIDDEN LAKE (Cable)—Arrangements were made at a recently held meeting to increase the force now employed at the mine. An examination of the property was recently made by an engineer for G. A. Donald, of New York, who has an option on the mine until Sept. 1.

ORO FINO (Georgetown)—State Senator W. H. Dunningan and Charles Bostrom have secured a lease and bond on this property and will begin work at once. A new 15-hp. electric hoist, capable of sinking to a depth of 400 ft. will be installed The mine has been idle for the last eight months, but during the 18 months prior was operated on a lease by Mr. Bostrom.

### Fergus County

NORTH MOCCASIN (Kendall)—During May the Barnes-King Development Co., which is operating this mine, mined and milled 3895 tons of ore having an average value of $8.38 per ton. Mining and milling costs were $3.50 per ton, leaving a net profit of $19,002. Of this amount $14,252 was paid on the purchase price of the mine, the remaining $4750 being retained in the treasury. From the beginning of milling operations, Dec. 14, 1912, to May 31, 1913, the company has mined and milled 18,897 tons of ore averaging $8.70 per ton, from which a net profit of $98,278 has been received. Of this amount $73,709 has been paid toward purchasing the property, and $24,569 kept in the treasury. Including the original cash payment of $5000, a total of $78,709 has been paid for the property, leaving a balance of $71,291 yet to be paid.

### Lincoln County

PETERSON-BERGSTROM (Libby)—J. J. Hibbard and P. S. Rose, who recently leased this gold property about 25 miles south of Libby, have received returns from a mill test of the ore, which they say is very satisfactory. The test showed that 90% of the gold could be saved. The ore assays about $20 per ton. It is the intention of the lessees to build a stamp mill and concentrator on the property.

KALISPELL-LINCOLN MINING CO. (Libby)—S. F. Ralston, manager, reports that the mill on the company's property in the West Fisher district has been running since June 13. There is a five-stamp mill on the property, to which five additional stamps and a concentrator are to be added this summer. This new equipment was shipped several weeks ago, but has been delayed in arriving here. The road from Libby to the mine has been put in good condition by the county commissioners, including the building of a bridge across West Fisher Creek.

### Park County

KIMBERLY-MONTANA GOLD MINING CO. (Jardine)—This company's property was recently sold at a sheriff's sale to William Hutchins, of Chicago. This was one of the richest gold mines in the state, but was closed years ago on the report that it was not paying expenses. Mr. Hutchins, who believes the shutdown was due to poor management, will begin operations shortly.

## NEVADA

### Clark County

ELDORADO CANYON produced several million dollars worth of gold and silver from surface ores about 30 years ago. Seven years ago G. A. Duncan, a mining engineer of Nelson, found it practically abandoned. Its geological and vein conditions pleased him, and he bought a large group of prospects. Since that time he has been developing these claims, and advising other seekers to exploit this region. Now four mining companies are developing as many groups of claims and all are encouraged in the belief that "The Cañon" is to become a mining center of importance.

### Humboldt County

TOTAL SHIPMENTS TO DATE from the camp of Rochester are estimated at about $85,000.

ROCHESTER QUEEN MINING CO. (Rochester)—This company, leasing Block No. 2 of the Elda Finas, made a discovery in surface stripping, of a 4-ft. vein assaying $20. A shaft has been sunk 60 ft. and a drift is being driven on the vein.

EASTERN STAR (Gold Circle)—At this property development work is being done and excellent results are being obtained. The developments have proved up ore beyond expectations, but while the company expects to build a mill eventually, no plans have thus far been made.

### Lyon County

COPPER BELT—A 3-ft. vein of good grade copper ore was struck recently in a 10-ft. shaft.

McDONALD-BOULTER—The shaft is now down 160 ft. Some good-grade copper ore is exposed at the bottom.

McCONNELL (Mason)—This mine is shipping 50 tons of good-grade copper ore to the Thompson smelting plant daily. The drift from the shaft at the 200-ft. level is being driven. When completed a larger tonnage of ore will be mined.

BLACK COPPER (Yerington)—This property, which is situated north of the Montana-Yerington, is being developed rapidly. The tunnel is now in 260 ft., and it is estimated that it will have to be driven 60 or 80 ft. farther to cut the vein.

### Nye County

SHIPMENTS in tons from Tonopah mines for the week ended June 21 were as follows:

| | | | |
|---|---|---|---|
| Tonopah Mining | 3050 | North Star | 300 |
| Tonopah Belmont... | 3553 | Mizpah Extension | |
| Montana-Tonopah | 997 | Jim Butler | 400 |
| Tonopah Extension. | 1113 | Tonopah Merger | 100 |
| West End | 965 | | |
| Midway | 50 | Total | 11,111 |
| MacNamara | 583 | Estimated value | $243,290 |

### White Pine County

NEVADA CONSOLIDATED (McGill)—The first of a series of four large Dorr thickeners recently went into service at the Steptoe concentrator. The thickeners are 50 ft. in diameter by 18 ft. in height. The clear water is pumped back for use again in the mill.

## OREGON

### Baker County

UNDERWOOD PLACERS (Cornucopia)—The manager states that the results of the cleanups are good this season.

MORNING—This mine is being developed under the management of Frank Pierce, for Portland people, owners.

### Coos County

WASSON BEACH PLACERS (Empire)—Wasson Bros., owners, state that they have had satisfactory results from work on their mines on Coos Bay. They have saved considerable platinum.

### Curry County

RED RIVER GOLD MINING & MILLING Co.—At this property on the lower Rogue River there are two 6-in. and two 4-in. giants in operation on the placer mines, and the quartz property is being developed. More than 800 ft. of tunnels has been driven on the property during the last winter.

### Josephine County

HUMDINGER (Grants Pass)—This mine, which has only been opened up a short time, is owned by Mascall & Scroggin. A bar of gold worth about $750, was recently made after seven wagonloads of ore had been treated in a mill three miles away. The mine is in the Williams district, and the owners will install machinery so that the ore can be treated at the mine.

## UTAH

### Beaver County

MOSCOW (Moscow)—The monthly output is about 600 tons, the ore being mined from four or five different faces. The drift on the 700, which is being driven for the Moscow vein is approaching its objective point. Much of the ore recently mined has come from above this ground, on the 500- and 600-ft. levels; 80 men are employed.

MAJESTIC (Milford)—This company is shipping copper ore from the Harrington and Hickory properties at the rate of about 40 cars per month. Shipments of ore of this character have been made for about 14 months, during which time most of the output has come from surface workings. More recently the 100-ft. level has been supplying a good share of the ore.

### Juab County

TINTIC SHIPMENTS for the week ended June 20 were 157 cars.

EAGLE & BLUE BELL (Eureka)—The new high-grade gold-silver orebody opened on the lower levels has been found to extend from the 1200- to the 1350-ft. level.

CHIEF (Eureka)—Connections at depth have been completed between this property and the Gemini. This will afford good ventilation in both mines, as well as another exit. In the Chief, the shaft has hitherto been the only outlet from the lower workings.

UNITED TINTIC (Silver City)—Preparations are being made for resuming operations below the water level, the work to be financed from the recently levied assessment of ½c per share. The shaft will be unwatered, and the north crosscut between the 200- and 300-ft. levels continued to the Bullock vein, along which drifting will be started. Conditions are more promising here than near the surface, as the vein grows wider as it approaches the water level. About 20 cars of ore have been mined from this vein in the past, but operations have always been arrested by water coming in.

### Summit County

PARK CITY SHIPMENTS for the week ended June 20 were 1425 tons.

AMERICAN FLAG (Park City)—High-grade ore carrying gold, silver and lead is being mined from the new vein, recently opened.

THOMPSON-QUINCY (Park City)—At a special meeting of stockholders held June 21, the question of a bond issue was voted on affirmatively. This will provide funds for development and for immediate obligations. Ore is being mined from the recent find.

C. C. CONSOLIDATED (Park City)—The upper part of the shaft, rotted from disuse, has been retimbered, and sinking below the 350 level will be begun. Prospecting has recently been done in old workings on the 250-ft. level, and some ore has been opened.

## WASHINGTON

### Ferry County

NORTH WASHINGTON POWER CO. (Republic)—Extensive improvements are being made in the mill. The old engine is being [illegible] and an excavation for a 40x32-ft. addition to the [illegible] is being dug. A 700-hp. corliss engine, an [illegible] and an additional electric generator will be immediately [illegible]led, and a 150-hp. boiler will be added later. The [illegible] is undergoing general overhauling, the work at present being the setting of the second 5x22-ft. tube mill. Later two additional tube mills will complete the equipment.

## CANADA

### British Columbia

NOBLE FIVE (Sandon)—Men are being put to work at this mine and the regular force will be engaged in development work within a week.

SILVERTON MINES, LTD. (New Denver)—The new mill to treat the ore from the Hewitt group is working satisfactorily; a few improvements are now being made.

CONSOLIDATED MINING & SMELTING (Rossland)—Following the announcement of the extension of the lead bounties for five years, the directors have placed the stock on a regular 8% basis.

BRITISH COLUMBIA COPPER CO. (Greenwood)—A concentrator is to be built at the Voight properties, near Princeton, according to a report. The action is prompted by results obtained from diamond drilling, and other investigations during the last two years.

CAPELLA (New Denver)—W. R. Will is clearing the trail to this mine on Goat Mountain, and work will probably be commenced this month. Some of the highest-grade ore mined in the district was taken out of the Capella some time ago, one car of ore giving smelter returns of $10,000.

DIVIDEND LAKEVIEW (Oroville, Wash.)—Recent developments in the Dividend, Lakeview and Gold Dust properties, in the Hedley district, are most satisfactory. Dividend Lakeview resumed shipments last week as the properties have blocked out and on the dump approximately 10,000 tons of $15 to $25 ore. Jacob L. Greatsinger, formerly president of the Brooklyn Rapid Transit Co., and who has been interested in the Mesabi iron mines, is in Oroville directing operations. Frank Sweeny, who is associated with the Guggenheims, is actively interested in the management of the Gold Dust properties.

### Ontario

RIGHT OF WAY (Cobalt)—This company, capitalized at $2,000,000, of which 1,635,500 shares were issued, has surrendered its charter and will dissolve July 7.

SAVAGE (Cobalt)—A discovery of high-grade ore has been made on this property south of Cart Lake. Where intersected, the vein showed 3 in. of 5000-oz. ore.

HUGHES-PORCUPINE (Porcupine)—The shaft is 260 ft. deep and is being continued to the 300-ft. level. A 10-ft. vein has been cut at the 200-ft. level 60 ft. from the shaft. The 2-stamp mill is again in operation after having been hung up for several weeks.

SHIPMENTS of ore and concentrates in tons, from Cobalt for the week ended June 27 were as follows:

| | | | |
|---|---|---|---|
| Bailey | | La Rose | 98.14 |
| Beaver | | Lost and Found | |
| Buffalo | | McKinley-Darragh | 32.60 |
| Casey Cobalt | | Nipissing | |
| Chambers-Ferland | 64.57 | Nipissing Reduction | |
| City of Cobalt | | O'Brien | 41.95 |
| Cobalt Lake | 32.28 | Penn-Canadian | |
| Cobalt Townsite | 42.00 | Provincial | |
| Colonial | | Right of Way | |
| Coniagas | | Seneca Superior | |
| Crown Reserve | | Silver Bar | |
| Dominion Reduction Co. | 43.18 | Silver Cliff | |
| Drummond | | Timiskaming | |
| General Mines | | Trethewey | |
| Green Meehan | | Wettlaufer | |
| Hargraves | | York | |
| Hudson Bay | | | |
| Kerr Lake | | Total | 354.72 |

## MEXICO

### Durango

BACIS (Bacis via Gavilanes)—This company has been obliged to suspend operations. The foreign force is in Mazatlan awaiting more settled conditions.

CINCO DE MAYO (La Descubridora)—The last carload of ore shipped to Douglas sold for over $8000. The property was owned by Col. Francisco H. Garcia, but was seized by the state government on account of Garcia being a Huertista.

### Sonora

EXPORTS OF METAL AND ORE through the port of Agua Prieta in the month of May amounted to 1,724,800 pesos as compared with 2,326,100 pesos in April. The decrease is due in part to the cessation of operations at the Nacozari plant during the strike.

IN THE OPUTA DISTRICT there seems to be a slight recovery from the unsettled conditions caused by the revolution. For the greater part of two years the properties have been idle. Among those opened up again recently are La Caridad, Good Enough, La Maria, San Ignacio, El Saffo, El Alico, La Marageza and Agua Maga.

## SOUTH AMERICA

### Venezuela

CANADIAN VENEZUELAN ORE CO.—This company has authorized a new issue of $500,000 bonds, the proceeds to be used for additional machinery at the Imataca mines, and for improving shipping facilities. The company has been hampered by the difficulty in securing steamers to carry ore, but has now been able to make additional charters, so that by late fall it will be able to ship 30,000 tons a month.

## AUSTRALIA

### Tasmania

THE EXISTENCE OF NICKEL ORE near Mt. Leehan has been known for a number of years, but nothing has been done until recently. Prospecting has been carried on by the Mt. Leehan Mining Co., and it has been decided to carry on explorations on a large scale through a subsidiary called the Cuni Mines, Ltd. The small quantity of ore so far found is chiefly pyrrhotite, carrying 4 to 14% nickel and 4.3 to 6% copper. The extent of the deposits is uncertain.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—July 2

The holiday week and the midsummer season have combined to make the metal markets quiet. Prices have not been strong, though fluctuations have been small.

By a misprint in part of the edition of the "Journal" last week the upper range of the price of Lake copper, June 19-25 was printed 15.75 instead of 14.75, as it should have been. The mistake was discovered and corrected on the press, so that it appears only in about 1150 copies; in the rest the figures are correct.

### COPPER, TIN, LEAD AND ZINC

**Copper**—The market has been rather featureless throughout the week. Leading sellers have not changed their limits, but an appreciable amount of copper is being offered by the smaller producers and dealers at the last prices, at which small transactions are taking place from day to day, principally for shipment to Europe. The close is undecided at 14.50@14.75c. for Lake, and 14.40@14.45c. for electrolytic copper in cakes, wirebars and ingots, while casting copper is quoted nominally at 14.15@14.20c. as an average for the week.

The London market has fluctuated within narrow limits, and the close is quiet at £63 15s. for spot, and £64 for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16c. per lb., for carload lots at mill.

Exports of copper from New York for the week were 6174 long tons. Our special correspondent gives the exports from Baltimore at 1560 tons for the week.

**Brass Prices**—Base prices, dating from July 1 are as follows: Sheets, high brass, 18c. net per lb.; low brass, 17⅞c. Wire, high brass, 15¾c.; low brass, 17⅞c. Rods, high brass, 15¾c.; low brass, 18⅝c. Tubes, brazed, 20½c.; open seam, 20½c. Brass angles and channels, 20½c. Scrap allowances, 10½c. net per lb. for high brass; 11⅞c. for low brass.

**Tin**—Under further onslaughts by the bear group, the London market broke very badly. There seemed to be no supoort forthcoming from any side, and even the excellent statistics which were published at the beginning of this month failed to arouse interest in the metal. Reports were current in London of a considerable falling-off of consumption in this country, but these rumors alone could not have brought about the severe decline.

Very little interest is shown by consumers in this market, and the continuous decline scares off buyers rather than attracts them. The little business which is done is confined to spot material, which is still closely held. The market closes weak at £188 10s. for spot, and £189 for three months, and at about 41¼c. for July tin here.

Visible stocks of tin on June 30, including tin afloat were: London, 6511; Holland, 929; United States, excluding Pacific ports, 3661; total, 11,101 long tons, a decrease of 2609 tons from May 31, and of 1819 tons from June 30 last year.

**Lead**—The market is unchanged at 4.17½@4.20c. St. Louis, and 4.30@4.35c. New York.

The London market is still in a very unsettled state. This week there has been a sharp decline, and the close is active at £19 7s. 6d. for Spanish lead and 7s. 6d. more for English.

**Spelter**—The improvement in the market for this metal has continued throughout the week. It is reported from the smelting centers that a curtailment has taken place in practically all plants, largely due to the fact that the smelting works find it impossible to secure an adequate supply of ore, the production of which has suffered considerably on account of unremunerative prices. On this account there is not much inclination to sell and the market is sensitive upward. The developments in Europe will probably determine in a large measure how much further the improvement can go. The close is strong at 5.05@5.15c. St. Louis, and 5.20@5.30c. New York.

The London market is very much depressed, due to the large accumulation of spelter in the hands of the Zinc Convention. The close is unchanged at £20 15s. for good ordinaries, and £23 7s. 6d. for specials.

The price of zinc sheets was reduced ¼c. per lb. on June 25, and is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

**Silver** has been very steady, with no pronounced tendency in either direction. Buyers for the future are watching the India crop prospects; these in turn are dependent on the Monsoon rains, which up to the present are understood to be moderately good.

### JUNE AVERAGE PRICES

Average prices of metals for the month of June were as follows:

**Silver,** 58.99c. per oz., New York; 27.199d. London.

**Copper,** 14.672c. per lb. electrolytic; 4.871c. Lake; £67.14 per ton London standard

**Tin,** 44.82c. New York; £204.208 London.

**Lead,** 4.325c. New York; 4.190c. St. Louis; £20.226 London.

**Zinc,** 5.124c. New York; 4.974c. St. Louis; £22.143 London.

### DAILY PRICES OF METALS

NEW YORK

| June-July | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 26 | 4.8665 | 58⅛ | 14.50<br>@14.75 | 14.40<br>@14.45 | 43½ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.15<br>@5.20 | 5.00<br>@5.05 |
| 27 | 4.8665 | 58⅛ | 14.50<br>@14.75 | 14.40<br>@14.45 | 42⅝ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.15<br>@5.25 | 5.00<br>@5.10 |
| 28 | 4.8665 | 58⅜ | 14.50<br>@14.75 | 14.40<br>@14.45 | 42⅝ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.15<br>@5.25 | 5.00<br>@5.10 |
| 30 | 4.8665 | 58⅜ | 14.50<br>@14.75 | 14.40<br>@14.45 | 42⅝ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 1 | 4.8675 | 58¼ | 14.50<br>@14.75 | 14.40<br>@14.45 | 41½ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.20<br>@5.30 | 5.05<br>@5.15 |
| 2 | 4.8660 | 58⅛ | 14.50<br>@14.75 | 14.40<br>@14.45 | 41¼ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.20<br>@5.30 | 5.05<br>@5.15 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| June July | Silver | Copper: Spot | Copper: 3 Mos | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| 26 | 26 13/16 | 64 | 64⅜ | 69½ | 198½ | 199½ | 20 | 21 |
| 27 | 26 13/16 | 63 9/16 | 63 13/16 | 69 | 194 | 195 | 19¼ | 21 |
| 28 | 26 15/16 | .. | .... | .... | | .... | .... | .... |
| 30 | 26 15/16 | 64⅛ | 64⅜ | 69½ | 193¾ | 194½ | 19¾ | 21 |
| 1 | 26 13/16 | 63⅝ | 63¾ | 69 | 189½ | 190 | 19⅜ | 20¾ |
| 2 | 26 13/16 | 63¾ | 64 | 69¼ | 188½ | 189 | 19⅜ | 20¾ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—Business has been rather light and unsettled. Quotations are variable, and some low prices are reported. A fair range appears to be about 23¼@24c. per lb. for No. 1 ingots, New York. Foreign is quoted at 19@19½c., in bond.

**Antimony**—Business is of a retail order only, and prices are unchanged. Cookson's is 8.65@8.75c. per lb.; Hallett's, 8@8.25c.; while 7.50@7.75c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—The market has been quiet and prices are unchanged here at $40 per flask of 75 lb., with 60c. per lb. for small orders. San Francisco, $39.50 for domestic orders and $37 for export. London, £7 10s. per flask, with £7 2s. 6d. asked from second hands.

**Bismuth**—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

**Cadmium**—The latest quotation from Germany is 725@750 marks per 100 kg. f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

**Magnesium**—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

**Nickel**—Shot, block and plaquettes are quoted at 40@45c. per lb., according to quality and size of order. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—Producers of this metal quote large lots at $2.75@3.50 per lb., according to size of order; while as high as $4.50@5.50 is paid for retail lots.

Included in the exports from Baltimore last week were 1323 lb. selenium to Hamburg.

**Exports and Imports of Metals**, other than iron and steel, in the United States, four months ended Apr. 30, are reported as follows:

| Metals: | Exports 1912 | Exports 1913 | Imports 1912 | Imports 1913 |
|---|---|---|---|---|
| Copper, long tons | 118,280 | 143,196 | 61,604 | 63,082 |
| Tin, long tons | 101 | 226 | 18,857 | 18,114 |
| Lead, short tons | 25,400 | 17,290 | 34,403 | 30,726 |
| Zinc, short tons | 5,060 | 1,754 | 1,038 | 383 |
| Zinc in ore, lb. | 9,867,834 | 7,637,649 | 9,936,295 | 15,839,388 |
| Nickel, lb | 8,927,931 | 10,465,730 | 13,024,663 | 15,628,264 |
| Antimony, lb. | 40,320 | 30,413 | 5,355,172 | 8,196,494 |
| Aluminum, lb. | 9,656 | 10,907 | 9,353,082 | 10,637,493 |
| Quicksilver, lb. | 9,594 | 28,099 | . . | . . . |
| Platinum, oz. | ..... | 629 | 32,732 | 45,330 |
| Ores, etc. | | | | |
| Zinc oxide, lb. | 12,464,255 | 10,289,802 | . | ........ |
| Zinc dross, lb. | 364,695 | 56,786 | . . . | |
| Zinc dust, lb. | ....... | 76,097 | .. . | 1,436,595 |
| Zinc ores, tons | 9,182 | 4,453 | 14,786 | 15,664 |

Copper, lead, nickel and antimony included the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately last year. The exports include reëxports of foreign material.

**Exports of metals and minerals from Spain** three months ended Mar. 31, reported by "Revista Minera," in metric tons:

| | Metals 1912 | Metals 1913 | Ores 1912 | Ores 1913 |
|---|---|---|---|---|
| Pig and mfd. iron | 18,702 | 2,983 | 2,204,240 | 2,540,326 |
| Copper | 5,725 | 4,837 | 37,653 | 43,344 |
| Copper precipitate | 2,712 | 1,124 | . | . |
| Lead | 43,695 | 51,010 | 850 | 439 |
| Zinc | 549 | 22 | | . |
| Quicksilver | 624 | 419 | | |
| Manganese | | | 10,563 | 5,346 |
| Pyrites | | | 716,326 | 783,876 |

Pyritic ores carrying 2.5% or over in copper are classed as copper ores; below that point they are included in pyrites. Exports of salt were 137,675 tons in 1912, and 141,352 tons this year.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London was unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Germany continues to take some gold, but there was less pressure for supplies than for some weeks past.

Imports of gold in Great Britain five months ended May 31 were £[illegible]115, exports, £11,818,064; excess of imports, £6,710,051, an increase of £1,770,271 over last year.

**Platinum**—The market is quiet and not specially active, but prices are steady and unchanged. Current quotations here are $45@46 per oz. for refined platinum and $49@52 for hard metal.

**Iridium**—Supplies are not increasing, and with a steady demand prices do not decline. Dealers continue to ask about $85 per oz. for pure metal.

Gold and silver movement in the United States five months ended May 31, as reported by the Department of Commerce and Labor:

| | Gold 1912 | Gold 1913 | Silver 1912 | Silver 1913 |
|---|---|---|---|---|
| Exports | $26,225,801 | $63,165,301 | $28,623,018 | $28,590,221 |
| Imports | 19,653,285 | 24,522,621 | 30,384,764 | 15,766,510 |
| Excess, exp. | $6,572,516 | $38,642,680 | $8,238,254 | $12,823,729 |

For the five months this year exports of merchandise were valued at $1,002,863,092, imports at $748,083,165, excess of exports, $219,779,927. Adding gold and silver gives a total of $271,246,319 as the export balance.

Imports of silver in Great Britain five months ended May 31 were £6,866,468; exports, £5,795,883, excess of imports, £1,070,585, an increase of £951,840 over last year.

Exports of silver from London to the East, Jan. 1, to June 19, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| India | £3,270,300 | £3,437,000 | I. | £166,700 |
| China | 873,500 | 344,500 | D. | 529,000 |
| Total | £4,143,800 | £3,781,500 | D | £362,300 |

Imports of silver at New York for the week were $136,144, chiefly from Central America; exports were $847,000 to London and Paris. Imports of gold for the week were $781,446, mainly from Mexico.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—June 28

The high price of zinc blende is $45.50, the base per ton of 60% zinc ranging from $40@43.50. Calamine sold on a base of $20@24 per ton of 40% zinc. The average of all grades is $40.46 per ton. Unchanged lead prices prevailed again; the base is $52.50 per ton of 80% metal contents, and the average of all grades is $52.20 per ton.

SHIPMENTS WEEK ENDED JUNE 28

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week | 10,614,280 | 465,800 | 1,429,300 | $261,588 |
| Totals six months | 283,292,680 | 18,886,690 | 47,261,360 | 7,903,280 |

Blende value, the week, $218,884; six months, $6,414,887.

Calamine value, the week, $5,331; six months, $246,171.

Lead value, the week, $37,426; six months, $1,242,222.

### OTHER ORES

**Manganese Ore** is quoted in London as follows, c.i.f. United Kingdom port: Indian or Brazilian, 50% manganese, 22@22½ per unit; 48%, 21@22c. Caucasian, 50%, 18½@19c.; 48%, 18¼@18½c. per unit.

## IRON TRADE REVIEW

### NEW YORK—July 2

There seems little doubt that the iron and steel markets are in an improving condition. It is not so much that there has been any actual improvement as shown by a definite increase in orders; but there is a decided easier tone and the pessimistic feeling which has held possession of buyers is passing away.

The strong features are the maintenance of full production of finished steel and the almost complete absence of cancellations or postponements on contracts; the general maintenance of steel prices, and the growing stiffness of pig-iron prices. There are no signs of any letting down in activity, or of more than the absolutely necessary holiday stops. The mills have enough work to carry them on for some time, and the gradual increase in orders looks as if there would be little or no cessation of work between the present time and the end of the year. Buyers have been holding out of the market until their stocks of material have run down to a low point, and it is the belief of many that August, at latest, will see active purchases to meet orders that must be filled.

Pig iron has shown no further recessions. There has been some quiet buying, which has strengthened the market. All indications are that there have been transactions which have been kept quiet by both buyers and sellers, but which have decidedly strengthened the situation. Steel scrap has shown a good deal of firmness, and an advance is expected.

### PITTSBURGH—July 2

The only change in the market this week appears in the talk of a probable readjustment of wire prices. Actual sales and prices of wire products have been under the nominal quotations. The talk is that a reduction from those nominal figures of about $3 per ton will be made, putting plain wire on a basis of 1.45@1.50c., and nails at $1.65. It is about time for such a readjustment.

**Pig Iron**—Pig iron is firm. On the surface the market is dull, but there are many reports of quiet buying. At any rate there is apparent a strong resistance to any further concessions and none have been made. We continue to quote: Bessemer, $16; basic, $14.50; malleable, $14.25; No. 2 foundry, $14; forge, $13.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—Small sales are still reported at a cut from former quotations. It is now generally believed that the Senate Amendment will prevail, letting ferromanganese in free. We quote prompt at $59, and contract nominal at $61, Baltimore, freight to Pittsburgh being $2.16 per ton.

**Steel**—There is no change in the situation. Mills are firm in their views, and might ask a premium for prompt lots, but just at present there is no urgency to buy. We quote forward unchanged at $26.50@27 for billets and $27@27.50 for sheet bars, maker's mill, Pittsburgh or Youngstown. Rods remain at $29, Pittsburgh.

**German Pig Iron Production** in May is reported at 1,641,600 metric tons by the German Iron & Steel Union. For the five months ended May 31 the total make was, in metric tons:

| | 1912 | 1913 | Changes 9 |
|---|---|---|---|
| Foundry iron | 1,318,752 | 1,500,235 | I. 181,463 |
| Forge iron | 230,118 | 221,620 | D. 8,458 |
| Steel pig | 848,749 | 1,055,211 | I. 206,492 |
| Bessemer pig | 163,274 | 145,317 | D. 17,97 |
| Thomas (basic) pig | 4,551,438 | 5,036,935 | I. 485,478 |
| Total | 7,112,331 | 7,959,318 | I. 846,987 |

The total increase this year was 11.9%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

**Foreign Trade of the German Empire** in iron and steel and in machinery four months ended Apr. 30, in metric tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Iron and steel | 1,926,473 | 2,171,745 | 213,596 | 208,917 |
| Machinery | 161,766 | 178,846 | 26,448 | 27,988 |
| Totals | 2,088,239 | 2,350,591 | 240,044 | 236,905 |

Increase in exports this year was 262,352 tons; decrease in imports, 3139 tons.

### IRON ORE

Shipments of Lake Superior ore continue large and steady, though they are hardly coming up to early expectations. Shipments from Lake Erie docks to furnaces have been on a good scale.

### COKE

The coke market is unchanged. Production and shipments of Connellsville coke continue about as they have been for several weeks past. No second-half furnace contracts have been closed, but some July contracts are reported at $2.50 per ton.

The Pennsylvania legislature has passed and the Governor has signed the bill imposing a tax of 2½% ad valorem on anthracite mined. It took effect July 1. It is said that the anthracite companies will contest the law on the ground that it is unconstitutional.

**Exports of Fuel from Great Britain** five months ended May 31 were: Coal, 29,519,825; coke, 424,334; briquettes, 837,070; coal sent abroad for use of steamships in foreign trade, 8,366,021; total, 39,147,250 long tons. This is an increase of 11,302,886 tons, or 40.8%, over last year, when the trade was cut down by the miners' strike.

## CHEMICALS

### NEW YORK—July 2

The general market is dull and quiet, as might be expected at this season. There is not much business forward.

**Arsenic**—The market is dull, and there is very little buying, although consumers are carrying no stocks of any account. The situation is weak and prices are again lower at $3.12½@3.25 per 100 lb. There are no signs of improvement.

**Copper Sulphate**—Trade is only moderate, but prices are steady at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is dull, as is usual at this time of year. Prices are off a little, 2.35c. per lb. being asked for both spot and futures.

### PETROLEUM

Production of oil in California in May is reported at 8,098,138 bbl.; deliveries, 9,566,079 bbl. The stocks reported were 46,367,329 bbl. at the end of the month.

### NEW CALEDONIA ORES

Exports of ores from New Caledonia four months ended Apr. 30, as reported by the "Bulletin du Commerce" of Noumea, were 19,179 metric tons nickel ore and 2854 tons chrome ore. Exports of metals were 2213 tons nickel matte.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective compan except in the few cases noted (by asterisk) as estimated, together with t reports of the U. S. Dept. of Commerce as to imported material, and in the m represents the crude copper content of blister copper, in pounds. In those ca where the copper contents of ore and matte are reported, the copper yield t is reckoned at 97%. In computing the total American supply duplications excluded.

| | Feb. | March | April | May | Ju |
|---|---|---|---|---|---|
| Alaska shipments | 660,250 | 472,293 | 1,730,252 | 1,771,508 | |
| Anaconda | 21,250,000 | 22,900,000 | 23,800,000 | 25,600,000 | |
| Arizona, Ltd | 3,000,000 | 3,200,000 | 3,100,000 | 3,200,000 | |
| Copper Queen | 6,810,706 | 7,558,709 | 8,210,166 | 8,301,605 | |
| Claumet & Ariz | 4,050,000 | 4,250,000 | 4,500,000 | 4,300,000 | |
| Chino | 3,898,998 | 4,464,723 | 3,925,409 | 3,883,611 | |
| Detroit | 1,689,277 | 1,640,671 | 1,856,517 | 2,001,633 | |
| East Butte | 1,325,000 | 1,400,000 | 1,400,000 | 1,268,595 | |
| Mammoth | 1,661,150 | 1,641,091 | 1,450,000 | 1,700,000 | |
| Giroux* | 600,000 | 625,000 | 600,000 | 625,000 | |
| Mason Valley | 1,348,070 | 1,608,492 | 1,264,304 | 1,186,560 | |
| Miami | | | | 1,943,900 | |
| Nevada Con | 4,798,537 | 5,555,320 | 5,650,000 | 5,933,275 | |
| Ohio | 380,849 | 591,651 | 690,001 | 650,071 | |
| Old Dominion | 2,381,000 | 2,853,000 | 3,040,000 | 2,749,000 | |
| Ray | 3,610,000 | 4,287,000 | 4,379,128 | 4,384,400 | |
| Shannon | 1,152,000 | 1,260,000 | 1,238,000 | 1,080,000 | |
| Sontz, Utah | *nil* | 62,224 | 132,267 | 200,000 | |
| Tennessee | 1,600,151 | 1,796,394 | 1,718,188 | | |
| United Verde* | 2,750,000 | 3,000,000 | 3,000,000 | 3,000,000 | |
| Utah Copper Co | 7,585,303 | 8,248,880 | 9,539,847 | 10,003,227 | |
| Lake Superior* | 19,000,000 | 19,000,000 | 17,000,000 | 18,705,000 | |
| Non-rep. mines* | 5,399,849 | 6,203,606 | 6,000,000 | 6,300,000 | |
| Total prod | 94,951,140 | 102,619,054 | 104,224,679 | | |
| Imports, bars, etc. | 21,372,292 | 24,215,480 | [illegible] | | |
| Total blister | 116,323,432 | 126,834,434 | 129,802,076 | | |
| Imp. ore & matte | 9,459,432 | 11,911,041 | [illegible] | | |
| Total Amer | 125,782,864 | 138,745,475 | [illegible] | | |
| Miami† | 2,817,209 | 3,102,200 | 2,312,900 | | |
| Shattuck-Arizona | 1,136,480 | 1,234,450 | 1,158,326 | 1,026,170 | |
| Brit. Col. Cos: | | | | | |
| British Col. Cop | 688,312 | 844,735 | 794,000 | ... | |
| Granby | 1,740,000 | 1,967,962 | 1,857,452 | 1,782,570 | |
| Mexican Cos.: | | | | | |
| Boleo† | 2,535,680 | 2,204,720 | 2,811,200 | 2,424,800 | |
| Cananea | 4,880,000 | 4,772,000 | 3,581,690 | 272,0002, | |
| Moctezuma | 2,730,914 | 3,062,159 | 2,753,240 | 2,695,881 | |
| Other Foreign: | | | | | |
| Braden, Chile | 1,178,000 | 1,472,000 | 1,512,000 | 1,150,000 | |
| Cape Cop., S. Af. | 712,320 | 732,480 | 586,880 | 387,520 | |
| Kyshtim, Russia | 1,352,960 | 1,478,400 | 2,544,640 | ... | |
| Spassky, Russia | 1,003,520 | 974,400 | 974,400 | 721,280 | |
| Exports from | | | | | |
| Chile | 5,824,000 | 7,840,000 | 7,616,000 | 3,584,000 | |
| Australia | 5,512,000 | 6,944,000 | 6,608,000 | 7,840,000 | |
| Arrivals—Europe‡ | 8,509,760 | 15,585,920 | 10,545,920 | 13,661,760 | |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From Ma. 1, Miami copper is refined in the U. S. and apperas under American mines.

‡ Does not include the arrivals from the United States, Australia or Chile.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VI, '12. | 122,315,240 | 66,146,229 | 61,449,650 | 49,615,643 | 117,801,600 | 167,417,244 |
| VII | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,[illegible] | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | | | | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | | | | | | |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Arlington, I[illegible] | July 3 | Aug. 4 | $0.002 |
| Aur[illegible], Ida. | June 16 | July 16 | 0.002 |
| [illegible] | June 10 | July 10 | 0.001 |
| [illegible], Utah | June 30 | July 21 | 0.005 |
| [illegible], Nev | June 3 | July 25 | 0.05 |
| Con. Virginia, Nev. | July 9 | July 30 | 0.10 |
| East Hecla, Ida | June 18 | July 25 | 0.003 |
| Etna King, Calif. | ...... | ...... | 0.01 |
| Giant M. & D. Co. | June 17 | July 17 | 0.001 |
| Gould & Curry | July 14 | Aug. 5 | 0.03 |
| Houghton Copper, Mich. | .... | July 15 | 1.00 |
| Hypotheek, Ida | June 20 | July 14 | 0.004 |
| Imperial M. & M., Ida. | June 2 | July 21 | 0.002½ |
| Imperial Mg., Ida. | June 10 | July 15 | 0.002½ |
| Mineral Farm, Ida. | June 7 | July 7 | 0.002 |
| Old Evergreen, Utah | June 17 | July 17 | 0.01 |
| Oreano, Ida. | June 9 | July 9 | 0.001 |
| Savage, Nev | July 14 | Aug. 5 | 0.05 |
| Sierra Nevada, Nev | June 24 | July 5 | 0.10 |
| Silver Flat, Utah | June 23 | July 7 | 0.001 |
| Silver Moon, Ida. | June 2 | July 26 | 0.005 |
| Silver Pick, Nev | June 25 | July 28 | 0.011 |
| Sunset Dev., Ida. | June 16 | July 10 | 0.00 |
| Tintic Standard, Utah | June 21 | July 19 | 0.005 |
| Tuscumbia, Ida. | Apr. 26 | July 10 | 0.001 |
| Union Chief, Utah | July 10 | July 31 | 0.01 |
| Wonderful, Ida. | June 10 | July 10 | 0.001 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | ...... | 24.486 | 28.215 | ...... |
| July | 52.630 | 60.654 | ...... | 24.286 | 27.919 | ...... |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | NEW YORK | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | ...... | 17.443 | ...... | 78.259 | ...... |
| July | 17.190 | ...... | 17.353 | ...... | 76.636 | ...... |
| August | 17.498 | ...... | 17.644 | ...... | 78.670 | ...... |
| September | 17.508 | ...... | 17.698 | ...... | 78.762 | ...... |
| October | 17.314 | ...... | 17.661 | ...... | 76.389 | ...... |
| November | 17.326 | ...... | 17.617 | ...... | 76.890 | .... |
| December | 17.376 | ...... | 17.600 | ...... | 75.516 | ...... |
| Year | 16.341 | ...... | 16.560 | ...... | 72.942 | ...... |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | ...... | 205.863 | ...... |
| July | 44.519 | ...... | 202.446 | ...... |
| August | 45.857 | ...... | 208.351 | ...... |
| September | 49.135 | ...... | 223.762 | ...... |
| October | 50.077 | ...... | 228.353 | ...... |
| November | 49.841 | ...... | 227.619 | ...... |
| December | 49.815 | ...... | 226.875 | ...... |
| Av. year | [illegible].096 | | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton.

### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | ...... | 4.321 | ...... | 17.588 | ...... |
| July | 4.720 | ...... | 4.603 | ...... | 18.544 | ...... |
| August | 4.569 | ...... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | ...... | 4.924 | ...... | 22.292 | ...... |
| October | 5.071 | ...... | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | ...... | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | ...... | 6.727 | ...... | 25.763 | ...... |
| July | 7.116 | ...... | 6.966 | ...... | 26.174 | ...... |
| August | 7.028 | ...... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ...... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.20 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | ...... | 14.38 | ...... | 14.38 | ...... |
| August | 15.43 | ...... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ...... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | ...... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ...... |
| Year | $16.01 | ...... | $14.93 | ...... | $15.28 | ...... |

# STOCK QUOTATIONS

### COLO. SPRINGS June 30

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02⅛ |
| Cripple Cr'k Con. | .01 |
| C. K. & N. | .12 |
| Doctor Jack Pot. | .06 |
| Elkton Con. | .51 |
| El Paso | 3.20 |
| Findlay | .02 |
| Gold Dollar | .09 |
| Gold Sovereign | .02⅛ |
| Isabella | .10 |
| Jack Pot | .04½ |
| Jennie Sample | .05½ |
| Lexington | ‡.08 |
| Moon Anchor | .095 |
| Old Gold | .01½ |
| Mary McKinney | .55¼ |
| Pharmacist | .01 |
| Portland | .94 |
| Vindicator | .88 |
| Work | ‡.004 |

### SALT LAKE June 30

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .05¼ |
| Black Jack | .09 |
| Cedar Talisman | .01 |
| Colorado Mining | .16½ |
| Columbus Con. | ‡.07½ |
| Crown Point | .01½ |
| Daly-Judge | 6.30 |
| Grand Central | .50 |
| Iron Blossom | 1.27½ |
| Little Bell | ‡.10 |
| Lower Mammoth | .01¼ |
| Mason Valley | ‡5.00 |
| May Day | .05½ |
| Nevada Hills | .85 |
| New York | ‡.02 |
| Prince Con. | .35½ |
| Silver King Coal'n | 3.35 |
| Sioux Con. | .02½ |
| Uncle Sam | .04 |
| Yankee | .07½ |

### TORONTO June 28

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | ‡.08 | Foley O'Brien | ‡.26 |
| Coniagas | ‡7.25 | Hollinger | 16.50 |
| T. & Hudson Bay | 66.00 | Imperial | ‡.03 |
| Timiskaming | .32 | Jupiter | .39 |
| Wettlaufer-Lor | .10 | Pearl Lake | .32 |
| Apex | .01 | Porcu. Gold | .10½ |
| Crown Chartered | ‡.00½ | Preston E. D. | ‡.03 |
| Doble | ‡.25 | Rea | ‡.12 |
| Dome | 14.00 | Swastika | .05½ |
| Dome Exten | .09 | West Dome | ‡.15 |

### SAN FRANCISCO June 30

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 5.05 |
| Belcher | .15 | Jim Butler | .70 |
| Best & Belcher | .05 | MacNamara | .16 |
| Caledonia | 1.17½ | Midway | .42 |
| Challenge Con. | .02 | Mont.-Tonopah | 1.10 |
| Chollar | .01 | North Star | .89 |
| Confidence | .21 | West End Con. | 1.20 |
| Con. Virginia | .05 | Atlanta | .15 |
| Crown Point | .20 | Booth | .02 |
| Gould & Curry | .01 | C. O. D. Con. | .04 |
| Hale & Norcross | .07 | Comb. Frac. | .03 |
| Mexican | .62 | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | .47 |
| Ophir | .17 | Silver Pick | .02 |
| Overman | .31 | St. Ives | ‡.30 |
| Potosi | .01 | Tramp Con. | ‡.01 |
| Savage | .06 | Argonaut | ‡1.60 |
| Sierra Nevada | .12 | Bunker Hill | ‡1.90 |
| Union Con. | .06 | Central Eureka | .12 |
| Yellow Jacket | .19 | So. Eureka | ‡2.75 |

### N. Y. EXCH. June 30

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 64 |
| Am. Agri. Chem. | 44½ |
| Am. Sm. & Ref., com | 61⅛ |
| Am. Sm. & Ref., pf. | 100 |
| Am. Sm. Sec., pf. B | 80¼ |
| Anaconda | 33⅛ |
| Batopilas Min. | 1 |
| Bethlehem Steel pf | 66¼ |
| Chino | 33¾ |
| Federal M. & S., pf. | 33½ |
| Great Nor., ore., ctf. | 32¾ |
| Guggen. Exp. | 41½ |
| Homestake | 100⅝ |
| Inspiration Con. | 14½ |
| Miami Copper | 20⅞ |
| Nat'nal Lead, com. | 45½ |
| National Lead, pf. | 105½ |
| Nev. Consol. | 14⅝ |
| Phelps Dodge | 195 |
| Pittsburg Coal, pf. | 76½ |
| Quicksilver, pf. | 4½ |
| Ray Con. | 16¾ |
| Republic I & S, com. | 18 |
| Republic I & S, pf. | 74⅞ |
| Sloss Sheff'd, com. | 24 |
| Sloss Sheffield, pf. | 86 |
| Tennessee Copper | 28 |
| Utah Copper | 41⅞ |
| U. S. Steel, com. | 52¼ |
| U. S. Steel, pf. | 103 |
| Va. Car. Chem., pf. | 93 |

### N. Y. CURB June 30

| Name of Comp. | Clg. |
|---|---|
| Barnes King | 1.43 |
| Beaver Con. | .31 |
| Big Four | .45 |
| Braden Copper | 6¾ |
| B. C. Copper | 2¾ |
| Buffalo Mines | 2⅛ |
| Can. G. & S. | .21 |
| Con. Ariz. Sm. | 5/16 |
| Davis-Daly | 1⅞ |
| Diam'field-Daisy | .02 |
| Ely Con. | .09 |
| Florence | .34 |
| Giroux | 1 9/16 |
| Gold Hill Con. | ‡¼ |
| Goldfield Con. | 1¾ |
| Greene Cananea | 5⅞ |
| Greenwater | .04½ |
| Internat. S. & R. | ‡109 |
| Kerr Lake | 3¼ |
| Keystone | ‡2 |
| La Rose | 2⅛ |
| McKinley-Dar-Sa. | 1⅝ |
| Min. Co. of A. new | 2⅝ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 8½ |
| Ohio Copper | ⅝ |
| Pacific Sm. & M. | 1/16 |
| Puebla S. & R. | 2 |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N. J. | 355 |
| Stewart | 1½ |
| Tonopah | 4½ |
| Tonopah Ex. | 2 |
| Tonopah Merger | .56 |
| Tri-Bullion | ⅛ |
| Tularosa | ¼ |
| Union Mines | 3/16 |
| United Cop., pfd. | 3 |
| Yukon Gold | 2¼ |

### LONDON June 14

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 16s 9d |
| El Oro | 0 14 9 |
| Esperanza | 0 17 6 |
| Mexico Mines | 5 12 6 |
| Oroville | 0 5 6 |
| Santa Gert'dis | 1 2 6 |
| Stratton's | 0 1 9 |
| Tomboy | [illegible] 7 6 |

### BOSTON EXCH. June 30

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1⅛ |
| Ahmeek | 265 |
| Alaska Gold M. | 10⅝ |
| Algomah | 1⅛ |
| Allouez | 30 |
| Am. Zinc | 17¼ |
| Ariz. Com., ctfs. | 2½ |
| Bonanza | .32 |
| Boston & Corbin | ½ |
| Butte & Balak | 1⅛ |
| Calumet & Ariz. | 59 |
| Calumet & Hecla | 410 |
| Centennial | 10 |
| Cliff | 1½ |
| Copper Range | 39½ |
| Daly West | 2 7/16 |
| East Butte | 10 |
| Franklin | 5⅛ |
| Granby | 54 |
| Hancock | 14½ |
| Hedley Gold | 30 |
| Helvetia | .30 |
| Indiana | 3⅞ |
| Island Cr'k, com. | 48 |
| Island Cr'k, pfd. | 79 |
| Isle Royale | 18 |
| Keweenaw | 1¼ |
| Lake | 7¼ |
| La Salle | 3⅛ |
| Mass | 2¾ |
| Michigan | 1 |
| Mohawk | 44¼ |
| New Arcadian | 1¼ |
| New Idria Quick. | ‡3⅞ |
| North Butte | 24¼ |
| North Lake | 1½ |
| Ojibway | .65 |
| Old Dominion | 43 |
| Osceola | 76 |
| Quincy | 57 |
| Shannon | 7⅛ |
| Shattuck-Ariz. | 22½ |
| Superior | 23 |
| Superior & Bost. | 2 |
| Tamarack | 22 |
| Trinity | 3¼ |
| Tuolumne | 1⅛ |
| U. S. Smelting | 35½ |
| U. S. Smelt'g. pf | 46⅝ |
| Utah Apex | 1⅛ |
| Utah Con. | 8 |
| Victoria | .99 |
| Winona | 1¼ |
| Wolverine | 43 |
| Wyandot | .60 |

### BOSTON CURB June 30

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 2¼ |
| Boston Ely | ¾ |
| Boswyocolo | ‡.01 |
| Butte Central | .15 |
| Cactus | .02 |
| Calaveras | 1⅜ |
| Chief Cons. | 1⅜ |
| Corbin | .95 |
| Cortez | ‡.30 |
| Crown Reserve | 3¼ |
| Eagle & Blue Bell | .75 |
| First Nat. Cop. | 1⅜ |
| Houghton Copper | 1¼ |
| Majestic | .35 |
| Mexican Metals | .39 |
| Moneta Pore | ‡.06 |
| Nevada-Douglas | 1⅜ |
| New Baltic | .70 |
| Oneco | .90 |
| Raven Copper | .01½ |
| Rhode Island Coal | .02 |
| Smokey Dev. | ¾ |
| S. W. Miami | 2 |
| South Lake | 4½ |
| Trethewey | .30 |
| United Verde Ext. | .63 |

‡Last quotation.

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# Conditions in Prominent Rand Mines

By E. M. Weston*

*SYNOPSIS—New Modderfontein will be large producer. Two shafts of Modder Deep close together. Modder B follows coal-mining practice, which has been found unsuitable for City Deep. Large reserves in Crown Mines. This company will probably take in the Robinson. Van Ryn Deep mill about ready to start. Water shortage in district feared for the winter. Important iron discovery reported from Prieska district.*

⁂

The yearly reports of a large number of companies have now been published. The New Modderfontein Gold Mining Co. promises to be one of the largest gold producers in the world. There are about 1120 intact claims 150x400 ft. The mill is equipped with 180 stamps and six tube mills and can crush 600,000 tons per year. When development is advanced at the deep circular shaft, it is proposed to raise the rate of crushing to a million tons per year. The mine is estimated to contain 20,000,000 tons of ore of a value of from 30s. to 35s. per ton; 3,355,000 tons have been crushed to January, 1913. The capital is £1,400,000 in £4 shares, valued at about £13 per share. The Modderfontein Deep lies to the south of this company. It is developing a triangular area from two shafts sunk 100 ft. apart. The shafts struck the reef at 2990 ft. To date, 3587 ft. of development shows 6.74 dwt. over 55.2 in.

Modder B Shaft and Mill

Shafts of the Modder Deep

The Modderfontein B Gold Mines Co. lies to the east of New Modderfontein Gold Mining Co. On this mine the outcrop of the main-reef series passes under the younger Dwyka coal measures and sandstones. The reef lies at between 600 and 1500 ft. from the surface. The mine has developed 2,600,000 tons valued at 30s. 3d. and 361,000 tons valued at 15s. 11d. The mill is handling ore above this grade; costs are 15s. 11d. per ton. The conditions in this mine allow mining on lines following coal-mining practice; the reef lies at a dip of 10% to 15% and is not badly faulted. The ground is easy to work and the efficiency of rock drills and hammer boys is high. The ore is cut in blocks 800x1000 ft., the drives are dry-walled and stopes packed with waste rock. One-ton trucks are hauled into the stopes, and parallel slope roads put in every 80 ft. on the dip.

The City Deep is slowly recovering from the mistake of endeavoring to apply to a reef dipping 40°, methods that were most suitable in a mine like Modder B. Costs are, however, still far too high and the 200-stamp mill cannot yet be fully supplied with ore. This has been partly due to shortage of native labor, but chiefly to mistakes in planning development. During 1912, 479,630 tons were crushed, yielding 35s. 6d. at a cost of 23s. 9d. and a working profit of £292,651. The ore reserves are 2,123,650 tons, valued at 8.7 dwt. Development cost 3s. 9d. per ton; 93.8% of the ore developed on the Main

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*Union Club, Johannesburg, South Africa.

Reef leader has been payable; over 10,170 ft. of development, it averaged 24.3 dwt. across 21 in. The ore reserves at the Crown Mines are now 10,607,671 tons, valued at 29s. 10d. per ton. Profits during 1912 were £1,314,247, with a yield of 32s. per ton and costs were 18s. 4d.; £238,000 went into capital expenditures.

The Robinson mine has now nearly finished development. The ore reserves are 1,373,100 tons of main-reef leader and south-reef, valued at 11 dwt. and 1,160,800 tons of main reef valued at 4.3 dwt. Costs were 15s. 8d.; 231,000 tons of sand were sent below. This mine will probably now be amalgamated with the Crown Mines. The Van Ryn Deep Gold Mines is developing rich ore. The mill is expected to start work in July.

The rainfall this season has again been low and most of the mine dams and reservoirs along the reef are not nearly full. There is some fear of a water shortage during the coming winter, unless additional supplies are developed. Important discoveries of rich iron ore are reported from the Prieska district of Cape Colony. The ore is reported to average nearly 70% iron and to run for 40 miles toward Bechuanaland.

⁂

## The Hall Desulphurizing Process

By Donald M. Liddell

The general outline of the Hall sulphur-recovery process was given in the Journal of July 5, 1913. A visit to the experimental plant in Brooklyn resulted in an interesting exhibition of how sulphur gases could be eliminated, and how easily the reduced sulphur can be absorbed.

The testing roasting plant consists of one small round furnace, hand-rabbled through a small hole in the top, and one a little larger, a miniature single-hearth mechanical roaster of the McDougall type. The small furnace has a hearth about 16 in. in diameter; the large one is probably 32 in. Both furnaces are fitted with hydrocarbon-gas burners, and air and steam connections. In both furnaces the burners, air and steam connections all enter radially, pointing slightly downward, near the bottom of the furnace, and the regulation of each one is entirely independent. The Hall process primarily consists in the nice regulation of these factors so that neither $H_2S$, $SO_2$, $SO_3$ nor COS is produced.

The furnace fumes can discharge directly into the atmosphere, or can be led to a condensing system. For the smaller furnace, this consists of two glass chambers in tandem, partly filled with water, through which the exhaust gases are allowed to bubble. For the large furnace, big wooden tanks are used. It should be noted that these scrubbing devices are of the crudest description. There are no sprays, agitators, centrifugal devices, or any of the other aids to scrubbing usually thought necessary, and the manner in which the scrubbers do their work is eloquent testimony to the ready absorbability of the fumes, of which Mr. Hall speaks.

With the furnaces working as ordinary roasters, there is the customary odor of $SO_2$ in the room, which, however, disappears as soon as the correct mixture of steam, air and reducing flame is turned on. If the flame is not made strongly enough reducing, the gases keep their $SO_2$ odor, although a portion of the sulphur oxides will be reduced. If too strongly reducing, the odor is that of $H_2S$.

If all conditions are right, when working under the Hall system, the fumes simply form a yellow cloud in the air. Some of these fumes were caught in a large tubulated retort and shaken with water for a few seconds, upon which they completely disappeared.

The demonstration, on the day I visited the plant, consisted in starting the roasters discharging into the air, without any attempt at distillation of the sulphur. There could be no question that $SO_2$ was present in large quantities. Regulation was then begun of the gas flame, steam and water, and the odor of $SO_2$ disappeared. Reduction was carried too far and $H_2S$ was formed, which manifested itself both by its odor, and by blackening strips of lead acetate paper. Soon the correct regulation was obtained, and a stream of gas carrying entrained particles of yellow sulphur escaped into the air. This stream had at times a barely perceptible odor of $SO_2$, but the gas would certainly have no effect on vegetation. This was quickly turned into the scrubbers after its lack of odor has been noted, as the neighbors, all of whom seem to be doing a large laundry business, object as vigorously to having their clothes covered with yellow sulphur, as did ever a western smoke farmer object to furnace fume.

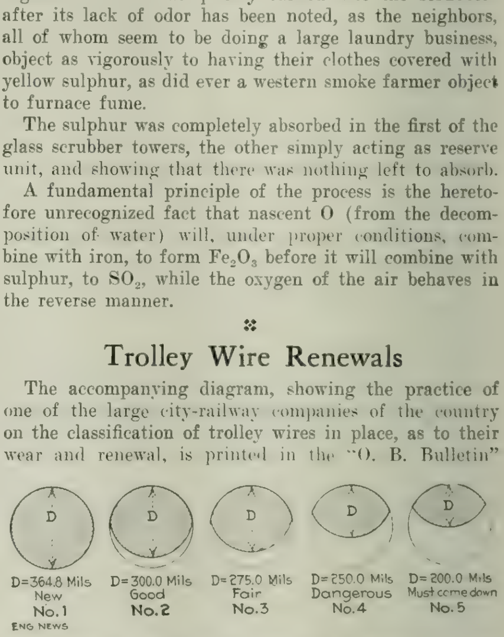
The sulphur was completely absorbed in the first of the glass scrubber towers, the other simply acting as reserve unit, and showing that there was nothing left to absorb.

A fundamental principle of the process is the heretofore unrecognized fact that nascent O (from the decomposition of water) will, under proper conditions, combine with iron, to form $Fe_2O_3$ before it will combine with sulphur, to $SO_2$, while the oxygen of the air behaves in the reverse manner.

⁂

## Trolley Wire Renewals

The accompanying diagram, showing the practice of one of the large city-railway companies of the country on the classification of trolley wires in place, as to their wear and renewal, is printed in the "O. B. Bulletin" (house organ of the Ohio Brass Co., Mansfield, Ohio), May, 1913. It is this company's practice to keep a record of the wire breaks and every fall and spring an engineer takes micrometer measurements of the trolley wires in sections where the worst breaks occur. These measurements are taken 300 or 400 ft. apart, the results plotted and compared with the accompanying diagram.



Where wire is found in condition No. 3, it is found that the expected life is six months under heavy service. Wire which comes into the class of No. 4 is considered dangerous and is renewed as soon as possible. If found in condition No. 5 anywhere, it is renewed without delay. These diagrams show that trolley wires are by no means a permanent installation, and that the copper producer may expect to make replacements of this material without any compensating amount of scrap coming back on the market.

# Principles and Methods of Ore Testing

By I. F. Laucks*

*SYNOPSIS—The object of ore testing is to determine whether a given ore can be treated at a profit, which process is most profitable, and the details of the chosen process. Such basic processes as amalgamation, concentration, cyanidation and smelting may be used in a variety of combinations. The factors to be determined in each combination and the methods of procedure are outlined.*

⁂

Thorough testing of ore in large amounts before building a plant nowadays is recognized as good practice and a wise precaution. There are large establishments devoted to this work. However, but little concerning this important phase of metallurgical work is to be found in literature. The workers in this field have developed their own ideas and practice, and perhaps a discussion of the principles and methods of ore testing may be of value to the profession.

### Several Basic Processes

At present in the treatment of ores, we have the following basic processes: Amalgamation, cyanidation, concentration (including specific gravity, flotation, magnetic and electrostatic concentration), smelting, and special processes, such as leaching of copper ores, chlorination, etc. The treatment of any one ore may consist of only one of the above, or the first four may all be used on the same ore.

An ore is tested to determine: (1) Whether it can be treated at a profit; (2) what process or combination of processes is the most profitable by which to treat it; (3) the details of the chosen process which are necessary for intelligent design of the treatment plant.

The first determination is required, for example, when a new mining property is to be taken over, and ordinarily does not need to be made as elaborately as the other two. The grade of the ore along with some preliminary tests generally will determine this point with sufficient accuracy, except in the case of ores where the margin of profit is extremely small. In such a case the test should be as detailed as the tests made before building a mill, and should be carried on until it is decided accurately that one process at least will return a profit on the ore in question.

The second and third determinations are required before building a mill to treat an ore. Most ores are capable of being treated by several different methods. For example, a certain gold ore may be cyanided direct, amalgamated and cyanided, or amalgamated, concentrated and cyanided. It will yield a different percentage of gold by each combination, the working cost will be different, hence a different profit will result from each combination. Again, a copper ore may be concentrated by ordinary gravity methods, or by flotation. It is, therefore, necessary to determine the method which will yield the greatest profit. It will be noted that this involves not only determining the percentage of saving, but also costs of operation.

The objection may be raised that the cost of operation of a mill cannot be accurately determined from a test run. It is true that the cost cannot be determined accurately to the last cent, but it can be determined near enough for correct comparison of several different processes. A careful study of the details of the processes under comparison, knowing the approximate costs of power, labor, transportation, etc., at the camp where the mill is to be built, will give a close comparison of the cost of several different methods of ore treatment.

Costs of somewhat similar ores may be used to advantage in making comparisons, if the factors making up such costs are known and corrected for the district and ore in question. Neglect of the latter precaution is often a source of error. The cost of a process in one district cannot be assumed as the cost of the same process in another district, unless the factors making up that cost are identical for the two districts and also for the two ores.

It will not be attempted to go further with the question of determination or prediction of costs, as that subject is worthy of a separate discussion. This article will deal mainly with the determination of the percentage of saving, taking up the following combinations: (1) Amalgamation alone; (2) amalgamation and concentration; (3) amalgamation and cyanidation; (4) cyanidation alone; (5) amalgamation, concentration and cyanidation; (6) concentration alone.

Few ores give a sufficient saving by amalgamation only. The percentage of saving depends mainly on the size to which the ore is crushed, to a lesser extent on its treatment after crushing, such as the dressing and slope of plates, amount and temperature of water used.

### Amalgamation and Concentration

This combination is applied to an ore containing free gold and gold in combination with sulphides or other valuable metals. In general the saving by amalgamation increases with finer crushing, while the saving by concentration decreases. It is required, therefore, to determine the size at which the sum of the two savings will be at a maximum. The size of the crushing is limited to from about 10 to 50 mesh.

The method of determining the maximum saving is as follows: Choose a size for the first run by inspection of the ore, depending on character of free gold, size and condition of sulphides. Suppose this to be 30 mesh: Crush one lot through 30 mesh, amalgamate (after adjusting plates, water, concentrators, etc., by small preliminary run), classify pulp from plates into sand and slime, treat each on a separate concentrator. The pulp is sampled on issuing from battery and again after passing amalgamating plates. The difference between these two samples gives the extraction by amalgamation. The saving by concentration is determined by drying, weighing and sampling the concentrates made.

Next crush a lot through 40 mesh, determining saving as before. If the total saving is higher, next try 50 mesh; if lower, try 20 mesh. Proceed in this manner until the maximum total saving is determined. Rate of crushing and capacity of concentrating machines, and amount of sand and slime are determined, affording a basis for cost calculations.

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*Falkenburg & Laucks, chemists and metallurgists, First Ave. and Yesler Way, Seattle, Wash.

### AMALGAMATION AND CYANIDATION

There are three variations of this combination: Amalgamation and leaching by cyanide solution; amalgamation, classifying, leaching sand and agitating slime; amalgamation, regrinding and agitation in cyanide solution.

*Amalgamation and Leaching by Cyanide Solution*—The total saving will generally be greater the finer the crushing. The fineness of crushing is limited, however, by the amount and character of the slime made in crushing, thus limiting the ability of the solution to percolate through the ore.

Determine first the finest-size screen which will still allow percolation, by crushing small representative lots of the ore. Determine also on these small lots, after amalgamating, the time of leaching required, the best strength of solution, amount of alkali, best ratio of solution to ore, etc. (see under cyaniding). Now crush a large lot to the finest leachable size as above determined, amalgamate, and leach with cyanide solution according to the details determined in the preliminary tests. Determine saving by amalgamation and cyaniding. Crush another lot through the next coarser screen, amalgamating and leaching according to the details determined in the preliminary test on this size. Proceed in this way until certain that the maximum profit in this direction has been reached.

As a check, crush a lot through the screen next finer to the size which was found to be the practical limit of percolation. Determine the consumption of cyanide and alkali, rates of crushing, etc., in the large tests. We can now determine the maximum saving by amalgamation and leaching, and the approximate cost.

*Amalgamation, Classifying, Leaching Sand and Agitating Slime*—Crush a lot through the screen determined above as being the limit of percolation, amalgamate and classify into sand and slime, after first determining the adjustment of classifier that will deliver an easily leachable sand product. Leach sand and agitate slime (the details should first be determined on preliminary tests as above). Repeat on finer size and so on until the maximum profit by this combination has been found.

The consumption of cyanide and alkali is determined in both the sand and slime treatments. The amounts of sand and slime and rates of crushing are also determined. The latter determinations are used in calculating the cost of the process.

It must not be lost sight of in all the different tests enumerated that the purpose is to determine the maximum profit by the specific combination described. All of these tests are part of a complete scheme of determining the most profitable process to use on any given ore, as will be seen later.

In the third variation as described below, it is easy to lose sight of amalgamation altogether, as the question of cost of crushing enters so largely into this test. The relation between the first crusher and the regrinder, influences the cost of milling to a large degree; and the tendency in working out this combination is generally to determine the most economical relation between the two as far as cost of crushing is concerned, and to lose sight of amalgamation.

For instance, the cheapest size for the first crusher to deliver, considering cost of crushing only, may not give any extraction by amalgamation. There are certain advantages in getting out a good percentage of gold by amalgamation, rather than throwing the burden of the saving on cyaniding. The advantage in getting quicker returns for the output by amalgamation may be great with a company which is short of working capital. There is also a technical advantage in getting a good part out of the process quickly instead of subjecting it to the more complicated cyaniding.

On the other hand, there is the extra cost of the attention to the plates and the greater liability of amalgam to theft. Also, if the most economical combination of first crusher and regrinder is departed from to secure a higher amalgamation, then amalgamation must be debited with the increased crushing cost. The cost of converting amalgam to bullion is cheaper than the reduction of cyanide precipitate. One of the main advantages in amalgamation before cyaniding, is to keep coarse gold out of the solution tanks.

*Amalgamation, Regrinding and Agitating in Cyanide Solution*—The fineness of regrinding, necessarily, should be determined by grinding portions of amalgamated pulp, say to 100, 150 and 200 mesh, and determining cyanide extraction. After deciding on the requisite fineness of regrinding, lots of ore are then crushed to different sizes, in the stamp mill, amalgamated, reground to the size determined and agitated in cyanide solution, having previously determined the necessary details.

These trials are continued, each lot being crushed coarser until the extraction by amalgamation becomes negligible. The capacities of stamps and regrinder are carefully noted, to be used in estimating costs. The cyanide treatment may vary somewhat, depending on the proportion of saving which is thrown upon it. It may, therefore, be necessary to make separate preliminary tests on each lot to determine the details of treatment.

The cost of regrinding is an important item in this scheme of treatment, and this cost will vary with the type of regrinder used. Comparative costs may be determined fairly close, so that the most economical combination of this one process, i.e., amalgamation, regrinding and cyaniding, can be determined, but it is more difficult to determine absolute cost, in order that this process may be compared with others, which may not use any regrinding.

To decide upon the most economical regrinder, it is necessary actually to test all that are worthy of consideration. To determine the best work of each, the factors which influence each must be worked out, such as size and rate of feed, speed and moisture in feed.

When a combination of processes including regrinding among them, is seriously in competition with a combination including no regrinding, then the cost of regrinding must be carefully considered, but fortunately, this is not so often the case. There is generally a wide enough difference between the results obtained with regrinding, and without, so that such close work is not necessary.

There are several variations of this process which should be tested out after the tests as above enumerated are made. A lot should be run, crushing to best size, etc., as above determined, except that the crushing is done in cyanide solution. If this shows any advantage, either in extraction or cost, then it will be worth while to make several other trials with different strengths of solution.

Another variation which might be tried is amalgamation again after regrinding.

### Cyaniding Alone

There are three variations, viz., leaching, agitating, leaching sand and agitating slime. Aside from the fineness of pulp, the factors which influence the extraction are: Strength of solution, time of contact, amount of alkali, ratio of solution to ore, completeness of precipitation and facility of washing. The ease of percolation of solution is a factor of the fineness of pulp. The factors influencing the cost of the process are: The fineness of the pulp, consumption of cyanide, alkali, zinc and other chemicals, ease of filtration and washing. It is required to find the combination of the above factors that will give the greatest profit.

*Leaching*—First determine finest size permitting percolation as previously described. Several representative small lots are then crushed through different-sized screens, and used for the determination of the other factors. The most important of these are the strength of solution and time of contact, along with comparative consumption of cyanide. The amount of alkali necessary is first determined. Too much alkali has been found to lower extraction. Trials are then made with different strengths of solution, each for some length of time, determining consumption. The most economical strength is then tried for varying lengths of time, again determining consumption. Enough check tests should now be made with other strengths of solution besides the one first chosen and with other lengths of time than that chosen in the last test, to be sure that no other combination is better than the one above chosen.

In Table I is given an example of treating a $5 ore with different strengths of cyanide solution, other factors remaining constant. The best strength at three days is evidently 0.2%. In Table II are shown the results of varying the time of contact, using a 0.2% cyanide solution. The 0.2 solution for four days' leaching would, therefore, generally be taken as the best combination. But suppose on testing with 0.1% solution, for five days, it is found to give $4.45 extraction with 0.7 lb. consumption, or $0.17. The relative profit is then $4.28, or better than any with 0.2%. This latter precaution is sometimes neglected.

TABLE I. TESTING WITH DIFFERENT SOLUTION STRENGTHS

| % Solution | Time | Extraction | Consumption | Relative profit |
|---|---|---|---|---|
| 0.1 | 3 days | $4.00 | 0.5 lb. @ 25c = $0.12 | $3.88 |
| 0.2 | 3 days | 4.25 | 0.7 lb. @ 25c = 0.17 | 4.08 |
| 0.3 | 3 days | 4.40 | 1.5 lb. @ 25c = 0.37 | 4.03 |

TABLE II. VARYING THE TIME OF CONTACT

| % Solution | Time | Extraction | Consumption | Relative profit |
|---|---|---|---|---|
| 0.2 | 2 days | $4.00 | 0.5 lb. @ 25c = $0.12 | $3.88 |
| 0.2 | 3 days | 4.25 | 0.7 lb. @ 25c = 0.17 | 4.08 |
| 0.2 | 4 days | 4.40 | 1.0 lb. @ 25c = 0.25 | 4.15 |
| 0.2 | 5 days | 4.50 | 1.5 lb. @ 25c = 0.37 | 4.13 |

After finally deciding on the various factors large lots are crushed at different sizes and leached. The true consumption of cyanide and alkali is determined in the large tests. Consumption tests in small samples are not reliable except in a comparative way. By testing sufficiently large lots the maximum profit by cyanide leaching is ascertained.

*Agitating*—The size of crushing is determined as before. Other details are then worked out until the best combination is found as described under leaching. Several sizes are then agitated in large tanks. Size of the pulp as affecting ease of agitation should be noted. Comparison should be made with grinding in cyanide solution.

*Leaching Sand and Agitating Slime*—This is worked out as under the second variation of amalgamation and cyanidation, omitting, of course, amalgamation. Crushing in cyanide solution should be compared with crushing in water.

The tests under so called "straight cyaniding" are the first that have not been limited to crushing by stamps, or similar machines preparing ore for amalgamation. The style of crushing may have some influence on the limiting size of crushing. For instance, it might be necessary to crush to a smaller maximum size with rolls, than with stamps, due to lesser amount of slime formed. The cost of crushing will also be affected. These points can be determined by trial.

As special cases under cyanide tests would come the preliminary treatment of old tailings, and of some ores, such as washing, roasting before cyaniding, and tests according to special cyanide processes, such as electrocyaniding and bromocyaniding.

### Amalgamation, Concentration, Cyaniding

After amalgamation and concentration, there are again the three possibilities of cyaniding by leaching, agitating, or both. As before, several lots are crushed through a range of screens, amalgamated and concentrated. On the tailings from concentration are made the detailed tests as described under cyaniding. The tailings are then tested in large lots by the three modifications of cyanide practice.

The complete test would include the following, on several different sizes: Amalgamate, concentrate, leach; amalgamate, classify, concentrate sand and slime separately, leach sand tailings, agitate slime tailings; amalgamate, classify, concentrate sand and slime separately, regrind sand tailings and agitate combined tailings; amalgamate, classify, concentrate sand and slime, regrind sand tailings and reconcentrate, agitate combined tailings. The latter test should always be tried where there is a cyanicide present which is capable of being removed by concentration.

Each of the above variations is tried on pulp originally crushed through enough different-sized screens to determine the maximum profit. Crushing in cyanide solution at the start is also to be compared. The remarks concerning regrinding made before, of course, apply in this case also. Whenever concentrates are made which contain no amount worth considering of other valuable metals than gold and silver, the concentrates themselves should be tested to determine the possibility of cyaniding them on the ground, as compared with shipping to a smelter. A complete cyanide test is necessary, determining maximum profit, as compared with the cost of transportation to smeltery and smeltery returns.

The preceding test is probably the most complicated of any. The saving by the individual processes will vary with the size to which the ore is first crushed. Saving by amalgamation will generally increase with finer crushing, while the saving by concentration will decrease. The less the saving by the first two processes, the more must be accomplished by cyaniding. It may be of special importance to make as large a saving as possible by concentration, either because of cyanicides, which can be so removed, or the presence of copper, lead, etc., or because of precious metals contained in the sulphides being slow to yield to cyaniding. In comparing this process with others, the losses in marketing the concentrates must be deducted in due proportion from the total saving. It can easily be seen where so many factors enter into the problem that the only correct method of solution is actually to mill an ore according to the different variations, and compare the results so obtained.

### CONCENTRATION ALONE

Concentration includes several different methods, ordinary concentration (based on specific gravity), flotation, electrostatic and electro-magnetic separation. The reasons for making concentration tests are: (1) To decide whether to concentrate an ore or smelt it direct, and (2) to determine the best method of milling and details of the process. The decision of the first point depends on the ratio of concentration, percentage of saving, cost of milling, cost of smelting, including deductions, and cost of transportation to smelter.

The best method of concentrating is the one yielding the largest profit, and the details of the method influence both the saving and the cost of operating. The fineness of crushing, closeness of sizing, number of stages in crushing, the size of tailings discarded, etc., all affect the saving, and it is, therefore, necessary to find the relation between them all which will give the best profit.

After the maximum profit by one method, say concentration by specific-gravity methods, has been determined, this should be compared with flotation, or, on special ores, with some of the other methods of concentration.

The following is the method of procedure for ordinary concentration. The size to which the ore shall be crushed is first to be determined. This, of course, is the size at which the valuable minerals contained are first freed from the attendant gangue matter. Crush a representative sample, screen out successive sizes until one is reached at which an appreciable amount of mineral is set free.

Sometimes the size to which the ore should be crushed is apparent on inspection of the screen sizes. With other ores, a gradually increasing amount of mineral is set free, the finer the size, so that it is difficult to decide by inspection. In such a case determine the amount set free. For the coarser sizes, the free mineral may be picked out by hand: on the finer, a small model concentrator can be used. Suppose the decision lies between 0.5 in. and 0.4 in. There is some amount of mineral free in the through 0.5 in. on 0.4 in. size, and a larger amount in the through 0.4 in. on 0.3 in. size. If now we crush through 0.5 in. we have an increased cost in screening, concentrating, and handling of tailings. If, on the other hand, we crush through 0.4 in., some of the mineral already set free between 0.4 in. and 0.5 in. will be reduced to slime in the finer crushing, and a poorer saving will result on the slime portion. The additional slime made can be approximated by screening out the through 0.5 in. on 0.4 in. size, then recrushing this through 0.4 in. and determining the through 200-mesh portion.

After deciding this point, the next in order is the number of sizes to make in preparing the ore for concentration. A close sizing test will show any heaping up of valuable mineral in certain sizes. Where such occurs, these sizes are worthy of special attention. The screening test will indicate the sizes to make. In a doubtful case, comparative tests can be run, making different sizes in each.

A large lot is now crushed and screened to the size decided upon in the preceding tests. Determine weight of each size, concentrate each separately, keeping each concentrate and each tailing separate, and sampling each tailing. After the tailings samples are assayed, we are ready to consider recrushing of tailings.

We can first decide which tailings can be thrown away. Tailings to pay for recrushing must contain enough recoverable mineral to pay for handling, recrushing and reconcentration, and an excess for profit. Wherever any particular size is in doubt, recrush it, concentrate and determine the amount of mineral recovered.

If the coarser sizes of tailings to be recrushed contain much mineral, they may be recrushed in two or more stages. To decide which course is the more profitable, the tailings in question may be divided into two or more lots. One is recrushed in one stage, another in two stages, and so on. The recrushed ore is concentrated separately and the saving determined. The lot crushed in two stages must yield enough more concentrate to pay for the extra expense of two-stage crushing. In any case the tailings are recrushed until they in turn yield tailings which can be thrown away. The above test is not strictly in accordance with mill practice. In a mill the sized pulp at any given stage is a mixture of ore from first crushing and the successive recrushings, while in the test these are all separate.

If desired, another lot may be run by throwing all ore of a size together. In some cases this may make a difference. For instance, the proportion of concentrates in a given size from first crushing may be quite different in the same size from the second crushing, and may affect the saving to some degree.

The final saving and ratio of concentration are determined from the combined weights and assays of concentrates. A screen test on a sample of combined concentrates will give further information concerning the best mill sizes to make. The amount of feed to the different types of machines can be calculated.

The maximum profit to be had by ordinary gravity concentration should be compared with that by flotation. Flotation is rapidly assuming more importance in the concentration of ores, and if the legal entanglements connected with it are once straightened out, it will be much more generally adopted. The combination of flotation and ordinary concentration may also be tested.

On more complex ores, such as contain zinc, for example, special methods must be tried, as electrostatic. The general methods in any case are similar to the above outlined. It can now be decided with certainty whether to mill any given ore or to smelt it direct, what method of milling will give best returns, and what is the best practice with regard to this method.

### SOME ORES MAY BE AMENABLE TO SEVERAL PROCESSES

The foregoing is all descriptive of special combinations of processes. An ore can be imagined which might give some recovery to any one of the six combinations, though such an ore would be rather a freak. However, a good many ores will yield a high saving to two, three or even four of the above combinations.

For instance, a gold ore may give a good recovery by amalgamation and cyaniding, cyaniding alone, or amalgamation, concentration and cyaniding. The yield and working cost by each combination will be different, and hence each will give a different profit.

In testing to determine which combination will yield the highest profit on a given ore, it is not necessary, of course, to try all of the above combinations, or other possible ones that might be thought of. Some can be eliminated at once by inspection, others by preliminary tests, until the list is cut down to those which by preliminary test give promise of being competitors. These latter are then fully tested to determine the maximum profit yielded by each, and the one yielding the greatest profit is the one finally chosen.

Enough ore should be milled by each of the competing processes to give accurate results. For instance, in the ore above mentioned a carload lot for each test would be none too much.

The process to treat an ore is too often chosen by a combination of inspection and testing. For instance, it is decided by inspection, reasoning or guesswork that amalgamation, concentration and cyaniding is the correct process. A test by the chosen process is then made, and if it gives a 90% recovery, this is taken as corroboration of the previous judgment. It might, however, have been found that amalgamation followed by regrinding and agitation, cutting out concentration altogether, would give better results.

Treatment of ore sometimes follows the fashions. It is often influenced by advertising campaigns of new machinery. For instance, there are some ores now being treated by regrinding and agitation with its attendant filter pressing, which would yield a greater profit, if not a higher saving, by the old-fashioned leaching process, or leaching of the sands at least. The determination of the most profitable process of treating an ore should be approached with an open mind, and not with a preconceived idea.

## Russian Salt Industry

For several generations the salt derived as a natural sediment from the numerous salt lakes and marshes fringing the shores of the Black and Azof seas, and also from those in the vast depression at the north of the Caspian Sea, formed an important factor in the commerce of this consular district, says John H. Grout, U. S. Consul at Odessa, in *Daily Consular and Trade Reports,* Apr. 11, 1913. The government levied an excise tax on the trade, which brought in a heavy revenue. Toward the close of the reign of Alexander II, the tax was abolished, and this gave a great stimulus to the salt-gathering industry, so that it soon nearly doubled in volume of output.

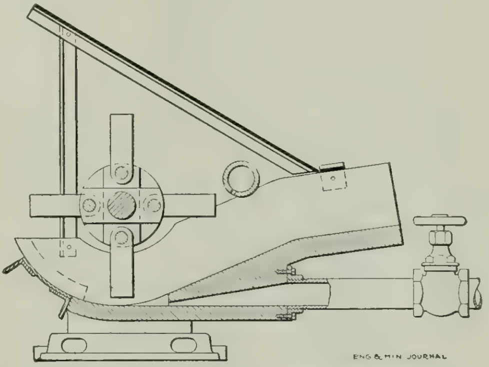
The industry, however, which centered at Odessa, soon experienced trouble. The large profits attracted attention and many attempts were made to realize through monopoly the sum of money returned to the public by the remission of the tax. Eventually one such syndicate was formed at Eupatoria and gained great wealth. At the same time another and quite unforseen obstruction to the development of the lake-salt industry appeared. This was the discovery of the immense underground field of rock salt in the Backmut region, which soon began to be worked. The syndicate secured control of this rock-salt mining, and for some time there was no real competition in the trade. The serious attention of the government was finally attracted, and the syndicate at last fell to pieces.

The present price of fine-ground salt at Odessa ranges from 8½ to 9c. per pood (36 lb.) delivered into railway trucks, and even these are much higher than those which existed before the formation of the syndicate. It is said that the salt millers gain too much profit in charging 1½ to 2½c. per pood for grinding, since rough crystal salt can be had at 6½ to 7½c. per pood. The salt dealers here are now working hard to obtain such railroad rates as will enable them to undersell rock salt in Poland and western Russia and that obtained from boiling down brine pumped up from the layers underground.

## Granulating Molten Slag

In the process of John T. Bergwith, of Chicago, Ill. (U. S. pat. 1,047,370), for the granulation of blast-furnace slag, the attempt is made to produce a dry granulated slag, nothwithstanding the use of water.

This is done by delivering the stream of molten slag to the action of a rotary feeder, driven at a high rate of speed, the feeder members of which scrape or shear off extended portions of the stream of slag and project it upward into the air. Simultaneously with the separation of the portions of slag from the main stream by the feeders, it is subjected to the action of a small stream of water, which combines with the feeders to produce the granulating action. During its flight through the air, it cools and dries, so that it is deposited in a nearly dry granulated state. As may be seen from the accompanying illustration, the lower portion of the feeder wheel runs in a suitable trough or runner, the sides of which rise nearly to the hub of the wheel. A guard bar, or shield, is arranged above the wheel. The trough, or runner, is approximately V-shaped in cross-section before it reaches the disintegrator, but broadens out to a flat-bottom trough in that portion which underlies the feeder blade. At a point approximately central to the lowermost part of the trough, a wide, relatively thin water inlet communicates with the trough. The feeder wheel comprises a number of plates supporting rods, or bars, separated by a number of face blocks.



DEVICE FOR GRANULATING MOLTEN SLAG

## Preparation of Barium

According to *Echo des Mines,* June 2, 1913, it is possible to prepare barium by heating an intimate mixture of silicon and anhydrous barium oxide.

$$3\,BaO + Si = BaSiO_3 + 2\,Ba - 37\ \textit{calories}$$

The reaction takes place at about 1200° Centigrade.

# Mammoth Copper Co.'s Hospital, Kennett, California

The Mammoth Copper Co.'s hospital at Kennett, Calif., was built in 1906-7. It is a two-story wooden building containing two wards and two private rooms. There are 14 beds, eight beds in one ward, four in the other and one each in the two private rooms. Beside these the office and operating room and the living apartments are also within the building. The hospital is in charge of Dr. J. P. Sandholdt. He is assisted by a trained nurse and an orderly. Dr. T. E. Grubbs is physician-in-charge at the mine, where there is a building containing an office and a small ward provided with two emergency beds and such other accessories needful for the immediate care of men in cases of serious accident. The mine is situated about four miles distant from the hospital at an elevation of about 3500 ft., while the elevation at Kennett is about 700 ft. The seriously injured men are carried to the hospital in an ambulance. The full number of men employed by the company when the mine and smelting plant are working at maximum capacity is about 1200. In 1913 the number was 800, the reduction being due to the fact that the plant was not being run at full capacity on account of the complaints of farmers in the county respecting alleged damages from fumes, although there has been no actual damage done to crops since the installation of the baghouse in 1910.

HOSPITAL AT KENNETT, CALIF.

The larger percentage of patients treated in the hospital are there on account of accident. There are no chronic diseases. The number of serious cases of accident is low considering the number of men employed. The average number of patients in the hospital at once is one to three. The hospital has been entirely without a patient for periods of from one to six weeks. The larger percentage of accidents are among unskilled laborers, but the foreigners in such cases do not exceed the Americans. Thirty per cent. of the serious cases are men who have worked at the mine or smelting plant less than one week. The men employed who are generally familiar with the work are largely in the majority, and it is the new men or green hands usually who are hurt. The percentage of men receiving their time checks on account of leaving the employment of the company is quite low, considering the number of men employed and will average about 10 per month.

The healthful climatic conditions at Kennett and at the mine are attested by the fact that while malarial fever is quite prevalent 10 to 20 miles south in the valley there have been only four cases of malarial fever in the Mammoth hospital in the past five years. The records of the hospital show a mortality at Kennett in 1912 of 5½ per 1000 persons. The mortality in the state at large is 12 to 14 per 1000 persons. This hospital does not restrict patients to employees of the Mammoth Copper Co., but patients are received from among the residents of the town of Kennett. The hospital is supported by a fund paid in by the employees of the company at the rate of $1 per man per month.

The accompanying photograph illustrates the hospital and garden and shade trees. It is situated on a hillside across a ravine from the smelting plant, within about 500 ft. of the yards. The photograph was made in May, 1913, when the flowers were in bloom and the lawn and trees were green. There was no evidence of any effect from fumes, because there were no fumes.

⁂

# Aluminum and Cobalt Alloys

As a result of exhaustive experiments, Doctors Borchers and Schirrmeister have shown that among the great number of theoretically and practically possible aluminum and cobalt alloys those containing from 9 to 12% Co represent a structure which, though rather coarse-grained and of scarcely greater tensile strength than pure aluminum, is not only substantially harder and easier to work by turning, polishing, etc., but also much less liable to atmospheric influences (*Min. Journ.*, June 14, 1913). They have now found that by small additions of metallic wolfram or molybdenum, the structure is rendered much finer, and, at the same time, the tensile strength of the alloy is increased to three times that of pure aluminum. The resulting material is also easy to be worked or rolled. The composition of the alloy may vary within the following limits: 0.8 to 1.2% wolfram, 8 to 10% cobalt, and the balance aluminum. The more the cobalt contents approach the higher of the above limits, the greater will be the tensile strength, while the suitability for rolling will decrease. The alloys which are richer in cobalt will, therefore, be most adapted for foundry purposes, and the poorer ones for the manufacture of wrought and rolled material. The molybdenum-cobalt-aluminum alloys may vary within the following limits: 0.6 to 1% molybdenum, 9 to 10% cobalt, balance aluminum. They are in all respects similar to the wolfram alloys, except that the hardness seems to be slightly less. The alloys are produced in accordance with methods well known and generally used in the technics of metal alloys.

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**Billiton Tin Sold in Batavia, Java,** at the first three public sales of 1913, according to Consul B. S. Rairden, at the following prices: Jan. 8, 5500 slabs @ $0.4806 per lb.; Feb. 5, 6000 slabs @ $0.4697; Mar. 5, 5500 slabs @ $0.45422. The slabs weigh 74.8 lb. each.

# Milling in Southeastern Missouri—IV.

By Claude T. Rice

*SYNOPSIS—The experimental section of the mill of the St. Louis Smelting & Refining Co. is described as an illustration of the Overstrom system, which departs radically from prevailing practice in the district. Jigs play a minor rôle, being used to treat the material between 3 and 12 mm. The tailing is recrushed and returned to the trommel system. Three Overstrom hydraulic classifiers handle the fine material, making 21 different products which are sent direct to Overstrom tables.*

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In previous articles in this series have been described the milling methods used in the Doe Run No. 3 and the Federal mills. These have differed from one another in important features, although resembling each other in the main point of using Hancock jigs. In the present article will be described the Overstrom experimental section of the mill of the St. Louis Smelting & Refining Co., St. Francois, Mo., which is a radical departure in milling methods.

### Overstrom System Being Tried

The section to be described incidentally in the elucidation of the Overstrom method of classification and general scheme of ore treatment is far from being what will finally become the accepted pattern for the rest of the mill. Indeed, the section has served mainly as an experimental one in which the new problems that come with the treatment of large tonnages by a new system could be worked out. Two things have already become evident: First, that it is simpler to classify products above 3-mm. size, than to size them, and, second, that a closer classification has been made on the finer sizes of pulp than was necessary for making a good saving on this ore.

In the first section 15 classified products are made from that portion of the pulp ranging from 1½ mm. down to the undersize of a 200-mesh screen, but it is probable that in the future sections this will be reduced to about six products. The number of classifications of the coarser sizes now treated on tables will be about the same as in the experimental section, or possibly a few more.

The most important change will be the substitution of hydraulic classification for screen sizing on pulp running as coarse as 10 mm. The feasibility of extending the range of classification into the field formerly universally considered to belong to screening systems is due to the experience obtained in this first section. It was found that coarse particles ranging up to as high as ⅝ in., resulting from broken trommel screens, have been safely carried up the ¾-in. pipe of the safety column of the classifier without causing any trouble.

The question still to be decided is whether the sizes coarser than 3 mm. will be jigged or treated on tables. If jigs are to be used it will be necessary to decide whether a harz or a Hancock jig, or a combination of the two, is to be employed. At present harz jigs are used, but there is a constant delay occasioned by the necessity of beating the screens once every 24 hr. in order to keep them in good working condition. The marked success that has attended the working of the coarse Overstrom tables handling the immediate undersize from the 3-mm. screen makes this form of concentrator worthy of consideration in a field which has heretofore been the exclusive domain of the jig.

### Outline of Experimental Section

A brief outline of the manner in which the ore is crushed and treated in this new section of the mill of the St. Louis Smelting & Refining Co., is given herewith. The ore from the different shafts is hauled to a bin in the crusher house. This crusher house is arranged in two sections, having in each section one 6D and two 3D Gates crushers with trommels having 1¾-in. openings ahead of each of the smaller crushers. The large gyratories crush to about 3½ in. and the smaller ones to 40 mm. The ore is then carried to the mill building by an inclined belt conveyor. Later a set of 24x54-in. rolls is to be installed in each section of the crusher house to break all the ore so that it will pass a 10-mm. opening. The ore will then be delivered directly to the Overstrom classifier that is to be installed to handle the coarse feed, instead of its going to trommels and being sized as in the present section. The ore is sampled by one Snyder and three Vezin samplers in series. The cut from the last Vezin goes to a sample grinder and is ready then for the assay office where electrolytic assays are made for lead. The rejects from the different samplers fall into the boot of an elevator and are taken to the conveyor at the top of the bins.

From the fine-ore bin the ore goes to a bucket elevator which delivers it to two trommels 48 in. in diameter and 18 ft. long, having 3-mm. screens on the first section, 6-mm. screens on the second section and 12-mm. screens on the last. Water is added at these trommels. The oversize joins the tailings from the jigs and goes to the Cole type of dewatering wheel, which is used to feed the 16x36-in. recrushing rolls. This recrushed material goes back to the first elevator and is returned to the trommels.

### Material Coarser than 3 Mm. to Harz Jigs

The undersize from the 3-mm. screen goes to the No. 1 Overstrom classifier, the undersize from the 6-mm. screen to one of the harz jigs, and the undersize from the 12-mm. screen to the second jig. These jigs are of the large harz type, having sieves 36 in. wide by 60 in. long. They are arranged so as to make gate concentrate chiefly, since, owing to the flap valves in the bottom of the plunger of these jigs, the suction stroke is not especially strong.

On the jig treating the 6- to 12-mm. sizes a screen having 3-mm. openings is at present used, while on the jig treating 3- to 6-mm. material screens having 2-mm. holes are used. Both jigs are run at 160 r.p.m. The coarse jig has a stroke of 1¼ in., while the stroke on the other jig is ¾ in. A bottom bed 1½ in. thick is used. The sieves on each jig are divided into two parts by a cross slat, while in the hutch there is also a cross slat coming up high enough to keep the two hutch workings apart. Owing to the size of screens used the hutch product is small in quantity, but there is some resulting from the attrition of the galena in the bed of the jigs, and from undersize particles that are carried over with the oversize as is inevitable when trommeling large tonnages.

It is the intention to use a 2-mm. screen on the 6- to 12-mm. jigs, and a 4-mm. screen on the fine jig, so as to let any coarse undersize particles of the feed go into the hutch; with the finer screens and the thin bed now used there is always a risk of these coarse undersize particles being thrown into the tailings. When this change is made, hutch jigging will be done. When using these coarser screens a heavy middling product will be drawn off through the second jig from above the screen, and a small amount of clean tailing obtained from the jigs. These harz jigs have the novel feature of an adjustable mid-partition between sieve and plunger compartments. This is built according to the centerboard idea of catboats. Eccentrics are used having no projecting setscrews.

While fairly clean concentrate is made in the first part of the hutches of the jigs, still all of the concentrates are fed to a 16x4-ft. Overstrom table placed on the coarse-table floor to be cleaned. At the time this article was written no middlings were made on the jigs. Instead they were allowed to go into the tails which were all reground. The jigs work well, but in order to keep the fine sieves that are used from blinding, they are pounded once every 24 hours. As previously mentioned, the shovel wheel feeds the dewatered jig tails, together with the oversize from the 12-mm. screen, to a pair of 16x36-in. rolls for regrinding.

### Overstrom Classifiers for Fine Material

The undersize from the 3-mm. screen goes to a series of three Overstrom classifiers, which make 21 different classified products and the slimes. The slimes are overflowed at No. 1 classifier, which in addition makes eight different classified feeds. The pulp that comes up the last or safety column of this classifier goes to the No. 3 classifier, while the pulp from the last classifying compartment, that is, the one just ahead of the safety column, feeds No. 2 classifier. In No. 3 classifier is treated the coarsest material. The overflow from its receiving compartment is water that goes to the tank that supplies hydraulic water to No. 2 classifier, which is fed at a lower level than No. 1. No. 3 classifier makes four classifications, while No. 2 makes eight, and the overflow at its receiving compartment is clear water, which is used for a wash on the table.

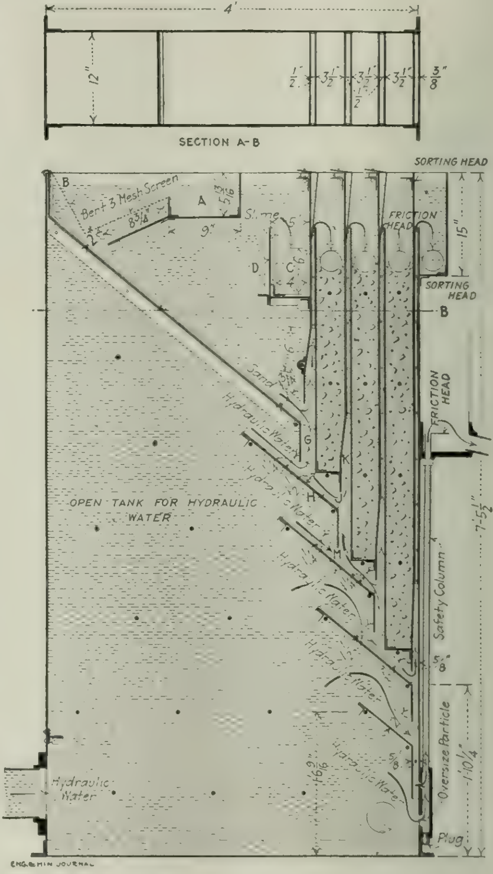
DATA ON OVERSTROM CLASSIFIERS

| | Classifier No 1 | Classifier No 2 | Classifier No 3 |
|---|---|---|---|
| Spouting velocity of columns, mm per sec | 300 | 500 | 1000 |
| Sorting velocity of column 1, mm. per sec | 10 | 55 | 178 |
| Sorting velocity of column 2, mm per sec | 13 | 65 | 212 |
| Sorting velocity of column 3, mm per sec | 17 | 75 | 250 |
| Sorting velocity of column 4, mm per sec | 21 | 87 | 480 |
| Sorting velocity of column 5, mm per sec | 27 | 100 | |
| Sorting velocity of column 6, mm per sec | 32 | 115 | |
| Sorting velocity of column 7, mm per sec | 39 | 131 | |
| Sorting velocity of column 8, mm per sec. | 47 | 500 | |
| Sorting velocity of column 9, mm per sec | 150 | | |
| Sorting velocity safety column, mm per sec | 1800 | | 1800 |
| Tons raised in column 1, per 24 hr | 9 | 26 | 48 |
| Tons raised in column 2, per 24 hr | 11 | 29 | 54 |
| Tons raised in column 3, per 24 hr | 13 | 31 | 57 |
| Tons raised in column 4, per 24 hr | 15 | 33 | 63 |
| Tons raised in column 5, per 24 hr | 17 | 35 | |
| Tons raised in column 6, per 24 hr | 20 | 37 | |
| Tons raised in column 7, per 24 hr | 22 | 39 | |
| Tons raised in column 8, per 24 hr | 24 | 42 | |
| Tons raised in column 9, per 24 hr | 272 | | |
| Tons raised in safety column, per 24 hr | 222 | | 5 |

Specific gravity of ore, 2.89

These classifiers increase in height with the number of classifications that are made in them. No. 1 classifier is practically 15 ft. high, and is 2 ft. 6 in. wide; No. 3 classifier, which is placed alongside it, is 7 ft. 6 in. high and 12 in. wide, while No. 2 classifier is 13 ft. high and 24 in. wide. An accompanying table gives the sorting velocities used in each compartment, and the tonnage lifted by each with the pulp at a dilution of 10:1.

The material from the safety column and the last compartment of the No. 3 classifier is treated on one 3x17½-ft. Overstrom table riffled over its top with a broad stratifying groove between riffles. Owing to its taking the feed from the safety columns, which is the catch-all of this system, the feed to this table is not closely classified. In order to get a lean middling, therefore, it is necessary to classify the middlings coming from the lower corner of the table so as to free them of fine sand and oversize particles of gangue that often follow the concentrates along the riffles. This classifier is simply a pipe affair of reducers, tees, nipples, elbows and other standard pipe fittings working on the old downward-discharge principle.



Section of Overstrom Classifier

The three other compartments of No. 3 classifier each feed a table, there being two other 3x17½-ft. tables and one 4x16-ft. table. Each spigot product of the other two classifiers feeds a table. The coarser sizes go to 5x11-ft. diagonal tables, and the finer sizes to 6x14-ft. diagonal tables, there being 10 of the larger size and eight of the smaller. The slimes go to a 7x9-ft. slime table, and several 6x14-ft. diagonal tables.

The long tables handling the coarse pulp are driven at 210 r.p.m., and have a stroke of ¾ to 1 in. The intermediate tables run at about 240 to 245 r.p.m., and have a stroke of from ⅝ to ¾ in. The slime tables run at 285 r.p.m., and have a stroke of ½ in. The riffles on the coarse tables have a depth at the head-motion end of ⅝ in. and taper to $\frac{1}{16}$ in. On the last two of the long tables grooves in the linoleum become important, and the riffles are only put on in sufficient number to carry the concentrates to the end of the tables. These grooves are ⅛ in. deep and taper at the discharge end to $\frac{1}{32}$ in. On the intermediate tables there are no riffles, and the grooves cut in the linoleum are ⅛ in. deep as a maximum and taper to nothing. On the slime tables the grooves are $\frac{1}{16}$ in. deep and taper to nothing.

The first two coarse tables make middlings that are sent back to the regrinding rolls and thence returned to the trommel system. The middlings from all the other tables go to the boot of an elevator and are returned to tables where a narrow streak of galena is saved and a pyrite-chalcopyrite concentrate is obtained. The tailings from the jigs and tables of each section go to a teeter-box sampler of improved type, and then by cars to the dumps.

### Overstrom Classifier Discharges at Top

The whole system is built around the Overstrom classifier, which is of a somewhat similar type to the Richards pulsating classifier, in that it raises its products instead of drawing them off at the bottom, as is the practice in all of the many variations of the time-honored idea in classification that has prevailed almost unquestioned since the time of Rittinger. The sorting columns are arranged side by side longitudinally, and what pulp cannot be raised in the sorting column ahead drops down from the bottom of it and goes out in a thin feed to the next column, where the next coarser size is floated up and discharged.

By reference to the accompanying engraving, which shows the design of No. 3 classifier, which is handling the coarser feed coming from the 3-mm. screens, the action of the Overstrom classifier will be better understood. The feed to the classifier comes to the box *A* and overflows past the screen *B*, in case a scalping screen cannot be put in on the launder some place ahead of the classifier. From there it drops into the first or receiving compartment, which connects with the hydraulic water of the classifier to the opening *E*. The head of the feed and the head of the hydraulic water are approximately equal; consequently, there is no upward flow of hydraulic water through *E* and no downward flow of slime other than that induced by the settling of the heavier pulp through the opening *E*. In case these two heads are not exactly balanced, the adjustment is made by means of a movable lip *C* of the slimes-overflow box.

The slime overflows from the first compartment; the only slime that can be drawn down into the classifier proper is that enmeshed by the heavier sands. The small percentage of slime that is thus carried down is floated off in the second or third sorting columns before it has gone far in the classification. The water coming off with the different sizes is comparatively free from slime. This freedom from slime is important in table work and is the leading feature of this Overstrom classifier.

The feed other than slime drops through the opening *E* into the sorting column of the first compartment. This opening *E* is a slot in the present type of classifier, which is made only for handling pulps 3 mm. and finer, such as are at present considered proper to send to classifiers. Consequently, the feed is spread out into a broad band that practically fills the opening and blocks the escape of any hydraulic water up that way. As the pulp slides off lip *E*, it meets the hydraulic water which comes into column *G* through the opening *J*, connecting with the common hydraulic tank that serves all compartments.

The compartment *G* is contracted just above the feed slot into the sorting column marked *F*. This sorting column varies in height with the size of the particle to be lifted, but is at least 3¾ in. high. At the top it contracts further into the discharging column so that the classified product issuing from that compartment may be carried up at a great velocity to the top, where it is discharged into the receiving box. From the latter, a discharge pipe takes the pulp to the concentrating device on which it is to be treated.

The main reason for this contraction of the top part of the sorting column is to cut down the amount of water necessary in discharging the pulp as well as to keep the sorting column from extending too high and thus becoming too sensitive to overfeeding. Also because of the higher velocity there is less liability of any trouble through plugging, and less likelihood of doubtful material dropping back into the sorting column and thereby discommoding the sorting action.

The pulp that is too heavy to be lifted in the first sorting column drops through *G* to the sloping lip *H* and goes to the next compartment where the action is repeated. The flow of the sorting water up the different sorting columns is due to the fact that there is a slight head given the water through dropping through the height of the discharge lip in each successive compartment. In order to prevent the robbing of any compartment, owing to this head, the drop of the discharge from one compartment to another is exceedingly small, and only enough to balance the frictional losses due to the greater travel of the pulp. Owing to the presence of sand in the pulp the friction is much greater than if water alone were rising in the column. The sorting velocities are obtained by the width given to the sorting column up which the water must pass with the head that has been decided upon.

### A Safety Column Provided for Oversize

At the end of the classifier after all the classifying compartments have been passed, a safety column is provided to take away any oversize that may get into the system. It is due to this column that the other compartments are kept from being clogged by oversize. In order to carry the oversize up this column, which is generally a ¾-in. pipe, with as little water as possible it is given a much greater head than the other compartments. Consequently, it has to be served first, and not until it gets its supply of water and feed do the other compartments begin to work properly. If the safety column does become blocked, the heavier sands that were going to it gradually build up in the classifier, stopping up the different compartments in turn as the sand extends back. When the safety column begins to discharge again, the classifier cleans itself and operates again just as before.

When underfed greatly the tendency of the classifier is to cause the overflowing slime to be thinner, for some of the hydraulic water will rise through the first feed slot as the settling sands no longer plug the opening. Owing to the head and the fact that less of the area of the discharge columns is taken up by sand, all the different classifications become more diluted. Because of the greater head within the safety column, there is always a tendency for it to take its full feed and because of the suction that is developed by the safety column, the last compartment also tends to take more nearly its proper feed of sand than do the others.

In case the classifier is overfed the bulk of the surplus goes to the last classifying compartment. In fact, the whole tendency is for the overfeed to be taken by the latter compartments. These are the ones treating the coarser sizes of the pulp and are the ones feeding the tables best able to stand an overfeed.

In handling pulp finer than 3 mm., the rectangular type of classifier would be used, but when coarser sizes are to be treated, pipes would probably be used for forming both the sorting and discharge columns. The classifiers at the mill under discussion are built of iron with cement between the discharge columns, but where the water is acid, the classifiers would be built of wood with a wood filling between the discharge columns.

With this type of machine Professor Overstrom considers that it is entirely practical to classify any size of pulp without excessive dilution. With the slimes closely classified he thinks that the field of the centrifugal-concentrating machine will be greatly restricted. He believes that the large dilutions necessary with other classifying systems are the cause of stopping classification before the 80- to 100-mesh sizes are reached.

By using several different classifiers in series, much of the water fed with the pulp to the later classifiers can be overflowed in a manner similar to that in which the slime is overflowed in the first classifier. This water is clear enough to be used as hydraulic water for the next classifier. The water overflowing from the receiving compartment of the last classifier is used for wash water on the tables. In this way the water is used over and over again without the necessity of clarifying.

The cost of these classifiers, which are at present sold outright, depends upon the size of the pulp to be classified. It varies from about $25 per compartment handling exceedingly coarse material, to $200 per compartment when handling exceedingly fine sizes.

Before closing this subject of classification, it is important to state that Professor Overstrom has found that on the coarsest sizes, when handling large tonnages, a sorting velocity approximately twice that given in the accompanying tables has to be used in order to overcome the [illegible] of the pulp, which has a tendency to fall in mass instead of as individual particles in the sorting column. In fact it is partly on account of this mass action that as high velocities are used in the discharge columns as are consistent with handling the pulp without plugging the columns.

The Overstrom classifier, however, is no cure-all for all conditions, or to be prescribed for any set of conditions. Each Overstrom classifier has to be designed to suit the tonnage and the dilution desired, as well as other conditions that present themselves in the problem, so that a more careful study of the ore has to be made when an Overstrom classifier is to be used than when one of the older type of hydraulic devices is used.

### Close Classification Avoids Many Tabling Troubles

Having gone rather thoroughly into the work of this classifier, it is now time to take up the subject of treating the closely classified pulp on Overstrom tables. The trouble with most table work at present is that the pulp going to the tables is not closely classified. In practically all mills, the Federal mill being one of the few exceptions, the table work is greatly hampered by the large amount of fines that have been sucked down at the classifiers into the different table feeds.

A principle of tabling worked out, I believe, by Professor Overstrom, is that on the riffled surface the finer particles in the feed work under the larger particles, irrespective of specific gravity. This is well shown in panning. This being so, it becomes highly important to keep out the finer sizes of gangue particles from the coarser classifier sizes in feeding tables.

The reason that the Wilfley table, with its diagonal termination of riffles, has been able to preëmpt the field of tabling and hold it so long has been that it provides the cleaning area so necessary in treating poorly classified material. Most of the improvements made in tables recently have been along the lines of providing a cleaning area some place on the deck without using the diagonal termination of the riffles.

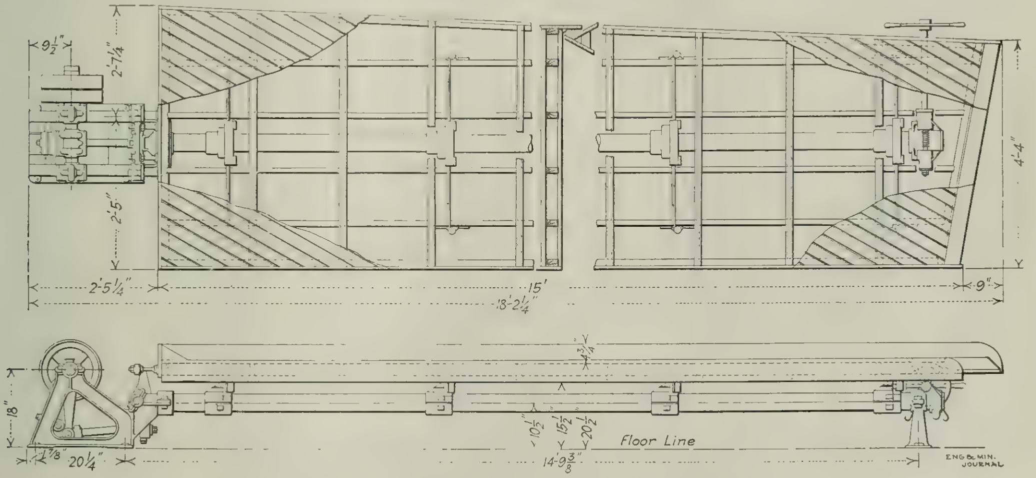
The separating action on the table is the result of two actions. There is the jerk of the table, which through friction carries the concentrates, or the material in contact with its surface ahead. There is also the washing of the material down the slope by the water in the pulp. The slanting line down which the material tends to travel as it works off the table is the result of the action of these two forces, which operate practically at right angles to each other. With the heavier quickly settling pulp the jerk forward along the table is the more important. With the finer, slower-settling pulp the carrying action of the water is the more important; consequently one shape of table cannot be made to handle all sizes of pulp equally efficiently. In the Overstrom improved table there are eight different sizes.

### Grooves Better Than Riffles for Fine Sizes

On the tables handling the coarser feed, riffles must be provided to allow the settled product to stratify and to keep the coarse concentrates from being rolled down the deck. In the finer sizes, Professor Overstrom believes that grooves are better than riffles for allowing the stratification to take place. The depth of the riffle or the groove is more important than the shape. The proper ratio between the diameter of the gangue particles and the depth of the riffles varies with the size of these particles. The depth should diminish gradually as the discharge end of the table is approached until, at the end, it has a depth equal to the diameter of the gangue minerals in the pulp being treated. The riffles should be tapered in order that the larger and lighter pieces in a classified feed will gradually come to the top of the riffle and be washed over. The shallower the riffles the better work, generally speaking, will the tables do, but the riffles must be of sufficient depth to carry the concentrates to the end of the table and keep them from being forced up too high in the bed behind the riffle when the feed first comes on the table.

Also the flatter a table can be run and still accomplish the separation, the better work it will do. The minimum flatness at which a table is to be run determines the minimum width that can be given the table. These details depend upon the size of the pulp that is being treated. Experiments have shown that with any but the finest pulps it is impossible on a short, wide table to get any tailings down off the lower side without an excessive tipping of the table, and if the table is tipped excessively, there is practically no separation. The reason for the narrow tables on the coarse feed now becomes evident, for a slight transverse inclination is especially to be desired upon the coarse table.

If the length and width of the table are proportioned properly for handling that size of feed, there will be enough concentrates left in the top riffles where the sand separates from the concentrates to prevent the finer sands working down into the concentrates and remaining buried by them. The bulk of the concentrates will be up rather high on the table. The bottom riffles must be filled with concentrates, or tailings will be carried along the upper side of them and contaminate the concentrates. If the table is too wide for its length, the top will have to be tipped too much in order to fill the lower riffles and the separating action, due to the rush of the water down the table slope, will not be as effective as it might otherwise be. In handling classified feeds the table does not have to be so wide as when unclassified pulp is being treated. The Overstrom tables are designed to handle classified material and are therefore built exceedingly narrow compared to the length.



Overstrom Table, St. Louis Smelting and Refining Co.

In treating large tonnages the tables are given capacity by increasing the length. In order to obtain high capacity it is necessary to have a loose bed of pulp in the riffles, and this bed must not be too thick. In order to spread the large feed over the table a long feed box is necessary. For the long table handling the coarse sizes of pulp coming from the No. 3 classifier the pulp is fed to the table for one-third its length, while the wash water obtained from the feed extends up as far as one-half to two-thirds the length before it meets the real wash water coming in at the end of the feed launder. On the tables treating the intermediate pulp the feed is distributed along the top of the table for approximately half its length; the slimes, for about three-fifths the length.

The proper dilution of the pulp is also important in obtaining a loose bed. For the coarser pulp the ratio of water to ore should be 10 : 1 by volume; for the sandy feed the dilution should be 12 to 15 : 1; for the finer sand and the slimes that have not been settled in tanks the best dilutions are from 15 to 18 : 1 by volume.

### Slime Problem Solved for Close Classification Preceding Tabling

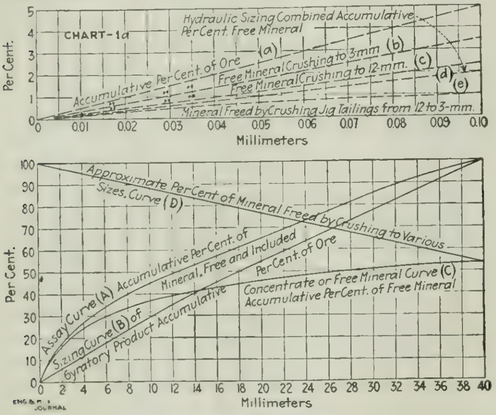
Coming to the question of slimes, Professor Overstrom holds that for the sandy slimes the solution is simply to do closer classification and avoid settling. He thinks that the settling results in the formation of a clay, due to the combination of the amorphous slimes of the gangue and the sandy angular particles of fine ore, which makes further settling difficult without great dilution of the pulp. That ore particles tend to slime to a certain size and then slime no further, at least not to as great an extent as up to that point, is partly confirmed by some of Professor Overstrom's investigations on classification with small sorting velocities. It was these tests on the classification of the finest pulp that led him to give up the idea of trying to work out a centrifugal machine for handling fine pulp, and to take up the subject of close classification, especially a system that was capable of classifying the finest pulp.

For classified slimes Professor Overstrom thinks that tables are better than vanners, as the capacity of the former is greater, and the concentrates obtained cleaner. From the slime table in the Overstrom section a concentrate assaying 73% lead is made, from 10 to 12 tons of dry slime being treated. For unclassified slime and clayey pulp that will not settle well, the vanner is probably better than the table.

For the treatment of difficultly settled feeds that come from the first compartments of the Overstrom system, it is believed that vanners or traveling canvas belts will do fully as well as centrifugal machines. In the treatment of the pulp it is necessary to bring the particles in contact with the vanner belt by making the film of pulp going over the table as thin as possible, so as to make the distance that the particles have to settle infinitesimal.

### Overstrom Tables Long and Narrow

It may be of interest to say something in regard to the construction and design of these improved Overstrom tables, as there is as yet no commercial literature, and little technical description of them. It might be thought that there would be some trouble in keeping these long, narrow table decks from warping, but after four months' operation no tendency toward warping had developed. This absence of any tendency to warping comes from the fact that selected wood is used, and nothing but wood is put in to tie the decks together. Warping of table tops was often due to using two different materials, like wood and iron, in binding together the decks. The two tend to expand and contract differently under changing conditions.



Charts I and Ia

The cross braces of the deck butt up against the longitudinal stringers, to both of which members the deck is fastened. On the bottom of the table deck is a series of cross-bracing planks that are lag screwed only to the longitudinal members of the frame. The deck is carried from a tipping shaft by means of transverse springs turned on edge and made up of three leaves. These springs are loosely secured at their ends to brackets that fasten to the deck itself.

The table deck is operated in tension. These leaf springs are made so that it requires a push of 160 lb. to straighten them. They are put in so that the head motion pulls against them during the backward stroke, while they push back against the head motion on the forward part of the stroke. On the slime tables there are only three of these springs, so that the deck is all operated in tension. In the long tables the deck is carried by a series of these springs placed approximately 3½ ft. apart, so that the table operates as a series of sections, all of which are in tension. The deck is covered with thick, fine-grained cork linoleum, which is grooved and also riffled in the case of the tables handling the coarser pulps, so as to prevent the rolling of the coarse concentrates.

The feed box and the wash-water box are combined in the form of a simple V-shaped launder with keyhole openings in the back. The wash-water pipe comes into this launder at the concentrate end of the table, while the table-tilting mechanism is also placed at that end so that the attendant, as he walks along the table aisle, can adjust the dip of the table and the amount of wash water conveniently. The concentrate end of the table is cut off with a backward-pointed bevel looking down the slope of 1 : 6, so that no pipe is required to drop water on the concentrate end of the table in order to keep the extreme edge of it moist.

The engraving on p. 61 shows the construction of the table and manner of supporting the deck. The table is extremely simple. It has a head motion that can be changed as to length of stroke without varying the tension of the spring under which the deck is working. The decks of the different tables are designed as to width so that they will run with a slope of approximately ½ in. per ft. The table is made in several different sizes; the dimensions of the tables used in the experimental section were given earlier in the article.

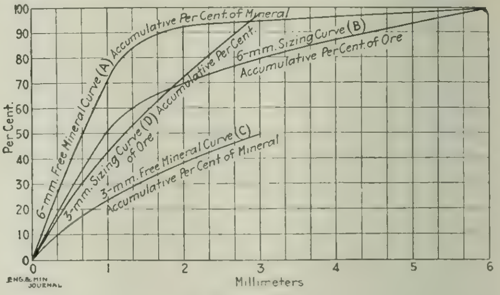


Chart II

### Extensive Tests before Designing First Section

Before designing the experimental section, Professor Overstrom tested the ore thoroughly. He was fortunate in that he was able to see how the ore actually crushed down to a size of 12 mm. when being handled on a large scale. This is somewhat different from what it would have been in a testing plant where the scale of operation is naturally small. Below 12 mm. the crushing of the ore had to be done in a testing plant and so was on a small scale. Representative samples of the ore were taken and the results of several tests were plotted and full curves drawn so as to average the results. In the tests used in making up the charts there were no large variations from the curves adopted. But it must be remembered that the curves are not those resulting from the study of the ore crushed in the first section but the preliminary curves used in working out the system of treating the ore and the flow sheet of the mill. All curves are plotted with the same origin, independent of each other and the percentages are cumulative.

It will be noted that only in Chart I is a curve given showing the assays of the different screen sizes as to total lead contents. This is because Professor Overstrom in all his milling work lays particular stress on the free mineral at different sizes, for it is only the free mineral that the concentrating devices can save. The amount of free mineral in the tailings indicates the character of the concentrating work on any device and not the assay results. Panning gives much information in regard to concentration that assaying never can.

In Chart I are shown the results of tests on ore from the gyratory crushers which are crushing to 40 mm. as a maximum. Curve *A* is the assay curve of the ore when it comes from the gyratory. Curve *B* is the sizing curve of that ore. Curve *C* shows the free mineral that is in the ore in different screen products. Curve *D* shows the amount of mineral that would be freed by crushing the mineral to various sizes.

In Chart Ia is shown the manner in which the undersize of a 200-mesh screen, or the slime as it is commonly called, is formed. These slimes are the sandy and the true slimes combined. The different curves of this chart were obtained by drawing straight lines from the point of origin to the actual point determined by weighing the 200-mesh undersize obtained from each of the different products that were tested. The chart is given simply to show graphically the way in which the slimes are formed by the different crushings. It must be remembered that Chart Ia is strictly a hypothetical one. The labeling on the different curves, I believe, makes clear what each is intended to represent.

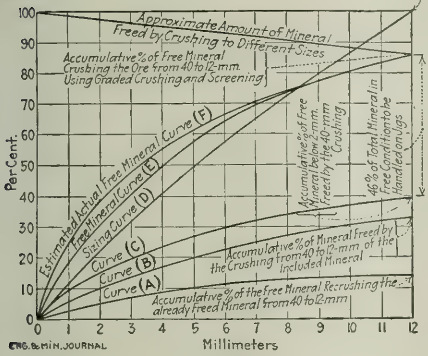


CHART III

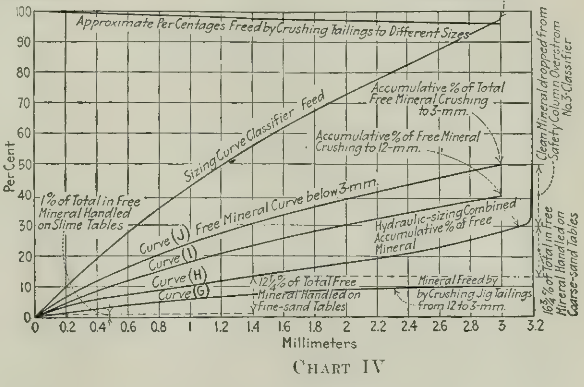


CHART IV

Chart II shows the advantage in regard to sliming that comes from taking the ore particles out by concentration at different stages of the crushing instead of leaving them in, even when the fine crushing is done entirely by rolls, which are rightly considered to be the apparatus that forms the smallest amount of slime. In this chart full-line curves *A* and *B* refer to the results obtained by stage crushing to 6-mm. size only, but without stage concentration. It is the result of crushing the ore in a mill handling 1800 tons per day and shows actual mill crushing. Dotted-line curves *C* and *D* show the results of stage crushing and stage concentration when the tailing or gangue material, but not the ore minerals, is crushed so that all of it will pass a 3-mm. screen. These latter curves show the results of the preliminary testing and do not show the actual results obtained in the finished section. However, they are probably not far different from the actual work.

Charts III and IV are the ones that show the main metallurgical results of the preliminary testing. They do not purport to give the actual results in the finished section, although they show conditions not far from the ones prevailing in the mill section. Chart III shows the test upon the product obtained by crushing the oversize of the 12-mm. screen in rolls so as to pass that screen and also includes the original undersize from the gyratory crushing. This carries the ore one step further than Chart I. Curve *D* is a sizing curve of the ore. Curve *E* is a curve showing the total mineral freed by the crushing at this stage. Curve *F* is one drawn in by Professor Overstrom to show what is the actual distribution of the free mineral at this stage of the crushing in a finished section, but it is purely hypothetical. The dotted curve at the top of this chart shows the amount of mineral that from the crushing test in the preliminary work could be expected to be free, as the ore is all crushed to these lower sizes before it is allowed to pass out of the mill.

Chart IV shows the total free galena below 3-mm. size that has resulted both from the recrushing in rolls of the tailings from the jigs and from the original gyratory and first-roll crushing. The curves can easily be understood by the labels that accompany them, except that curve *H* is a new one showing the amount of free mineral that would be in different spigot products, the sizes of which are rated by the size of the average limestone particle that would be in that spigot product. It is a theoretic curve, as is shown by its being dotted, and is obtained by transferring the points of the total free-mineral curve by multiplying the abscissas of any free-mineral particle by the free-settling ratio of limestone and galena, in other words, by 3¼, so as to throw the galena into the spigot size where theoretically it would be found. This curve is used in determining the manner of dividing up the feed in the classifier for the different tables.

Four tables were decided upon for handling the coarser sand in the feed from the 3-mm. trommels. After this decision was made, the rest of the subdivision of the pulp except as to number of classifications came as a matter of course. It was also decided to make 21 different classifier products for treatment on the tables simply because there were 21 tables available, and it was considered advisable to err on the side of too close classification in the first section at least. A system of classification that will permit of making that many products without excessive dilution of the pulp, and which does the classification in such a way that not a single settling device of any kind is required in a whole mill, is worthy of consideration.

⁂

## Electro-Metallurgy in Norway

The Christiania correspondent of the *Journal du Four Electrique* (through *Min. Journ.*) communicates interesting information and statistics relating to the progress of the electro-metallurgical industry in Norway in 1912.

The electrothermic manufacture of iron and steel has not progressed as speedily as was anticipated, owing to unforeseen difficulties. The Hardanger works produced 2200 tons of iron from its electric furnace of 3500 hp. The two furnaces of the Tinfos works were started toward the end of 1912 and are running 10 tons of good pig iron each daily. The ore smelted contains only 44 to 45% of iron, and 700 cwt. of coke are consumed to produce a ton. The furnaces at Ulefos, Stavanger and Jossingford have also produced iron in smaller quantities.

The carbide factories rapidly increased their output as indicated:

| | Tons | | Tons | | Tons |
|---|---|---|---|---|---|
| 1908 | 36,895 | 1910 | 50,579 | 1912 | 64,000 |
| 1909 | 48,352 | 1911 | 60,593 | | |

The value of the 1912 production reached £560,000. The agreement to restrict the production of carbide has been unsuccessful, since the output increases yearly. However, the uses developed for cyanamide have enormously increased the exports, which have risen from 752 tons in 1909 to 13,892 in 1912.

During the last three years the exportations of ferrosilicon have been only slightly augmented. In 1910 the amount was 5121, and in 1912 only 6493 tons.

The two factories of Vigeland and Stangfjord exported 1792 tons of aluminum in 1911 and about the same quantity in 1912. A new works is to be established at Arendal. There are now two works where zinc ore is reduced by the electric furnace. In 1911 were exported 6600 tons, which in 1912 was enhanced to 8928 tons.

[We are doubtful respecting the zinc statistics, conceiving that the correspondent who is quoted has made some mistake.—EDITOR.]

⁂

## Starting Compensator for Induction Motors

It is an inherent characteristic of squirrel-cage type induction-motors to take a heavy starting-current ranging from three to seven times the full-load current. This, in the case of large motors, may cause a serious drop of potential in the supply circuit, and to avoid trouble from this source, a starting compensator is offered by the General Electric Co., which consists of an auto transformer with taps for obtaining a number of reduced potentials. Suitable mechanism connects the motor to these taps momentarily for starting, and then, when the motor has attained full speed, disconnects it and throws it directly on the supply circuit.

## Utilization of Highly Silicious Iron and Manganese Minerals

By N. Tarugi

It is known that in Italy, as well as in other countries, immense deposits of iron and manganese minerals exist, that cannot be utilized in the iron industry on account of their excessive content of silica, amounting to 20% and upward. Many methods to make such minerals serviceable have been devised without apparent success. My method offers a solution of this important problem.

It is commercially payable, as the material to be applied may, without much expense for handling, be recovered with small loss in a continuous circuit. The reaction on which the method is based is as follows: By action of heat and of steam under pressure, HCl is obtained from magnesium chloride, which is allowed to act on the mineral in suitable vessels. Iron and manganese are converted into their corresponding chlorides and these are separated from silica by leaching. The solution of iron and manganese chloride thus obtained acts upon the magnesium oxide, which remains in preparing the HCl from magnesium chloride. The whole of the iron is precipitated as hydrated oxide and magnesium chloride is re-formed.

The separation of manganese from iron can be effected at the same time or separately by replacing at the start the magnesium in part or in its entirety by lime. This substitution is also advantageous in case iron-bearing minerals exclusively are to be treated, because by another simple and inexpensive method of mine, calcium chloride may be converted into magnesium chloride through the action of carbonic acid after a calculated amount of magnesia is added to the solution.

As is known, the manganese in manganiferous iron minerals is chiefly present in the form of its higher oxide and will generate chlorine by the action of HCl. The chlorine is taken up by the mineral when heated to a high temperature, or furnishes pyrolusite with the lime added at the start when manganese passes through the precipitation vats. The principal stages of this method will be indicated by the following equations:

With iron minerals:

$$(1)\ 3\,MgCl_2 + 3\,H_2O = 3\,MgO + 6\,HCl.$$

$$(2)\ 6\,HCl + Fe_2O_3 = 2\,FeCl_3 + 3\,H_2O.$$

$$(3)\ 2\,FeCl_3 + 3\,MgO = Fe_2O_3 + 3\,MgCl_2.$$

With manganiferous iron minerals:

$$(1)\ 4\,HCl + MnO_2 = MnCl_2 + Cl_2 + 2\,H_2O.$$

$$(2)\ Cl_2 + MnO_2 = MnCl_2 + O_2$$

$$(3)\ 3\,MnCl_2 + 3\,CaO + O = Mn_3O_4 + 3\,CaCl_2$$

$$(4)\ Cl_2 + MnCl_2 + 2\,CaO = MnO_2\ 2\,CaCl_2$$

$$(5)\ CaCl_2 + MgO + CO_2 = CaCO_3 + MgCl_2$$

$$(6)\ CaCO_3 = CaO + CO_2$$

The product obtained by this method possesses the following advantages: (1) It is free from sulphur even if the initial material is rich in it. (2) It is free from phosphorus no matter how much the original mineral contained. (3) It may be briquetted easily. (4) It may be made to contain any desired percentage of iron, manganese, calcium or magnesium. (5) Its easy reductibility means a considerable saving in fuel.

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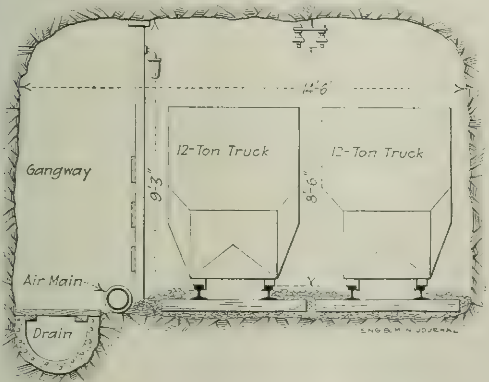
Note.—Translation by O. H. Hahn from the "Chemiker Zeitung," Apr. 26, 1913, of an article by N. Tarugi, an Italian metallurgist.

# DETAILS OF PRACTICAL MINING

## Design of Main Haulage Drift

The 13th level of the Crown Mines, Ltd., on the Witwatersrand is opened up as a main haulage level. The main drift in its course through the property picks up ore for transport to shafts Nos. 5 and 7, the main hoisting shafts. At present, only that part of the drift tributary to No. 5 shaft is in use. It is almost a straight drift, says R. C. Warriner (*Journ.* So Afr. Inst. of Engrs., April, 1913), there being only a few gentle curves. It has a grade of 0.54% in favor of the load. The dimensions and arrangement are as shown in the accompany cross-section.

The 45-lb. rails rest on mild-steel chair plates on 4x6-in. tarred wood ties, the latter set at 2½-ft. centers. The track is ballasted and packed like a surface railroad. The turnouts have 240-ft. radii with crossings of one in six. The minimum curve entering any crosscut is of 50-ft. radius.



Cross-Section of Two-Track Haulageway

The two trolley wires are carried in the center of the haulageway, eight inches apart, thus making it possible to support both insulators on the same T-hanger. To compensate for inequalities in the height of the back, adjustable extension pieces were provided for these hangers where necessary; the voltage is 500. The manway on one side provides against contact with the trolley wires ordinarily. Where it is necessary for men to pass under them, protecting troughs are installed. At the crosscut entrances and at the first loading chute in the crosscuts, there are automatic cutouts, so that the line is dead when opposite the chute at which cars are being loaded and when the locomotive is out of the crosscut.

⁂

**A Manganese Steel Dipper** on a steam shovel should never be heated to remove frozen material or for any other reason, according to the "Excavating Engineer." Manganese steel requires delicate heat treatment to give it toughness and take away its brittleness. Indiscriminate heating restores it to the brittle state.

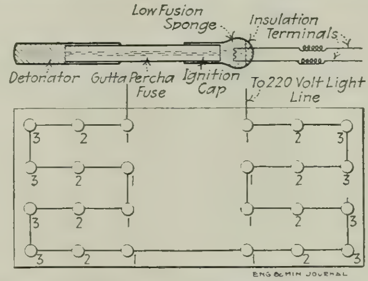
## Sinking with Delay Action Fuses

By W. V. DeCamp*

Many of the electrical firing devices placed on the market during the last five years have been a failure, due largely to the skeptical attitude of mining men regarding any new and unproved device for simplifying their work. Most miners have had a limited experience along this line and they are generally prejudiced against anything of an electrical nature for firing purposes.

In addition, certain electrical firing devices, and, in fact, those longest on the market, depend for their operation on the instantaneous explosion of all holes connected on a circuit; the resulting explosion being so great that the danger to timber carried close to working faces, far offsets any advantages gained by their use. Moreover, improper manipulation or a poor firing device often results in missed holes.

The more recent development of the electrical cap, known as the "delay action fuse," placed on the market some years ago by the Giant Powder Co. and later by the du Pont company has neither the disadvantages of the old instantaneous nor those of the long gutta-percha fuse, subject to so many causes of failure.



Section of Delay Action Detonator and Diagram of Wiring in Shaft

The delay-action fuse is in reality an electrical means of spitting holes; for it consists simply of a small piece of gutta-percha fuse, on one end of which is placed an ordinary detonator, and on the other, a cap containing the igniting material. Through this cap, terminal wires are inserted and connected by a ribbon or sponge of low-fusion material. This sponge is ignited by the passing current and in turn ignites the fuse which burns to the cap and explodes the charge. It is obvious that any length of delay can be obtained by lengthening the piece of fuse. At the present time there are 10 different lengths placed on the market. The entire device, fuse, detonator and ignition cap, is incased in a rubber tube and coated with a good waterproofing paint. The terminal wires, where they enter the ignition cap, are also incased in sulphur, insuring perfect insulation. In most underground work only three, or possibly four delays are necessary. Each fuse with terminal wires attached has a tag fastened to it, stating its number, so that there need be no confusion whatever in loading holes.

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*General manager, Pacific Copper Mining Co., 206 East Gurley St., Prescott, Ariz.

Recently a thorough trial of this type of fuse was made at the property of the Pacific Copper Mining Co., Crown King, Ariz., which resulted in a material reduction in sinking costs.

The shaft in which the trial was made was broken about 7x10 ft., and while sinking through an extremely hard siliceous schist a large volume of water was encountered; this, with the small dimensions of the shaft and the hard rock, greatly delayed the work; 20 to 24 holes were required to break a 4-ft. round; missed holes were a regular occurrence and the cost became almost prohibitive. The average time required for a full round was from 36 to 48 hr. and the average depth broken was four feet. During the month previous to the use of delay fuses the daily average advance was 2.1 ft. The delay fuses were used on the last 48 ft. of shaft sunk, 10 rounds being required in this distance. Every round fired was satisfactory, there being only two missed holes in the entire 10 rounds.

COMPARATIVE COSTS OF SINKING WET SHAFT WITH AND WITHOUT DELAY ACTION FUSES

| | Ordinary Method<br>Depth Sunk, 63 Ft.<br>Time, 30 Days | | | Using Delay Action Fuses,<br>Depth Sunk, 48 Ft.<br>Time, 15 Days | | |
|---|---|---|---|---|---|---|
| Labor | Total Cost | Cost per Ft. | | Total Cost | Cost per Ft. | |
| Miners | $1210.75 | 19.20 | | 617.50 | 12.87 | |
| Topmen | 242.00 | 3.84 | | 116.00 | 2.42 | |
| Engineers | 522.80 | 8.35 | | 310.00 | 6.45 | |
| Foreman | 186.00 | 2.95 | | 99.00 | 2.06 | |
| Blacksmith and helper | 239.30 | 3.81 | | 122.00 | 2.54 | |
| | | | 38.15 | | | 26.34 |
| Power supplies | | | | | | |
| Fuel oil | 648.00 | 10.30 | | 402.00 | 8.38 | |
| Lubricants | 37.87 | 0.60 | | 21.00 | 0.43 | |
| Coal | 35.50 | 0.56 | | 16.20 | 0.33 | |
| | | | 11.46 | | | 9.14 |
| Supplies | | | | | | |
| Machine repairs | 22.80 | 0.36 | | 19.50 | 0.40 | |
| Powder | 194.00 | 3.09 | | 91.50 | 1.90 | |
| Fuse | 42.15 | 0.68 | | *a* 24.00 | 0.50 | |
| Caps | 6.60 | 0.01 | | .... | .... | |
| Candles | 34.75 | 0.56 | | *b* 12.10 | 0.25 | |
| | | | 4.70 | | | 3.05 |
| Timbering | | | | | | |
| Setting | 72.00 | 1.15 | | 45.00 | 0.94 | |
| Framing | 63.00 | 1.00 | | 46.50 | 0.97 | |
| Timber | 190.00 | 3.02 | | 146.50 | 3.05 | |
| | | | 5.17 | | | 4.96 |
| Water | | | | | | |
| Fuel and oil | 139.50 | 2.22 | | 210.50 | 4.37 | |
| Pumping labor | 27.00 | 0.43 | | 124.00 | 2.58 | |
| | | | 2.67 | | | 6.95 |
| Total | | | $62.15 | | | $50.44 |

*a*—Electric fuses.
*b*—Lamp.

Operations were as follows: After loading, the holes were connected in series and thence to a 220-volt direct-current lighting line on which there were two switches, one at the nearest level, the other at the collar of the shaft, both under lock and key, the key in possession of the boss. Three different lengths of fuse were used, one length on the eight cut-holes, the second length on the next row of four holes on each side and the third length on the two rows of end holes; as per diagram. The length of fuse in each case was 1.5 in., 2 in. and 3 in., respectively. From such a round one would naturally expect to get three distinct reports, but such was never the case. There would be from eight to 16 reports for the entire round; the reports would be close together and sounded much like the rattle of a bunch of firecrackers. The large number of reports obtained was probably due to the fact that pieces of fuse of the same length would not burn down in exactly the same time, and to the probable difference in resistance of the ignition material in different caps, thereby requiring a slightly longer time for ignition.

In all of the 10 rounds the rock was broken much finer than had been the case with ordinary fuse, this was probably due to the rapid succession of the explosions, thereby maintaining the rock mass in a constant state of rapid vibration and resulting in greater fracturing, as the successive charges would explode. The average depth of round using delay fuses was five feet, the average depth broken, 4.8 ft., and the average time for each round, 36 hours.

The accompanying drawing shows a longitudinal section of a delay-action fuse, and also the order in which the holes were fired and the manner of connecting the terminals. The table shows the difference in cost of shaft sinking by the two methods. It will be seen from total costs, that there was a large increase in the expense of handling water, also an increase in cost of engineers, due to some heavy repairs made, otherwise the costs check up fairly well.

Delay-action fuses can be obtained with practically any length of terminal wire up to 10 ft.; the cost varies from 7.5c. in shorter lengths to 16.5c. for those with longer terminals.

⁂

# Concreting Methods in Michigan Copper Shafts

In the Baltic mine the concrete support for the roof of the shaft is reinforced with 1¼-in. ropes, three carried down each skipway and stretched between eye-bolt anchorages. The ropes are stretched until at the center they are about six inches from the edge of the concrete. At intervals of 8 to 14 in., cross-reinforcement of the same material is put in. Alternate ropes of this cross-reinforcement are turned up about one-third of the way out from the side walls and also turned up to pass over the dividings for the purpose of taking the shear.

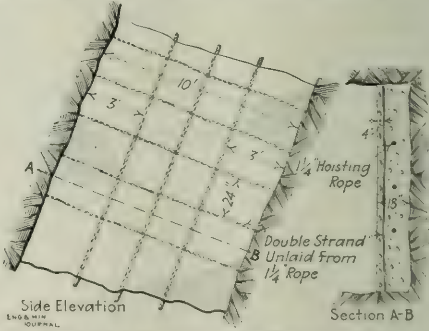

FIG. 1. ROPE REINFORCEMENT IN CONCRETE-SHAFT SIDE LINING

Along the sides, three ropes in the direction of the shaft afford reinforcement. Cross-reinforcement in these side walls consists of double strands unlaid from 1¼-in. cable. These are set in a vertical plane and at right angles to the long axis of the shaft, about two feet apart and four inches from the face of the concrete. Fig. 1 shows the general arrangement.

When there is continuous concrete on the hanging, dividings are put in 10 in. thick and 6 ft. along the shaft with 6-ft. spaces between. These are shown in Fig. 2. Three 1¼-in. ropes in the direction of the shaft and three pairs at right angles, spaced as shown, afford reinforcement. The pair lowest in the divider is bent at the ends to take shear. Bolts in the direction of the shaft axis are set in at top and bottom of the divider and serve to carry 3-in. nailing strips to which the planks covering the spaces between the dividers are nailed. These nailing strips are set back two inches so that the planks are flush with the concrete and are thus protected against being knocked off by falling rock.

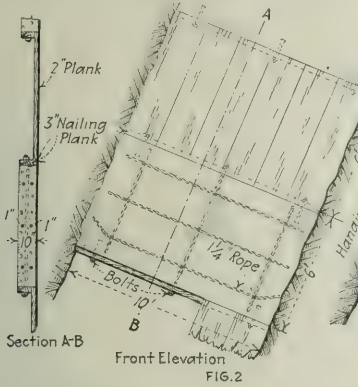

FIG. 2

CONCRETE AND PLANK DIVIDER

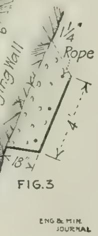

FIG. 3

HANGING-WALL CROSSBEAM

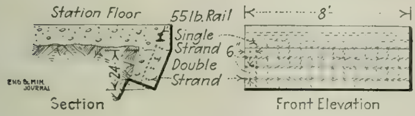

FIG. 4. CONCRETE STATION BROW REINFORCED WITH 55-LB. RAIL

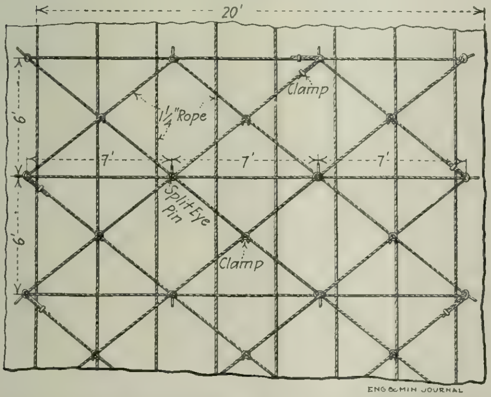

FIG. 5. ROPE REINFORCEMENT IN CONCRETE HANGING WALL OF SHAFT

In case the hanging wall stands, but the sides give trouble, the latter are reinforced as described and dividers also set, but with the spaces between increased to 10 ft. To take the side thrust of the walls, a crossbeam against the hanging is put in about every 25 ft. This is 10 to 18 in. thick and four feet wide as shown in Fig. 3. This brace is reinforced with three 1¼-in. ropes across the shaft. It has its top face beveled to prevent material from lodging. These beams are set at the same points as the dividings so as to be braced against side bending.

The stations are equipped with concrete brow pieces over the skipways, shown in Fig. 4. These are reinforced with a grilling of double strands across and single strands in the direction of the shaft, so put in as to form 6-in. squares. The angle at the floor of the station is strengthened with a 55-lb. rail.

In the Champion shafts, the roof reinforcement of 1¼-in. rope is put in as a network in the manner shown in Fig. 5. The cross-ropes are strung through eye-bolts and carried up and across in a zigzag manner. The ropes in the direction of the shaft are anchored only at the top and bottom. The ropes in the network are clamped at the crossing points and ends. The approximate spacing is as shown.

⁂

## Safety Rules—The Shaft*

(1) There should be provided and maintained at every mine two outlets to the surface, or an underground communicating passageway between every such mine and some other contiguous mine, so that there shall be at all times at least two distinct and available means of access to the surface to all persons employed in such mine or mines. Such outlets should not be less than 50 ft. apart and should, if covered, be provided with separate and distinct and nonconnecting houses on the surface.

The following are exceptions to rule (1):

(A) New workings being opened between two or more shafts or for searching for or developing ore.

(B) Any mine in which one of the outlets has temporarily become unavailable, provided that every effort is being made by the management to open such outlet, and provided that the situation is not dangerous to the health or life of the miners.

(2) No structures should be permitted over any shaft except headframes, hatches or doors or buildings constructed of fireproof material.

(3) If houses cover the shafts, no inflammable material should be stored within 30 ft. of the exterior walls of the house.

(4) Shaft collars should be guarded with self-closing gates equipped with toe boards at least 6 in. high, set close to the ground.

(5) The collars of timber shafts should be guarded with a fence which may be constructed in the shape of gates on two or more sides to permit lowering of timber.

(6) At all shaft stations a gate or a guard rail not less than 3 ft. or more than 4 ft. above the floor should be provided and kept in place across the shaft, except when cage, skip or bucket is being loaded.

(7) At timber tunnels the shafts should be protected by a gate connected with a derailing switch on the tramway, so that if the gate is open the switch is set to derail an approaching car.

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*From Inland Steel Co.'s book of rules.

(8) Wherever the tracks of any level lead directly to any compartment of the shaft, a safety switch should be used there.

(9) If hoisting be done from greater depth than 100 ft. by means of a bucket, shaft doors must be constructed that will prevent any material from falling into the shaft while the bucket is being dumped.

(10) Operating shafts are dangerous places; all men should keep away from them except as imperatively called there by their duties, and they should stay near shafts only so long as such duties require. Where pipe or other telephones are provided, particularly around incline shafts, men should not approach the shaft closer than is necessary to use such telephone, until the skip has arrived at the level.

(11) All stations or levels shall have a passageway around or through the working shaft, so that crossing the hoisting compartment may be avoided.

(12) Men should never cross the bottom of a shaft to get from one side to the other.

(13) Counterweights should be properly boxed in or protected and care must be taken that they are in good working order.

(14) Every shaft, if exceeding 50 ft. in depth, shall be provided with an efficient means of interchanging distinct and definite signals between the top of the shaft and the lowest level and the various intermediate levels from which hoisting is being done. The signaling shall be a cord or wire actuating a knocker, bell or whistle, which should be supplemented with a speaking tube or telephone or an electric system.

(15) Special care should be taken to keep the signaling apparatus in good order.

(16) If either of the two systems of signaling is out of order, extra care should be taken and report made at once.

(17) The timbers in all manways in daily use should be cleaned of all loose rock lodged upon them at least once in every 24 hr. Such manways should be kept clear of obstructions.

(18) When a skip pit is to be cleaned, or when men are ordered to work in the shaft, they should make sure that the hoisting engineer is notified not to move the skip, cage or bucket until signaled that the shaft is clear.

(19) Men engaged in sinking a shaft shall be protected from the danger of falling material by a suitable covering extending over the whole area of the shaft, a sufficient opening being left in the covering for the passage of men or the conveyance used in the sinking operations.

(20) In sinking a shaft a bell rope shall be provided which can be operated by a man standing in a bucket at the bottom of the shaft.

⁂

# An Ore-Feeding Device

By W. F. Boericke*

Trouble was experienced in a small Wisconsin zinc mill by the chute from the rock breaker to the rolls choking with the crushed ore, making it necessary for a man to push it along with a rake to the rolls in order to prevent overflowing. It was impossible to increase the grade of the chute and some schemes to do away with the manual persuasion had to be devised.

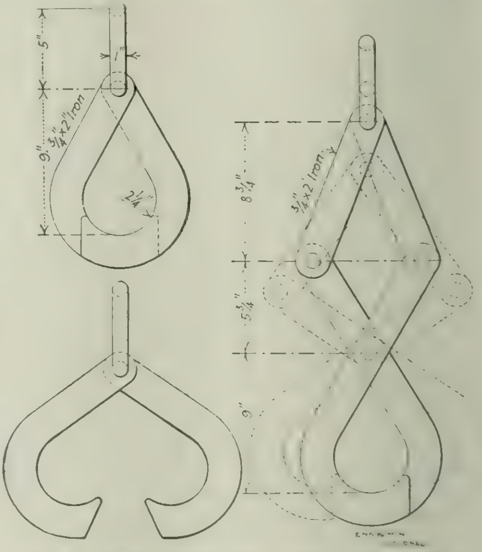
The blacksmith was called upon, and a bar of 3/4-in. iron 6 ft. long was bent into a 6x7-in. rectangle, proportioned so as to fit snugly the channel iron of the chute. The other end was bent and forged into a loop. This loop was fitted to the bolt that held the heavy spring in front of the breaker in place, and by nuts and washers was kept in front of the spring. This spring constantly vibrating back and forth when the breaker was in operation communicated the motion to the bar which agitated the crushed ore in the chute sufficiently to cause it to move forward into the rolls. By this simple device a man's labor was saved, and the capacity of the mill considerably increased.

⁂

# Safety Bucket Hooks

By F. C. Rork*

The accompanying drawing shows two styles of bucket hooks which are quite common in Canadian mines. They comply with the Ontario laws, which specify that no open hook shall be used in hoisting or lowering.



Bucket Hooks Complying with Ontario Law

The hooks can be made by any blacksmith from material which is usually kept in stock at a mine and combine safety with ease and speed of operation.

⁂

**Seven Fatal Mining Accidents Occurred in Ontario** during the third quarter of 1912 according to the report of E. T. Corkill, chief inspector of mines. There were also two fatal metallurgical accidents and one quarry accident. The total number of fatal accidents in Ontario mining and similar operations for the first nine months of 1912 was 26, as compared with 34 for the same period in the previous year. Nonfatal accidents for the third quarter were 110, an increase over 1911, due to the fact that accidents less serious are now being reported.

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*Mining engineer, Mineral Point Zinc Co., Mineral Point, Wis.

*Mine superintendent, Moose Mountain, Ltd., Sellwood, Ont., Canada.

# DETAILS OF METALLURGICAL PRACTICE

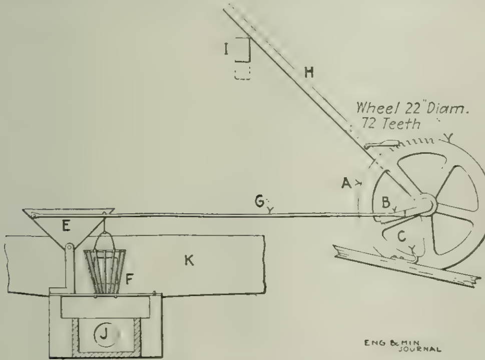
## Automatic Sand Sampler

By L. D. Davenport*

The automatic sampler described below is used in front of the duplex Dorr classifier in the Ernestine mill, Mogollon, New Mexico.

The power which moves the sampler is derived from one of the classifier rods *I*, shown in section on the sketch. This rod moves up and down about 4 in. with each stroke of the classifier. The top of the rod, protected with a piece of round iron, moves the lever *H*, the lower end of which is supported by the shaft carrying the gear *A*. There are two dogs fastened to the lever *H*, one being about ¼ in. longer than the other so that with each movement of the lever, the gear is turned half the width of a tooth.

In front of the gear *A*, and turning on the same shaft, is a piece of 1¼-in. square iron 9 in. long, marked *B* in the sketch. About 4 in. from the end of *B* is a stud which carries the connecting-rod *G* which in turn is connected to the triangle *E*. This triangle is supported at its lower corner and the other corner is connected with an iron link to the sampler *F*. This sampler consists of eight half-round troughs 8 in. long by ½ in. deep, fastened together at their ends and hinged at the lower end on a ¼-in. iron rod, as shown. The square outlined in the sketch behind the sampler is an opening in the launder *K* through which the sand product from the classifier flows into the launder *J* and thence to the sand vats.



Automatic Sand Sampler

The stud *L* on one of the spokes of the wheel raises *B* until the latter stands perpendicular, then at the next movement of the wheel, *B* swings of its own weight through a half-circle, and is caught by the spring *C*, which prevents it from oscillating. When *B* swings through the half-circle just described, the rod *G* transmits the motion to the sampler *F* through the triangle *E* and causes *F* to dip up a small quantity of sand. The sample thus taken is thrown into a small pan placed directly in front of *F*.

This device takes a sample every 10 min., the total sample for one shift amounting to about 5 lb. It was designed and constructed by Fritz Aude, mill superintendent for the Ernestine Mining Company.

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## Concentrating High-Grade Fines by Hand

By A. L. Flagg*

In the early history of a mine producing high-grade ore, all or a part of which is of shipping quality, it is frequently a problem to know just what disposition to make of the fine material. This is especially true if it is attempted to keep the mine self-supporting until a plant can be installed to treat all the ores, depending in the meantime on the revenue derived from shipments for all or a part of the development fund, or even setting aside such income as a sinking fund for the purchase of the necessary mill equipment.

A mine which can pay for its own development and in addition build a mill for itself is indeed rare. However, such mines do exist. It is the purpose of this paper to describe a method adopted to make a marketable product out of the fine material taken from a high-grade silver mine in Mexico during the early stages of its development.

The mine was nearly a hundred miles from a railway. In addition to the charge of $20 per ton for muleback transportation, there was an additional railway freight charge of nearly $5 per ton to the smeltery. To this must be added the smelter's charges, assaying and commissions for liquidating at the smeltery, taxes and the cost of mining. To stand all these charges and still pay a profit the ore had to be high-grade indeed. As broken in the mine the ore under consideration ran from 40 to more than 1000 oz. of silver per ton, with a small amount of gold. Almost invariably the higher the silver content, the greater the percentage of fines produced in the mines.

At the period when this process was put into use the mine was in the prospect stage. A small, single-compartment incline shaft was being sunk on the vein with drifts each way at intervals of 50 ft. As a rule the ore was exceedingly hard but, it carried many minerals rich in silver and extremely brittle. The predominant minerals were galena, proustite, pyrargyrite and stephanite, besides native silver in wires and flakes. The gangue was quartz and rhodonite with local occurrences of calcite. Zinc and iron sulphides also occurred as accessory minerals. In instances where quartz or calcite predominated as the gangue mineral, every round fired would produce a large amount of fines composed of the more brittle components of the ore. The result was that frequently 20% of the mine-run would pass a 1-in. screen and assay from $60 to $150 per ton.

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*Engineer, Ernestine Mining Co., Mogollon, N. M.

*Mining engineer, Tucson, Ariz.

As each carload of ore was brought from the mine, it was dumped on the patio. There it was sorted by boys into: (1) Mill ore, which went to a stack, to await the erection of a mill; (2) shipping ore, which went through the usual sorting process common in such instances; (3) fines, that is, material which would pass a 2-in. ring. In some cases where the face showed exceptionally brittle ore which was correspondingly high-grade, the fines were put in sacks to lessen the risk of loss from rehandling.

After all the coarse material had been picked out, the fines were shoveled over a screen having a 1-in. opening. Of the oversize, about 4% was picked out as shipping ore, the rest being sent to the mill stack. The undersize was all treated in a two-compartment hand jig. While some material of a grade suitable for shipping was obtained as coarse concentrates from the two compartments, the real value of the jig lay in the classification between the coarse material, which remained on the screens and the high-grade hutch product.

The overflow water from the jig was run through settling tanks to save the slimes. Just what disposition can be made of these slimes is at present a problem. It is quite probable that they can be mixed successfully with the mill feed in small quantities and not cause any trouble. The amount of slimes saved was small, being about 1% of the whole, but they were worth $50 per ton.

The coarse concentrates were removed by skimming; the tailings were dumped from the boxes after lifting them out of the jig. While the amount of ore won in this way was comparatively small, it was sufficient to justify the expense. In the period of test, the average amount obtained this way was 81.4 pounds per day per man, running 534.58 oz. of silver per ton.

The frequency with which the hutch product was removed for retreatment on a *planilla* varied with the percentage of fines produced. As a rule, it was necessary to clean out the hutch every third day, sometimes oftener To do this, the screen boxes and plunger were removed and the material taken out with a short-handled shovel.

The *planilla* requires some skill to operate. In this instance it consisted of a shallow box 10 in. deep, 4 ft. wide, 6 ft. long, open at one end, and resting on the ground, with a slope of not over three inches in its length. Directly in front of the lower open end, a soap box was sunk even with the ground surface. A 1-in. cleat, six inches from the end and extending to within one inch of the sides of the box nailed across the bottom completed the device. A small pipe leading from the creek kept the soap box full of water.

After piling about 25 lb. of the hutch product against the back of the *planilla*, the operator takes his position over the soap box with a small, oval, wooden bowl, called a *batea*, in his hand. With this he scoops up water from the soap box and throws it on the *planilla* heads all in one motion. After a while it is necessary to scrape the concentrates back into the end of the box as they wash down with the sands. The sands are carried off by the wash water past the ends of the cleat at the open end of the *planilla*. The washing is continued until a remarkably clean product is obtained, this being dried and sacked for shipment as concentrates from any table would be.

A careful record of production and costs was kept, covering a period of about six months. It was found that with the labor of the jig men at $0.50 a day, clean concentrates could be produced at a cost of $6.16 per ton, exclusive of mining. The average amount of concentrates produced daily over the period of test was 136.4 lb., of which 81.4 lb. was a coarse jig product, while the remaining 55 lb. was from the *planilla*. The accompanying table will express more concisely the results that were obtained.

RESULTS OF HAND CONCENTRATION

| | Pounds | Oz. of Ag per ton |
|---|---|---|
| Undersize from 1-in. screen, jig heads... | 39,304 | 172.9 |
| Coarse jig concentrates, shipped......... | 1,760 | 582.2 |
| Coarse jig middlings and tailings, stacked | 17,732 | 58.2 |
| Hutch product ............................ | 9,680 | 307.0 |
| Planilla concentrates .................... | 6,776 | 534.6 |
| Planilla tailings ........................ | 2,904 | 146.4 |
| Planilla slimes .......................... | 55 | 26.5 |
| Jig slimes ............................... | 15 | 105.9 |

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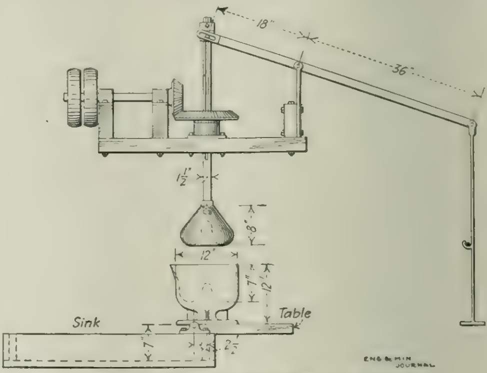
## A Small Clean-Up Mortar

The accompanying drawing shows the details of a mortar and muller which are used for cleaning up small quantities of amalgam from gold-milling operations. It consists of an ordinary mortar fixed to a wooden table mounted on a shaft so that it can be tilted into a sink and emptied. The muller is power driven and arranged so that it may be raised and lowered, with respect to the mortar, by means of a lever as shown. A hook on the lever handle allows the muller to be suspended free of the mortar when desired. The device was designed by Mr. Schmal, superintendent of the South Eureka mill, Sutter Creek, Calif., where it is in use.



Clean-Up Mortar for Small Plants

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## Electrolysis with High Current Densities

In order to secure electrolysis with high current densities without the likelihood either of contaminating the cathode by float slime, if the circulation is too high; or of getting sprouts and nodules, if it is too low; Kenneth S. Guiterman, of New York, purposely directs the flow of electrolyte so as to scour the anodes (U. S. pat. 1,062,966). The electrolyte is withdrawn continuously, and filtered before returning to the tank. Preferably the incoming electrolyte is directed down against the anode and the outgoing stream is withdrawn from the bottom, so that, as far as possible, the force of gravity (as manifested in the natural fall of the slime) will assist the moving current of solution.

# NOTES FROM CURRENT LITERATURE

## Economic Sulphate Minerals in Utah

It appears that in the oxidized ores of Utah there are present in comparative abundance several complex basic ferric sulphates, sulpharsenates and allied minerals, according to B. F. Butler (*Econ. Geol.,* June, 1913,). One of the principal of these minerals is plumbojarosite, the hydrated sulphate of lead and iron. This is a yellow or brown mineral, looking like hydrated iron oxide but distinguishable by its smooth, oily feel. It is usually crystallized, though it may be finely so, and appears micaceous when rather coarse. This has been found in many diferent mines in the state. A similar mineral is beaverite, which includes a copper oxide in its composition. Beudantite and corkite are names for a series of variable and uncertain minerals which are sulpharsenates or sulphophosphates of lead and ferric iron, with minor quantities of other constituents, especially copper. Jarosite, a hydrated sulphate of iron and potash, and utahite, a hydrated iron sulphate, have been noted in various localities. All these minerals are found in the oxidized portion of the vein slightly below the outcrop. They are the result of oxidation of mixed sulphide and arsenide ores, and are an intermediate step in the formation of the more permanent carbonates. They would seem to be particularly common in arid regions, but have been reported from Leadville, Colo. Their discovery and study indicates that all yellow and brown, more or less earthy materials, are not limonite. They may be composed of one or several of these minerals described, and when such material contains metals other than iron, these are not necessarily present as carbonates or "chlorides," intermixed with the iron oxide.

## Cement Copper Making at Butte

The following notes on cement copper precipitation at Butte are taken from the *Mining Journal,* Mar. 30, 1912:

The plants which secure their water direct from the mines and those operated on the sites of abandoned smelting plants have by far the strongest water with which to work. The water as it comes from the mines averages from 0.04 to 0.06% copper. With the 0.06% water copper precipitate as high as 90% is secured, and from this it runs as low as 30%. Some of the operators are so favored in the location of their plants that they can cause the water to flow through the tailings of the abandoned smelting plants [possibly concentrators is meant. —Ed.], thereby materially increasing the efficiency of the water.

At present there are two methods of precipitation, the box system and the tower system. The latter is generally conceded to be the more successful, the towers occupying less space, while the precipitant is more thoroughly exposed to the water. The box system consists of a series of troughs from 1 to 3 ft. wide and 1 ft. deep, covering a great deal of surface. The boxes are so arranged that there is a gentle incline, and gravitation keeps the water in motion. Into these troughs the scrap iron and tin cans are thrown. The copper precipitate, after being washed through many compartments, sinks to the bottom of the receiving tank, which is cleaned out about once a month. The tower system consists of a tower about 3 ft. wide, 20 ft. high, and 30 ft. long, and is partitioned off by means of floors 18 in. apart. These floors are made of 2x4-in. scantlings, placed 3 in. apart, running lengthwise. Tin cans and scrap iron are placed on the several floors. By means of a small motor the copper solution is raised to the top of the tower, where it is distributed equally and constantly over the scrap iron. The tin cans and smaller pieces of iron are eaten up in a comparatively short time, but the larger pieces must be scraped regularly in order to remove the precipitate. The latter is washed to the bottom, and then into tanks alongside the towers.

The operators sell their output to the smelters at 4c. less than the market quotations for copper, and the shippers must pay a treatment charge of $5 per ton. The cost of making a pound of copper is estimated at betwen 7 and 8c., so that the present price of copper gives a fair return.

## The Uranium Deposits of Portugal

Under the title, "Uranium Depoits of Portugal," MM. Segaud and Humery publish a study in *Annales des Mines* (p. 111, 1913), from which we give the following abstract:

Until recently most of the uranium and radium products of Europe were derived from the deposits of nickeliferous and cobaltiferous pitchblende of Joachimsthal. Cornwall and Devonshire have also produced the two metals, but in an irregular way. Norway also possesses two deposits of fergusonite, rich in uranium.

The existence of minerals of uranium in Portugal has been known for about 40 years, but they were not developed until about 1908. Following the researches of Mme. Curie, on radio-active substances, a number of enterprises for the exploration and working of these deposits, were constituted, among which we note: L'Urane (E. Urbain); A. Feige & Co.; Paul Girod; Harding Brothers & Co.; the Guarda Co., Ltd.; and Henry Burnay & Company.

This region of uranium ores is situated in the great granite basement which covers almost all of the north of Portugal, from the frontier of Galicia to Castello Branco, extending over the provinces of Minho, of Tras-os-Montes and of Beira. The richest part is found between the villages of Guarda and of Sabugal, toward the south of the granite basement. The uranium deposits are found in Cambrian strata to the north of Guarda, the veins are chiefly made up of wolframite. Finally the region of Villar-Formoso is equally uraniferous. The uranium veins outcrop at the surface of the granite, and exist also in the Cambrian schists; for example, at the mine of Pontao de Rapoula.

At the depth attained by present workings, that is, above ground-water level, scarcely any other minerals have been encountered except of the types autunite and torbernite or chalcolite. Autunite presents itself under different forms, either in little groupings of square crystals of an intense yellow, or in thin plates of almost pure autunite, or in spots of brilliant yellow disseminated in a yellow rock. In clayey strata the autunite is often completely invisible and its presence is only shown by electroscopic methods. Finally, there is often an impregnation of the country granite foot wall, which presents so intense a yellow color as to lead to the belief of a high uranium tenor, but, although the granite is sometimes workable, it is never rich.

The autunite is probably accompanied by uranocircite, $BaO(U_2O_3)_2P_2O_5.8H_2O$. Chalcolite presents itself under analogous forms to those of uranite, but the color is a beautiful emerald green.

The tenor of the uranium minerals varies greatly, but a content of 2% is excellent, and 1% is good, while some deposits are workable at even 0.3 to 0.5%. Probably all the ores yet found are secondary, caused by uranium minerals reacting with apatite in the region of the circulating waters. There is some reason to believe that the original ore if found, would be pitchblende.

According to the present theories, that the slow disintegration of an atom of uranium gives an atom of helium and an atom of ionium, and that the latter, in turn, gives an atom of helium and one of radium, and calculating by Boltwood's coefficient, there should be 0.1 gram of $RaBr_2.2H_2O$ per 30 kg. of $U_3O_8$. In the chemical treatment, the radium is found with the barium-sulphate precipitate (from the autunite).

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## Making Copper Wire by Electro-Deposition

Patents have been granted to William E. Gibbs, of Plainfield, N. J., for the manufacture of copper wire by electrodeposition, says the *Brass World*, May, 1913. Attempts formerly have been made to accomplish this object, but they have been unsuccessful.

The Gibbs method requires a fine copper wire as a core for making the desired product, and the additional copper is deposited on it while it moves through a tank containing the solution. The fine copper wire is made endless and passed through a regular plating solution containing sulphate of copper and a little sulphuric acid. The wire passes over grooved rollers operated from outside while passing through the tank. After leaving the tank, the wire passes through a small rinsing tank to remove the solution, and then goes to a reel around which it passes a number of times, returning again to the plating tank. The plating may thus be continued until the required thickness is obtained.

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## Pyrrhotite at Elkhorn

The Elkhorn district about 33 miles northeast of Butte, Mont., has [illegible] sufficiently described, particularly the lead-silver Elkhorn mine. The discovery of an auriferous pyrrhotite orebody is described by Adolph Knopf (*Econ. Geol.*, June, 1913) in the Golden Curry mine. The body of sulphide is isolated from the other ore deposits and is wholly inclosed in granite whose intrusion has given rise to most of the ore deposits on its border. The pyrrhotite body is elliptical in plan, measuring 100 ft. long, 18 ft. wide and has been stoped upward to a height of 10 or 12 ft. It has yielded 2000 tons of ore containing $4 in gold, 2% in copper and 35% iron excess over silica. It consists of a mixture of pyrrhotite, chalcopyrite and dark green or black pyroxene. The best evidence indicates that the body is a magmatic segregation from the surrounding granite, but it is remarkable in being segregated from a relatively siliceous rock, other pyrrhotite orebodies, such as at Sudbury, being segregations from basic formations; it is also extraordinary in its high gold content which is most unusual in orebodies of this origin.

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## Trinidad Oil-Field Development

The absorption of a big oil-field company of Trinidad by a British petroleum syndicate, has created public apprehension that it is an attempt to monopolize the oil trade of the colony, says Vice-Consul Edward B. Cipriani, Port of Spain, in *Daily Consular and Trade Reports*, June 25, 1913. It is reported from London that the transaction has made it difficult for independent oil-field developers to obtain money. A lake-petroleum company, which had a daily flow of 17,000 to 20,000 bbl. for several days from its No. 37 well, has obtained not less than 2000 bbl. daily for nearly six months; present flow is 300 bbl., which, it appears, would be maintained. Another concern has drilled a productive first well at the southern end of the island, while two other companies are producing extra-good oil from shallow wells.

The local demand for fuel oil is increasing steadily. Four sugar factories are using it, and it is hoped that the government railways and steamers will, in the near future, use this home product rather than imported fuel. Some automobile and motor-boat owners are also using locally made petrol (gasoline) with excellent results. This can be bought much cheaper than imported petrol. The supply is limited, but one company has ordered large stills from England which, it is thought, will enable it to supplant the imported petrol.

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## Nickel Determination with a-Benzildioxime

A new reagent for nickel has been proposed by Frederick W. Atack (*Chem. Trade Journ.*, June 14, 1913), an ammoniacal alcoholic solution of a-benzildioxime. The reagent was quite as delicate as the dimethylglyoxime reagent of Tschugaeff, and has the advantage that coloration was produced almost immediately even with minute traces of nickel, whereas with dimethylglyoxime the solution had often to be allowed to stand for some time.

a-Benzildioxime, said the author, was particularly suitable for the estimation of small amounts of nickel, giving a much more insoluble precipitate which contained only 10.93% of nickel, whereas that from dimethylgloxime contained 20.31% of nickel. Moreover, quantitative precipitation took place immediately with the new reagent, whereas the precipitation was only complete after some time in case dimethylglyoxime was used. The method was available in presence of cobalt, iron, manganese, zinc, chromium and magnesium.

# The Sanitation of Mining Towns*

The U. S. Bureau of Mines has recently incorporated a new section within its organization which is known as the mine sanitary-engineering section, the function of which is to improve sanitary conditions in and about mines. This is a logical step in the development of the Bureau's work in promoting greater safety and efficiency in mining operations. Certainly the waste caused by unnecessary sickness and death on account of unsanitary surroundings must be stopped, as well as the loss caused by explosions, fires and other similar mining disasters.

### No Way of Measuring Value of Sanitary Improvement

I suppose the reason why sanitary improvements are neglected and why people hesitate to spend money on them is because it is difficult to get an accurate measure of the returns on the investment. It is unfortunate that the results are not more tangible. You can install a meter and readily discover the slippage in a pump or you can put an indicator on the steam chest of the engine and get an actual photograph of the waste, but you cannot calibrate humanity. We do possess an imperfect method—viz., vital statistics—but they are difficult and expensive to obtain, are subject to gross misinterpretation, and even when their story is told in the most graphic way they fail to drive the lesson home. Even epidemics arouse only local interest. The simple practice of learning from the experience of others is theoretical rather than real.

I assume that most of you come from in and about Pittsburgh and that your ideas of a mining town are rather clear and well defined, so that instead of giving a general description of a typical mining town I shall outline its unique characteristics and lay stress upon how it varies from the ordinary incorporated village or town of the same size and shall endeavor to show how these special conditions affect some of the established principles and practices of sanitation, justifying the phrase "mine sanitation."

The unique characteristics of a typical mining town are: (1) Company ownership, e.g., the streets, lots, houses, stores, churches, schools, hospitals and the public utilities are owned and controlled by the operator of the mine. (2) The completion of the town at the time of its inception; it is a "made-to-order" product and only occasionally the result of growth and development extending over a period of years. (3) The absence of permanency; the life of the average mining town is 20 to 25 years and the idea of abandonment at some time in the future is manifest. Modern mining towns are now being constructed with a longer life in view. (4) The pronounced similarity and sameness of the occupations of all the people residing in the town. (5) The absence of local self-government. (6) The dual capacity of landlord and employer vested in the same party.

Let us investigate how these conditions affect some of the fundamental sanitary problems; on account of limited time we will discuss only the following three: (1) Housing problems; (2) water supply and disposal of waste; (3) the establishment and enforcement of sanitary rules and regulations.

### Mining Towns Uniformly Bad or Good

Let us take up the housing problem. I drew your attention to the fact that the mining town does not grow but is built at a single stroke. The effect of this is that the valuable lessons learned by the "try-out" method and the profit gained by previous mistakes do not exert their powerful influence, so that the errors existing in one house exist in all; if one house is not properly lighted, none of the houses will be properly lighted; if a few houses are placed too closely together, all houses will be similarly spaced; if there is congestion in one section, there will be congestion throughout; if one privy is unsanitary, all the privies will be the same. Of course, one could have learned from the experience of other mining towns already built, but this information was perhaps not readily available and local conditions modify each case. One of the first investigations which the Bureau intends to take up is this house problem, with a view to putting before the mining world the best practices and the ones which have stood the test of time.

I believe you can see that the uniformity of occupation of the tenants has its effect upon the housing situation. While no two human beings are the same, none of us can deny that similar means of livelihood has marked effects upon our practices, habits, recreations and dress. This in a way simplifies the housing problem, as it eliminates the variety of conditions and conveniences that must be provided.

The company ownership is the most important factor entering into housing conditions. Every house reflects the standard which the operator wishes maintained—comparisons, variations and gradations are absent. It is difficult to stimulate personal pride among the inhabitants and friendly rivalry is absent. However, if improvements are introduced they are far-reaching, and the tone of the entire town is raised, so that one house does not point the finger of scorn at its neighbor. The employer being also the landlord means, as a general rule, compulsory payment of rent, and the importance of an assured income should be given due weight.

In discussing the water-supply situation, it must be kept in mind that the town site is generally determined by the situation of the mine shaft, which in turn is established by such factors as topographic conditions, formation of coal, economic transportation and similar commercial considerations. The necessity and importance of a satisfactory domestic water supply for the people who were to get out the coal was probably not given much consideration in the past; it is hoped that more consideration will be given to this phase of mine development in the future. In some places the men are carried daily to the mine in work trains, and numerous difficulties are thus avoided. In studying conditions with a view to introducing a public water supply into a town, the cost of improvements and the age of the town must be carefully balanced. Another factor which may complicate the problem is the relatively large industrial consumption of water, compared with the demands for domestic use. This may mean an extra large filter plant to purify all water (both domestic and industrial), or the installation of separate pumping and distribution systems. The possibility of piping water in from a neighboring town may furnish a solution at certain places and its feasibility should always be investigated. In many mining towns the domestic water supply is from individual wells, and while this system is far from perfection, it can be brought up to a safe standard. The usual indictment against the system is the susceptibility of the wells to infection, and on account of the inconvenience of drawing water an insufficient amount will be used for household and personal cleanliness. The danger of infection may be minimized by abolishing the unsanitary privies (this will be discussed more fully later on) and improving conditions around the well by lining it with terra-cotta pipe (if it is a dug well), placing the water-tight covering of concrete over the top and installing a pump. The nature of the soil plays an important part in the safety of the well, sandy soil furnishing a natural protection. In a limestone region pollution may come from miles away, which makes the potential danger of the well great. This may involve the distribution of drinking water in bottles throughout the town, the well water being used for cooking and washing purposes only. The inconveniences due to the difficulty of getting water from the wells may be eliminated by establishing bath houses at the mine shaft, so that the men may wash upon coming out of the mine. These bath and change houses are being widely introduced; in a few states they are required by law. A public laundry is a great convenience for the women; lugging in several tubs of water preliminary to doing a week's washing is a severe burden. Bath houses in or near schools for the women and children are almost necessary accessories to the perfect well system. Wholesome and safe drinking water is essential to existence; its supply is one of the gravest responsibilities accompanying company ownership.

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*Excerpts from an address before the senior sanitary engineers, University of Pittsburgh, May 20, 1913, by J. H. White, sanitary engineer, U. S. Bureau of Mines.

### Difficulties of Sewage Disposal

Relative to the subject of sewage disposal, you probably know there are few mining towns with sanitary sewer systems and some of the statements already made explain their absence. A sanitary sewer system presupposes a public water supply for flushing purposes, and all that has been said about the difficulties of a public water supply bear indirectly upon the sewerage question. In the second place, the approximate location of the town site is determined by the mine shaft and the topography must be accepted as it is. This is generally rough and hilly and a single gravity system of sewers is next to impossible, as the cost of leveling off the hills and grading the streets is prohibitive. Moreover, a suitable stream to take the discharge of the sewers may not be near at hand; and the necessity of installing a sewage-disposal plant looms up. Besides these difficulties, the expense of making house connections, installing plumbing fixtures and keeping these in repair, means a large expenditure. In the construction of new towns, some of these objections could be avoided by a more careful selection of the town site and arranging streets so that they follow contours. In some cases also, the experiment has been tried of building the outhouses or privies over the sewers and having a single automatic flush serve for a number of houses. This obviates expensive plumbing fixtures and cuts down the extravagant use of water.

I believe we are now prepared to take up the question of dry closets or privies, and the reason of their existence is probably now better appreciated. At its best the dry closet is not an institution to be proud of, and one would hesitate to estimate the sickness and loss of life caused by these neglected filth spots that abound in most mining towns.

A privy is sanitary when there is: (1) No possibility of ground pollution or infection of water supply; (2) no possibility of the spreading of germs by flies or other insects or animals.

The ground pollution and water infection is eliminated by the water-tight receptacle, but it is difficult to shut out flies. Methods used are darkening vault, covering each deposit with sand or clay or ashes, placing of a strong deodorant in the cans, or possibly by half filling the cans with water which causes an immersion of the stools. Depending upon fly-tight construction is seldom practicable.

The sanitary collection and disposal of night soil is another important feature, and one which has not been satisfactorily solved. It is almost impossible and practically uneconomical to destroy this material by fire. Disinfection by a liquid is not efficient because of the impermeability of the solid matter and the nauseating work of bringing about thorough mixture by stirring. Burying in the ground is not without its drawbacks, because of the pollution of water supplies and because in the development of the fly larvæ, disease germs may be brought up from several feet under the surface. One method which is being experimented with is placing this material in a septic tank and promoting liquefaction of the solid matters by various agencies in the tank and then applying a liquid disinfectant to the effluent. This method is being tried out by an Alabama mining company.

The collection of garbage, trash and waste of all kinds offers no special difficulties. There is a surprisingly small amount of this and the hens, hogs and dogs usually consume it.

In closing, I can just briefly discuss how the establishment and enforcement of health laws and regulations in mining towns vary from those of other places. Company ownership expedites the legislation and simplifies the enforcement. The official sanitary inspector is in absolute control, and he need be retained only so long as he does his work satisfactorily. It is not necessary for him to cater to any particular parties or show any favoritism or partisanship, as his job does not depend upon his popularity. The dual capacity of landlord and employer commands obedience to the laws, as their violation may be punishable by discharge and eviction from the town. On account of similarity of occupation, the regulations will affect all the inhabitants with same severity, and one class is not discommoded for the benefit of another—like, for instance, in a city where stable regulations and permits bring neighbors into conflicts. These are the advantages that mining towns possess, but the drawback lies in the fact that the initiative in maintaining sanitary and clean conditions throughout the mining town rests entirely with the operator. Indifference on his part may give rise to deplorable sanitary conditions. The residents have no official voice in the government of the town and unofficial aggressiveness is seldom exerted because the total absence of property rights breeds irresponsibility.

# CORRESPONDENCE AND DISCUSSION

## Calculation of Extraction in Concentration

The custom of using the content of bullion produced plus the content of tailing discharged as the value of the feed[1] in milling operations easily accounts for the high percentages of extraction frequently reported. Occasionally more reasonable estimates[2] may be found in the reports published by large mining companies working low-grade ores, as such companies generally make use of sampling devices and employ their own assayers, but no calculation into which the assay value of the tailing enters can be of value because, under working conditions, it is impossible to ascertain directly the real value of the tailing.

From the moment concentration commences the water made use of carries off mineral of value, and this continues all through the process. The amount of floating mineral will vary with the fineness of division of the particles, degree of concentration, amount of water used, and inclination of the tables, or with the rapidity of concentration. The effect of these circumstances is to cause the settled tailing to be invariably of lower assay value than if there were no float.

The subject of extraction percentages is one which occupied my attention for several years, owing to my having been engaged by a mining company to carry out investigations with a view to ascertaining the amount and manner of loss in the wet concentration of silver ores. No trouble or expense was to be spared and ample opportunity was afforded to make experiments on whatever scale seemed advisable.

To estimate the extraction it was clearly necessary to know either the correct value of the mill feed or of the tailing. To obtain the tailing value was difficult on account of the constant loss in the overflow and the impossibility of collecting the whole of the material under ordinary circumstances of working, and it was therefore decided to depend on the assay value of the feed.

During the tests, samples of the settled tailing were taken and assayed, but in no instance did their value agree with the theoretical value obtained by difference. Their value was invariably lower and the difference greater with higher degrees of concentration. At first, it was supposed that some error had been made in sampling or assaying, and check samples were taken and assayed, but these only confirmed the low value of the settled tailing. In the opinion of the operators, the water only carried off the more soluble portion of the waste. It seemed, however, that the mineral accompanying this might account for the low value of the settled tailing. After this, a number of tests were made to ascertain the extraction in jigging, in sand treatment, and in concentrating slime, by concentrating in the usual manner about 10 tons of ore in the same condition as fed to the different machines, it being possible in concentrating a moderate quantity of ore to collect the entire tailing in tanks. As a result of many tests it appeared that the percentage of floating material was proportional to the fineness of the particles treated and that its value was more than twice the theoretical assay value of the tailing. Thus, the discrepancy between the theoretical and actual assay value of settled tailing was accounted for.

The tests referred to were made with the same care in weighing, sampling and assaying the ore and products of concentration as would be exercised by a smelter purchasing ore, and were under my constant personal inspection, the object being to arrive at the actual rate of loss per degree of concentration of value in each of the three operations mentioned. The assumption was that with this data it would be possible to calculate with precision the probable results to be obtained in concentrating ores of different assay value to different degrees of value, by the methods of concentration made use of at the establishment under consideration, without the necessity of weighing the feed or the tailing.

Loss in concentration appears to arise from: First, the unavoidable loss characteristic of the particular ore concentrated, arising from the degree of natural concentration of the value in the gangue, its combination with various sulphides, and the nature of these; and second, the degree of division of the particles, which is the main cause of loss.

Some minerals are more friable than others, but the percentage of mineral to gangue is so small that it would not materially affect the general friability of the mass, and it may be assumed that ore of different minerals will crush in a similar manner and that the effect of division would be similar, although the float slime might be of higher value with friable ore. Hence, the weight of float arising from a certain degree of crushing an ore may be taken to be a measure of the percentage of float in crushing any ore to a similar degree, and this appears to be confirmed by the few examples which it has been possible to obtain.

The accompanying scale of extraction percentages obtained in concentrating a silver ore, crushed to pass a 30-mesh screen, aperture 0.0166 in., will illustrate the application of the results of some of the tests made. The silver was associated mainly with iron pyrites and a small amount of blende and occasional small quantities of galena, and occurred as pyrargyrite and in combination

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[1] "The calculation of extraction is performed by using the content of bullion produced plus the content of tailing discharged as the value of head sample." "Silver Cyanidation at Tonopah III," by Herbert A. Megraw. "Eng. and Min. Journ.," Mar. 8, 1913.

[2] A formula much used for calculating the extraction, and which is stated to be convenient for approximate estimations when it is impracticable to weigh the products, is the following:

$$\frac{\dfrac{A-B}{C-B} \times 100\,C}{A} = \%\ \text{extraction.}$$

When
A = Assay value of feed;
B = Assay value of tailings;
C = Assay value of concentrates.

This formula would give correct results if the assays of feed and tailings could be relied upon, but with an assay of settled tailings, i.e., tailings minus float, the extraction percentages so obtained may be more than 18% above the actual extraction and it is therefore undesirable to make use of this formula. Ashcroft. "The Flotation Process," "Trans.," I. M. M., 1912, and "Eng. and Min. Journ.," Dec. 7, 1912, p. 1085.

with copper (fahlerz). The matrix was quartz of average hardness.

The extraction by formula based on the assay value of the settled tailing was 1.2669% at 2:1 concentration, and 18.3545% at 12:1 concentration, in excess of the actual extraction.

It will be observed that the difference in the assay value of the settled tailing and the total tailing is so small in low degrees of concentration that, with ores of little value, it might escape attention unless great care were taken in sampling and assaying.

The method adopted for finding the percentages of extraction and loss incurred, weight and value of concentrates and tailings, for any degree of concentration or value of feed, according to results obtained in carefully made tests, was as follows:

COMPARISON OF EXTRACTION PERCENTAGES. THE FEED IS SILVER ORE CONTAINING 20 OZ. PER TON

| Degree of Concentration of Values | Tons Concentrate % | Tons of Tailing % | Extraction % | Loss % | Calculated Assay of Total Tailing per Ton Oz. | Assay Value of Settled Tailing % per Ton, Oz. | Extraction by Formula % | Total Tailing Tons | Settled Tailing Tons | Assay Value per Ton Oz. | Float Tailing Tons | Float Assay Value per Ton Oz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 39.25 | 60.75 | 78.51 | 21.49 | 7.0748 | 6.1428 | 81.86 | 60.75 | 51.41 | 6.1428 | 9.34 | 12.2056 |
| 3 | 24.38 | 75.62 | 73.14 | 26.86 | 7.0960 | 5.8766 | 78.29 | 75.62 | 61.09 | 5.8766 | 14.53 | 12.2644 |
| 4 | 16.94 | 83.06 | 67.77 | 32.23 | 7.7606 | 6.0742 | 75.35 | 83.06 | 63.91 | 6.0742 | 19.15 | 13.3890 |
| 5 | 13.28 | 86.72 | 66.43 | 33.57 | 7.7422 | 5.9826 | 74.55 | 86.72 | 65.89 | 5.9826 | 20.83 | 13.3654 |
| 6 | 10.84 | 89.16 | 65.08 | 34.92 | 7.8332 | 5.9420 | 73.96 | 89.16 | 66.88 | 5.9420 | 22.28 | 13.5100 |
| 7 | 9.10 | 90.90 | 63.74 | 36.26 | 7.9780 | 5.9516 | 72.84 | 90.90 | 67.31 | 5.9516 | 23.59 | 13.7600 |
| 8 | 7.80 | 92.20 | 62.40 | 37.60 | 8.1562 | 5.9772 | 73.59 | 92.20 | 67.40 | 5.9772 | 24.80 | 14.0806 |
| 9 | 6.89 | 93.11 | 62.07 | 37.93 | 8.1472 | 5.9442 | 72.68 | 93.11 | 67.83 | 5.9442 | 25.28 | 14.0586 |
| 10 | 6.17 | 93.83 | 61.73 | 38.27 | 8.1572 | 5.9240 | 72.53 | 93.83 | 68.13 | 5.9240 | 25.70 | 14.0778 |
| 11 | 5.58 | 94.42 | 61.39 | 38.61 | 8.1684 | 5.9116 | 72.39 | 94.42 | 68.34 | 5.9116 | 25.08 | 14.1180 |
| 12 | 5.09 | 94.91 | 61.05 | 38.95 | 8.2078 | 5.9072 | 72.24 | 94.91 | 68.46 | 5.9072 | 26.45 | 14.1616 |

The total possible loss being 100%, the loss due to different degrees of concentration of the values will be proportionate percentages of this loss according to the degree of concentration:

PERCENTAGE OF LOSS IN VARIOUS DEGREES OF CONCENTRATION

| Degree | = % of total loss | Degree | = % of total loss |
|---|---|---|---|
| 0 | = 0 | 9 | = 88.28 |
| 2 | = 50.0 | 10 | = 89.06 |
| 3 | = 62.5 | 11 | = 89.84 |
| 4 | = 75 | 12 | = 90.625 |
| 5 | = 78.125 | 13 | = 91.41 |
| 6 | = 81.25 | 14 | = 92.19 |
| 7 | = 84.375 | 15 | = 92.97 |
| 8 | = 87.5 | 16 | = 93.75 |

To find the total loss, first divide the assay of the concentrate by the assay of the feed to find the degree of concentration, then by means of the table find the relative percentage and, from this, the total loss. When the total loss is found by means of a test, the loss in concentrating similar ore of any assay value, and in a similar state of division, may be found, as it will correspond to the percentage of the total loss for that degree. In this manner the percentage weight of tailing and concentrate may be found and the actual value of the tailing.

The total loss may exceed 100% when the rate of loss is great, due to water used in concentration being excessive—or there is a reversal of concentration.

A knowledge of what the actual value of the tailing may be at different degrees of concentration is of great importance, as concentration may be carried to such an extent as to become negative, that is to say, the discard will be of greater value than the feed, owing to the tailing increasing in value in proportion to the degree of concentration. The first tailing discarded, up to a concentration of 2:1, is the largest in amount and the least valuable. After this it becomes richer and less in quantity; this, however, is liable to pass unnoticed, as the amount being small in comparison with the first tailing, the average value of the whole of the tailing is not greatly increased. The following example of concentrating copper ore, sand and slime, with buddles will illustrate this:

| Degree of Concentration | Tons Concentrate % | Tons Tailing % | Extraction % | Loss % | Average Value of Tailing Units |
|---|---|---|---|---|---|
| 2 | 22.56 | 77.44 | 45.12 | 54.88 | 7.0868 |
| 4 | 4.42 | 95.58 | 17.68 | 82.32 | 8.6127 |
| 8 | 0.495 | 99.505 | 3.96 | 96.04 | 9.6518 |

The unit has been taken as 10 for feed.

In this scale of concentration the total loss found by experiment was 109.76%, so that there was a reversal of concentration at some point. Concentrating 22.56 tons to 4:1 would produce 4.42 tons concentrate with 18.14 tons tailing at 15.127 units, but concentrating to 2.5 deg. the tailing would be worth 9.463 units, the limit to which concentration could be carried without reversal.

In the vanner treatment, the total possible loss, found by experiment was 106.66, about the same as with the buddles; consequently it was not possible to concentrate beyond 2.5 degrees in either case. The concentration, however, was carried to 4.9471 degrees by vanners and 2.6277 degrees by buddles. The combined concentration was, by jigs, 12.734 degrees, extraction, 57.095%; by vanners, 4.9471 degrees, extraction, 17.589%; and by buddles, 2.6277 degrees, extraction, 36.545%; and combined, 8.4692 degrees, extraction, 69.575%. Assuming the data given to be correct, the tailing would have an average content per ton, 0.70443% copper, of which, according to the loss in float resulting in tests of silver ores, 35% of the weight of tailing would have been carried off with 57% of the calculated contents of same, and the value of the settled tailing would have become reduced to 0.46594% copper, equal to a reduction of 0.23849% in the percentage value.

Calculating the percentage of extraction by the formula, with value of settled tailing 0.46594%, an extraction of 80.10% would be obtained or 15.127% in excess of the actual combined extraction. The excess, however, would be much more in calculating separate recoveries by vanners or buddles.

The relative extraction by the different machines at the same degree of concentration was: Jig, 76.48%; vanner, 46.67; buddle, 45.12%. This must not be considered as a measure of efficiency but, if anything, a measure of the fineness of division of the particles. The float percentage on the tailing was: Jig, 10 to 15%; sand tables, 30%, due to a portion being reground; buddles, 45%, due to nearly all being reground.

A single test was not found to be sufficient as a test of the recovery or of the amount of float occurring in the operations of a mill, because, in working, buddle heads are sent to tables, and table seconds and slime go to buddles, and these combinations alter the conditions. It was found that the regrinding greatly increased the loss and this without doubt was the main cause of lower results being obtained under working conditions than in single tests. The main loss arises from float whatever machne is used and there appears to be little chance of overcoming this difficulty. The great loss of tin slimes in Cornwall is evidence of this—but it may be possible to improve extraction by paying more attention to coarser crushing and jigging. It is not sufficient to infer from observation only that an ore requires to be crushed fine to obtain the best results in its concentration and the possibility of obtaining better results from coarse crushing may well repay the trouble of carefully ascertaining the most favorable degree of crushing in each case, as even adjacent veins vary much in the natural concentration of their values. With silver ores, the tailing is hardly ever of lower value than 8s. per ton; consequently, every ton of waste picked out by hand before concentration results in a considerable saving, as it raises the value of the remainder, thereby reducing the degree of concentration required and, at the same time, reducing the loss in treatment of the whole.

William S. Welton.

London, Eng., Apr. 8, 1913.

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## Milling in Southeastern Missouri—I

In the Journal of June 21, "Milling in Southeastern Missouri—I," page 1231, there is a description of the method employed at the Doe Run No. 3 mill of the Doe Run Lead Co. for the estimation of weight of the feed to the mill. This, if it is correctly reported, furnishes a rather interesting example of the fact that many plants, apparently built under the best of supervision, are still deficient in certain ways, so that the management is actually depending upon impressions, instead of upon the information that it should have, and, no doubt, thinks it is receiving.

After describing in some detail the general conditions of the district, and especially the construction of this particular mill, which he says represents an investment of about $600,000, C. T. Rice states that the tonnage sent to the mill is determined by recording the number of mine cars dumped into the crusher (presumably at the various mines) and delivered to the railroad cars. The weight of ore per mine car is in turn estimated by occasionally weighing a railroad car containing a known number of mine-car loads, on a railway-track scale.

Mr. Rice evidently feels that this process demands some apology, but his excuses reflect on the ingenuity of the designers of the mill, since the methods of weighing ore which he mentions are not all of those in common use, nor are automatic methods barred by dust.

At a certain mill with which I was connected, where all the ore is dried and where fine crushing and screening is practiced and where the dust is almost unbelieveably dense, all the ore was received from two mines in 50-ton, hopper-bottom steel cars, pushed up a siding as delivered, and dropped to the crusher by gravity via a standard railway-track scale. The time taken to weigh a car was short, and opportunity was found for frequently checking the tare weights also. At that mill, as now arranged, all the ore is weighed satisfactorily on a belt-conveyor scale, which is by no means free from dust.

At the mill which I am now operating, all the mill feed is weighed in an automatic dumping scale, and with good results, although the place is dusty, and it is necessary to have a boy blow off the joints of the apparatus at half-hour intervals with an air hose.

Almost everyone who has handled muckers and trammers underground knows of the fondness of the tribe for sending out short cars, and in an actual test covering a period of over a year, with a mine under ordinarily good supervision, the output as figured from the average supposed load of the mine cars, checked at intervals in much the same manner as is done at Doe Run, showed 17% higher than the weight given by automatic scales.

The method of weighing at this otherwise well designed mill, taken in connection with the absence of automatic samplers except for concentrate, leads one to view with considerable doubt the statements of recovery, although securing 83% to 86% of the lead from such an ore as described is not a matter of extreme difficulty. The doubt arises from the fact that the denominator of the recovery fraction is an estimate; an impression, instead of information.

In the second article of this series, in the Journal of June 28, Mr. Rice describes the Hancock-jig practice of this same mill, and this also, if correctly reported, does not appear to represent the best kind of work, since, although only a single separation is made, the quantity of middling produced is so great as to be too much for a single jig and part of it is returned, after recrushing, to the jigs where it originated, although the capacity of a 25-ft. jig is given as 600 tons per day, which is conservative. If it is true that 25% of the feed to the mill is in circulation as middling it would seem that improvement might be made. So far as my own work is concerned, I have found that much better results can be obtained with this jig by clothing it from end to end with heavy screen cloth with the same size openings throughout, large enough to pass the maximum feed particle, and making an artificial bed which is independent of feed variations.

W. O. Borcherdt.

Austinville, Va., July 3, 1913.

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## Copper Precipitation Box

It seems worth noting that the copper-precipitation box illustrated in the Journal of July 5, 1913, p. 18, is nothing but a zinc-shaving box as used in the cyanide industry, with the exception that the screens which support the shavings are omitted.

However, the advantages of this sort of box, whether originally discovered by a copper or a gold-metallurgist, cannot be too strongly urged. The producer of copper precipitate will be amazed, after beginning to use a box of this sort, to note how much higher will be the tenor of the precipitate recovered, which will save him freight and smelting tolls, and how much lower will be his iron consumption.

I would suggest this improvement, however. Make the box double ended, then when the iron is almost consumed in the first compartments, clean them, throw the scrap in the last compartments, fill up the first with clean iron, and reverse the direction of flow.

Bluestone.

Wilmington, Del., July 7, 1913.

# PHOTOGRAPHS FROM THE FIELD

Lady Belle Mine in the Newly Discovered Silver District, Eagle, Colo.

Stunner, Colo., in the Platoro District, with Newly Established Sawmill in Foreground

Platoro, Colo., May 31, 1913, Where Promising Gold Discoveries Were Recently Made

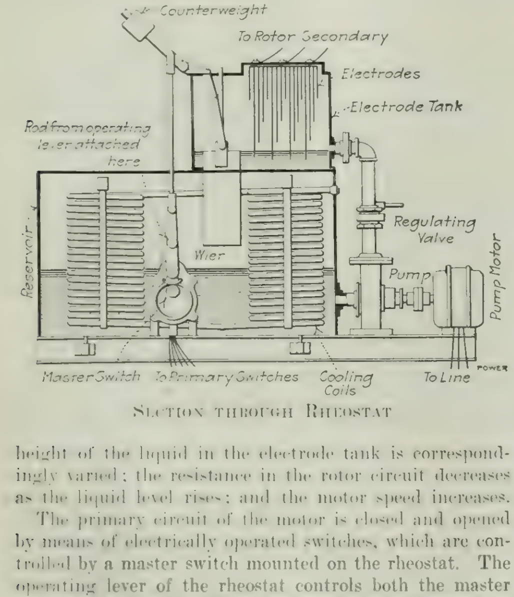
Eagle, Colo. The Silver Strike at the Lady Belle Claim Was Made Seven Miles to South

Gilmore, the Actual Site of the First of the Recent Discoveries in the Platoro District

## Liquid Rheostats for Large Alternating-Current Motors

The use of large alternating-current slip-ring motors for mine hoists, has created a demand for a simple, efficient and economical controller. To meet this demand the Westinghouse liquid rheostat was developed. This rheostat provides an infinite number of steps between the minimum and maximum limits, thus permitting fine speed adjustments and smooth acceleration. The rate of acceleration can be definitely fixed and is independent of the rate at which the operator manipulates the starting lever, making it impossible to injure the motor or the machine it drives by too rapid acceleration.

As shown in the accompanying diagram, the rheostat consists of two compartments, an upper tank for the electrodes, and a lower reservoir. The three phases of the rotor are connected to electrodes suspended in the upper tank. A small motor-driven pump delivers a steady stream of liquid, usually a solution of soda, from the reservoir into the electrode tank, and back into the reservoir over the weir. By raising or lowering the weir, the height of the liquid in the electrode tank is correspondingly varied; the resistance in the rotor circuit decreases as the liquid level rises; and the motor speed increases.



SECTION THROUGH RHEOSTAT

The primary circuit of the motor is closed and opened by means of electrically operated switches, which are controlled by a master switch mounted on the rheostat. The operating lever of the rheostat controls both the master switch and the weir. When the lever is in the central, or off, position, the primary switches are open and the weir at its lowest level, so that the secondary resistance is at a maximum. Moving the lever in one direction closes the proper primary switches for starting the motor forward and raises the weir. Moving the lever in the opposite direction reverses the motor and also raises the weir. Speed control is secured by varying the position of the weir with the lever; the primary switches do not open until the lever is placed in the off position.

A valve in the intake pipe of the electrode tank regulates the rate at which the liquid is pumped in, so that no matter how quickly the operating lever is moved, the liquid can rise only at the rate for which the valve is adjusted, thus limiting the rate of acceleration. When the lever is returned to the off position, the weir drops and the liquid level promptly falls. Cooling coils in the reservoir prevent rapid evaporation of the liquid. The rheostats are made in capacities varying from 400 to 1500 horsepower.

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## Broken Hill Proprietary Co., Ltd.

The Broken Hill Proprietary Co., Ltd., New South Wales, Australia, for the half year ended Nov. 30, 1912, reports that the gross profits were £177,594, which after deducting £12,691 for depreciation gave a net profit of £164,903 as against £186,884 for the preceding six months. During the period two dividends aggregating £144,000 were distributed. The sum of £29,341 was expended in construction during the half year.

The amount of ore mined was 120,839 tons, which would have been increased if sufficient labor were obtainable. Development work was retarded from the same cause. The regrinding section handled 88,364 tons of dump tailings yielding 3057 tons of lead concentrates. An improved method of feeding was introduced with satisfactory results as to working costs. The residue handled by the zinc-concentration plant amounted to 148,132 tons producing 42,003 tons of zinc concentrates.

The slime plant was only worked for about 2½ months as the zinc distillation furnaces at Port Pirie could not treat more, owing to shortage of labor. During the period under review, 17,414 tons of slime were handled, producing 5472 tons of concentrate.

The smelting plant at Port Pirie, during the half year, treated 100,605 tons of ore, flue dust, refinery drosses, etc., yielding 50,302 tons of bullion, which is a record production. The refinery treated 45,730 tons of bullion, producing 2,059,197 oz. of silver, 872 oz. of gold, 43,578 tons of soft lead and 362 tons of antimonial lead. The spelter plant, although not fully running, owing to want of labor, produced 1367 tons of spelter and 212 tons of blue powder. The output of lead for the six months was 49,052 and of silver 2,687,411 ounces.

Mechanical feeders were installed for charging the sulphur burners. The production of strong acid from the sulphuric-acid plant was 2503 tons, of which 429 tons were sold to other consumers, while 550 tons of acid were produced from the gases of the zinc roasters. An aërial ropeway was constructed for the conveyance of tailings from the zinc-concentration plant to the underground chutes with good results.

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## Peruvian Mineral Production

The following figures of the mineral production of Peru for 1910 and 1911, are taken from Boletin 78, of the Cuerpo de Ingenieros de Minas del Peru, and are arranged in order of descending values of the 1910 production (quantities are given in metric tons, except when otherwise noted):

| | 1910 | 1911 |
|---|---|---|
| Copper | 27,375 | 27,734 |
| Silver, fine, kg. | 252,565 | 289,383 |
| Petroleum | 167,712 | 195,276 |
| Vanadium ore | 3,130 | 2,251 |
| Coal | 307,320 | 324,000 |
| Gold, kg. | 708 | 441 |
| Salt | 17,594 | 24,867 |
| Borax | 2,351 | 1,423 |
| Lead | 1,866 | 2,209 |
| Bismuth, refined | 24 | 24.5 |
| Tungsten ore | 12 | 18.5 |
| Quicksilver, kg | 350 | 560 |
| Antimony | 49 | ...... |

# EDITORIALS

## Copper at the Midyear

We have often pointed out that the copper statistics considered month by month are unreliable as an indicator of the trend of things. Considering the statistics quarterly, the disturbing factors are ameliorated and we become able to obtain a fair idea of the situation, although, of course, with no such certainty as we can upon the basis of the annual figures.

Considering the American statistics for the first half of 1913, and using round figures, it appears that the refinery production in the first quarter was 410,000,000 lb.; in the second quarter, about 398,000,000 lb. The average quarterly production in 1912 was about 395,000,000 lb. The decrease in the second quarter of 1913 is attributable to the labor troubles at the Nichols refinery during June.

The smelters' production in the first quarter of 1913 was about 402,000,000 lb.; in the second quarter, about 409,000,000 lb. Their average quarterly production in 1912 was about 413,000,000 lb. By the "smelters' production" we mean all of the crude copper that comes to the American refiners.

It appears consequently that primary production, i.e., the copper as reported by the miners and smelters, has been going on in 1913 at a less rate than in 1912. On the other hand, the refiners' figures show a larger rate in spite of the recent check at the Nichols refinery. The reason for this is that the refining of the smelters' production in 1912 was delayed, which was freely discussed at the time, and during 1913 the refiners have been catching up. There may be still some surplus of crude copper at the refineries, but the quantity ought no longer to be considerable and before long the refiners' figures ought to fall into step with the smelters'.

Turning now to the deliveries, it appears that the shipments to domestic consumers in the first quarter were about 201,000,000 lb.; in the second quarter, about 228,000,000 lb. The average quarterly domestic deliveries in 1912 were 205,000,000 lb.

The foreign deliveries in the first quarter of 1913 were 210,000,000 lb.; in the second quarter, 222,000,000 lb. The average quarterly delivery for export in 1912 was about 187,000,000 lb.

The statistics of deliveries look peculiar in view of the talk that we have been having lately about contraction in consumption. There has been such talk ever since the first day of January. The prophets of recession have foretold that each month's reduction of stocks would be the last. When the May figures were out they spoke approvingly of them, but shook their heads and said: "Just wait until you see the June figures." Now that the June figures are out and look good, they are saying, "Wait until we have the July figures, a month hence."

During the first half of 1913, the consumption of American copper has exceeded the supplies to American refineries by 50,000,000 lb.; stocks of refined copper have been largely decreased and also the stocks of standard copper reported from Europe. The excess of the second quarter has been greater than that of the first. Yet the price for copper has declined to the lowest point of the year and such pessimism prevails in some circles as might be explained by the belief that within a few weeks the brass makers, wire drawers and sheet rollers are going to cease using copper. This pessimism obtains extensively among traders and an occasional producer, but it does not extend, we think, beyond one or two of the big agencies, although all of them are disturbed, no doubt, in that buyers do not buy. In view of the general situation in the world's markets it is but natural, however, that buyers should defer their necessary purchases until the last possible moment.

## The Witwatersrand Strike

The strike of the white miners on the Witwatersrand, which is gradually subsiding, but is not yet entirely over, will temporarily reduce the gold production of the Transvaal, which had been, up to the end of May, heavier than ever. The strike was the outcome of discontent with existing conditions which had existed for some time past, and might have been expected at any time. The alleged cause—the discharge of a few men from the Kleinfontein mine—was really trivial, and could have been arranged easily, had there been no underlying reasons. The wages of miners on the Rand have apparently been fairly good in comparison with other districts, but they have been coupled with a very high cost of living and with other conditions tending to make life undesirable. Prominent among these has been the unhealthy condition of many of the mines and the prevalence of miner's phthisis and other occupational diseases. Some companies and many managers have been trying to improve the health conditions, but with little success so far.

Besides these, there has been the demoralization due to the employment of a great body of workmen of an inferior class or race. This has been unavoidable if the mines were to be worked at all; but the use of a class of workmen who were, temporarily at least, in a condition approximating slavery, could not fail to have an unfavorable effect on all labor of a higher grade. It made discipline difficult and always suggested the idea that the negro was the main cause of lower wages and bad conditions; while it was difficult to attract to the mines the better class of men, who will not, if they can help it, work with a host of inferiors.

All of these causes, and perhaps others, worked together to produce a feeling of discontent and of bitterness against the large companies which control the mines. The Transvaal is a country of large mines, where there is little opening for individual effort, and employment by one of the large companies is the only opportunity.

The violence accompanying the strike and the conflicts with the police and soldiers seem to have been due, in part at least, to the presence in Johannesburg of a number of unemployed men, some of whom ascribe their condition to the general use of negro labor, while many others are adventurers who are ready to take a hand in any disturbance which may offer a chance of profit or temporary license. The strike is approaching its end for the present, but some time will be required to put matters on a better basis which will give promise of permanency.

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## Air Hose

It is sometimes difficult to ascertain how far current engineering practice is based on experiment and reason, and how far it is merely inherited tradition, unproved and often unwise. Occasionally a skeptic discovers some surprising facts. For instance, it has long been supposed that for air drills underground, armored hose was necessary, the wire windings being applied to resist wear and abrasion. Observation and analysis will show that the armoring is a nuisance. Armored hose in ordinary mine use soon becomes badly distorted either by short kinking or by being crushed, and, though the fabric may be still intact, the air friction passing the strictures is soon excessive. A dent, once occurring, can hardly be straightened out again. Furthermore, to cut and patch the hose in such case, or if it be punctured, is a vexatious job, as the wire winding gives trouble.

Mr. Catlin, of the New Jersey Zinc Co., noting this trouble, adopted a hose similar to that used for air couplings on railroad trains, with a heavy fabric to stand the pressure, protected by thick rubber on the outside, on the principle of an automobile shoe. Such hose is not injured by short kinking nor is a stricture formed by rock falling on it, and should it be cut by a blast it can be quickly mended. A length of this was coupled to a length of armored hose and put in service in the South Mine opencut, at Franklin Furnace, in February, 1908. It remained in continuous service until September, 1912, while the armored hose connected with it had to be renewed every few months. In fact it outwore so many lengths of the latter that count was lost.

The material broken here was not particularly hard and sharp, and it is possible that in a quartzose mine the wear on rubber might be so excessive as to make armoring advisable. However, we are inclined to think that the idea of armored hose being necessary for rock drills is a superstition in the same class with the belief that dynamite in exploding exerts all its force downward.

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## Respecting Some Trust Busting

The disclosure in Washington last week that the resolution constituting the Stanley committee to investigate the Steel Corporation in 1911 was in fact framed by one David Lamar, whose character is best indicated by his notorious sobriquet of the Wolf of Wall Street; and was hawked about in New York for stock-market purposes for several weeks before its introduction in Congress; threw a ray of light into the minds of the altruistic legislators of Capitol Hill. The Hon. Mr. Stanley was innocent, no doubt; he was simply "taken in."

That the shaft went home was manifested in the remarks of a gentleman from Texas a few days later, in the course of which he indulged in some animadversions upon the disingenuousness of Mr. Untermyer, who steered the Pujo committee. In about the same time Elbert Hubbard has been discoursing upon Mr. Brandeis, who almost attained a seat in the cabinet.

The upshot of it all is the awakening of the statesmen of Wisconsin, Oklahoma, etc., to the realization that "trust busting" is not always what it seems. The polyonymous Lamar's confession will give the people of the country some information respecting the attacks against the Steel Corporation and the motives behind them, and may lead them to inquire along with the New York *Sun*: "How far has the Congressional fury against great corporations been a supposed concession to popular sentiment? How far has it been fanned and exploited by the chevaliers of industry?"

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## Right-of-Way in Mining

An interesting piece of litigation is now pending in Arizona, between the Inspiration Consolidated Copper Co. and the New Keystone Copper Co. The Inspiration Consolidated was formed by the combination of the old Inspiration company and the Live Oak, the properties of these constituent companies being separated by that of the New Keystone. This separation was manifestly disadvantageous to the Inspiration Consolidated, and that company sought to buy the Keystone property, but it proved impossible for the two parties to agree upon terms.

Among other things, it is necessary for the Inspiration Consolidated to have a main haulage gallery connecting the two divisions of its property. A few months ago it was discovered that the Inspiration Consolidated was driving such a gallery through the Keystone ground and under the Keystone orebody, without having obtained authorization from the New Keystone company. The latter immediately obtained an injunction, restraining further work, the final hearing upon which has not yet been held. In the meanwhile the Inspiration Consolidated has brought suit to condemn a right-of-way through the Keystone ground.

Some unsettled points of law are involved in this case. In the late litigation at National, Nev., which was recently reviewed in the JOURNAL, it was held by the court that, although the law of the apex gave the owner of the apex of a vein the right to follow it outside of his side lines, there was no right conferred to take anything but the vein. In this case, the vein was very narrow, and in order to extract it some of the back claims' country rock had to be extracted, which was held to be illegal. Consequently, although the owner of the apex won its suit, it was, nevertheless, obliged to buy the back claims in order to be able to secure what the court had declared to be its own property.

Opposed to this principle of law are the statutes of several states, which, under certain circumstances, confer upon mining companies the right of eminent domain. Apparently, the Inspiration Consolidated is proceeding under the terms of such a statute. It is doubtful, however, whether such a statute is constitutional, and it may consequently remain for the United States Supreme Court ultimately to decide. There are some nice points of law herein, and altogether the case is interesting from both the legal and the practical standpoints.

# BY THE WAY

Experts should avoid stepping outside their own special lines. A well known physician in New York, who died recently, left among his nominal assets 36,000 shares of mining stocks, the list including such choice properties as San Juan Gold, Goldfield Century, Heart of Goldfield and Red Elephant. The official appraiser lumped the whole lot as "of no value." The doctor evidently could not diagnose the case of a mining company.

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In Madagascar there is no commission to revise rates downward, apparently; in fact, there is only one railroad and that belongs to the government. It is 229 miles long, from Tamatavo to Tananarivo. An express passenger train runs twice a week, taking 15 hours for the run, an average of 15.3 miles an hour; on other days there is a mixed passenger and freight which runs at an average rate of 6.3 miles an hour, taking 36 hours for the trip. First-class passenger fares are 6.2c. per mile, though a third-class passenger can ride for 1.24c. per mile. Freight rates vary from 1.5 to 18c. per ton-mile.

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In the Journal of Apr. 19, 1913, we related circumstances of the cruel killing of Boris Gorow by Mexican rebels. Our story of this led to the matter being brought to the attention of the Department of State. J. B. Moore, counselor of the department, writing in behalf of the Secretary of State, communicated the following letter to a reader of the Journal who interested himself in the matter:

> In further reply to your letter of May 9, transmitting a published account of the murder of Mr. Boris Gorow by Mexican bandits, you are informed that the Department is in receipt of a report from the Consul at Mazatlan in which it is stated that the account of the death of Mr. Gorow which you forwarded to the Department is substantially correct. The Consul adds that he is informed that the two persons who were arrested for this murder escaped from jail.
>
> The Department has instructed the American Embassy at Mexico City to bring to the attention of the appropriate authorities the circumstances connected with the murder of Mr. Gorow, and the reported escape of the persons arrested therefor, with an urgent request that immediate measures be taken looking to the apprehension and punishment of the persons guilty of this crime.

Boris Gorow was a Russian prince, who having been exiled from Russia came to the United States and in due course of time became naturalized as an American citizen. His murder was one of the crimes that have been committed in barbarous Mexico. The stories of many others have not been told.

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In accordance with the recently amended act requiring all mining and other property to be assessed at the "cash value," the Arizona Tax Commission has been sending out blank forms to all owners of mining property for a statement of the gross and net value of the products, the assessed value being based on 12½% of the gross and four times the net value of the products. Complete reports have been submitted by most of the large companies. Occasionally no figures are submitted, as explained in the following reply from an owner in Mohave County:

> Gentlemen—Your Elaborite and Finished Product of the Printer, named Statement of the Gross and Net Products of holes in the ground, at hand and noted, I take it that the Law and Your Request applies to Producers, and as I have no mining property that ever produced anything but Assessments I construe it that I am exempt from its Force and Effect. I am somewhat interested in holes in the rocks that have cost something like $40,000 to explore, but no dividends or even gross proceeds marketed. I am very sorry that this is so, as I would be very glad to have something for you to tax, then I might expect some revenue, but the ways of the pay shoot is devious and past finding out by the treasure seeker without means. I have no patented wildcats or producing claims on the sandy Public Domain. I don't understand this law to apply to anything I claim, or of any kin of mine, maid servant or uniformed keeper of the gate. Understand I am not in contempt of the great majesty of the law; it is exceeding great, but I am not as yet in the Income Tax column, like our friend Rocky Fellow and Ca-negie. Hope the State will find some way of taking my wildcats over and seperating me from any further worry of raising assessments. I Remain,
>
> STILL A DIGGER WITH HOPES LONG DEFERED.

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The mining industry is often accused of slackness and wasteful methods. The mechanical engineer in particular is accustomed to hold up his hands in horror at the power installations of the average small mine. This criticism is mostly undeserved and is the result of ignorance on the part of critics as to how uncertain and temporary an affair mining is bound to be. But sometimes we must plead guilty. One J. H. Stretton, writing in *Power,* June 24, 1913, gives an account of some funny things he saw when he had no gun. On a ramble through Nevada County, Calif., he stopped to look at a compressor plant that had just been installed for a mine on Deer Creek. The compressor was direct-connected to a waterwheel. Mr. Stretton watched them make a trial run, shut down to repair leaking pipes and start again against the full air pressure, a matter of some difficulty, accomplished by opening the gate slowly until the water from the nozzle could turn the machine over against 100 lb. of air. His suggestion that a relief device be installed to permit starting the machine against atmospheric pressure was met with the remark by the superintendent that the man who had put in the plant had made a business of that for several years and he guessed that if he could not do it right, nobody else could. It developed that later, starting under the same conditions, they wrecked the waterwheel and compressor and removed part of it at high velocity to the other side of the creek. Still more remarkable was the unique design of a first-motion hoist that he happened upon, as he says, about half way between Grass Valley and the mining camp of Rough & Ready on the righthand side of the trail. The hoist had a vertical, single-cylinder engine that was bought, the rest was home-made; the drum was originally the spool on which the hoisting cable came; the throttle was an ordinary globe valve, so placed that the engineer could not reach it, without leaving the brake and clutch levers. To hoist he had to bring the engine up to fair speed, throw in the clutch, release the brake, jump for the throttle, give the engine more steam and then help on the flywheel until things were going. In conversation he remarked that he always wondered, when hoisting, whether he could get the men to the top without the hoist going to pieces. It appears that if he did not get to the throttle before the engine stopped, he had to jump back and apply the brakes or the car would drop and hurt somebody underground. Apparently all Nevada County mining is not up to the standard of the Empire and the North Star.

## Miners Strike on the Rand

The strike of the white miners on the Rand, after raging about a week, is probably in process of successful settlement as we go to press. It was a strike of unusual virulence, and was apparently almost unexpected. The first intimation of trouble was contained in press dispatches of July 1, stating that the miners had voted to strike on July 6; dispatches of the next day, however, reported the strike as having broken out with violence.

The dispute arose out of a simple question of working hours at the New Kleinfontein and spread thence over the whole district. The original strikers were placated by the mine owners, who conceded their demands as regards working hours, but a new dispute arose because the owners refused to displace the men who had worked during the strike or to recognize the union. A general strike was called by the leaders and the men responded. Some fear was felt that a sympathetic strike might bring out the railroad employees and the electricians of the power plants, but this apparently did not occur. Fierce rioting, however, took place and the Governor-General, in response to a request, is reported to have sent in 3000 troops. Martial law was declared, and to judge from the reports the city of Johannesburg became a veritable battlefield with hourly encounters between the strikers and the troops taking place. In the actual fighting, the strikers always got the worst of it, and suffered large losses, but their resistance was so stubborn that the government sought a compromise, and a meeting between representatives of the mine owners, the men and the government was arranged, at which General Botha presided.

A settlement was then arranged on the following terms: (1) The strike to be declared off, the men to return to their homes, no further disturbances or destruction of property to take place; (2) the New Kleinfontein strikers to be reinstated, the strike-breakers not to be victimized and to receive compensation from the government; (3) the strikers in the other mines to be taken back to work as operations were resumed and not to be victimized; (4) representatives of the miners to be at liberty to lay other grievances before the government, which would make investigations. Unfortunately, as often happens, the men refused to abide by the decision of their leaders and only a part of them returned to work. Compensation for the "martyrs" shot by the troops was demanded, and the rioting continued to some extent. The final outcome remains in doubt, but it seems probable that the government, acting with many of the strike leaders, should be able to end the trouble soon.

The total number of casualties is estimated at 110. During a few hours of the fiercest fighting, it is reported that 60 were shot. The city and district are still in a state of terrorism. Many white citizens are under arms and are guarding the residences of the wealthy classes, where it is feared that the miners will use dynamite. An extremely keen source of anxiety is the great number of natives, some 250,000, now under close guard in their compounds. If they should be liberated and looting should begin, it is difficult to say what the end might be. The Rand club was a special point of attack, as being composed largely of mine owners. It was partly demolished in one raid. The Union club also suffered to some extent. The Wernher-Beit & Co. headquarters were attacked at one time. The weapons of the strikers were partly obtained by looting a gunsmith's store. No street cars are running in Johannesburg and no railroad trains are being moved. An agreement was reached between the newspapers and the trade unions, providing that no papers should be issued other than a sheet got out by the printers' union, which gives an unprejudiced account of the events taking place.

It is a good many years since there has been so savage and bloody a strike in the metal-mining industry. It is customary over the world, especially in other English-speaking nations, to assume that such violence and lawlessness are possible only in the United States. Here, in what is in many ways one of the most British among the British colonies, is an example that it would be hard to match in recent American history. We may expect the usual crop of statements that the trouble all started with irresponsible agitators from the United States.

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## The Beatty-Guggenheim Case

A brief note in our issue of July 5 announced the decision of the New York Supreme Court against the plaintiff in the case of Beatty vs. Guggenheim Exploration Co. The suit was brought by the plaintiff to recover $54,000 in cash, 23,000 shares of the Yukon Gold Co., and—on tender to the defendant company of the cost of said shares, about $2 per share—40,000 additional shares of the Yukon Gold Co. Plaintiff also asked $225,000 damages for the non-delivery to him of said stock. It appears that the money and the stock were held by the defendant company for delivery to O. B. Perry, but the Guggenheim Exploration Co., having learned that the stock was to go from Perry to the plaintiff, Beatty, withheld its delivery on the ground that Beatty was employed as its agent, and while so employed became interested with Perry secretly in the ownership of certain mining claims in Alaska and increased the price of them and the commission paid in order that he might obtain a share for himself. The defendant company therefore claimed that it was entitled to all profits made by the plaintiff through what was claimed to be a breach of his fiduciary relations. Perry, who was made a codefendant, took a neutral position and made no claim to the shares, leaving the court to decide as to the legal ownership.

The case was heard by Justice Gerard, and the elaborate opinion which he has filed gives a rather interesting history of the case from the evidence accepted and the point of view taken by the Court. The first part of the decision goes fully into the contract, made in 1903, between A. Chester Beatty and the Guggenheim Exploration Co., and to subsequent action thereunder, establishing the acceptance and understanding of its terms. It is not necessary to take this part up in detail; simply to say that the Court holds plaintiff's position as an agent and employee of the company, holding in such capacity confidential relations with its management. As such there appear to have been for a time no differences and a clear and satisfactory understanding. The plaintiff made certain investments in mining property on his own account, but in all cases with the full knowledge and consent of his employer.

These conditions persisted, according to the narration of the Court, until the Yukon properties came into question. In 1905 one Erbsloh appeared upon the scene and gave the Exploration Co. the information that A. N. C. Treadgold, who had been prominent in the early days of the Yukon excitement, had acquired a number of claims on Bonanza Creek, where the first important gold discoveries were made, and had a plan for working them as a whole, in which he wanted to interest capital. Erbsloh's role was confined to the conveying of the information or suggestion, and he appears no more in the narrative. The company did take an interest in the suggestion and it was referred to its consulting engineer, John Hays Hammond, who was at San Francisco at the time, as was also the plaintiff Beatty. Hammond and Beatty consulted together and also conferred with the silent defendant Perry, who had an office in San Francisco and was a mining engineer with much experience in placer mining and apparently some knowledge of the Yukon. An agreement was made under which Perry received $25,000 for examination and prospecting expenses, with the promise of an interest in any property which might be bought on the strength of his recommendation. This, however, was only temporary and was subsequently terminated when the negotiations for the Bonanza Creek properties were begun.

It appears that Treadgold gave the company an option on the property owned by him. He owned 25% of the claims on Bonanza Creek and controlled 25% more. Perry went to the Yukon in June, 1905, and telegraphed back in July that the business could be arranged for $250,000. The company was not willing to advance this without further examination, and Beatty was sent to the Yukon in August. He reported back that besides the Treadgold property, 30% more of Bonanza Creek claims could be secured, besides a large extent of hill ground which could be worked through the creek claims; that $300,000 would be required immediately, with $300,000 later; that he estimated the whole property would return $12,000,000. On the strength of this he was authorized to expend $300,000 in the purchase of claims. The company, however, thought that Treadgold wanted too much, a 40% interest, and was not willing to promise over 30%; moreover, it preferred to close the negotiations with him in New York. About the end of August, Beatty again telegraphed the company, reducing his estimate of return to $9,000,000, receiving in return a despatch saying that "business is not attractive on the basis of money returned and $9,000,000 profit, in view of terms of promoters. Therefore, do not commit us to deal on that basis." The court calls attention to the point that neither in this telegram nor any other put in evidence did the company withdraw its authorization to spend $300,000 to protect the situation. The plaintiff, however, claimed that his understanding was that the last telegram terminated the transaction, and he telegraphed back, "Cannot buy independently."

Here began the series of transactions to which the opinion of the court takes exception. The court says that on Aug. 29, 1905, Beatty and Perry entered into an agreement to buy claims 89 to 104 below discovery on Bonanza Creek, which were outside the Treadgold option. Through their claims the hill ground could be satisfactorily worked. In fact, these claims formed the key to the situation, and could have been secured for the company under the $300,000 authorization. From the evidence it appears that Perry and Beatty discussed them as the basis of a "small dredging scheme." To enable Perry to secure these claims, Beatty caused to be sent by his brother in New York, who was not in any way connected with mining, the sum of $15,000 and later $20,000 additional. These sums, the plaintiff claims, were loans to Perry to enable him to buy the claims as stated.

Later Perry and Treadgold came together again, and the claims 89 to 104 below discovery were placed under option to Treadgold, Perry advancing the money for the purchase, it being agreed that for each $1 advanced he should receive $1 in cash, plus $1 in preferred stock and six-tenths of a share of common stock in any company that might be formed. Plaintiff claims that the managers of the Exploration Co. had notice of these transactions and of his loan to Perry, but the court holds that there was no such notice or information given. Finally Perry and Treadgold came to New York and concluded a deal under which the Exploration Co. took the property concerned, and based on them the Yukon Gold Co. with a capital of $3,000,000 preferred and $5,000,000 common stock; also the Northwest Hydraulic Co., the latter to take over properties which might be acquired in the future, and not appearing in the present action at all. Treadgold received a large amount of stock, but the terms of his contract are not material to the present proceeding. Perry accepted as compensation for his services in examining the property and conducting the negotiations, an engagement as manager for two years at $15,000 a year; 4% of the preferred and common stock of the Yukon Gold Co., with an option of purchasing at cost 4% additional and 2% of the stock of the Northwest Hydraulic Co. It further appears that Treadgold besides the 30% of the stock which he received, was to be paid back what he had spent on the property, and for the claims 89 to 104 on lower Bonanza he did receive $205,000, though the actual cost was $160,000; the $45,000 additional being the profit to Beatty and Perry for advancing the money. This $45,000 he paid over to Perry and it is part of the money which plaintiff sought to recover in the present action.

On the Treadgold agreement the court makes no criticism, nor would the agreement with Perry be questioned if it had been solely for his own benefit. The point now criticized is that by a private agreement Beatty was to receive 1¼% of the Yukon Gold Co.'s stock, Perry retaining 2¾% for himself; while of stock on which an option was given Perry was to take only one-fourth and Beatty the other three-fourths. This private agreement, the court holds, is evidence that the transaction was not known to the company nor made with its consent. If it had been so made, there was no reason why Beatty's compensation should not have been openly expressed. Perry testified that he would have been satisfied with 2¾% of the stock, but asked 4% in order that he might settle with Beatty. It was claimed that John Hays Hammond was informed of the transaction, but the evidence showed that all Mr. Hammond knew of it was that Beatty had loaned Perry money; and even if he did know more, such knowledge did not constitute legal notice to the company. Some illumination is cast on this question by the fact that the plaintiff after accompanying the president and another director to the Yukon in 1906, called attention to the fact that he had advanced money to Perry and thus made it possible to put through the transaction and asked that in return he be given an option to buy 180 shares of Guggenheim Exploration stock at $200 per share. As the stock was then selling at about $310, this was equivalent to a present of $20,000. After some objection the request was granted. "It is inconceivable," says the judge, that this would have been granted if he had disclosed to the company the great profit he had made out of the Yukon deal.

The court goes at considerable length into the law governing the relation of principals and agents and finds no deviation from the absolute rule that the agent is stopped from acquiring for himself any interest in the property which he is directed to purchase for his principal, or from seeking any profit in the transaction beyond the salary or commission due him by agreement with the principal.

This rule is held so strictly that no inquiry is permitted into the fairness of the purchase or the terms on which it is made. Moreover, if the liability of the trustee or agent depends upon disclosure of his transactions, such disclosure must be made in full, and it is not sufficient for the trustee or agent to say that he had given sufficient information to put the principal upon inquiry. There is no question of the fact that the plaintiff went to the Yukon as an agent for the company, by its direction and in its employ; and no question that as agent he had been liberally treated, though that does not affect the decision in the case.

The opinion of the court, in conclusion, sums up the reasons for its decision against the plaintiff as follows:

"The Guggenheim Exploration Co. has never, with full knowledge of all the facts of the transaction, waived any rights that it has. The plaintiff, who was sent to the Yukon in order to negotiate for the Guggenheim Exploration Co. with reference to the purchase of certain claims, had no right, under the circumstances of this case, to become interested himself in the purchase of these claims or of any of them, and the Guggenheim Exploration Co. cannot be required to pay over to the plaintiff any part of the stock or money claimed in this action, which stock or money is profit made by the plaintiff out of the purchase of these claims by himself in partnership with Perry, because of the fact that he, the agent of the defendant company and acting in a fiduciary capacity for it, was sent to the Yukon for the purpose of negotiating for the purchase of these claims."

If Justice Gerard's deductions are correct—and the decision seems to be carefully worked out—the plaintiff seems to have allowed the hope of large and immediate profit to overbalance all other considerations. Or, perhaps, the "lure of the Yukon," about which the poets and novelists have written, was strong enough to overbalance his judgment.

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## Ojibway, the New Town of the Steel Corporation

Ojibway, the site of the big new plant of the United States Steel Corporation, on the Detroit River, just below Sandwich, was officially born on Dominion Day, July 1, when it joined with the rest of Canada in celebrating the federation of the various provinces which make up the Dominion. A cottage has been dignified with the title "Town Hall," and on Tuesday a new Union Jack was floated from a high pole in front of the hall, rented from the Steel Corporation as the temporary seat of government. There Mayor Wollatt and the four councilmen held a public reception. A number of visitors from Detroit, as well as from Windsor, Walkerville and other Essex County towns, participated in the celebration. Ojibway consists of 1650 acres and the mayor extended the "freedom of the city" to the visitors. At its first meeting, the council will plan sewers and drainage and other improvements, to include a fine harbor on the most modern lines. The population of the town is now about 1500, mostly farmers.

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## New England vs. Mining Investments

Hayden, Stone & Co., possibly inspired by a recent article in the JOURNAL, has published in its weekly bulletin the remark that the argument has frequently been advanced that New England investors should invest their money at home instead of seeking Western mining enterprises. Capital, however, is influenced not by sentimental considerations, but by the dividend return which it can obtain, and in the past year or two the shareholders in some of the Western mining companies have fared better than the shareholders in what were formerly considered some of New England's soundest investment corporations, as appears in the following table, showing the changes of the past year, in the rate of dividend payments made by some of the leading home industries and mines in which New England capital has been interested:

| New England investments: | Dividend Reductions | Net Loss to Shareholders |
|---|---|---|
| Boston & Maine | 4% passed | $1,580,120 |
| New Haven | 8% to 6% | 3,600,264 |
| Arlington Mills | 8% to 4% | 320,000 |
| Draper Co | 20% to 12% | 480,000 |
| New England Cotton Yarn (com) | 7½% passed | 292,500 |
| Total |  | 6,272,884 |

| Mining investments: | Dividend Increases | Net Gain to Shareholders |
|---|---|---|
| Calumet & Arizona | $4 to $5 | $599,383 |
| Chino | Began $3 | 2,507,400 |
| Homestake | 6% to 7 8%* | 452,088 |
| Nevada Consolidated | 50c extra Dec., 1912 | 1,000,000 |
| Ray Consolidated | Began $1 50 | 2,174,652 |
| Total | ........... | 6,733,523 |

*Also paid 15% stock dividend

"Moreover, it is noticeable that every one of these New England companies has been subjected to either legislative and public hostility, or the fear of tariff revision. The mines have no occasion to dread any reduction in the tariff, as there is no duty on copper or gold, their income is not limited by the rulings of any government commission, as the market for their product is entirely open and competitive, and there is practically no danger of any suit being entered for dissolution under the Sherman law. Is it any wonder that harassed capital is finding the shares of the well managed Western mines more and more attractive as investments?"

In these remarks we concur. It may be pointed out that the mining dividends ought not to be figured wholly as income, but partly as return of principal. However, the present trouble of the Boston & Maine railway results from previous distribution of principal in dividends, and after all there may not be so much difference in that respect among mines, and railways and cotton mills as is commonly thought.

## PERSONALS

Robert J. Kerr, of New York, has sailed for England for a short trip.

Philip L. Foster has returned to New York from a short trip to Colorado.

W. A. R. Brockway, operating in the Helvetia district in Arizona, has gone to Los Angeles.

Fredrico Stallforth, of the House of Stallforth at Parral, Chihuahua, Mexico, is in New York.

Bulkeley Wells, of Telluride, will make a trip abroad for recreation before returning to Colorado.

J. E. White, of the Yucca Mining Co., has returned to the mines in Arizona after a visit to Los Angeles.

Kirby Thomas, of New York, will be in Ontario during July on examinations in the Sudbury and Cobalt districts.

C. Ivan Murray has accepted a position as metallurgical engineer with the Pittsburgh Electric Furnace Co., Pittsburgh.

F. G. Clapp, managing geologist of the Associated Geological Engineers, sailed for Europe on June 24 for professional work in Hungary.

C. B. White is superintendent of the Idaho-Alamo Mines at Three Forks, B. C. These mines are owned by John A. Finch and associates of Spokane.

Sir Starr Jameson has been elected to the presidency of the British South Africa Co., rendered vacant by the death of the late Duke of Abercorn.

H. H. Armstead, president, Mexican United Co., sailed from New York for Vera Cruz, July 10, to make an inspection of the company's property in Guanajuato, Jalisco and Tepic, Mexico.

T. Walter Beam recently returned to Denver, Colo., from the Similkameen district, B. C. He is prospecting with the diamond drill a group of mineral claims in Hedley camp, Similkameen.

Chas. A. Banks, manager for the Jewel & Denero Mines, Ltd., operating a gold mine and stamp-mill in Long Lake Camp, Boundary District of British Columbia, has returned from a visit to England.

F. Z. Nedden, of London, England, has been appointed engineer in charge of the centrifugal pump department of the Goulds Manufacturing Co., Seneca Falls, N. Y. He has had much experience in Europe.

James Finlay, for several years actively connected with the management of the Sullivan mine and smelting works in East Kootenay, B. C., is now manager of the Maple Leaf coal mine, near Frank, Southwest Alberta.

A. L. Gatsinger, of New York, is spending some time on the property of the Dividend-Lakeview Consolidated Gold Mining Co., Ltd., on Dividend Mountain, Osoyoos mining division, British Columbia, in which property he is interested.

H. F. Wierum has gone to Coram, Calif., to make preparations for the trial of the Hall process at the Balaklala works, but the beginning of actual tests will have to be deferred until a suitable gas producer for making gas from oil can be installed.

Albert I. Goodell, formerly manager of the copper smelting works at Boundary Falls, B. C., and afterward of the Le Roi Mining Co.'s smeltery at Northport, Washington, is now manager for the Idaho-Continental Mining Co. He represents the Ryan interests.

## OBITUARY

Charles F. Hoffmann, who died at his home in Oakland, Calif., June 20, was one of the older generation whose work was perhaps less well known to younger men than it deserved. Born at Frankfort-on-the-Main in 1838, he was one of the pioneer engineers of the Pacific coast, and in particular he was a large factor in laying the foundation of American supremacy in topographic surveying. Trained at Freiberg, he obtained his first practical experience as topographer of the Lander's expedition and J. D. Whitney found him in California, 24 years of age and eager for a new task, when the California Geological Survey was organized. As a member of its staff he was associated with Whitney, King, Brewer, Ashburner, Gabb, and others whose names are now well known. Whitney ranked Hoffmann with Brewer as the best of his staff, and he placed in his hands all the topographic and cadastral work of the survey. As a result, Hoffmann was the engineer who developed the methods that have proved of such wide usefulness. He was able to reconcile the accuracy of engineering to the conditions under which geologists must work, and combined a well controlled base with sketched detail. After the disbanding of the California survey corps, Hoffmann spent two years as a professor at Harvard and then turned to mining, and he was for many years associated especially with gravel mining in California. He examined and reported on many of the more important properties of the Pacific Coast from Alaska to Mexico and also made pioneer studies in Siberia and the Argentine. Later he engaged in actual operation. For years he was engineer and manager at the Red Point mine in Calaveras county, long the largest drift mine in the state. His four sons, George, Jack, Karl, and Ross, have all followed him in the profession and in South Africa, Mexico, and Siberia, as well as in North America.

William Penn Miller, who died June 14 in San Francisco after a lingering illness, was one of the most widely known mining engineers of the Pacific Coast. Born in Philadelphia in 1837, he obtained his engineer's degree from the Polytechnic College of Pennsylvania in 1856, and he engaged for a few years in the anthracite coal fields of Pennsylvania, where his father was a pioneer operator. In 1861 he went to California and entered upon a career which carried him into every mining district of note throughout the Pacific Coast. In the early days of the Central Pacific railroad, Mr. Miller became connected with that enterprise as contracting engineer and division superintendent. In 1871 he went to Arizona, where, after considerable success with various mines he discovered and developed the rich lead-silver mines of Castle Dome, which he operated successfully until, in 1880, associated with the late William P. Blake, he organized a company in New York to take over the mines and establish a smelting and refining plant at Melrose, Calif., of which plant he was manager during the life of the company. During Mr. Miller's individual operation of the Arizona properties he established, about 1874, a small smelting furnace at San Francisco. During his experience with Castle Dome ores, Mr. Miller developed and put into successful use the present form of inverted siphon for connecting furnace crucible and outer lead-well. The past 25 years of Mr. Miller's life, previous to his illness, were devoted to active work as examining and consulting engineer in various fields of mining and metallurgy, during the course of which work he added largely to the general store of knowledge of mining geology and vein formation, and the treatment of ores. In 1891, during the infancy of the cyanide process, appreciating its possibilities as a means for recovering gold and silver from the slimes, after exhaustive laboratory work and experimenting, he was granted patents covering the application of agitation and filtration to slime treatment. Owing to lack of economically operated filtering appliances, such as have since been evolved, he was unable at that time to put his invention into practical operation.

## SOCIETIES

**Kansas State School of Mines and Metallurgy**—A number of students from this school accompanied by Superintendent B. L. Wolfe, Profs. E. C. O'Keeffe and A. W. Young, inspected the mines, smelteries and mills in the mining district around Joplin, Mo., and in southeastern Kansas, during the first week in July.

**Utah Society of Engineers**—The regular monthly meeting, usually held in Salt Lake City, took place June 21, out of town in Ogden cañon, at the Hermitage, a summer inn. A paper on "Electric Traction" was read by C. P. Kahler, electrical engineer for the Oregon Short Line. Following the reading of the paper, dinner was served to the members and their families.

**Lake Superior Mining Institute**—Secretary A. J. Yungbluth has announced that the meeting this year will take place on the Mesabi range on Aug. 26-30. The arrangements are now being made by the general committee at Duluth and the program will be announced soon. A report will probably be made by the committee on "Mining Methods on the Mesabi Range" appointed by the president of the institute in the past year. It consists of Willard Bayliss, Chisholm; E. D. McNeil, Virginia, and J. S. Lutes, Biwabik.

## TRADE CATALOGS

Myers-Whaley Co., Knoxville, Tenn. Bulletin No. 3-1913. Shoveling machines. Illus., 26 pp., 10½x8½ in.

Green Fuel Economizer Co., Matteawan, N. Y. Folder. Conical-flow fans. Illustrated.

The Gardner Governor Co., Quincy, Ill. Duplex power pumps. Illustrated, 8 pages, 6x9 in.

Detroit Lubricator Co., Detroit, Mich. Catalog No. 36L. Locomotive lubricators. Ills., 56 pp., 5x8 in.

Henry R. Worthington, 115 Broadway, New York. Bulletin No. 202. Volute centrifugal pumps. Ills., 62 pp., 6x9 in.

Sprague Electric Co., 527-531 W. 34th St., New York. Catalog No. 521. Flexible steel-armored hose. Ills., 16 pp., 5½x7½ in.

The Goulds Mfg. Co., Seneca Falls, N. Y. Bulletin No. 115. Horizontal double-acting plunger pumps. Illustrated, 8 pages, 8x10 in.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 127. Pneumatic drills, reamers, wood borers, etc. Illus., 40 pp., 6x9 in.

The Baldwin Locomotive Works, Philadelphia, Penn. Record No. 75. Mikado type locomotives. Illustrated, 40 pages, 6x9 in.

A. S. Cameron Steam Pump Works, 11 Broadway, New York. Bulletin No. 150. Centrifugal pumps. Illustrated, 16 pages, 6x9 in.

Ideal Case-Hardening Compound Co., 1784 Broadway, N. Y. Pamphlet. Case-Hardening and Heat-Treating of Steel. 38 pages, 6x9 in.

The Yale & Towne Manufacturing Co., 9 East Fortieth St., New York. Catalog No. 12 D. Chain Blocks, Electric Hoists, Trolleys and Cranes. Illus. 32 pp., 5¼x3½ in.

Smooth-On Manufacturing Co., 572-74 Communipaw Ave., Jersey City, N. J. Pamphlet. Extracts from Smooth-On Instruction Book No. 12. Illustrated, 16 pages, 3½x6 in.

Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill. Bulletin No. 34. Illustrated; 48 pages, 6x9 in. This bulletin treats particularly of general engineering information of value to users of compressed air. It contains tables giving efficiencies of air compression at different altitudes, density of gases and vapors, mean effective pressures and horsepowers, loss of pressure due to friction in pipes, also information for intending purchasers, showing the data required for intelligent estimates. Various types of compressors are illustrated.

Eimer & Amend, New York. Catalog C. Chemical and Assay Laboratory Supplies. Illus.; 483 pp., 8x11 in.

The recently issued catalog of Eimer & Amend may be considered an indispensable treatise to the chemist and physicist. The practitioner should look this book over simply to see what is being done in the manufacture of various forms of specialized apparatus, with the chances strongly in favor of his discovering something not in his stock which he cannot get along without. The book is not the mere trade catalog of commerce, it is an addition to the scientist's library.

Baldwin Locomotive Works, Philadelphia, Penn. Record No. 73. Recent development of the locomotive. Illus., 54 pp., 6x9 in. Record No. 74. Gasoline locomotives. Illus., 24 pp., 6x9 in.

In the second of the above publications, is taken up the question of the adaptability of the gasoline locomotives for industrial purposes. The locomotives are built under patents granted to A. H. Ehle and combine automobile practice with [illegible]-locomotive design. They are said to be suitable for work [illegible] mines and are safe, efficient and clean. Their availability, of course, is largely determined by the relative cost of [illegible] and electric or other power. The principle on which they operate embodies a central longitudinal shaft transmitting power from a four-cylinder vertical engine to transverse [illegible] connected to the drivers and having a suitable arrangement of gear ratios and clutches to give two different [illegible] either direction. The arrangement is such that for forward motion, the two drivers on one side are employed and for [illegible]ward motion, the other two. The fuel consumption [illegible] normal or rated load is stated to be about [illegible] gal. of [illegible] hp.-hr. The locomotives are built in [illegible] 5-, 7- and 9-[illegible] sizes, ranging in horsepower from 25 to 65 and in drawbar pull from 750 to [illegible] pounds.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ALLOYS—Process of Manufacturing Alloys. Ludwig Weiss, Berlin-Charlottenburg, Germany. (U. S. No. 1,065,855; June 24, 1913.)

SLIME CONCENTRATORS—Improvements in Slime Concentrators. W. F. Deister, Fort Wayne, Ind. (Brit. No. 18,626 of 1912.)

BLAST FURNACE. C. Hicks, Hellertown, Penn. (Brit. No. 15,685 of 1912.)

BLAST FURNACES—Improvements in or Relating to Blast Furnaces. R. Kunz, Georgsmarienhutte, Germany. (Brit. No. 26,806 of 1912.)

EXTRACTION—Process of Extracting Iron and Steel. A. Hiorth, Christiana, Norway. (Brit. No. 16,275 of 1912.)

FURNACE TOP. Frank C. Roberts, Wynnewood, and Albert Broden, Reading, Penn. (U. S. No. 1,066,225; July 1, 1913.)

MANGANESE-STEEL CASTING and Process of Producing the Same. Edgar A. Custer, Philadelphia, Penn. (U. S. No. 1,066,258; July 1, 1913.)

PUDDLING FURNACES—Improvements in Puddling Furnaces. F. J. Millard and R. J. Hadlington, West Bromwich, Eng. (Brit. No. 22,073 of 1912.)

TIN—Improvements in or Relating to the Extraction of Tin from Ores or Slags. W. E. Gibbs, Birkenhead, Eng. (Brit. No. 11,643 of 1912.)

ZINC—Improvements in and Relating to the Extraction of Zinc or Precious Metals from Their Ores. T. Dobbie, Selukwe, S. Afr. (Brit. No. 11,244 of 1912.)

ZINC FURNACES—A Device for Mechanically Discharging Metallurgical Furnaces, particularly Zinc Muffle Furnaces. F. Meguin & Co., A. G., Dillingen-Saar, Germany. (Brit. No. 494 of 1913.)

CAR UNLOADING—System for Unloading Cars Into Vessels. George H. Hulett, Cleveland, Ohio, assignor to the Wellman-Seaver-Morgan Co., Cleveland, Ohio. (U. S. No. 1,066,015; July 1, 1913.)

DUMPING CAR. Ernest H. Schur, Hibbing, Minn. (U. S. No. 1,066,156; July 1, 1913.)

EXCAVATING MACHINE. George W. King, Charles B. King and Benjamin Jacoby, Marion, Ohio, assignors to the Marion Steam Shovel Co., Marion, Ohio. (U. S. No. 1,066,286; July 1, 1913.)

FLUME—Trough or Open Flume. William Lennon, Manitou, Colo. (U. S. No. 13,586, reissue; June 24, 1913.)

FLUME GATE. Lorentz Ritzman, Canon City, Colo. (U. S. No. 1,065,839, June 24, 1913.)

FLUME GATE. Minnie Bedorie Andersen and Martin Andersen, Redlands, Calif. (U. S. 1,065,494; June 24, 1913.)

MINE-CAR WHEELS, Roller-Bearing for. Franklin C. Hockensmith, Pittsburgh, Penn., assignor to Hockensmith Wheel & Mine Car Co., Penn Station, Penn. (U. S. No. 1,066,276; July 1, 1913.)

SEALING SHAFTS, Tunnels and the Like, Method for. Ralph G. Johnson, Pittsburgh, Penn. (U. S. No. 1,065,369; June 24, 1913.)

TUNNEL CONSTRUCTION. Frank Bradley, New York, N. Y. (U. S. No. 1,065,502; June 24, 1913.)

CRUSHER. William H. Lieber, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,065,535; June 24, 1913.)

CRUSHING—Ball Mill. Charles Lewis Carman, Riverside, Calif. (U. S. No. 1,066,077; July 1, 1913.)

CRUSHING ROLLS. Richard Bernhard, Milwaukee, Wis., assignor to Power & Mining Machinery Co., New York, N. Y. (U. S. No. 1,065,998; July 1, 1913.)

WASHING, ETC.—Improved Apparatus for Washing, Grading and Concentrating Ores, Minerals and the Like. G. Michel, Paris, France. (Brit. No. 29,617 of 1912.)

ALLOY—Lead-Copper Alloy. Edward D. Gleason, New York, N. Y., assignor, by mesne assignments, to Plastic Metal Co., Inc., Brooklyn, N. Y. (U. S. No. 1,066,403; July 1, 1913.)

CLAD METALS—Process of Producing Clad Metals Having a Ferrous Base. William Marshall Page, Philadelphia, Penn. (U. S. No. 1,066,312, July 1, 1913.)

CRUCIBLE FURNACES—Improvements in or Relating to Crucible Furnaces. F. Hundt, Gesweid b Seigen, Germany. (Brit. No. 4908 of 1913.)

FURNACE GASES—Apparatus for Treating Furnace Gases and Preparing Fuel. Burdett Loomis, Hartford, Conn., assignor to Loomis Utilization Co. (U. S. No. 1,066,296; July 1, 1913.)

FURNACES—Improvements in Connection with Furnaces for Melting and Alloying Metals in Vacuo. W. S. Simpsom, London, Eng. (Brit. No. 12,067 of 1912.)

ROASTING—Improvements in or Relating to Stirring or Agitating Devices for Use in Roasting Furnaces and the Like. M. Van Marcke de Lummen, Cologne, Germany. (Brit. No. 13,551 of 1912.)

ROASTING—Improvements in or Relating to a Process of and Apparatus for Roasting Ores and the Like. E. Bracq, Lens (Pas de Calais), France. (Brit. No. 20,108 of 1912.)

ROASTING—Furnace for Roasting Ores. John B. F. Herreshoff, New York, N. Y., assignor to Nichols Copper Co., New York, N. Y. (U. S. No. 1,066,110; July 1, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—July 2

**Eldorado County Needs Boosting,** in the opinion of a San Francisco engineer who has recently visited the district. He recommends that public interest in the mining industry of the county be increased by establishing a mining bureau and making a display of the mineral products in connection with the board of trade. He not only recommends the boosting of the mineral industry, but of the fruit-growing advantages of the region as well. Until one has visited this county, and gone underground in many of the mines, he is not apt to appreciate how much work is actually being done. Two mills are running regularly, the one at the Poverty Point mine is dropping 15 stamps and the Ajusta below El Dorado, 10 stamps. The comment is made, that there has been a tendency to spend too much money above ground, and not in developing enough ore to assure the profitable working of a large mill. Near Fairplay, hydraulic mining is soon to be resumed in the Slug Gulch property. It will be necessary to build a retaining dam to impound the tailings, but there is a splendid site for such a dam. A revival of placer mining is expected to follow the resumption of mining at this property. The company owns riparian rights which assures a bountiful supply of water at all seasons, but probably the present dam on the river will be enlarged. Prospecting work on the Livingstone mine next to the Slug Gulch property is being done by R. B. Pate, who holds a lease on the property. The Edner mine, above Fairplay, is being reopened. Development work is in progress at the Martin mine, near Grizzly Flat, and to the southwest of the Mount Pleasant, and also on the Mount Pleasant. At the Poverty Point mine, the 15-stamp mill is in continuous operation; a large crew of men is employed, and four drifts and a raise are being driven. The ore is run out in cars and dumped into a long chute which carries it down to the bins just above the mill. An aërial tramway is used to carry the concentrates to the top of the hill for shipment. Shortage of water is hampering operations at the Fort Jim mine above Smiths Flat. A peculiar feature of this mine is that no water has yet been encountered in the gravel. Dr. J. W. Hyatt, who is in charge of operations, expects to drive a long tunnel on the Sunshine property to intersect the main channel, this summer. There is much activity in the district south of El Dorado. O. A. Ingram is operating the 10-stamp mill on his property, the Ajusta, and is working in good ore. Near-by the Hill Brothers are installing a gasoline engine and air compressor for operating drills. This will facilitate work greatly. Grant Busick, on the Hillside, has done a great deal of development work in the last year, more than 1000 ft. of tunnels and crosscuts having been driven to cut the orebody. There is a 5-stamp mill in operation, which has been crushing the ore taken out in development work. It is expected that the company will install a modern mill, probably using rolls as the ore is easily crushed. The Union property has been recently examined by a San Francisco engineer. In Placerville, mutual harmony seems to be lacking to such an extent as to be positively detrimental to the progress of the mining industry of that district.

### DENVER—July 5

**Investigation of the Smelting Trust** has been the subject of many rumors and it has been reported for some time that the Attorney General at Washington would take some action in the matter. One of his staff is now in Colorado with the object of ascertaining the facts in the relation of the American Smelting & Refining Co. to the producing mines. He will interview competitors in the ore fields and the main facts will doubtless be brought out.

**Gold-Bearing Coal** is said to exist in Montrose County. The story comes from Delta and is to the effect that a gold-coal mine has been found in the Grand Mesa just north of the town. The owner of the coal seam, which is called the "Rollins Mine," claims to have been taking samples for two months, and that the assays show from $8 to $11 per ton in free-milling gold, also that ashes from the boiler furnace were panned and showed a string of colors. It is quite possible that the gravels, clays and shales of the Grand Mesa, in which this coal seam lies, contain gold, but the coal story will be still more interesting when corroborated by expert sampling, which is about to be done.

**Claim Grabbing at Platoro,** the recently revived old gold district in southwestern Colorado, has begun as was to be expected, for those enterprising people known as "claim hogs" are at work with their location stakes, says the state commissioner of mines. They are taking from 30 to 80 claims each, not to work them, but to sell them before the 60 days expires in which they must commence the work of proving up their locations. Unfortunately there is no law to prevent a man staking as many claims as he can work, but there is an unwritten law which will probably be invoked as it used to be in the early days, when claim grabbers were simply run out of camp. These men do no digging on their claims, and they work great hardship on the real prospector who begins to develop just as soon as he has stuck his stakes and recorded.

### SALT LAKE CITY—July 3

**Silver King Coalition Mines Co.** has made two payments, together amounting to $450,000 on the judgment awarded the Silver King Consolidated for ore taken from jointly owned ground. The total amount of the judgment, with interest, is $905,000, and the $455,000 remaining must be paid on or before July 15. The suit for trespass recently filed against the Silver King Coalition Mines Co. by the Silver King Consolidated has been dropped, as a recent survey of the Coalition workings has failed to disclose trespass.

**The Oquirrh Tunnel Has Been Completed.** This is a drain and transportation tunnel, which was driven by the Utah Metal Mining Co. through the Oquirrh range, to connect Bingham and Tooele. It is 11,478 ft. long, and is exceeded in length only by one other similar work in the state, the Ontario drain tunnel at Park City, which is 3½ miles long. The present company took over the work from the Bingham Metal Co., when the tunnel was about 2000 ft. long, and in the last three years has completed the project at the rate of over 3000 ft. yearly, working from both ends a part of the time. The company is financed by Boston men, and operations are under the direction of E. P. Jennings, of this city, consulting engineer and president of the company. Water amounting to 800,000 gal. daily has been developed. This will furnish more than ample power to drive the cars used in transportation and to carry on development work. The surplus will be used by other companies. In the progress of the work, six or eight ore-bearing fissures, some of them as much as 5 ft. in width, were opened, and development on these will begin immediately.

### BUTTE—July 1

**Railroad Electrification** of the Butte end of the Butte, Anaconda & Pacific line, is being completed with all possible speed, and it is expected that trains will be running under the new power within a few weeks. There are about seven miles of line around the Butte mines of the Anaconda Copper Mining Co. and these lines will be equipped with alternating current, automatic block signals, the Union Switch & Signal Co. having taken the contract to install the system. Similar signals are being used on the lines of the Illinois Traction Co.

### HOUGHTON—July 4

**Exploration at the Wolverine** will not be continued for the present, although the management is by no means satisfied that the Osceola lode is without commercial value. Just now all energies are being concentrated in the extraction of the copper rock on the main Kearsarge lode. It might be stated, however, that the Wolverine has, in several places, opened the foot-wall lode and found it carrying copper in fairly good amount, although in none of these instances has the grade been as high as in the similar openings in the South Kearsarge branch of the Osceola mine where the foot-wall openings have been in rich rock.

### ISHPEMING—July 5

**The Tax Commission** of the state of Michigan has had several geologists, working under the direction of R. C. Allen, state geologist, inspecting the iron mines of the upper peninsula with a view of placing new valuations on most of the properties. There has been a great deal of dissatisfaction all through the region since James R. Finlay made his appraisals a few years ago. Many of the companies have paid their taxes under protest and several suits have been brought, but the companies lost every case in the lower courts and have taken appeals to the state supreme court. Mr. Allen and his crew have completed their work in Gogebic, Dickinson and Iron Counties and have just started work on the Marquette range and it will be at least a month before they are through. They have received figures from the companies as to their operations during the last five years, Mr. Allen stating that the operators have met him more than half way. He has made personal examinations of all of the mines and should be able to present reliable figures to the tax commission.

### MARQUETTE—July 2

**Expense of Spanning the Chapin "Cave,"** on the Menominee range is increasing steadily. Railway tracks and a public highway are maintained over this cave. Filling is necessary because, as the ore beneath is taken out, the surface drops away, and there has already been created a pit of immense proportions. This spring the Chicago, Milwaukee & St. Paul R.R. alone was engaged in track-filling work for 50 days. During that time fully 100,000 cu.yd. of gravel were dumped. The Chicago & Northwestern likewise is compelled to do much filling, while the Steel Corporation, operator of the mine through its subsidiary, the Oliver company, has men and teams engaged the year round in maintaining the grade of Stephenson Ave. The ground dropped much faster this spring than ever before. In fact, the filling operations seem endless and are becoming more burdensome. The end will be reached only when the Steel Corporation suspends mining work, which will be a long time in the future. The cost of filling to date has run well into the hundreds of thousands of dollars, sufficient to build several substantial bridges.

### DULUTH—July 3

**Work on the New Steel Oredock** for the Duluth, Missabe & Northern Ry., in Duluth, is progressing favorably. The foundation is composed of concrete, and the work is sufficiently advanced to permit beginning the work of erecting the steel superstructure. The steel for the great oredock is being furnished by the American Bridge Co. This new concrete and steel dock will be the largest ore-shipping dock in the world and will cost about $2,700,000.

**Reports from the Cuyuna Range** are to the effect that two drill holes on the property of the Mesabi-Cuyuna Iron Co. have gone through greenstone into ore. The two holes are 250 ft. apart, and in each case, after going through about 200 ft. of ore the drill went through from 12 to 15 ft. of greenstone and into ore again. Greenstone is usually the signal to stop drilling, and the reason the first drill hole was put through that rock was due to the crew having received no definite order to stop, and the second was put down for general information. Whether this greenstone, which is underlaid with iron ore is a horse, or intrusion, with the ore extending back under it, or whether there actually is ore under the main mass of the greenstone remains for further development to establish.

### ROCHESTER—July 1

**A Geological Examination of Rochester** has been made by F. C. Schrader, of the U. S. Geological Survey, and is interesting from the fact that this department of the Government sent a representative there within almost six months of the discovery of the camp. The ores are chiefly silver bearing, but also carry gold, which in some of the ore amounts to 50% of the value. The ores were apparently deposited from solutions. The strike in Nenzel Hill was made late in November, 1912, and the shipment of a few carloads of high-grade ore by Joseph Nenzel, Frank Schick and Walter Moynaugh about Christmas started the Rochester boom. In less than a month the hitherto desolate cañon had a reported population of 3000 and contained many substantial two-story frame buildings. Leases on blocks 300x600 ft. in area were taken and were operated by experienced mining men, with the result that to date the development of the mines and the showings of ore are remarkable. Six or eight leases are opened to a depth of 130 ft. by crosscut tunnels from 100 to 300 ft. in length. About 2000 tons of ore averaging $30 per ton has been mined and shipped, and it is said that 100,000 tons of ore are in sight. Nearly a score of properties are producing. The Rochester district lies mainly on the eastern slope of the Humboldt mountains, between 4000 and 8400 ft. in elevation, [illegible] area about six miles long by five miles wide, [illegible] the Survey will probably later publish a report accompanied by a geologic and topographic map. The district is easy of access, being 10 miles east of Nixon, formerly Oreana, the [illegible] station and ore-shipping point on the main line of the Southern Pacific R.R., and 25 miles northeast of Lovelock. With both of these places it has daily freight, express, passenger, mail and auto service and telephone connections.

The country is mountainous but not rugged. The ravines are open and most of them are passable for team and wagon. Nenzel Hill, in which lie the orebodies from which the present production is chiefly derived, is situated in the eastern portion of the district and forms a part of the crest of the range between the head of Rochester cañon on the west and South American cañon on the east. It is a northeastward-trending oval part of the ridge about 3000 ft. long by 2000 ft. wide and rises to 7300 ft. in elevation, or about 500 ft. above the adjoining portions of the divide. In Nenzel Hill the veins, 10 or more in number, range from 100 to 3700 ft. in length and some apparently have a vertical range of at least 400 ft. The west vein or lode, now being worked chiefly on the Codd lease and the Platt lease, is about 32 ft. in width and contains two veins, seven to eight feet wide, of good ore composed chiefly of alternating layers of quartz and silicified rhyolite. The workings on these veins have been continuously in ore.

Lincoln Hill, which also contains producing properties and received much attention last winter, is a prominent landmark in the western part of the district, 2½ miles distant from Nenzel Hill, on the north side of Rochester cañon, above which it rises 1200 ft. or to 6600 above the sea. Packard Hill, the seat of the new "strike," is in the southern part of the district, at an elevation of about 5800 ft. in the lower part of a broad ridge, and on the trend of the Nenzel Hill zone of mineralization. The ore deposits of the district are chiefly quartz replacement veins in fissures and shear zones in rhyolite and rhyolitic rocks which are of great thickness. The rocks range from felsitic to coarsely prophyritic. They are more or less silicified, devitrified and sericitized, and were referred by the geologists of the fortieth parallel survey to the Triassic period. The rocks dip about 35°. east, but the veins dip 60° west and are approximately conformable with the dominant sheeting and shear structure of the country rock. The principal camp is East Rochester, with a population of 700, situated at an elevation of 6200 ft. in the head of Rochester cañon, at the foot of Nenzel Hill, where about 200 miners are at work. Rochester or "lower town," two miles down the cañon at the foot of Lincoln Hill, has a population of 250, and Packard, the newest settlement, but a few weeks old, at the south base of Packard Hill, has a population of about 100, which is daily increasing. Panama, on the northeast near Spring Valley pass, in the head of Limerick cañon, has about a score of people.

### FAIRBANKS—June 15

**The Output of Fairbanks** from lode mining in 1912 is given by the banks as $200,000. The year of 1913 should witness a considerable increase. There are now in the camp 14 mills ranging in size from two to ten stamps, and it is likely that several more will be built during the summer. Of these 14 mills, however, only three are being operated with any degree of regularity, although it is hoped that several more will get under way soon. The Rhoads-Hall mine has made the best showing during the winter. Spalding, lessee on the property of the Reliance Mining Co. on Dome Creek, has done well, as have Crites & Feldman, on Fairbanks Creek. Other mines that have shown encouraging results are the properties of the Chatham Mining Co. and the Pioneer Mining Co., both on Chatham Creek, and the Rainbow mine on Skoogy Gulch. As a whole, however, the outlook for quartz mining is not as favorable as it was a year ago. All of the mines so far have proved rather disappointing in depth, but this may be only a temporary setback.

### JENA, GERMANY—June 23

**Decision in the German Oil Controversy** is the one sensational event that has transpired in the commercial world lately. The judgment of the supreme court of the empire in the case of the German Standard Oil Co. (D. A. P. G.) against the European Petroleum Union controlled by the "Deutsche Bank," is adverse to the former. The supreme court has ruled that the contract between the two concerns which was made in London, in the English language, is null and void as it violates the rules of "business morals." The action of the Deutsche Bank in breaking the contract has thus been vindicated. The decision of the court has, however, no bearing upon the proposed illuminating oil monopoly pending before the German parliament. A good many chambers of commerce and other influential bodies of western Germany have passed resolutions opposing the monopoly and memorialized the secretary of the imperial treasury to withdraw the bill. The secretary has, however, declined to interfere. The bill is expected to come up in parliament for discussion in the autumn session.

# THE MINING NEWS

The items in this department are classified by states and counties. Whenever it can be done conveniently the post office address of each company or mine that is mentioned is given in parentheses immediately after the name of the mine or company.

## ALASKA

AN INTERESTING DECISION was rendered recently in the U. S. circuit court of appeals for the ninth district, in the case of Jesse Noble, Ben Noble and Luther C. Hess, vs. Algot Gustafson, in which it was ruled that laborers helping to repair ditches on a claim have no lien on the dump.

THE FIRST SHIPMENT OF BERING RIVER COAL to be mined by the United States Government party was received at salt water at Katalla, June 26; the shipment weighed 2½ tons and was brought down the river in a small boat. A total of 700 tons of this coal is to be taken out for a test in the cruiser "Maryland."

REPEAL OF THE ROAD TAX law has worked a hardship upon those who are compelled to travel the roads of the Fairbanks district. The objectionable tax was removed at a time when there was urgent need of repair work, and, though the local offices have stretched available funds to the utmost, the unpreparedness of the road commission to take up the work has left the district in a sorry plight.

BESSIE BENCH (Nome)—A large dredge is being placed on this property, which has yielded well in the past.

ALASKA TREADWELL (Douglas)—In May, 71,512 tons of ore were crushed, the yield being $190,072, or $2.68 per ton, and the profit $96,389.

ALASKA MEXICAN (Douglas)—May profits are estimated at $28,280, 20,286 tons of ore having been crushed from which $54,052 or $2.69 per ton was recovered.

ALASKA UNITED (Douglas)—The Ready Bullion mill crushed 17,934 tons of ore in May, $36,419 worth of bullion and concentrates being recovered at an estimated profit of $8343. The ore yielded $2.03 per ton. In the 700-Ft. Claim mill 18,738 tons ore yielded $2.64 per ton, a total of $48,034, $16,498 being estimated as profit.

MACGILLIVRAY & TREML (Fairbanks)—Colon MacGillivray and Joseph Treml, lessees on the Wild Rose claim on the right limit of Dome Creek, have found ore wherever they have uncovered the vein by trenching. A working shaft has been started, for which timbers sufficient for 50 ft. have been landed on the claim.

HUDSON BROS. (Fairbanks)—The two-stamp Nissen mill recently completed the crushing of a shipment of 60 tons of ore from this mine, on the divide, between Ready Bullion and Moose Creeks, tributaries of Ester Creek. The mill is no claim No. 7, Above, Ester. The cleanup showed the ore to average between $35 and $40 per ton. Considerable ore has been blocked out, and it is thought that no difficulty will be experienced in keeping the mill supplied during the summer.

## ARIZONA

### Cochise County

GREAT WESTERN COPPER CO. (Courtland)—This company recently purchased the old Mammoth-Collins mine near Mammoth. The new company proposes to open up the property only below the 800-ft. level.

### Gila County

TRANSMISSION LINE CONSTRUCTION between the Roosevelt dam and Superior, via Miami, is being done by a force of about 25 white men and 75 Indians. It is now at the head of Queen Creek box cañon, one mile from Superior. As the concrete foundations for the towers are laid a road gang cuts a 4-ft. trail, building it at a wagon grade, and slight widening of the trail in the future will transform it into an excellent wagon road, filling in the gap between Iron's ranch and the town of Superior and thus placing Globe, Miami, Superior, Florence and all the intermediate towns and mining camps on a direct line of communication, beside bringing Ray and vicinity into closer relation with the Miami mining districts. When the line reaches Superior it may be considered feasible to build a branch line to the Calumet & Arizona property 2½ miles south, whence a transmission line leads to Winkelman, where the power is generated. With such arrangements temporary disability at either the government plant at Roosevelt or the Ray Consolidated power plant at Winkelman could be relieved at the other end.

MIAMI (Miami)—In a letter addressed to stockholders of this company, Adolph Lewisohn & Sons state: "There is every likelihood of continued large increase of ore reserves and of a reduction in costs, particularly as we have just arranged with the Greene Consolidated Copper Co. for a reduction of ½c. per lb. of copper in their smelting charge, such reduction to commence at once. We expect the production to be increased within a reasonable time to 3,500,000 or 4,000,000 lb. of copper per month, and hope that in the not distant future it will be at the rate of 50,000,000 lb. of copper per year, at a cost of not over 8c." No radical changes of any kind will be made at the concentrator until the Inspiration's tests of the flotation process and the tests being conducted at the Miami mill by Mr. Canby with Keystone ores have resulted in definite conclusions. It was thought that the two holes recently drilled would be the last, but two more have been started. There is no particular interest attached to the present drilling. The ground now being drilled was only partly developed during the original exploration.

INSPIRATION CONSOLIDATED (Miami)—Grading at the millsite is going on at a steady rate, the grading for the primary crushing plant just west of the main east and west shafts of the property is finished, the railroad grade between the mine and millsite is complete, and the concrete work on the mill foundations should be begun in July. Preparatory work for blocking out the orebody is well under way, but beyond admitting that the Colorado orebody is to be caved as is the ore at the Ray, a process differing somewhat from that in use at the Miami, the Inspiration management has not yet announced its plans for mining the reserves. Although a good water supply has been developed in wells below Miami a contract has been made with the Old Dominion for its surplus mine water, which probably will be handled as the Miami handles the water from the same mine, pumping it from a place in Pinal Creek, about five miles below and northwest of Globe. The request of Inspiration's attorney for calling of a special venire that a jury might be selected therefrom for trial of the Inspiration-Keystone suit makes it probable that the case will not go over to the September term of court, as a trial will be possible this month if a special venire is called.

OLD DOMINION (Globe)—The steel-erecting gang is working on the new sampling mill adjoining the concentrator orebins. Most of the erecting work is completed, but some riveting remains to be done. The steel work on the crusher plant has been delayed because of the late arrival of some steel columns. Excavation work in connection with the new concentrator has been completed and forms are now being put in place for the concrete. The foundations for the rolls are already in place. The steel work on the new concentrator will not be started before the crusher plant, sampling mill and various conveyors are completed. The capacity of the custom orebins above the "A" shaft will be doubled. The timbering and lining of the pockets at the 1200 and 800 levels has been completed and a pocket is now being cut for concentrating and smelting ore on the 1600 level, the lowest level of the shaft at present. Several changes are being made in various stations near the shaft in connection with the new skip hoist, and the tracks will be changed later. Ore production and development in the mine continues about normal. The sinking of the "K" shaft for a sump below the 1400 level is finished and in a few days all timbering will be in place and the shaft will be ready for hoisting ore. It was expected that the raise from the 1200 level of the Old Dominion to connect with the present bottom of the Gray shaft would hole through about July 5, and the shaft will then be timbered with shaft sets down to the 1200 level. A new slime pond has just been completed near Pinal Creek on the old Hamm ground, and will be used for settling slime from the concentrator. No changes or improvements of note have been made at the smelting works.

### Greenlee County

ARIZONA COPPER CO. (Clifton)—This company has recently created the post of local inspector at its mines and has employed Frank Farmer in that capacity. He has familiarized himself with all the underground workings of the company's properties at Morenci, Metcalf and Coronado, and his duties will be chiefly to advise and instruct the miners in matters relating to the safety of their work and to anticipate as far as is possible any conditions that might arise to endanger the men working underground. The company recently purchased apparatus for resuscitating men overcome by smoke or gas.

### Yavapai County

COMMERCIAL MINING CO. (Skull Valley)—This Phelps-Dodge company is shipping about 40 tons per day of high-grade ore to the Douglas smelting works. The company is operating two properties in this district; one, the Senator, producing high-grade sulphide ore from fissure veins, the other, the Copper Basin, in which a large tonnage of 3% oxidized ore has been developed. High-grade ore is shipped from the last property but unless sulphides are encountered, an attempt to leach the ore will probably be made eventually. The properties are managed by Maj. A. J. Pickerill of Prescott.

## CALIFORNIA

### Amador County

SOUTH EUREKA (Jackson)—All of the 80 stamps are now dropping. Preparations are being made to put 20 stamps of the Oneida mill in commission. The recent development of the vein extending from the South Eureka south into the Oneida has proved the orebody to be extensive and warrants the increased milling capacity.

MAPKLEE (Volcano)—it is probable that this mine will be reopened. It was a producer in the early days of mining in the east belt of the Mother Lode and development disclosed some rich ore. The mine was then equipped with a 10-stamp mill and rock breaker driven by steam. There are 80 acres in the holding. A. F. Nivergoll, of Sacramento, has a purchase option.

### Butte County

GOLD BANK (Forbestown)—The lack of water has necessitated the temporary closing down of the 20-stamp mill, for a period of probably 60 days. The mill obtains water from the Forbestown ditch and at present the ditch is obliged to supply the demands for irrigation at a sacrifice of the mine. The present year has been an exceptionally dry one in the Forbestown district.

### Calaveras County

PENN MINING CO. (Campo Seco)—A switch tender at the mine was killed June 20, while ascending the shaft on a water skip. He fell from the skip, a distance of 300 ft., to the bottom of the sump. The man had been ill, and the two men on the skip with him were of the opinion that he became dizzy or fainted, as there was no other apparent cause for his falling.

### Nevada County

GOLDEN CENTER (Grass Valley)—The new electric pump has been completed and given the initial try-out. The pump has a capacity of 300 gal. per minute.

BRUNSWICK (Grass Valley)—The new compressor is ready for duty. It is a direct-acting Ingersoll-Rand 64,000-lb. machine. It has a capacity of 1500 cu.ft. of air per min.

OUSTAMAH (Nevada City)—The mine has been unwatered to the 600-ft. level. The shaft will be deepened to 1500 ft. There are 700 tons of ore in the bins ready for the stamp mill which will resume operation immediately.

VICTOR GATES VS. NUMITOR GOLD MINING CO.—Gates was recently awarded a verdict of $10,000 for the loss of a leg which was caught in machinery at the Numitor mine. The defendant has asked for a new trial

### Placer County

CRANDALL (Auburn)—The strike of electricians of the Pacific Gas & Electric Co. has interfered with the installation of the new electric hoist at this mine in the Ophir district. A 20-ton orebin has been built. The ore will be trammed direct to the mill, a compressor will be installed. A tunnel has been driven to intersect the shaft at the 75-ft. level for tramming the waste. The ore will be hoisted through the shaft to the surface. A new headframe will be built.

### Santa Clara

QUICKSILVER MINING CO. (Almaden)—The mine will be reopened under the management of W. H. Landers, managing director, who was recently appointed at a stockholders' meeting in New York to examine the mine and the books. Since the change in management it is believed the mine will again be put on a paying basis. It is said that the new directors elected in New York June 18 have refinanced the company and will supply Mr. Landers with sufficient funds to do necessary development.

### Shasta County

BALAKLALA (Coram)—Preparations are being made to test an apparatus for condensing the fumes from the smelting plant.

MOUNTAIN COPPER CO. LTD. (Keswick)—Transportation facilities for handling ore from the Iron Mountain mine have been increased by the addition of two engines and other equipment. A large amount of ore is being extracted and stored on the dumps at the mine. Large shipments of ore are going to the company's plant at Martinez. Should the fume trouble be settled under the present state law and the proper method adopted for neutralizing the smoke it is probable that the Keswick works will be rebuilt.

### Sierra County

GOLDEN SCEPTER (Bunker Hill)—This gravel property has been bonded to San Francisco men and work has been begun under the direction of Telfer & Winters.

HIGH COMMISSION (Downieville)—S. W. Van Syckle, of Sierra City, has a bond on this property and a tunnel is being driven at a lower level to intercept the rich sulphide ore which was found in shallow workings.

RIO ANTIGUA (Forest)—Work has been resumed in the main tunnel which is now in more than one mile and will be driven 300 ft. farther and then a raise will be made for gravel. A Los Angeles company is the owner.

SIERRA BUTTES (Sierra City)—Work has been resumed with a large force of men, and the 40-stamp mill is to begin operating soon. The outlook here is better than for many years. Hayes Bros., of San José, are the owners.

## COLORADO

### Aspen District

MOLLIE GIBSON—The shaft has now been drained by the Smuggler Leasing Co., and the output will be largely increased, as it is said there are large bodies of ore in the lower levels. The unwatering was done by a drift from the Free Silver shaft.

### Clear Creek County

LITTLE MATTIE (Idaho Springs)—It is reported that a rich strike has been made in this mine on Chicago Mountain. The ore is 3 ft. wide and assays have ranged from 10 to 40 oz. gold and 100 to 300 oz. silver per ton, probably picked samples.

### Lake County

MANY PROSPECTORS ARE ARRIVING daily in Lackawanna Gulch owing to the recent strike in the Eureka claim, where 4 ft. of 6-oz. gold ore has been opened in the main tunnel.

### San Juan Region

AT OURAY the Virginius lessees are shipping 150 tons of 200-oz. silver ore and the Camp Bird has completed the shaft to the [illegible] level and will now drift for the orebody.

IN THE LA PLATAS great excitement prevails owing to a rumor that [illegible] of almost pure gold has been opened in the May Day, [illegible] famed for its extraordinarily rich shipments. So far, however, nothing official has been given out.

[illegible] MINING & MILLING CO. (Lake City)—The Hidden Treasure [illegible] has resumed the shipment of concentrates. The [illegible] are stated to be large and the ore high grade. [illegible] from now on go out regularly.

### Summit County

PRODUCTION FROM PLACERS in the Breckenridge district [illegible] June was [illegible] $100,000. The Colorado Gold Dredging Co. in Swan Valley has produced $1000 worth of placer gold per day for weeks past, the Reliance Gold Dredging Co. in French Gulch, $800 per day, and the French Gulch Dredging Co., 64 lb. of gold in the last 10 days.

### Teller County

PRODUCTION FOR JUNE in the Cripple Creek district was as follows; the first figures indicating tonnage, the last gross value: Smelters, 3850, $250,250, Golden Cycle, 3400, $680,000, Portland (Colorado City), 9950, $218,900; Portland (Cripple Creek), 13,600, $30,000; Stratton, 11,800, $27,845; Colburn, 4245, $11,674; Gaylord, 1800, $5400, Kavanagh, 1500, $3450; Wild Horse, 1300, $4160, Isabella, 620, $1250; Grand Total, 82,670, $1,233,732.

CRESSON (Cripple Creek)—The output from this mine on Raven Hill for May was 4700 tons and in June 4000 tons, nearly double what was produced in previous months.

EL PASO (Cripple Creek)—The output for June was 148 cars of ore of good grade. Of this 48 carloads were from lessees and 100 cars on company account. As the main oreshoots have now been opened in the lower levels, there is more ore in sight than at any time during the last few years.

## IDAHO

### Coeur d'Alene District

HERCULES (Burke)—A cave-in has resulted in an almost complete shutdown of this mine. The collapse of the galleries took place June 4, closing all the underground openings above the No. 4 tunnel. An effort is being made to resume operations in the levels off the winze, and some ore is being removed.

TUSCUMBIA (Wallace)—The final payment of $25,000 on the bond and option of the Tuscumbia group was recently made. The Tuscumbia was owned by George B. Markle, of Hazelton, Penn., and has been under bond and option to the Tuscumbia Mining Co. for $50,000. The property is in the Sunset Peak district. The company has spent about $15,000 on the property during the period of option, with satisfactory results.

INTERSTATE-CALLAHAN (Wallace)—The new 300-ton concentrator has been in operation since about June 1. It is estimated that 250,000 tons of ore is blocked out in the mine. The company has an option on the Amazon-Manhattan property for $160,000, the first payment on which has already been made. The Interstate and Callahan mines are now connected by a 5400-ft. tunnel which is being extended a distance of 2000 ft. to connect with the Amazon-Manhattan. The Callahan property lies on the Nine Mile or Wallace side of the divide and the Callahan and Amazon-Manhattan properties lie on the north or Beaver Creek side of the divide. The purpose of the long tunnel connecting the three properties is to permit bringing the ores from the different properties out on the Nine Mile side, where there is transportation. The ores from the mines are conveyed to the mill by an aërial tramway capable of hauling 1000 tons per day and the mill, as now constructed, can be increased to that capacity. The three properties have been developed by a series of tunnels and there is a vertical depth of 1200 ft. between the lower tunnel on the Amazon-Manhattan and the highest tunnel on the Callahan property.

## MICHIGAN

### Iron

PORTLAND (Michigamme)—A shaft is being sunk at this mine on the western end of the Marquette range and several mine buildings are being built, a force of about 25 men being employed. No stripping is being done this summer so no ore is going to the docks.

BENGAL (Stambaugh)—This new mine of Pickands, Mather & Co. has begun shipping ore; a temporary wooden headframe is being used pending the completion of the permanent steel headframe. The new steel headframe will be one of the largest in the Iron River district, 105 ft. from shaft collar to center line of sheaves.

LAKE ANGELINE (Ishpeming)—The management of this company states that there is less than 100,000 tons of ore left in the mine and it will not be long before the property will have to be shut down. This mine has produced the richest iron ore of any Lake Superior property and when it ceases to be worked Jones & Laughlin will have only one mine on this range, the Rolling Mill at Negaunee.

IMPERIAL (Michigamme) This property has been placed in first-class condition for mining by the Cleveland-Cliffs company, but is still idle and there is little likelihood that it will be reopened this summer. A new steel headframe has been erected, an addition has been made to the change house, the coal dock has been lengthened and several other improvements have been made, but there is little demand for limonite ore at this time, so the company will not operate the mine and stock the ore. The mine is owned by the Michigan Land & Iron Co. and the lease expires in 1919, but the Cleveland company will probably have an opportunity to renew.

TILDEN (Bessemer)—Considerable argument recently arose over the valuing of this mine of the Oliver Iron Mining Co. for taxation purposes. The local assessors at Bessemer considered the mine worth at least $1,000,000, while the representative of the State Tax Commission valued it at $156,000, exclusive of personal property. The local board of review finally adopted the figure of $200,000 for realty value.

TULLY (Stambaugh) Sinking at No. 2 Shaft has made practically no progress for several weeks, as considerable difficulty is being experienced from quicksand and water. The depth remains at 160 ft. with 18 ft. more to go before bedrock is reached. It may take several months more to sink to bedrock. This is not the first shaft to give trouble from sand and water in the Iron River district. Tully No. 1, Bates and Rogers shafts were expensive sand shafts, although compressed air at 40 lb. pressure was used in the caisson at the Rogers to hold back the water. The new headframe at Tully No. 1 is nearly completed.

CLEVELAND-CLIFFS IRON CO. (Negaunee) This company will in the near future start sinking a shaft on the Harvey lots, which are owned by the Athens Mining Co. It has been known for years that a large orebody existed there, but the lands were in litigation, being claimed by the Cleveland company and the Breitung interests, but all differences were settled a short time ago with the formation of the Athens Mining Co. The ore lies at a depth of more than 2000 ft. and it will require several years to open up the mine as the shaft will be concreted from the top to the bottom. The equipment will be an almost exact duplicate of that at the Negaunee mine, which is considered the most uptodate in the district. The specifications have been drawn and the contracts will be awarded in the near future.

ASHLAND (Ironwood)—This mine on the Gogebic range, owned in fee and worked by Congressman E. A. Hayes and his brother, both of California, is idle, work having been suspended recently. The Ashland was operated by the Cleveland-Cliffs company for several years until last February, when the lease was surrendered. Since then the Hayes brothers had been doing exploratory work in the western part of the property. They also rebuilt the No. 9 shaft, in which the old timbering was removed and steel sets were substituted. it had been understood that a new and what was said to be an important body of ore had been encountered on the 14 level, and for this reason the suspension of operations has caused surprise. The Ashland was employing 130 men. These have all found places at other properties in the Ironwood district.

## MINNESOTA

MAPS OF THE IRON RANGES have been prepared by the School of Mines of the University of Minnesota. The set is very comprehensive, including the Mesabi, Vermilion and Cuyuna, with an authentic list of the principal ownerships. The data was gathered under the supervision of Dr. Rukard Hurd, Secretary of the Minnesota State Tax Commission. The maps are the most important and best of their kind that have been issued for several years. A limited number of sets are available for free distribution and can be had by addressing Dean W. R. Appleby, of the School of Mines, Minneapolis, Minn.

INTERESTING LITIGATION is now pending in the district court of St. Louis County to determine whether or not, under certain conditions, a minority interest in the fee ownership of mineral property, may force the development of the property, even against the wishes of the majority interests. The property involved is a 160-acre tract in Sec. 3, 61-15, on the Vermilion range, near Tower. John Brannan, owner of approximately 18% of the property, has brought suit against Thomas Walsh, a prominent Vermilion range mine operator, and others for an equitable partition of the tract, or the sale of same and a division of the proceeds. Conversely, some of the defendants in this suit are bringing action against the plaintiffs under a Minnesota law which provides that when a majority of the owners of a mining property fail to proceed with development work and abandon such work, then the minority owners may proceed with the work. The particular tract involved is said to be of doubtful or speculative value, but the precedent to be established is exceedingly important to fee owners on the Minnesota iron ranges, where many ownerships are split to small fractions.

KENNEDY (Crosby)—This mine will be electrically operated as soon as present plans are carried out. A 5-ton electric locomotive will be installed underground. The company expects to generate its own power. The new steam shovel has arrived, and shipments from stockpile will begin immediately. There is more than 90,000 tons of ore into stock.

MORTON (Hibbing)—The experiments which have been carried on at this property of the Oliver Iron Mining Co. for the last month with a Sullivan coal puncher and a Jeffrey auger have proved satisfactory and it is not at all unlikely that more of the machines will be used. One of the orebodies is being undercut and the coal puncher does the work more rapidly than would be possible with any of the iron mining machines that have been tried out. The auger is working well because the hematite is soft and of uniform texture. Steam and air augers have been tried out at other places in the district but have not given satisfactory results because of the fact that the ore was not uniform. The augers would be able to go just so far when iron of a harder grade would be encountered and it would be impossible to proceed farther.

## MONTANA

### Butte District

ANACONDA (Butte)—At the Pennsylvania mine the main shaft has been sunk to a point 40 ft. below the 2200-ft. level. Sinking has been temporarily suspended at this depth and the work of cutting a station on the 2200-ft. level has been started. With the completion of the station a pump will be installed to assist the one on the 2000-ft. level in relaying the flow to the large electric pumps on the 1800-ft. level.

GAMBRINUS (Butte)—The shaft on this property, recently acquired by the Corbin Copper Co., has now reached a depth of 70 ft. A wooden headframe has been erected and a hoist which can be used to a depth of 500 ft. has been installed. The trestle from the shaft, running north across Caledonia St. to the Butte, Anaconda & Pacific Ry., is rearly completed. This will be used for transporting timber and supplies to the mine.

### Lewis & Clark

MONTANA COPPER SILVER MINING CO. (Helena)—E. R. Purnell, superintendent, reports that the shaft at the company's property in the Scratch Gravel hills is 370 ft. deep, and a new air compressor will be installed to operate machine drills in the place of the hand work being done at present. No crosscutting to the lode has been done as yet and the company is undecided whether to crosscut in the near future, or wait until the 500-ft. level is reached.

### Madison County

A NEW ROAD is being built by the forestry service from Sheridan to the head of Mill Creek, near Branham Lake, which will enable the owners of several mines that yield low-grade ore to ship the ore, and work the mines with profit.

FAIRVIEW (Sheridan)—Arthur B. Clark, who is operating the Bonanza group, has a lease and bond on this group of claims on Wisconsin Creek and will soon begin development work there.

BLOWOUT (Rochester)—In crosscutting on the 500-ft. level at this property of the Corbin Copper Co., a 4-ft. vein of ore was recently cut which contains from 4 to 5½% copper. The ore is of excellent milling grade and drifting on the vein will be begun at once to determine the extent of the shoot.

## NEVADA

### Lyon County

OAKLAND COPPER BELL (Yerington)—The shaft on this property recently cut a 3-ft. vein of good-grade copper ore at a depth of 40 ft. Shipments will be made soon.

NEW YERINGTON (Yerington)—The new orebins have been completed and are now in use. Shipping will be started in a few days. Recent development has disclosed orebodies of large size and good grade.

COPPER BELT (Ludwig)—The orebody recently discovered in the shaft at this mine continues downward. A loading station, it is reported, will be erected at Ludwig, and shipping will begin in the near future.

### Mineral County

CINNABAR HAS BEEN DISCOVERED nine miles east of Mina. Large quantities of ore averaging 1% mercury are reported. Specimens of high-grade ore are on exhibition. There is a rush of prospectors to the locality.

A GOLD DISCOVERY has been made six miles west of Kinkead. A gold-bearing vein has been discovered, which is 6 to 8 ft. wide, and has been proved for several hundred feet in length. Native gold specimens have been taken out from near the surface.

SHIPPER COPPER CO. (Luning)—This company owns four claims five miles southeast of Luning. Regular shipments of ore averaging 8% copper are being made. It is reported that negotiations for a sale to Eastern men have just been completed.

### Nye County

TONOPAH EXTENSION (Tonopah)—The north crosscut on the 750-ft. level from the new main working shaft has encountered a vein about 10 ft. wide carrying good ore in spots, and drifting on this ore has been started. This is believed to be the extension of the North vein in the eastern workings, but is 500 ft. west of these.

### Washoe County

A RICH SILVER STRIKE was recently reported as having been made near Pyramid Lake. There was a rush of prospectors from Reno, Rochester and Tonopah.

THE OLD CAMP OF OLINGHOUSE, 28 miles from Reno, east of Derby, is again attracting attention. The mines are shallow, none being over 300 ft. deep. Several properties are being worked on a small scale by lessees. The average value of the ore after sorting is from $40 to $100 per ton. it is treated in a custom mill, equipped with Huntington mills and plates.

### White Pine County

CONSOLIDATED COPPER MINES CO. (Ely)—It is reported that Butte, Mont., stockholders of Butte & Ely Copper Co., have begun injunction and receivership proceedings in the district court against Joseph B. Cotton, John W. Neukom and Edward J. Meaney of Duluth, executive officers of the company, to prevent absorption by Consolidated Coppermines Co. It is charged the defendants have grossly mismanaged affairs of Butte & Ely since Giroux interests secured control Sept. 11, 1909, when Giroux purchased 229,175 shares of Butte & Ely stock for $1 per share, when it was worth $2, the deal being made on representation that the money be used for developing Butte & Ely ground. It is further alleged that not more than $20,000 has been spent on Butte & Ely development and that the defendants took $100,000 out of the Butte & Ely treasury without authority from directors and loaned it to the Giroux company taking that company's note as security. At the time Giroux got hold of the company, Butte & Ely had $246,000 in its treasury and no debts. Suit is brought by I. A. Heilbronner, local broker, owner of 23,794 shares of stock. In regard to plans for development of the consolidated properties it is reported that the old Giroux concentrator will be used as an experimental plant to test the flotation process of concentration. Much of the machinery of the old mill has been dismantled for use on other parts of the property and the work of putting it in shape for even an experimental run would involve some time and expense. Its location, however, is excellent for the intended purpose, as it is only a short distance from all the principal properties of the Consolidated company and is in direct rail communication with several of them. Water for concentration purposes can be pumped from the Giroux shaft. The experiments will not be the first test of the process to be made in the Ely district. The Nevada Consolidated has also done some experimenting along these lines but the tests were made at a time when the process was not so well understood as it is now. Copper Flat ores of the Nevada Consolidated and those from the Giroux are said to be well adapted to such concentration, but those of the Veteran mine could not be treated on account of an excess of oxidized matter. It is reported that the plans of the company also include the unwatering of the Giroux shaft which was flooded at the time of the general strike in the Ely district last autumn when the strikers refused to allow the Giroux management to continue working the pumps. The shaft and all workings below the 1000-ft. level are now filled with water and the draining of the mine will be slow and expensive process. Shipments from the Morris and Bunker Hill shafts of the Giroux company are going on as usual at the rate of about 800 tons a day.

## OREGON

### Baker County

DUTCH GULCH PLACER (Susanville)—A large nugget was panned June 19 by George Armstrong and Richard Staunton on their placer claim, three miles from the town of Susanville and 60 miles from Baker. The nugget is worth $1500; it weighs 6¾ lb., and is worth $17.50 per oz. The men were hydraulicking when the nugget was found. They have worked the claim for about 40 years.

### Jackson County

BEAVER-PORTLAND CEMENT CO.—J. C. Burch, president, states that this company will build a modern cement plant at Gold Hill at once, owing to the decision of the Oregon railroad commission allowing the Southern Pacific a low freight rate on cement.

## UTAH

### Beaver County

GLASGOW & WESTERN EXPLORATION CO., LTD. (Salt Lake City)—This company is a parent concern to the Adelaide Star Mines, Ltd. It owns the Copper Cañon and Copper Basin group of claims in Lander County, Nev., and the Montreal group in Beaver County, Utah. The Adelaide Star Mines, Ltd., owns the Adelaide group of claims near Golconda, and the Star group at Cherry Creek, both in Nevada. Reduction plants of expensive design were erected at both these places and were failures. A large sum of money has been squandered on these properties during the last 15 years, the sum approximating $5,000,000. At present a reorganization of the business of the company is being arranged, and it expected that in a few weeks things will be in such shape that mining may be done, as the Montreal and the Copper Basin and Copper Cañon properties possess merit to justify extensive work, but no mining has been done up to the present. Arrangements are being made to sink two three-compartment shafts to water level at the Montreal property. These shafts will be sunk to depths of about 500 and 850 ft., respectively. The various properties are being surveyed for patent, for although the number of claims is large, and although the large sum mentioned has been squandered, no effort to patent the property was made except to a small extent. On Apr. 1, debts against the company amounted to over $95,000, and up to within about six weeks before the company's executive left England there was no idea that any such indebtedness existed. In order to avoid the tediousness of bankruptcy the executive was empowered by the petitioning creditor to offer a composition, and has settled with the various creditors upon a basis approximating 40c. on the dollar.

### Juab County

THE OUTPUT FROM TINTIC is increasing, and shipments for the week ended June 27 amounted to 182 cars. This is a gain of 25 cars over those of the week preceding.

GRAND GENTRAL (Robinson)—This property is keeping up its record of steady production, and ore is being mined from many levels. The 2400 will not be unwatered before winter.

EAGLE & BLUE BELL (Eureka)—What is thought to be a new vein carrying shipping ore has recently been opened in a winze 50 ft. below the 1350 level. The new find is in hitherto unprospected territory, and occurs in limestone; 18 cars were shipped the week ended June 27.

MAY DAY (Eureka)—Owing to the cessation of zinc shipments while the low price for that metal holds, the working forces have been reduced. Lead ore is being mined from between the 1000- and 1100-ft. levels, and prospecting for ore of this character is being done in other parts of the mine.

DRAGON CONSOLIDATED (Silver City)—The tunnel which is being driven through this property from north to south is in more than 600 ft., and drifting is being done along the vein encountered a short time ago. The tunnel will afford an outlet for the ore which is now being mined through the Iron Blossom.

OPOHONGO (Robinson)—Lessees on this property shipped two cars of ore the week ended June 27. Prospecting is being done on company account for the possible continuation in Opohongo ground of an orebody developed on the 700-ft. level of the Gold Chain; and from the main tunnel level of that property a drift is being driven for the Opohongo. This is within 100 ft. of the line.

MAMMOTH (Eureka)—The case of this company versus William Werrett, resulting from the sale to the latter and associates of an old mill dump was settled out of court. After a considerable quantity of dump ore had been shipped, the company got out an injunction to prevent further shipments by the defendant, and started suit, alleging that misrepresentation on the part of the purchaser had resulted in the sale of the dump for less than its actual worth. The company retains possession of the dump, after a money settlement the amount of which has not been made public.

### Summit County

SNAKE CREEK TUNNEL—(Midway)—The Williams Contracting Co. recently secured the contract for driving the Snake Creek tunnel about 9000 ft This bore is 9 ft. 4 in. wide by 6 ft. 6 in. above the track (both in the clear), and carries a ditch 3 ft. 6 in. deep by 4 ft. wide on the right-hand side of the tunnel. A large amount of preparatory work has been finished and work on the contract proper, it is expected, will be begun about July 1. The tunnel is a drainage and exploration bore for the southwest portion of the Park City mining district and the eastern portion of the Alta district.

## WASHINGTON

### Ferry County

SAN POIL (Republic)—Installation of the new machinery at this mine is nearing completion, and the plant will be in operation at an early date.

### Stevens County

UNITED COPPER (Chewelah)- Delay of about 30 days has been occasioned in the installation of the new concentrator and other equipment at this mine However, the installation will be completed by the end of the month, and 40 more men will be added to the already large force. The capacity of the new plant will be 120 tons per day.

## CANADA

### British Columbia

REVIVAL OF THE MINING INDUSTRY is being brought about by the availability of money for legitimate mining ventures and the optimism that seems to prevail in regard to metal prices and markets for the near future With nearly all the metalliferous mines being operated at full capacity and better conditions now existing in the coal fields, the whole mining industry is healthier in British Columbia that it has been for some time. The oldest gold-producing camp, Hedley, is about to enter upon an era of expansion. The British Columbia Copper Co. has started prospecting on its claims in the Voigt camp and on Copper Mountain; President Erb states that large orebodies have been found and that the grade of the ore is higher in proportion to quantity than in any other properties owned by the company. When the Kettle Valley Ry. connects Princeton with the numerous Okanagan towns and the Vancouver, Victoria & Eastern gives a direct line to the Pacific Coast and the new Wenatchee field, then the coal operators will not be handicapped by discriminating transportation rates. Since these lines have already been started, it seems probable that the coal-mining industry will shortly receive a unprecedented boost.

### Ontario

HOLLINGER (Schumacker)—The entire working force of the company has been put on an 8-hr. day basis without reduction of wages, anticipating the new law limiting the number of hours of underground work to eight, which does not come into operation until next January.

STERLING SILVER MINES CO. (Elk Lake)—An order has been issued by the court in Toronto for the winding up of this company. It has a nominal capital of $1,250,000, but only a small proportion of the shares were taken up. It is stated that the failure is due to the nonpayment of assessments by shareholders.

FOSTER (Swastika)—About $7000 in gold has been realized from the first cleanup of this mill in the Kirkland Lake district, after a month's run during which about 10 tons per day were treated, about $10 per ton going into the tailings. The shaft is now 170 ft. deep, and the ore holds good at that depth, carrying about 9 in. of high-grade split into stringers in addition to milling ore.

DANE COPPER (Dane)—A recent report issued on this company's properties, states that they have several veins of quartz carrying about 4% copper, and in addition, shoots of rich ore are occasionally encountered which have been known to run as high as 17%. The high-grade ore is shipped to the smelters and the company is making arrangements for the purchase of a plant to treat 100 tons per day of the lower-grade ores.

CANADIAN NICKEL CORPORATION LTD.—This corporation has been organized with a capitalization of $30,000,000, divided into $10,000,000 6% debentures and $20,000,000 common stock. The properties held by the company cover 17,500 acres in the Sudbury district, including the Murray mine, and as a result of development up to May 1, 6,800,000 tons of ore is said to have been blocked out. Among those connected with the company are Dr. F. S. Pearson, president of the Brazilian Traction, Light & Power Co.; J. Frater Taylor, vice-president of the Lake Superior Corporation. J. E. McAllister, Benjamin Lawrence, of New York; E. R. Wood, Walter Gow, and Miller Lash.

## MEXICO

### Mexico

EL ORO MINING & RY. CO. (El Oro)—In June 23,500 tons of ore and 11,640 tons of tailings were treated yielding bullion worth $214,930. Railway profit was $12,710; net total profit, $88,210 for the month's operations of mines and railway.

### Sonora

ARCHIPELAGO (Cumpas)—This mine is being operated by the Minneapolis Copper Co. The force at the mine was recently increased and it is expected that work will continue now without interruption.

ESTRELLA—(Nacozari)—Norton Hand, who is leasing this property from the Moctezuma Copper Co. is shipping about two cars per day to the smelting works at Douglas. He recently encountered a streak of high-grade ore.

MINNEAPOLIS COPPER CO. (Cumpas)—After being shut down for a week while some minor repairs were being made, the furnaces have been blown in again and are now making about 10 tons per day of matte containing about 30% copper.

MONTE CRISTO (Moctezuma)—Carlos C. Soto is now shipping another car of high-grade silver-lead ore to the El Paso smelting works. The ore contains about 250 oz. silver and 20% lead. Shipments will amount to one car per week before another month.

MEXICAN METALS CO. (Cananea)—Power facilities are to be increased so that the mill may be operated to its full capacity of 100 tons per day and still provide for ample power for all other departments. Shipments are made regularly to El Paso and 100 men are now employed.

CHURUMIBABI (Nacozari)- This property of the Moctezuma Copper Co. is being operated by Colonel Hand, who reports that a strike of high-grade ore has been made in some of the old workings of the mine. About 100 men are employed and shipments are made regularly to the Douglas smelting works.

EL TEMBLOR—(Esqueda)—The new mill on this property recently built by W. L. Rynerson, who has a lease on the mine, is running well, and about two tons of concentrate are made each day. This concentrate will run about 250 oz. silver and 2½ oz. gold per ton The ore being milled contains about 20 oz. silver and about 0.20 oz. gold. The shipping ore contains about 400 oz. silver and about 3 oz. gold per ton

LUCKY TIGER (Yzabal)—Because of the annoyances and inconveniences attending the settlement of duties, arising from the stipulations of the "constitucionalistas" at Agua Prieta, an attempt will be made to ship ore to the Copper Queen smelting plant at Douglas, Ariz., instead of to El Paso, although United States import duty on lead will have to be paid as the ore cannot be shipped to Douglas in bond as it can to El Paso.

## SOUTH AMERICA

### Ecuador

DEVELOPMENT OF OIL LANDS will now be carried out by S Pearson & Son, Ltd., a contract with the government having recently been signed giving the company exclusive right to explore and develop the oil lands of the republic.

# THE MARKET REPORT

## METAL MARKETS

**NEW YORK—July 9**

The metal markets have generally been rather quiet, under the combined influences of the holiday and of the midsummer season.

### Copper, Tin, Lead and Zinc

**Copper**—The market continues dull and weakish. Buyers both here and abroad are evidently deferring their purchases as long as possible, and while it is believed that the time is approaching when they will have to replenish their stocks, the inquiry remains very small. Sellers generally have reduced their prices in an effort to find a level at which business would be stimulated. The old "asked prices" have been abandoned completely among the sellers of electrolytic, all of whom are apparently willing to meet buyers and trade. During the week electrolytic has been freely offered at 14⅜c., delivered, usual terms, or about 14.20@14.25c., cash, New York. The Lake producers on the other hand are more stand-offish. No transactions in Lake have been reported during the week, and the market for this sort is quoted nominally at 0.25c. over electrolytic. At the close we quote electrolytic in cakes, ingots and wire bars at 14.20@14.25c. Casting copper is quoted nominally 13.95@14.05c. as an average for the week.

The London market for standard copper has again declined. On July 3, it was £63 8s. 9d. for spot and £63 12s. 6d. for three months. On July 7 it advanced to £63 17s. 6d. for spot and £64 three months, closing at £62 10s. for spot and £62 15s. for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16c. per lb., for carload lots at mill.

Exports of copper from New York for the week were 3751 long tons. Our special correspondent gives the exports from Baltimore at 1532 tons for the week.

Visible stocks of copper in Europe on June 30 are reported as follows: United Kingdom, 19,230; France, 2860; Rotterdam, 4700; Hamburg, 3400; Bremen, 1910; total, 32,100 long tons, or 71,904,000 lb.; a decrease of 1770 tons from the June 15 report. In addition to the stocks given 1360 tons are reported afloat from Chile and 4700 from Australia, making a total, visible and afloat, of 38,160 tons.

**Tin**—Further heavy liquidation in the London market brought about a severe decline in quotations, and the metal today is selling at a lower price than has been quoted for almost two years. The market, as so often in the past, is entirely in the hands of speculators, the bear party having it all its own way. The short position in this metal must be abnormally large, and this fact may mean an abrupt change in the situation one of these days. While consumers in this market were liberal buyers, especially for future delivery, the latter part of last week, the continual decline in the London market has entirely checked all buying for the time being; even at concessions on the importation price, no interest is shown. The close is weak at £177 5s. for spot and £178 5s. for three months, and 39c. for July tin here.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in May at 2022 tons, of which 1982 came from Bolivia and 80 tons from South Africa.

Shipments of tin from the Straits in June are reported by cable at 4820 long tons, an increase of 540 tons over June, 1912. Deliveries into American consumption in June, 1913, are estimated at 3800 tons.

Tin production of the Federated Malay States five months ended May 31 was 19,817 long tons in 1912, and 19,148 in 1913; decrease this year 669 tons.

**Lead**—The market is unchanged at 4.17½@4.20c. St. Louis and 4.30@4.35c. New York.

The London market was somewhat firmer early in the week. Spanish lead being quoted £19 10s.@£19 15s., but it eased off on July 8 and 9 and closes at £19 7s. 6d. for Spanish and 7s. 6d. more for English lead.

**Spelter**—The market is dull with some inquiry both for early and distant shipment which is being freely met. Prices are unchanged at 5.05@5.15c. St. Louis and 5.20@5.30c. New York.

The London market is quiet and somewhat easier, good ordinaries being quoted £20 7s. 6d. and specials £21 7s. 6d. per ton.

The price of zinc sheets was reduced ¼c. per lb. on June 25, and is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Included in exports from Baltimore for the week were 560,000 lb. spelter to Liverpool.

Zinc smelters have lately curtailed their operations materially; also some of the zinc miners. The American Zinc. Lead & Smelting Co. is operating only two blocks at Caney and two at Deering, but at Hillsboro four are running.

**Cadmium**—The latest quotation from Germany is 725@750 marks per 100 kg. f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

DAILY PRICES OF METALS

NEW YORK

| July | Sterling Exchange | Silver | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 3 | 4.8685 | 58¼ | 14.50 @14.60 | 14.30 @14.40 | 40½ | 4.30 @4.35 | 4.17½ @4.20 | 5.20 @5.30 | 5.05 @5.15 |
| 4 | ...... | | .... | .... | | ...... | ...... | ...... | ...... |
| 5 | 4.8700 | 58⅜ | 14.45 @14.50 | 14.20 @14.25 | 40½ | 4.30 @4.35 | 4.17½ @4.20 | 5.20 @5.30 | 5.05 @5.15 |
| 7 | 4.8685 | 58½ | 14.45 @14.50 | 14.20 @14.25 | 40⅛ | 4.30 @4.35 | 4.17½ @4.20 | 5.20 @5.30 | 5.05 @5.15 |
| 8 | 4.8680 | 58⅛ | 14.45 @14.50 | 14.20 @14.25 | 39¼ | 4.30 @4.35 | 4.17½ @4.20 | 5.20 @5.30 | 5.05 @5.15 |
| 9 | 4.8675 | 58⅜ | 14.45 @14.50 | 14.20 @14.25 | 39 | 4.30 @4.35 | 4.17½ @4.20 | 5.20 @5.30 | 5.05 @5.15 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| July | Silver | Copper | | | Tin | | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| | | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | | |
| 3 | 26⅞ | 63 7/16 | 63⅝ | 69 | 185 | 185¼ | 19½ | 20⅜ |
| 4 | 27 | 63½ | 63⅝ | 69 | 186¾ | 187¼ | 19¾ | 20½ |
| 5 | 26 15/16 | .... | .... | ... | .. | | .... | .... |
| 7 | 26 15/16 | 63⅞ | 64 | 69¼ | 183½ | 184¼ | 19½ | 20½ |
| 8 | 26 13/16 | 63 3/16 | 63¼ | 69 | 178½ | 179½ | 19¼ | 20¼ |
| 9 | 26 15/16 | 62½ | 62¾ | 68½ | 177¼ | 178¼ | 19⅜ | 20⅜ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = [illegible]26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—Business is still rather light and unsettled, and prices are rather uneven. Quotations are 23@24c. per lb. for No. 1 ingots, New York. Foreign is quoted at 19@19½c. in bond.

**Antimony**—Business is of a retail order only, and prices are unchanged. Cookson's is 8.65@8.75c. per lb.; Hallett's 8@8.25c.; while 7.50@7.75c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—The market has been quiet and prices are unchanged here at $40 per flask of 75 lb., with 60c. per lb. for small orders. San Francisco, $39.50 for domestic orders and $37 for export. London £7 10s. per flask, with £7 2s. 6d. asked from second hands.

**Magnesium**—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

**Nickel**—Shot, block and plaquettes are quoted at 40@45c. per lb., according to quality and size of order. Electrolytic nickel is 5c. per lb. higher.

### GERMAN FOREIGN METAL TRADE

Imports and exports of metals other than iron and steel in Germany for the quarter ended Mar. 31 are reported as below, in metric tons:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Copper | 59,548 | 53,446 | 21,817 | 26,286 |
| Tin | 3,756 | 3,379 | 2,481 | 2,916 |
| Lead | 16,271 | 21,655 | 12,322 | 15,896 |
| Zinc | 10,585 | 12,692 | 24,643 | 32,864 |
| Nickel | 470 | 581 | 632 | 455 |
| Aluminum | 3,781 | 3,006 | 1,174 | 2,358 |
| Miscellaneous | 460 | 525 | 4,137 | 5,853 |

Exports of metals include alloys and manufactures of those metals.

## Gold, Silver and Platinum

**Gold**—Prices on the open market in London continued at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. In New York a total of $5,000,000 has been taken for export to France, and more is expected to follow.

Sales of gold bars from the U. S. Assay Office in New York in June were $2,815,847. For the six months ended June 30 the total sales were $13,950,242 in 1912, and $16,984,648 in 1913, an increase of $3,034,406. These sales are for use in the arts.

Gold in the United States, July 1, is estimated by the Treasury Department as follows: Held in treasury against gold certificates outstanding, $1,086,727,169; in treasury current balances, $173,084,093; in banks and circulation, $608,979,598; total, $1,868,790,860, an increase of $7,420,965 during June.

**Iridium**—Prices are unchanged at $85 per oz., with a fair demand.

**Platinum**—The market is quiet but steady and prices are unchanged. Dealers ask $45@46 per oz. for refined platinum and $49@52 per oz. for hard metal.

Our Russian correspondent writes under date of June 29 that the situation is strong. Demand is fair and fully up to the current supply. Stocks are small and in strong hands. Supplies offered by the starateli are considerable, but are quickly taken by speculators. The quotations for small lots at Ekaterinberg are 9.75 rubles per zolotnik for crude metal, 83% platinum, at St. Petersburg, 37,700@37,800 rubles per pood for the same grade. These prices are equal to $36.66 and $37 per oz., respectively.

**Silver**—The market has fluctuated within narrow limits. June, usually a brisk month with the Indian bazaars, was this season rather dull, and the merchants were poor buyers. An occasional order from China has helped to steady the market. Buyers are watching the course of the Monsoon, on which so much depends. So far this season the rainfall has been fair.

Exports of silver from London to the East, Jan. 1 to June 25, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £3,336,700 | £3,653,600 | I. £316,900 |
| China | 893,500 | 344,500 | D. 549,000 |
| Total | £4,230,200 | £3,998,100 | D. £232,100 |

Exports of silver from New York for the week ended July 5 were $[illegible], chiefly to London. Imports were $194,934, mostly from Mexico and South America.

Coined silver in the United States July 1 is estimated by the Treasury Department as follows: Dollars, $565,618,020; subsidiary coin, $175,471,210; total, $741,089,230. Of the dollars, $[illegible] are held in the treasury against silver certificates outstanding.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—June 28

The high price of zinc blende is $47, the base per ton of 60% zinc ranging from $41 to 44. Calamine sold on a base of $20@22 per ton of 40% zinc. On account of an unusually heavy sale of calamine the average of all grades dropped to $38.78 per ton. Nothing has happened to cause a change in the lead situation and prices are quoted steady at $52.50 per ton of 80% grades and the average of all grades $51.04 per ton.

SHIPMENTS WEEK ENDED JULY 5

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week .. | 9,197,680 | 1,848,620 | 1,770,380 | $271,030 |
| Totals 27 weeks ... | 293,080,360 | 20,735,310 | 49,031,740 | $8,174,217 |

Blende value, the week, $203,233; 27 weeks, $6,618,120.
Calamine value, the week, $22,609; 27 weeks, $268,780.
Lead value, the week, $45,195; 27 weeks, $1,287,417.

### PLATTEVILLE, WIS.—July 5

The base price paid this week for 60% zinc ore was $42@42.50 per ton. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED JULY 5

| | Zinc ore, lb. | Lead ore, lb | Sulphur ore, lb. |
|---|---|---|---|
| Week ............ | 2,931,190 | 118,360 | 955,950 |
| Year to date..... | 75,716,830 | 3,694,080 | 32,213,740 |

Shipped during week to separating plants, 1,988,700 lb. zinc ore.

The report for June 28, received too late for publication last week showed shipments of 2,452,340 lb. zinc ore; 195,850 lb. lead ore, and 1,119,010 lb. sulphur ore; zinc ore sent to separating plants, 2,047,930 lb. Base prices, 60% zinc ore, $42@42.50; for 80% lead ore, $52@53 per ton.

# IRON TRADE REVIEW

### NEW YORK—July 9

There is little change in the market situation, except the inevitable slowing down over the holiday.

Production of pig iron in the first six months of this year has easily equalled 16,500,000 gross tons, against 15,655,000 tons in the second half of last year, the best previous record. Steel production has shown a corresponding gain. The chances appear even as to the second half breaking the first half record.

There has been an almost complete cessation of new business since July 1, and specifications against old contracts have also decreased, this latter being due partly to the expiration of a number of contracts on June 30 at lower than prevailing prices. Despite the market stagnation the mills are able to continue operation at practically full capacity, due to old business. Without any improvement in buying or specifying, the majority of mills will be able to run full until early September, but it is conceded that unless there there is a decided improvement in buying by that time there will have to be a material curtailment in output. There are those who seem to regard it as certain that there will be no improvement, while the majority of steel producers predict that there will be a buying movement in September of sufficient volume to insure full operation to the close of the year. It goes without saying that the present month will be dull.

There is rather more inquiry for pig iron, but many furnaces are holding out for some advance. They claim that there is no money in working at present prices of coke.

### PITTSBURGH—July 8

Prices are very well maintained all along the line, except as to wire products and sheets, which began to show weakness months ago. Black sheets have not declined further in the past week, but galvanized are quotable $1 a ton lower.

**Pig Iron**—The feature in the pig-iron situation is the developments in coke. Furnacemen claim that prices asked for coke are too high. Pig iron prices do not advance. There has been moderately heavy buying in the past two or three weeks but this has not helped the situation and may indeed have injured it, by removing so much demand. We quote: Bessemer, $16; basic, $14.50; malleable, $15.25; No. 2 foundry, $14; forge, $13.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh. Bessemer has possibly sold in small lots at concessions from the quoted price. The American Steel Foundries bought 3000 to 5000 tons of basic, delivery to the middle of August, at a price which figures back to about $14.25, Valley, but the iron is understood to come from a furnace having a special rate.

**Ferromanganese**—The market continues to soften, with little demand. Prompt lots can be had at $58, Baltimore, and the nominal contract price of $61, Baltimore, could be shaded to $59 or $58 in all probability. Freight to Pittsburgh is $2.16 per ton.

**Steel**—Billets and sheet bars continue scarce. The National Tube Co. has bought a round lot of billets and the American Sheet & Tin Plate Co. at least 2000 tons of sheet bars in the open market, the supplies from corporation mills being insufficient. The large mills are indifferent as to sales and are maintaining prices strictly at $26.50 for billets and $27.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown.

**Sheets**—Until the past few days a price of 3.30c. on galvanized sheets has been exceptional, though done on occasion, but this figure is now common enough to be regarded as the quotable market. Black sheets are rather firm at the former quotation of 2.25c., while blue annealed are firm at 1.75c. New business is light, but some of the mills have specifications to run from six to eight or 10 weeks. Others are disposed to restrict production. In the past week about 90% as many sheet mills have been in operation as at the time of greatest activity, the leading interest and the independents running about evenly.

### IRON ORE

Little is doing in iron ore, either in the East or on the Lakes, so far as buying is concerned. Nearly all furnaces have completed their arrangements for the year.

Total production of iron ore in 1912 is estimated by the Geological Survey at 55,150,000 tons, an increase of 25.7% over that of the previous year.

Imports of iron ore into the German Empire five months ended May 31 were 5,593,659 metric tons; exports 1,162,565. Imports of manganese ore were 300,002; exports, 3885 tons.

### OTHER ORES

**Manganese Ore** is quoted in London as follows, c.i.f. United Kingdom port: Indian or Brazilian, 50% manganese, 22@22½ per unit; 48%, 21@22c. Caucasian, 50%, 18½@19c.; 48%, 18¼@18½c. per unit.

### COKE

**Connellsville Coke** is the feature of the market. According to the most trustworthy estimates, there was about 175,000 tons a month of furnace coke contracts expiring June 30, and the group of operators holding these contracts months ago made up their minds to insist upon $2.50 for their renewal. The furnacemen absolutely refused to pay the price, and in the closing days in June a compromise was effected with some furnaces, chiefly in the East, whereby coke for July only was purchased at $2.50, the price being guaranteed against sellers' declines. Such sales amounted to about 90,000 tons for July, about one-half the amount supposed to be required. The remaining consumers have not bought, nor do they inquire and at this writing the operators do not know whether they have covered, will blow out or bank, or are about to appear in the market. The operators intended to blow out ovens to shut off any coke not sold. Last week the holiday helped, and the operators involved made Saturday an idle day also. This week coke is somewhat scarce and it remains to be seen whether the operators will weaken as to price or will curtail production.

**Coal Production of German Empire** four months ended Apr. 30, metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal mined.... .. | 56,083,434 | 63,379,455 | I. 7,296,021 |
| Brown coal mined..... | 26,769,972 | 28,176,021 | I. 1,406,049 |
| Coke made.... | 9,061,330 | 10,660,315 | I. 1,598,985 |
| Briquettes made............ | 7,855,712 | 8,803,963 | I. 948,251 |

Of the briquettes reported this year 6,886,452 tons were made from brown coal or lignite.

## CHEMICALS

The general market is still inclined to be dull. Little or no improvement is expected this month.

**Copper Sulphate**—The market is dull, but prices are unchanged, at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is very quiet. Quotations are 2.37½c. per lb. for spot and August; 2.35c. for September and forward. Buyers seem to be holding back in hope of lower prices.

**Arsenic**—Practically no business is being done. Supplies are good, but there is little demand. The quotations are $3.12½@3.50 per 100 lb., but are largely nominal.

### PETROLEUM

The monthly review of the "Oil City Derrick" gives new wells completed in June as follows: Pennsylvania grade, 794; Lima-Indiana, 102; Kentucky, 16; Illinois, 153; Kansas-Oklahoma, 1072; Texas-Louisana, 103. This is a grand total of 2240 wells completed with a new production of 68,242 bbl. The increase in the completions over May is 214, but the new production is 653 bbl. less. Among the completions were 367 dry holes and 168 gas wells, an increase in the failures of 115 and of 8 in gas producers. At the close of the month there were 642 rigs and 2387 drilling wells.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | Feb. | March | April | May | June |
|---|---|---|---|---|---|
| Alaska shipments.. | 660,250 | 472,293 | 1,730,252 | 1,771,508 | |
| Anaconda ....... | 21,250,000 | 22,900,000 | 23,800,000 | 25,600,000 | .... |
| Arizona, Ltd ..... | 3,000,000 | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 |
| Copper Queen..... | 6,810,706 | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 |
| Calumet & Ariz. . | 4,050,000 | 4,250,000 | 4,500,000 | 4,300,000 | .. |
| Chino ......... | 3,898,998 | 4,464,723 | 3,925,409 | 3,883,611 | 3,787,157 |
| Detroit....... ... | 1,689,277 | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 |
| East Butte........ | 1,325,000 | 1,400,000 | 1,400,000 | 1,268,595 | ........ |
| Mammoth.... .. | 1,661,150 | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 |
| Giroux*.. .... | 600,000 | 625,000 | 600,000 | 625,000 | ........ |
| Mason Valley..... | 1,348,070 | 1,608,492 | 1,264,304 | 1,186,560 | ...... |
| Miami .... | ...... | ...... | .. .. | 1,943,900 | 2,612,000 |
| Nevada Con...... | 4,798,537 | 5,555,320 | 5,650,000 | 5,933,275 | ........ |
| Ohio... ..... | 380,849 | 591,651 | 690,001 | 650,071 | ........ |
| Old Dominion..... | 2,381,000 | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 |
| Ray.............. | 3,610,000 | 4,287,000 | 4,379,128 | 4,384,400 | ....... |
| Shannon.......... | 1,152,000 | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 |
| Sontz, Utah....... | *nil* | 62,224 | 132,267 | 200,000 | ......... |
| Tennessee........ | 1,600,151 | 1,796,394 | 1,718,188 | .. . | ........ |
| United Verde*.... | 2,750,000 | 3,000,000 | 3,000,000 | 3,000,000 | ........ |
| Utah Copper Co.. | 7,585,303 | 8,248,880 | 9,539,847 | 10,003,227 | ....... |
| Lake Superior*.... | 19,000,000 | 19,000,000 | 17,000,000 | 18,705,000 | ...... |
| Non-rep. mines*... | 5,399,849 | 6,203,606 | 6,000,000 | 6,300,000 | ...... |
| Total prod...... | 94,951,140 | 102,619,054 | 104,224,079 | ......... | .... |
| Imports, bars, etc. | 21,372,292 | 24,215,480 | 25,578,297 | ........ | .... |
| Total blister.... | 116,323,432 | 126,834,434 | 129,802,076 | ..... . | ..... |
| Imp. ore & matte.. | 9,459,432 | 11,911,041 | 7,177,363 | . ...... | ... |
| Total Amer..... | 125,782,864 | 138,745,475 | 136,989,439 | ....... | . |
| Miami†....... ... | 2,817,200 | 3,102,200 | 2,312,900 | .. ... | . |
| Shattuck-Arizona | 1,136,480 | 1,234,450 | 1,158,326 | 1,026,170 | . |
| Brit. Col. Cos: | | | | | |
| British Col. Cop... | 688,312 | 844,735 | 794,000 | ....... | . .. |
| Granby........... | 1,740,000 | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 |
| Mexican Cos.: | | | | | |
| Boleo† . .. | 2,535,680 | 2,204,720 | 2,811,200 | 2,424,800 | ...... |
| Cananea.......... | 4,880,000 | 4,772,000 | 3,581,690 | 272,0002, | ...... |
| Moctezuma . | 2,730,914 | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 |
| Other Foreign: | | | | | |
| Braden, Chile .... | 1,178,000 | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 |
| Cape Cop., S. Af.. | 712,320 | 732,480 | 586,880 | 387,520 | ......... |
| Kyshtim, Russia . | 1,352,960 | 1,478,400 | 2,544,640 | . . | ......... |
| Spassky, Russia... | 1,003,520 | 974,400 | 974,400 | 721,280 | ..... .. |
| Exports from | | | | | |
| Chile............. | 5,824,000 | 7,840,000 | 7,616,000 | 3,584,000 | ......... |
| Australia......... | 5,512,000 | 6,944,000 | 6,608,000 | 7,840,000 | ..... ... |
| Arrivals—Europe‡. | 8,509,760 | 15,585,920 | 10,545,920 | 13,661,760 | ........ |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines

‡ Does not include the arrivals from the United States, Australia or Chile.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VI, '12. | 122,315,240 | 66,146,229 | 61,449,650 | 49,615,643 | 117,801,600 | 167,417,244 |
| VII.... | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII.... | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX.. . | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X .. | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI.. . | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII.... | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. ... | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III.... | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV..... | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V...... | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI .... | 121,860,853 | 68,452,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII ... | ...... | ......... | . | 52,904,606 | 71,904,000 | 124,808,606 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Arlington, Ida | July 3 | Aug. 4 | $0.002 |
| Atlas Wonder, Nev | July 14 | Aug. 6 | 0.01 |
| Aurora-Sampson, Ida | June 16 | July 16 | 0.002 |
| Belcher, Calif | July 21 | Aug. 14 | 0.10 |
| Black Pine, Utah | June 30 | July 21 | 0.005 |
| Blue Star, Ida | July 10 | Aug. 1 | 0.004 |
| Caledonia, Nev | June 3 | July 25 | 0.05 |
| Central Eureka, Calif | June 6 | July 5 | 0.025 |
| Challenge Con., Calif | July 17 | Aug. 5 | 0.03 |
| Clary Gold, Calif | .. | July 31 | 0.05 |
| Con. Virginia, Nev | July 9 | July 30 | 0.10 |
| Eagle Mountain, Ida | July 19 | Aug. 16 | 0.0005 |
| East Hecla, Ida | July 16 | July 15 | 0.003 |
| Giant M. & D. Co | June 17 | July 17 | 0.001 |
| Gould & Curry | July 14 | Aug. 5 | 0.03 |
| Houghton Copper, Mich | .... | July 15 | 1.00 |
| Hypotheek, Ida | June 20 | July 14 | 0.004 |
| Imperial M. & M., Ida | June 2 | July 21 | 0.002½ |
| Imperial Mg., Ida | June 10 | July 15 | 0.002½ |
| Old Evergreen, Utah | June 17 | July 17 | 0.01 |
| Overman, Calif | July 24 | Aug. 13 | 0.05 |
| Savage, Nev | July 14 | Aug. 5 | 0.05 |
| Silver Moon, Ida | June 2 | July 26 | 0.005 |
| Silver Pick, Nev | June 23 | July 28 | 0.011 |
| Tintic Standard, Utah | June 21 | July 19 | 0.005 |
| Union Chief, Utah | July 10 | July 31 | 0.01 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | .... | 24.286 | 27.919 | .... |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | . |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | |
| October | 53.340 | 63.471 | ..... | 24.594 | 29.299 | .. |
| November | 55.719 | 62.792 | ..... | 25.649 | 29.012 | .. |
| December | 54.905 | 63.365 | ..... | 25.349 | 29.320 | .. |
| Year | 53.304 | 60.835 | | 24.592 | 28.042 | .. |

New York quotations, cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | NEW YORK | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | ... | 17.353 | | 76.636 | ... |
| August | 17.498 | . | 17.644 | | 78.670 | ...... |
| September | 17.508 | | 17.698 | | 78.762 | .... |
| October | 17.314 | ...... | 17.661 | | 76.389 | .... |
| November | 17.326 | | 17.617 | | 76.890 | .. |
| December | 17.376 | | 17.600 | | 75.516 | .... |
| Year | 16.341 | | 16.560 | | 72.942 | ...... |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | | 202.446 | ... |
| August | 45.857 | | 208.351 | .. |
| September | 49.135 | | 223.762 | |
| October | [illegible].077 | | 228.353 | |
| November | [illegible].891 | | 227.619 | |
| December | [illegible].815 | | 226.875 | |
| Av. year | [illegible] | | 209.322 | |

New York in cents per pound; London in pounds sterling per long ton

### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | .... | 4.603 | .... | 18.544 | .... |
| August | 4.569 | ... | 4.452 | ...... | 19.655 | ..... |
| September | 5.048 | ... | 4.924 | | 22.292 | ..... |
| October | 5.071 | . | 4.894 | ... | 20.630 | ...... |
| November | 4.615 | . | 4.463 | ...... | 18.193 | ..... |
| December | 4.303 | . | 4.152 | .. | 18.069 | ..... |
| Year | 4.471 | ...... | 4.360 | .... | 17.929 | ..... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | ...... | 6.966 | .... | 26.174 | ..... |
| August | 7.028 | .... | 6.878 | ... | 26.443 | ...... |
| September | 7.454 | | 7.313 | ... | 27.048 | ...... |
| October | 7.426 | .. | 7.276 | ... | 27.543 | ...... |
| November | 7.37 | | 7.221 | . | 26.804 | ...... |
| December | 7.162 | | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ... | 6.799 | | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No 2 Foundry 1912 | No 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | ...... | 14.38 | ...... | 14.38 | .... |
| August | 15.43 | ... | 14.90 | .... | 14.85 | ...... |
| September | 16.86 | ..... | 16.03 | ... | 15.63 | ...... |
| October | 17.90 | ..... | 17.18 | ..... | 17.22 | ...... |
| November | 18.07 | .... | 17.09 | ... | 18.00 | ...... |
| December | 18.15 | ..... | 17.45 | . | 18.73 | ...... |
| Year | $16.01 | ... | $[illegible] | ... | $15.28 | ...... |

# STOCK QUOTATIONS

**COLO. SPRINGS** July 8

| Name of Comp. | Bid. |
|---|---|
| Acacia | ‡.02⅜ |
| Cripple Cr'k Con. | ‡.01 |
| C. K. & N | ‡.12 |
| Doctor Jack Pot | .05½ |
| Elkton Con | .50½ |
| El Paso | 2.50 |
| Findlay | .02 |
| Gold Dollar | .08 |
| Gold Sovereign | ‡.02⅜ |
| Isabella | .09½ |
| Jack Pot | .04½ |
| Jennie Sample | ‡.05¾ |
| Lexington | ‡.008 |
| Moon Anchor | ‡.0095 |
| Old Gold | .01 |
| Mary McKinney | .53 |
| Pharmacist | ‡.01 |
| Portland | .95 |
| Vindicator | .88 |
| Work | ‡.004 |

**SALT LAKE** July 8

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .05½ |
| Black Jack | .09 |
| Cedar Talisman | .00¾ |
| Colorado Mining | .15 |
| Columbus Con | ‡.07½ |
| Crown Point | .01½ |
| Daly-Judge | 6.30 |
| Grand Central | .50 |
| Iron Blossom | 1.32½ |
| Little Bell | ‡1.10 |
| Lower Mammoth | .01½ |
| Mason Valley | 5.00 |
| May Day | .06 |
| Nevada Hills | .92 |
| New York | .01 |
| Prince Con | .35 |
| Silver King Coal'n | 3.12½ |
| Sioux Con | .03 |
| Uncle Sam | .02 |
| Yankee | .03 |

**TORONTO** July 7

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .08 | Foley O'Brien | .26 |
| Coniagas | 6.75 | Hollinger | 15.75 |
| T. & Hudson Bay | 66.00 | Imperial | .02 |
| Timiskaming | .34 | Jupiter | .36 |
| Wettlaufer-Lor | .11 | Pearl Lake | .28 |
| Apex | .01 | Porcu. Gold | .10 |
| Crown Chartered | .00½ | Preston E. D. | .03 |
| Doble | .25 | Rea | .12 |
| Dome | 15.00 | Swastika | .05 |
| Dome Exten | .09 | West Dome | .15 |

**SAN FRANCISCO** July 8

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 6.05 |
| Belcher | .17 | Jim Butler | .69 |
| Best & Belcher | .05 | MacNamara | .17 |
| Caledonia | 1.35 | Midway | .41 |
| Challenge Con | ‡.02 | Mont.-Tonopah | 1.00 |
| Chollar | .01 | North Star | .93 |
| Confidence | ‡.21 | West End Con. | 1.27 |
| Con. Virginia | .13 | Atlanta | .14 |
| Crown Point | .20 | Booth | .2 |
| Gould & Curry | .01 | C O D. Con | .04 |
| Hale & Norcross | .07 | Comb. Frac | .03 |
| Mexican | .71 | Jumbo Extension | .11 |
| Occidental | .70 | Pitts.-Silver Peak | .48 |
| Ophir | .17 | Round Mountain | .46 |
| Overman | .50 | Silver Pick | .03 |
| Potosi | .04 | Tramp Con | ‡.01 |
| Savage | .11 | Argonaut | ‡1.60 |
| Sierra Nevada | .12 | Bunker Hill | ‡1.90 |
| Union Con | .08 | Central Eureka | .10 |
| Yellow Jacket | .22 | So. Eureka | 2.00 |

**N. Y. EXCH.** July 8

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 63¼ |
| Am. Agri. Chem | 46½ |
| Am. Sm. & Ref., com | 61¼ |
| Am. Sm. & Ref. pf | 99⅜ |
| Am. Sm. Sec., pf B | 81 |
| Anaconda | 32 |
| Batopilas Min | 1¼ |
| Bethlehem Steel pf | 65 |
| Chino | 33 |
| Federal M. & S., pf. | 35 |
| Great Nor. ore ctf | 31⅜ |
| Guggen. Exp | 42 |
| Homestake | 100 |
| Inspiration Con | 14 |
| Miami Copper | 20⅞ |
| Nat'nal Lead, com | 45 |
| National Lead, pf | 105½ |
| Nev. Consol | 14⅛ |
| Phelps Dodge | 190 |
| Pittsburg Coal, pf. | 74½ |
| Quicksilver, pf. | 4½ |
| Ray Con | 16¼ |
| Republic I & S, com. | 18½ |
| Republic I & S pf | 76¼ |
| Sloss Sheffi'd com | 23 |
| Sloss Sheffield, pf | 85 |
| Tennessee Copper | 28 |
| Utah Copper | 41½ |
| U. S. Steel, com | 52⅝ |
| U. S. Steel pf. | 104¼ |
| Va. Car Chem., pf | 95 |

**N. Y. CURB** July 8

| Name of Comp. | Clg. |
|---|---|
| Barnes King | 1.43 |
| Beaver Con | .30 |
| Big Four | .41 |
| Braden Copper | 6½ |
| B. C. Copper | 2¼ |
| Buffalo Mines | 2⅜ |
| Can. G. & S | .22 |
| Con. Ariz. Sm | $\frac{5}{16}$ |
| Davis-Daly | $2\frac{1}{16}$ |
| Diam'field-Daisy | .03 |
| Ely Con. | .10 |
| Florence | .35 |
| Giroux | 1⅝ |
| Gold Hill Con. | ‡¼ |
| Goldfield Con | 1¾ |
| Greene Cananea | 5⅞ |
| Greenwater | .05 |
| Internat. S. & R | ‡109 |
| Kerr Lake | 3⅛ |
| Keystone | ‡2 |
| La Rose | $2\frac{5}{16}$ |
| McKinley-Dar-Sa | 1⅝ |
| Min. Co. of A. new | 2⅝ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 8⅝ |
| Ohio Copper | $\frac{9}{16}$ |
| Pacific Sm. & M | ⅛ |
| Puebla S. & R. | 2⅛ |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N. J | 354 |
| Stewart | $1\frac{1}{16}$ |
| Tonopah | 4⅝ |
| Tonopah Ex | 2¼ |
| Tonopah Merger | .61 |
| Tri-Bullion | ⅛ |
| Tularosa | $\frac{5}{16}$ |
| Union Mines | ⅛ |
| United Cop., pfd. | ‡3 |
| Yukon Gold | 2⅜ |

**LONDON** June 26

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 15s 3d |
| El Oro | 0 15 0 |
| Esperanza | 0 17 6 |
| Mexico Mines | 5 12 6 |
| Oroville | 0 5 0 |
| Santa Gert'dis | 1 2 6 |
| Stratton's | 0 1 9 |
| Tomboy | 1 7 6 |

**BOSTON EXCH.** July 8

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1⅛ |
| Ahmeek | 280 |
| Alaska Gold M. | 17⅜ |
| Algomah | 1⅛ |
| Allouez | 31½ |
| Am. Zinc | 18¼ |
| Ariz. Com., ctfs. | 2½ |
| Bonanza | .32 |
| Boston & Corbin | 60 |
| Butte & Balak | 1¼ |
| Calumet & Ariz | 59⅛ |
| Calumet & Hecla | 415 |
| Centennial | 11 |
| Cliff | ½ |
| Copper Range | 40 |
| Daly West | 2½ |
| East Butte | 10 |
| Franklin | 5 |
| Granby | 54¼ |
| Hancock | 15 |
| Hedley Gold | 32 |
| Helvetia | .30 |
| Indiana | 5 |
| Island Cr'k, com | 47½ |
| Island Cr'k, pfd | 79 |
| Isle Royale | 18 |
| Keweenaw | 1½ |
| Lake | 7½ |
| La Salle | 3⅜ |
| Mass | 2⅝ |
| Michigan | 1 |
| Mohawk | 44 |
| New Arcadian | 1¼ |
| New Idria Quick | ‡1⅞ |
| North Butte | 24¼ |
| North Lake | 1¼ |
| Ojibway | .67 |
| Old Dominion | 44 |
| Osceola | 74½ |
| Quincy | 57 |
| Shannon | 6¾ |
| Shattuck-Ariz | 22½ |
| Superior | 23¼ |
| Superior & Bost | 2 |
| Tamarack | 26½ |
| Trinity | 3¼ |
| Tuolumne | 1½ |
| U. S. Smelting | 34⅞ |
| U. S. Smelt'g, pf | 46 |
| Utah Apex | 1½ |
| Utah Con | 9 |
| Victoria | .90 |
| Winona | 1½ |
| Wolverine | 43½ |
| Wyandot | .65 |

**BOSTON CURB** July 8

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 2½ |
| Boston Ely | .48 |
| Boswyocolo | ‡1 |
| Butte Central | .17 |
| Cactus | .05 |
| Calaveras | 2¼ |
| Chief Cons | [illegible] |
| Corbin | $1\frac{1}{16}$ |
| Cortez | .10 |
| Crown Reserve | 3¾ |
| Eagle & Blue Bell | .80 |
| First Nat. Cop | 1⅜ |
| Houghton Copper | 1⅞ |
| Majestic | .35 |
| Mexican Metals | .54 |
| Moneta Pore | .07 |
| Nevada-Douglas | 1⅛ |
| New Baltic | .70 |
| Oneco | .85 |
| Raven Copper | ‡.01½ |
| Rhode Island Coal | .02 |
| Smokey Dev | ‡¼ |
| S. W. Miami | 1½ |
| South Lake | 4 |
| Trethewey | .35 |
| United Verde Ext. | .60 |

‡Last quotation.

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# Tungsten in Boulder County, Colorado

By Leroy A. Palmer*

*SYNOPSIS—Boulder County, Colo., furnishes 60% of United States tungsten. Veins are associated with pegmatite in granite. The economic mineral is ferberite. Mines are small and shallow. Stoping is simple. Conger mine largest producer. Most of the ore is concentrated. Different concentrating systems employed in Primos and Wolf Tongue mills.*

⁂

During 1912 the tungsten production of the United States was equivalent to 1290 tons of concentrate carrying 60% of tungsten trioxide. Of this amount, 1200 tons equal to 775 tons of the 60% product or 60% of the total, came from Boulder County, Colo., the only district in the country where this rare metal is found in commercial quantities in the form of ferberite.

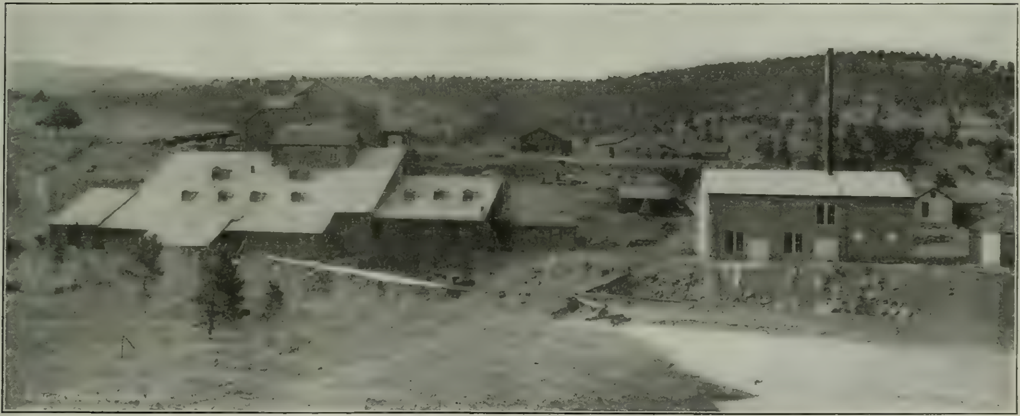

Fig. 1. Wolf Tongue Mill and Power Plant, Nederland, Colorado

In 1900, Sam P. Conger, an old prospector of this district and locator of the Caribou mine, learned from a former partner, just returned from Arizona, where he had seen tungsten mined, the true nature of the "black iron" which was found abundantly as float and as numerous croppings to the detriment of much good agricultural land on the near-by ranches. Mr. Conger got a lease on a portion of the Boulder County ranch and in the same year the Great Western Exploration & Reduction Co. entered the field, the combined output being 46 tons, averaging a little better than 60% of trioxide.

The district lies in the southwestern part of Boulder County, the mines now producing extending about eight miles in a general northeast and southwest direction, although discoveries have been made over an area of eight miles east and west and 16 miles north and south.

## Mineral Occurs as Ferberite

As stated, the metal occurs as ferberite, a black or brownish-black mineral, crystallizing in the monoclinic system with perfect cleavage; hardness, 4 to 4½; sp.gr., 7.1 to 7.5 (according to Dana 6.8); friable and distinguished from similar minerals by its fusibility (5), specific gravity and cleavage. Seven analyses from the Nederland-Beaver Creek (southwestern) portion of the field show it as an almost pure ferrous tungstate carrying $WO_3$ from 72.36 to 75.35% and MnO from 0.10 to 0.86% and a slight excess of FeO, while analyses from the northeastern portion of the field show MnO as high as 4.16%. The Boulder County deposits are remarkable for the absence of the minerals usually associated with such deposits, pyrite and galena being rarely found and no occurrence of native copper has so far been reported.

The district extends from the uptilted sedimentary rocks, rising from the plains, westward to the Front Range, thus presenting an easterly sloping belt in which many cañons and steep gulches have been eroded. The tungsten area lies in the Front Range in pre-Cambrian strata, three miles west of the nearest sedimentary rocks.

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*Mining engineer, 46 Federal Bldg., Helena, Mont.

### DISTRICT IS LARGELY GRANITE, GNEISS AND SCHIST

The most important rocks of the district are a more or less gneissoid granite and a granitic gneiss, which grades into quartz-mica schist and mica schist.[1] As a rule, each rock occurs in a well defined area but sometimes bodies of one are found within the other, showing no distinct contact but a gradual transition from one to the other. Granite, in the form of irregular intrusive bodies, cuts the granite and the gneiss and in the western and northwestern parts of the field are many other dikes varying in composition from acidic porphyry to basalt. The granite and gneiss are themselves complex, being made up of a primary rock mass and many intrusions, the latter comprising a large portion of the whole. The intrusions occurred in different periods and there is a corresponding variance in the degree of metamorphism shown, but, with the exception of the dike rocks, there is little that has not been subjected to this action, and the older intrusives have been so metamorphosed that they are only with difficulty distinguished from the inclosing rocks.

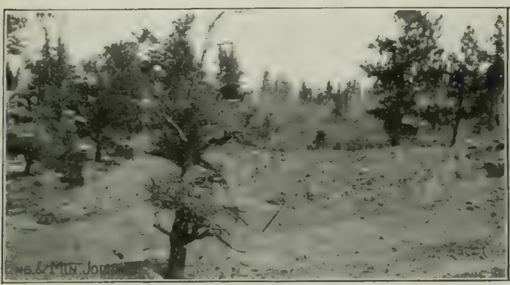

FIG. 2. SURFACE WORKINGS AND DIKE, STAR MINE

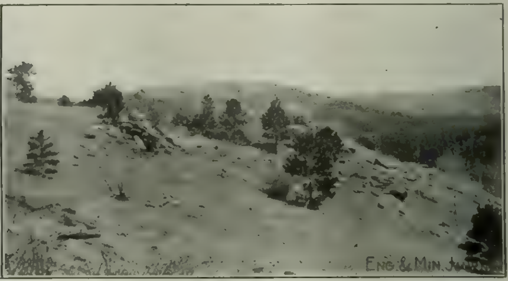

FIG. 3. OUTCROP AT THE CONGER MINE

The granite and the gneissoid granite were intrusive and the structure varies from massive to one in which directional structure is marked and segregation of mica particularly noticeable. The granite is the ordinary biotite variety with hornblende crystals. Orthoclase is the principal constituent of the granite proper but as the rock grades into gneiss the quartz becomes predominant. The gneiss, which has the general chemical composition of the biotite granite, and in many places resembles it in structure, is much older than the latter rock and lies in the western and northwestern part of the field. The evidence is that this is of sedimentary origin. Neither rock shows any regularity of dip or strike.

### PEGMATITE IS OF FREQUENT OCCURRENCE

Pegmatite occurs in two different forms, coarse-grained, which is found as dikes frequently holding large masses of country rock, and a finer-grained, which grades into the surrounding country rock and was formed by the solution and recrystallization of the latter along seams and fracture lines. The most common occurrence of the latter form is in connection with orebodies. The ore is usually found as a breccia which includes a chalcedonic quartz or "hornstone," dike granite and pegmatite, country rock and ferberite.

### BEST OREBODIES IN GRANITE

The best orebodies are found in the granite, gneissoid granite and the more granitic parts of the gneiss. There are only a few instances where mines are situated at any distance within the gneiss, most of them being in the granite or near the granite-gneiss contact. It is extremely rare to find a valuable orebody in the more pronounced gneiss or schistose portions of the district. When the vein reaches these formations it pinches and is usually barren. In view of the almost identical compositions of the gneiss and the granite this fact, at first, appears puzzling and the explanation is physical rather than chemical. It appears that the schists acted as plastic masses and the forces which caused fracturing and consequent opening of channels in the pegmatite and gneissoid granite resulted in folding, crumpling and shearing in the schist so that any openings were small and in many cases were closed again, thus allowing only a limited circulation of the mineral-bearing solutions or cutting them off entirely. A similar condition obtains in Gilpin County, which adjoins Boulder on the south.[2] In the Nederland-Beaver Creek portion of the field, fissuring seems to have been subsequent to the intrusion of the pegmatite dikes and to have followed the general line of the latter as that of least resistance.

There does not seem to be any regular vein system, although the strike of the veins is principally through the northeast and southwest quadrants varying from due north to N80°E. The dip is usually steep, rarely less than 45°. According to Prof. R. D. George, the ore deposition took place in the following stages: (1) The first opening of the fissures accompanied by much crushing and the formation of masses of angular fragments. (2) The silicification of the rock fragments and their partial cementation into an open breccia and a slight local deposition of tungsten mineral. (3) The second movement and brecciation. (4) The first important deposition of tungsten mineral. (5) The third movement, crushing the breccia ore, and mingling it with much rock matter and in places forming a new breccia by pressure. (6) The second deposition (local) of chalcedony-like silica. (7) The second important tungsten deposition, partly cementing the breccia. It is possible that this was a secondary enrichment, but no clear evidence has been found to support this theory. (8) The contemporaneous deposition of silica and tungsten. (9) Local solution of the tungsten and deposition of silica. (10) In parts of the field, slickensiding and recent brecciation, showing that movement has occurred later than recognizable deposition of ferberite and silica. This is particularly well illustrated at the Clyde mine.

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[1] Geologic data largely obtained from report of Prof. R. D. George, Colorado Geological Survey.

[2] Collins' "Application of Genetic Theories to the Search for Local Enrichments in Veins," Proc., Colo. Sci. Soc., Vol X.

### Prominent Outcrops Led to Surface Working

As noted, many of the veins follow the general course of the pegmatite dikes, sometimes on one wall, sometimes on the other and occasionally splitting a dike. In Fig. 2 the dike at the Star mine of the Wolf Tongue Mining Co. is shown in the background through the trees and Fig. 3 shows the prominent dike north of the Conger shaft of the Primos Mining Co. The veins themselves crop prominently, which fact, with the soft nature of the ferberite, rendered them particularly susceptible to erosion, resulting in an abundant float which thoroughly impregnated the soil in the vicinity and rendered location easy. These conditions naturally led to surface mining and the country is gophered with opencuts, trenches and shallow shafts, as shown in Figs. 2 and 4. The latter is a stope at the Clyde mine, which was opened on the surface and then, after the Clyde shaft was sunk, stoped by the overhand method from the 80-ft. level. The stulls shown are typical of the timbering found in the district. A great many tons of high-grade ore have been shipped by simply picking up float, which was found abundantly in pieces as large as one's fist, and, after this was pretty well worked over, by shoveling up the surface soil near the outcrops and hand-jigging it.

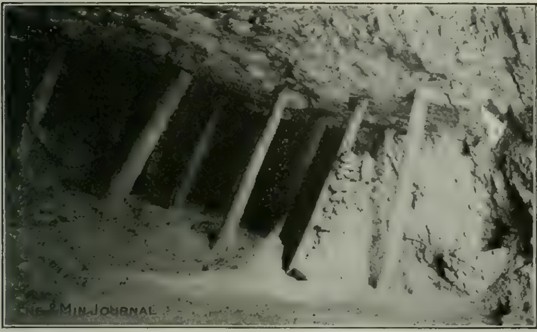

Fig. 4. Open Stope in the Clyde Mine

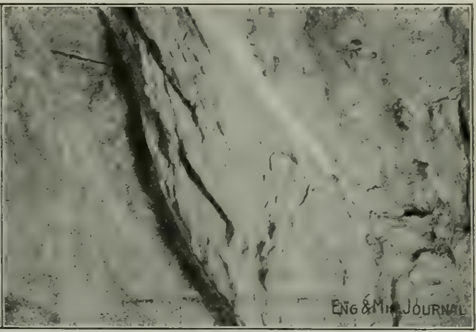

Fig. 5. Stringer of Rich Ore, Cold Spring Mine

The largest mining companies in the district are the Primos Mining Co., at Lakewood, and the Wolf Tongue Mining Co. and Colorado Tungsten Corporation, at Boulder. The last has not been in operation recently and production comes from the other two and several leases on scattering groups of claims.

The Primos Mining Co., a subsidiary corporation of the Primos Chemical Co., owns 1680 acres scattered over an area of five miles in the northern portion of the field. Title to about three-fourths of this acreage was originally obtained from the Government by agricultural patent and after the value of the "black iron" was discovered the company bought the ranches outright to secure the mineral land thereon. The headquarters of the company are at Lakewood on North Boulder Creek at a point about central to its holdings.

This company operates three mines, the Quaker & Oregon, four miles from Lakewood, which has a 325-ft. shaft and works eight to 10 men, the Lone Tree, ½ mile from Lakewood, 325 ft. deep with 10 men, and the Conger, two miles from Lakewood, with a 450-ft. shaft and 45 men. The output of the Quaker & Oregon and the Lone Tree is small and is hauled to the mill by wagon. The latter is of interest from the fact that in the schist here a high-grade orebody, measuring 100 ft. long, 70 ft. high and with a width up to 20 ft., was stoped out.

### Conger Mine a Large Producer

The Conger, the largest producer of the district and probably of the world, was originally opened by an incline on the vein and later by a vertical shaft 580 ft. distant and at 60 ft. lower elevation. This shaft has been sunk 450 ft. and gives 600 ft. of backs. A 5x8-ft. tunnel, 350 ft. long, meets the vertical shaft on the 150-ft. level and is continued to the incline shaft where a 15-hp. electric hoist has been installed so that the incline may be used for hoisting while the next 100-ft. lift of the vertical shaft is being sunk this summer. Fig. 6 shows the vertical shaft house at the left and the incline shaft house and dump in the middle background.

The mine has been opened by seven levels. The shaft is 5x10 ft. with hoistway and ladderway. Equipment consists of a 10x12-in. Hendrie & Bolthoff, duplex, second-motion hoist having a rope speed of 400 ft. per min with full load; a 6¾x12x12-in. air and 10x12-in. steam Norwalk two-stage, straight-line compressor with a capacity of 200 cu.ft. of free air per min. working at 90 lb.; a 100-hp. return-tubular boiler; and a 5x6-in. Deming triplex pump geared to a 10-hp. Fort Wayne motor on the 450-ft. level. The water question is not serious, although the flow has increased recently on account of the fact that one of the drifts has been carried under a nearby creek; the small pump handles all of the water, working about half of the time.

Three veins, the Conger, Middle and East have been developed. The dip is such that they are expected to unite at depth and the Conger and Middle veins have united on their strike at the 450-ft. level where a large orebody was formed on the intersection. Most of the orebodies are ideal for convenient mining. They occur more or less lens-shaped, pinching down to a narrow seam, then opening out to from 4 to 8 ft. over frequently a considerable length, as exemplified by the fact that above the 200-ft. level they have been stoped in a continuous body for 800 ft. The width mentioned is sufficient to give good working room without involving any serious problems of timbering.

### STOPING BY SHRINKAGE SYSTEM—NO FILLING

The usual procedure is to crosscut from the shaft until a vein is reached and then to follow it until it opens out. It is then stoped up about 8 ft. and 14- or 16-in. round stulls are put in with round lagging laid on top. Usually the regular system of shrinkage stoping is followed. Chutes are put through holes left in the lagging and uppers are drilled in the ore, which is broken down on the lagging and drawn off only in sufficient amount to allow working room for the miners. As the ore is broken down it receives a rough hand-sorting in the stopes and if a high-grade streak is encountered it is carefully broken out by single-hand drilling instead of by stopers in order to avoid mixing it with the lower grade. When a stope is worked out to the level above, the ore is drawn off and the stope abandoned. At first when a stope was emptied, waste was run in and the walls were shot down, but this was found to be unnecessary as the hard and, in most cases, nearly perpendicular walls stand without support. On the 200-ft. level the "big stope" has been emptied and only partially filled with waste and stands, a huge cavern, 250 ft. long, 90 ft. high and about 8 ft. wide.

The ore is hoisted to the tunnel level and trammed to a bin at the mouth, Fig. 7. Here it is dumped over grizzlies, hand-sorted and loaded to cars of 1¼ tons' capacity, which are hauled to the mill in trains of five by a 3½-ton, 10-hp., storage-battery, General Electric locomotive. The tramway is a little over two miles long, with an average grade of 2%, 24-in. gage and 30-lb. steel.

The Wolf Tongue Mining Co. owns 593 acres of land, 75 acres of which is in the Beaver group, about a mile south of Nederland, and 518 acres in the Ranch group, about three miles northeast; 160 acres of the latter was homesteaded and patent secured in 1881 as agricultural land and 80 acres is placer. No attempt has yet been made to work the placer, but it is quite possible that work will be undertaken this season by hydraulic methods.

### WOLF TONGUE MINES OPERATED BY LESSEES

Since 1907, when the financial depression seriously affected tungsten mining through the steel industry, the Wolf Tongue has extracted all of its ore by leasing, a policy which, judging from the appearance of the mines, will be of doubtful benefit to the company in the long run. A rather unusual agreement has recently been made with the lessees by which the latter are paid $7 per ft. for all shaft-sinking in barren ground. Most of the workings on Wolf Tongue ground are comparatively shallow and the ore is extracted from a number of small shafts. In the past most of these have been equipped with whims or small steam hoists, but since the Central Colorado Power Co. has brought electricity into the district this equipment is being supplanted with small electric hoists of from 10 to 22 hp. Four leases are operating on the Beaver group in shafts from 50 to 150 ft. deep and 19 on the Ranch group at depths up to 300 feet.

FIG. 6. CONGER SHAFT HOUSES

The principal producers are the Clyde and the Cold Spring, both on the Ranch group. Both of these mines show a high-grade ferberite. Fig. 5, taken on the 150-ft. level of the Cold Spring, shows a 6-ft. face of ore with an 18-in. streak diagonally across that carries 56.9% $WO_3$. The Clyde was opened by a 4x8-ft. incline on the vein, which has a dip of about 80°. The shaft is 305 ft. deep and at the 230-ft. level a 5x8-ft. tunnel has been run 560 ft. to the shaft, where it cuts the vein, and 94 ft. beyond on the vein. At the tunnel level a rather unusual pumping equipment has been installed, consisting of a Fairbanks-Morse, American deep-well pump. This is simply an ordinary lift pump, of the same principle as the ordinary hand pump used in deep wells, with the rods driven by a crank geared to a 5-hp. Fort Wayne motor. The piston is 3 in. in diameter and attached to 67 ft. of wooden rods. The pump makes a 2-ft. stroke, 37 per min., and delivers about 20 gal. to the tunnel level. In the drift beyond the shaft an underground compressor has been installed. This is a 10x10-in. Blaisdell with a capacity of 130 cu.ft. per min., sufficient to run two Waugh stopers.

The Cold Spring is opened to the 150-ft. level with three levels at 50-ft. intervals. It is equipped with a 10-hp. hoist and a 10x8-in. Chicago Pneumatic Tool Co. compressor with a capacity of 120 cu.ft. per min. belted to a 20-hp. motor. Pumping is done by a Deming triplex pump geared to a 3-hp. motor and discharging 16 gal. per minute.

The general ore occurrence in the Wolf Tongue mines is similar to that at the Conger; although, as a rule, the orebodies are smaller, more high-grade ore is found. The usual practice is to break the ore down by overhand stoping, usually by hand, and tram it out as broken. Stulls are put across the stopes, and lagging laid on them as a platform for the men to work on. All ore is hauled by wagons to the mill at Nederland.

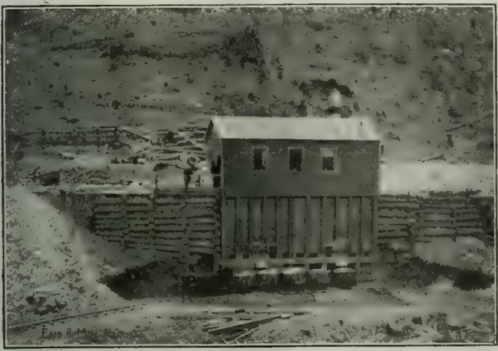

FIG. 7. CONGER ORE BIN AND ELECTRIC STORAGE-BATTERY LOCOMOTIVE

### PRIMOS MILL IS CONVENIENT AND ROOMY

The Primos mill, Fig. 8, is situated at Lakewood, near North Boulder Creek. It is a frame building and, as shown by the illustration, is abundantly supplied with windows and skylights and is, in general, built with a view toward convenience, being roomy, with motors on elevated platforms, broad runways to the line shafts, etc. The tramway from the Conger enters the south side and makes a loop for the return. Wagons from the Quaker & Oregon and Lone Tree are driven in on the floor below. Below the tram track are the bins, six of 15-ton capacity for high-grade or custom ore and one of 100 tons for mill ore. The former is wheeled by buggies to a 6x12-in. Blake crusher set to 1 in. and driven by a 10-hp. motor and from the bin beneath wheeled to pockets similar to those above while awaiting settlement or shipment.

The mill ore is fed through two lever gates over 1⅛-in. grizzlies and the oversize shoveled to a 10x16-in. Blake crusher set to 1 in. and making 250 r.p.m., driven by a 15-hp. motor. The crusher discharges to the 125-ton battery bin beneath the grizzlies. On the crusher floor is the sample-grinding equipment, consisting of two jaw crushers, a gyratory and a pulverizer driven by a 5-hp. motor. Below the battery bin are two 5-stamp batteries driven by a 35-hp. motor and fed by Challenge feeders actuated by the middle tappet of each battery. The stamps weigh 1000 lb. each and make 88 drops from 6½ to 8 in. per min. with a 1½-in. discharge. The order of drop is 1-5-2-4-3. Each stamp delivers from 3½ to 4 tons per 24 hr., crushing from 1 in. through a 20-mesh Ton-cap screen.

Each battery discharges to a No. 6 Wilfley table, which treats the feed without any classification. The Wilfleys make ⅞-in. strokes, 240 per min., sending the concentrate to tubs and the tailing to a 3-in. Frenier pump, which raises it 16 ft. to a tub from which it flows to a four-compartment V-shaped settling tank above six 4-ft. Frue vanners which make 210 strokes per min. with a belt speed of 44 in. The first compartment of the settler feeds two of the vanners, which have corrugated belts. The second and third compartments, each feed one plain-belt vanner, and the fourth compartment, two plain-belt. The vanner tailing is delivered by 3-in. Frenier pumps in two lifts of 9 and 12 ft. to a large V-shaped settling tank 60 ft. long, 10 ft. wide and 10 ft. deep, provided with six gooseneck discharges. The discharge from the first gooseneck goes to a Dorr classifier, the sand from which goes to a 66x84-in., silex-lined Prosser tube mill, which makes 21 r.p.m. The slime from the classifier is piped around the tube mill and with the discharge of the latter is lifted by a Frenier pump against a 19-ft. head to the third compartment of the large settler. Each of the spigots from the settler, except the first, feeds a Frue vanner, the first three with 6-ft. belts and the last two with 4-ft. These vanners are plain-belt and make 180 strokes per min. with a belt speed of 40 in. per minute.

### SEVERAL SERIES OF CANVAS TABLES

All tailing from these vanners is conveyed by a launder to 12 plain canvas 6x40-ft. tables on the next lower floor, Fig. 9, the tailing from which goes to the next floor to 14 "rags," 6x30 ft., and then to 16 tables, 6x20 ft., so that the tails from the five vanners are treated on 7320 sq.ft. of canvas. All of these tables have a slope of 9°. They are cleaned, as necessary, by diverting the feed and sluicing off the surface with a hose. Little attention is required and the management states that the saving is satisfactory.

Below the last row of canvas tables are four rows of settling tubs, two of which may be seen in the illustration. In order to effect a thorough settling of all particles held in suspension, all water from the slime concentrate must pass through the entire series, which extends the full width of the mill, before being discharged. All concentrate is shoveled into buggies and wheeled to a steam drier, those from the Wilfley tables and vanners being lowered down a 20° incline with a slope carriage and small hoist, as the drier is on a level with the lowest floor of the mill.

### ELECTRIC POWER IS PURCHASED

Power is bought from the Central Colorado Power Co. and transformed at the mill from 13,000 to 440 volts. The following General Electric three-phase induction motors are in use:

| Machines | Number of motors | Hp. |
|---|---|---|
| 1 crusher | 1 | 15 |
| 10 stamps | 1 | 35 |
| 2 Wilfley tables and 1 Frenier pump | 1 | 5 |
| 1 tube mill | 1 | 35 |
| 11 vanners, 3 Frenier pumps and 1 Dorr classifier | 1 | 10 |
| Total horsepower | | 100 |

The mill uses about 200 gal. of water per min. A ditch 6500 ft. long connects it with North Boulder Creek and for about seven months of the year supplies all necessary water, but during the winter an additional supply is furnished by a triplex pump operating against a total head of 125 ft. The regular day shift consists of one man for crusher, one for batteries, tables and vanners, two ragmen, drierman and foreman. Crusherman and drierman do not work at night. Wages are \$3.50 and \$4.50 for a 12-hr. shift.

### Wolf Tongue Mill Handles Lessees' Ore

The Wolf Tongue mill and power plant, Fig. 1, are adjacent to each other on South Boulder Creek, at Nederland. The ore is hauled from the various mines by wagons and dumped in four 15-ton ore pockets. Ore running better than 50% $WO_3$ is shoveled to a 5x8-in. Sampson crusher set to 1 in., which dumps to a chain-and-sprocket elevator with 4x4x6-in. cups and a 19-ft. lift. This elevator running at a speed of 88 ft. per min. dumps to a Vezin sampler which makes a $\frac{1}{10}$ cut, the sample reject going to a 4-ton bin from which it is sacked and shipped.

The lower grade is shoveled to an 8x10-in. Colorado Iron Works Blake crusher set to 1 in. and making 203 r.p.m. From the crusher it goes to a set of 14x32-in. MacFarlane cornish rolls set to ¼ in. and driven at a speed of 110 r.p.m. by a 48-in. wooden "bull-wheel" and friction. The rolls discharge to an elevator similar to the one described; this raises the ore 20 ft. to a Vezin sampler which makes a $\frac{1}{10}$ cut, the reject going to an elevator which raises it 30 ft. and chutes it to one of three 30-ton bins in which it is held until settlement is made with the lessee. These bins are provided, in the mill, with gates from which the ore may be chuted to the elevator which raised it to the bin and delivered through another chute to the jig bin and, on the outside, with gates through which it may be unloaded and hauled away if, for any reason, the lessee decides not to have it treated. All the above machinery is driven by a 50-hp. motor.

### Jigs Are Used

After settlement is made the ore is delivered to the elevator and chuted to a 20-ton bin from which a plunger feeds it to the screen line consisting of two 3x7-ft. trommels with 6 and 12 meshes per in. Each trommel sends its oversize to a two-compartment harz jig. These jigs work through side and hutch, making concentrates in both compartments, that from the first compartment assaying 53 to 55% and that from the second 25%. They are sacked and shipped as separate products. A 15-hp. motor drives the jigs and trommels.

The jig tailing goes to a 50-ton battery bin from which it is fed by Challenge feeders to three of four 5-stamp batteries. The stamps weigh 900 lb. each and drop 5 in. with even discharge, each stamp crushing two tons per 24 hr. from ¼-in. through 18-mesh Ton-cap screens. The fourth battery is used for regrinding, as many stamps as may be necessary being dropped for this purpose. The even discharge is used to minimize the amount of slime produced. A 35-hp. motor drives the batteries and two Frenier pumps mentioned later. The battery discharge goes to an 8x44-in. Frenier pump which lifts the pulp 15 ft. and discharges it to a tank to which the undersize of the second trommel of the screen line flows by gravity.

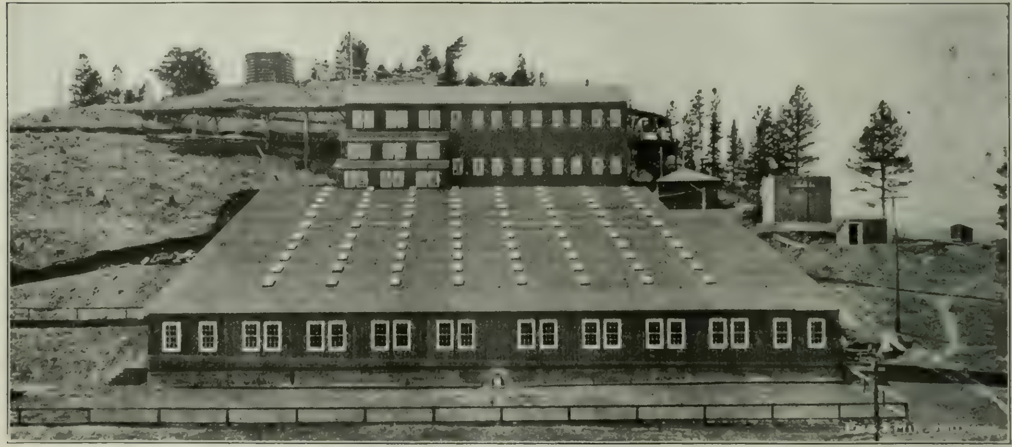

Fig. 8. The Primos Mill at Lakewood

### Special Sizer Used

On the table floor below the batteries are one Wiltley and five Card tables with speed and stroke as follows: 240 r.p.m., ¾-in.; 260 r.p.m., ½-in.; 270 r.p.m., ¼-in.; 270 r.p.m., ¼-in.; 285 r.p.m., ¼-in.; 258 r.p.m., ¼-in. The last table is a Wiltley and is used for treating the recrushed product. Classification is by means of three, small, shaking screens designed by William Loach, manager of the Wolf Tongue, and peculiar to this plant. The screen consists of an eccentrically operated, galvanized-iron hopper with a screen inside, so that the oversize is discharged to the table and the undersize passes out of the bottom of the hopper and on to the next screen. The first three tables are provided with these sizers as follows: 20-mesh, 240 ½-in. strokes; 10-mesh, 260 ¾-in. strokes;

90-mesh, 280 ¾-in. strokes. They are found to give satisfaction.

The first five tables, the Cards, make two grades of concentrate, a first grade running from 62 to 65%, and a second grade running from 25 to 30%. All tailing from the first table is reground, but the second and third make a rejection. The fourth and fifth treat the undersize of the last shaking screen and send all tailing to the slimers. All middling from the first three and last tables goes to an 8x44-in. Frenier pump which elevates it 21 ft. to the regrind battery, where it is passed through a 60-mesh screen and sent to the Wilfley table, which makes only second-grade concentrate and middling. A 20-hp. motor drives the tables and sizers.

### Monell Slimers in Use

Slime is treated on three Monell slimers. This is a comparatively unknown machine, but has given good results on this ore. It consists of a rubber-edged canvas belt with an exposed surface of 5x18 ft. and a transverse slope of 2 in. Feed is discharged lengthwise for a length of 12 ft. along the upper edge of the belt from a perforated pipe and wash water is fed on at the concentrate end. It has a belt speed of 1 ft. per min. and receives 260 ½-in. strokes longitudinally from an eccentric without differential motion. The slimer feed consists of the middling of the fourth and fifth Card tables and the overflow of the table-feed tank, one slimer to each of the above products. The slimers make second-grade concentrate and the tailing is sent to a double-compartment concrete sump, 18x18 x4 ft. While this tank is filling, quicklime in the proportion 20 lb. per 100 tons of tailings is added to settle the colloids which, otherwise, would remain in suspension almost indefinitely. As many of these fine particles consist of valuable mineral too fine to be recovered by any process yet devised, it is sometimes found advisable to ship the slimer tailing as second-grade concentrate. All tailing of ore running over 20% $WO_3$ is treated in these tanks and either shipped or pumped back by an 8x44-in. Frenier pump and re-treated. A 15-hp. motor drives the slimers, Frenier pump, 2-in. centrifugal pump for delivering slime concentrate to the drier and a small compressor for cleaning the motors.

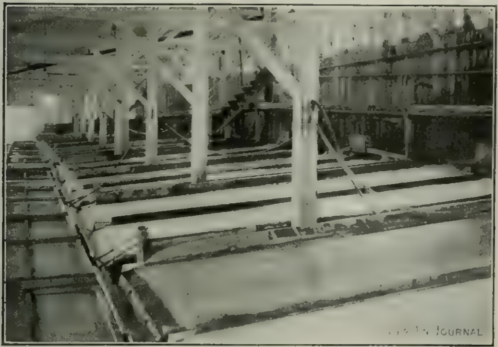

Fig. 9. Canvas Tables, Primos Mill

### Concentrates Shipped to McKeesport

The concentrates are dried and shipped to the Firth-Sterling Steel Co., McKeesport, Penn., where their principal use is in the manufacture of ferrotungsten. First grade is settled for at the market quotation and second grade at about 5% better than the same grade in ore.

All motors are General Electric, three-phase, induction, 440-volt and are distributed as follows:

| Machines | Number of motors | Hp. |
|---|---|---|
| 1 crusher, 1 set rolls, 2 elevators, 1 sampler.... | 1 | 50 |
| 2 trommels, 2 jigs.............................. | 1 | 15 |
| 2 pumps, 20 stamps.............................. | 1 | 35 |
| 6 tables, 3 sizers.............................. | 1 | 20 |
| 3 slimers, 2 pumps, 1 compressor................ | 1 | 15 |
| Total horsepower.................................. | | 135 |

Tailing is settled consecutively in three ponds before the overflow is discharged to the creek. The mill operates 12 hr. per day with superintendent, foreman, sampler, jigman, tableman, weigher and a mechanic who makes repairs in the mill and attends to the power house. The extraction is claimed as from 88 to 90%. This is possible when the slime tailing is shipped and the only rejection made is from three of the Card tables.

The power plant occupies half of a 40x60-ft. concrete building. The company has 42 sec.-ft. of water appropriated and uses about 20. This is brought through 1500 ft. of 48-in. and 280 ft. of 30-in. wood stave pipe and discharged with 91-ft. head to a 150-hp. vertical Leffel turbine with two 17½-ft., 15-in. draft tubes. The turbine is direct connected to a 480-volt, 100-kw. General Electric alternating-current generator with a 5-kw. exciter. Connection is also had with the lines of the Central Colorado Power Co., and an auxiliary steam plant is provided.

### Conger Mine Better Operated—Wolf Tongue Mill Follows Better Practice

A study of the methods of the two companies shows many interesting contrasts. The Conger mine follows uptodate methods and is a pleasure to examine. The exclusive leasing system practiced by the Wolf Tongue has brought about the almost inevitable gophering and its advantages would appear questionable.

The mills show an even greater variance in practice. The Wolf Tongue follows coarse crushing as closely as possible, considering that it is obliged to adapt an old stamp mill to present usage, while the Primos uses practically an all-sliming process, crushing to 20-mesh at the outset and sliming in a tube mill. As the ore is extremely friable and the "hornstone" that accompanies it is tough and as the Wolf Tongue states 55 to 60% of its output comes from the jigs, the argument would seem to be in favor of that system. One cannot but be impressed with the power used in operating both mills, especially the Wolf Tongue. The Primos is run practically without classification, the only attempt at this process being the tanks which classify for the vanners, while the Wolf Tongue makes a classification for every concentrating machine. While the Wolf Tongue is working under adverse conditions in being obliged to adapt to its uses an old mill built for the treatment of gold ores and doubtless would do away with stamps entirely if it were designing a new mill, it is probable that a millman examining both systems would conclude that the principles it is following conform more closely with successful practice elsewhere.

The writer wishes to acknowledge the courtesy of officials and employees of both companies and especially that of William Todd, of the Wolf Tongue, and George W. Teal, of the Primos.

# Sale of Power on the Rand

*SYNOPSIS—Central generation of electric power and compressed air on the Rand has proved successful. Additional installation planned. Air sold by units specially devised. Venturi recording air meter designed.*

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The Victoria Falls & Transvaal Power Co., Ltd., was formed at the end of 1906 with the object of supplying power in South Africa and Rhodesia, and of acquiring the concessional rights to develop the Victoria Falls. The proposed development of the falls has been delayed for various reasons, and the Witwatersrand has been supplied from steam plants using local fuel.

When it was appreciated that a cheap power supply was available, the mining groups entered into contracts with the company and the demands for power increased rapidly. In 1908 the group of mines controlled by the Rand Mines, Ltd., and Eckstein & Co., decided to change over their mines to electric drive. In addition to a supply of electricity, compressed air also was demanded. It was stipulated in the case of the Rand Mines group that the air supply should come from a company to be formed for the purpose. This led to the registration of the Rand Mines Power Supply Co., Ltd., the entire capital of which was provided by the Victoria Falls Power Co. The two companies are working under separate licenses, but from an engineering point of view they are one undertaking.

### Scale of Operations Is Large

The peak load of the combined undertaking has reached 88,000 kw., and the sales average 1,350,000 units per day. These figures include the sales of compressed air by the Rand Mines Power Supply Co. to 10 mines. The air units represent practically the same amount of energy as if these mines had converted their compressors to electric drive and purchased electricity. When the further demands for power are met by the plant now ordered, the sales will reach 2,000,000 units daily. The monthly load factor, based on the hour of maximum output, varies from 70 to 74 per cent.

The power supply is furnished to all mining consumers at 2100 volts and 525 volts. The necessary step-down transformers and switches are provided by the power company, while the consumer supplies the substation building and pays the power company a sum equal to 2% of the power bill to cover the losses in the step-down transformers.

The agreed standard price in mining contracts, of 1.06c. per unit, has reduced the cost of power to the mines by 40%, and has reduced the cost of production of gold by an amount varying from 12c. to 25c. per ton of ore milled. It has further resulted in a saving of capital expenditure on plant, which in the case of a new mine may amount to $500,000.

The area which a power supply has to cover lies within a strip about two miles broad, stretching 50 miles from east to west. The total power used by the mines at the present time is estimated at about 400,000 hp. The town of Johannesburg, which has its own electric plant, is situated about the middle of this strip, while the township of Germiston, about nine miles to the east, is supplied by the company. These relations are exhibited in Fig. 1. Power plants aggregating nearly 180,000 kw. have been installed or are in process.

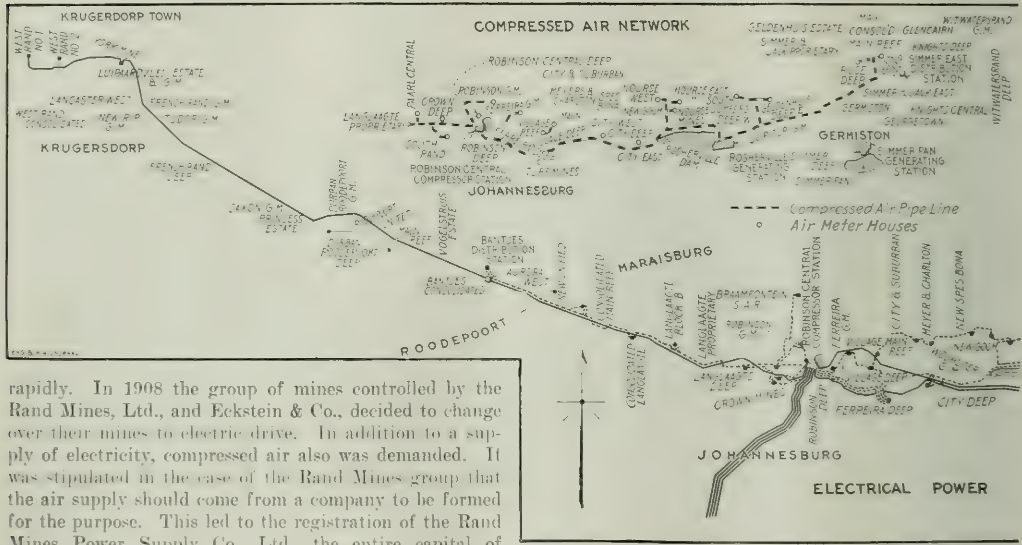

Fig. 1. Map of Power Distribution

### Various Transmission Pressures Employed

At all stations steam-turbine electric generating sets are employed and produce a 50-cycle, three-phase current. Step-up transformers raise the pressure to 40,000, 20,000 or 10,000 volts. The main system of transmission involves 40,000-volt overhead lines stretching practically the whole length of the reef. At the present time, however, the western extremity is working as a 20,000-volt distribution line. Where the load is most dense the transmission system consists of two rows of towers, each of these being arranged to carry two circuits.

The 40,000-volt transmission system is fed at four

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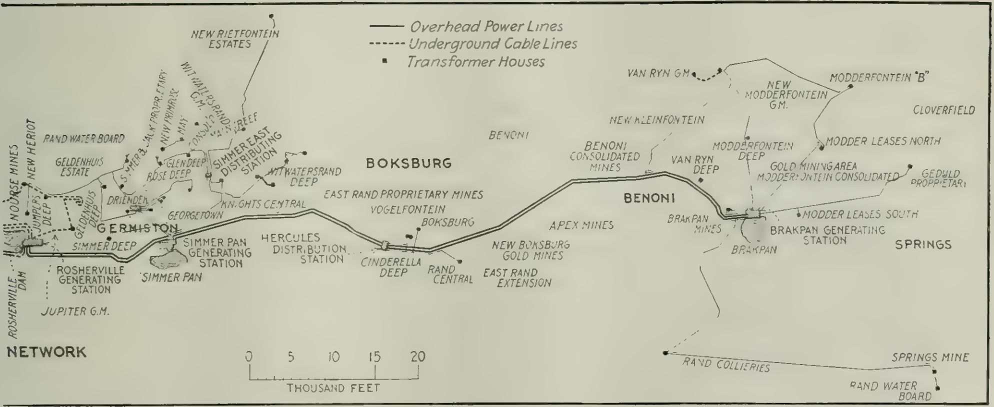
Note—Excerpts from a paper by A. E. Hadley presented before the Institution of Electrical Engineers, London, Mar. 13, 1913.

points, namely, Brakpan, Simmer Pan, Rosherville and Robinson Central. In addition to these distribution stations the transmission lines pass through two other distributing centers, Hercules to the east and Bantjes to the west. From these six points, distribution networks, laid out as ring mains, supply the various substations on the mines. The three eastern distribution stations supply the system through 10,000-volt overhead lines; the central portion of the area is served by an underground 20,000-volt cable system, and the western distribution network as mentioned is working at 20,000 volts with overhead lines. The Vereeniging station is connected to the Rand by an 80,000-volt line approximately 35 miles long, terminating at the Robinson Central distributing station, where the pressure is transformed to either 40,000 or 20,000 volts.

### Two Compressing Stations Installed

The Rand Mines Power Supply Co. installed two central compressing plants. By the use of two stations the advantages of centralization are obtained, and a considerable saving in the cost of mains is effected. The distance between the two extreme mines served by the air-pipe system is approximately 14 miles; the total length of pipe is about 20 miles, varying from 9-in. to 24-in. At Rosherville Dam were installed six steam-driven rotary compressors and at Robinson Central Deep six miles to the west, six similar compressors, electrically driven. These rotary compressors, rated at about 3500-kw. each, were made by three German firms. They are said to be the largest compressors yet constructed. Three additional steam machines each rated at 7000-kw., are under construction.



Systems on the Rand

### Special Measurements to Determine Fair Unit of Air Power

It was arranged to sell the compressed air to the consumers at the rate which it would have cost them to produce it from their local steam-driven plants, supposing these plants to be driven by power costing the same as the electrical power brought from the distributing company at the price charged by it. To obtain this figure it became necessary to measure the efficiency of the compressors in use. Six sample machines were selected and tested and it was found that the average overall efficiency was 64.1%. Therefore, a commercial air unit was fixed upon equivalent to 0.641 of the quantity of air which would be compressed isothermally by the expenditure of 1 kw.-hr. of electrical energy. The measurement of the compressed air was a problem, and it was important that it be accurately done in view of the large amount of power to be sold over a long period of years. A master three-crank displacement meter of large size was specially designed with clearances, leakages, etc., reduced to a minimum. It was sufficiently sensitive and accurate to give good results for a flow of air through an orifice 0.1 in. in diameter. Using this master meter as a standard, a series of orifices were calibrated and the coefficients of flow through these were thus determined. The flow through these orifices was used in testing the sample compressors.

### A New Design of Air Meter

The development of a satisfactory meter to measure the air used by the various consumers was a matter of difficulty and importance. A meter working on the Venturi-tube principle was finally adopted. It records the actual air consumption in the air units before mentioned, and allows for the efficiencies of the various types of compressors originally used. It is necessary in such a meter to measure the quantity of air passing and the pressure under which it is contained. The Venturi tube measures the quantity of air and has the advantage of containing no moving parts such as those present in fans or displacement meters. The coefficient for the tube was determined by exhaustive tests. The arrangement is sensitive to a "Venturi head" of less than 0.0001 lb. per sq.in., and will measure a Venturi head up to 0.85 lb. The pressure is measured by steel diaphragms and the combined measurement of pressure and quantity is made to show a displacement on the dials proportionate to the actual air units delivered. The dials are driven by clockwork, which is itself driven by a small, constant-speed air turbine. The meter is guaranteed accurate to 1.5% at full load, 1.75% at half load, and 2.25% at one-tenth load.

### TESTS IN PRACTICE CONFIRMED ESTIMATES FOR SYSTEM

The compressors on the line work in parallel and no difficulty has been encountered from hunting of the electrically-driven machines. A series of careful monthly tests have been conducted for some time past by taking throughout the working day 10-min. readings of the output from the compressors and of the meter readings and pressures at the mines. It has been found that of the air units sent out, 95% were recorded on the consumers' meters; 3% were lost in transmission and 2% were unaccounted for. The monthly air-load factor is at present 50%. The delivery pressure has to be about 100 lb.; the average pressure drop from the generating plant to the consumer is not more than 6 lb. The pressure drop for each consumer was calculated before the distributing pipe was installed, and it has been found that the observed delivery pressure does not vary more than 2% from the calculated figure. The condition of the pipes is carefully watched. There are 4000 joints designed to allow for contraction and expansion, and only those within a radius of half a mile from the station, where the temperature variations are greatest, have required attention. The accompanying drawing, Fig. 2, shows the joints on the pipe line. It is of the bell-and-spigot type, and the jointing material consists of an india-rubber ring brought down tight by means of a gland, held from bolts to a flange on the socket end of the length.

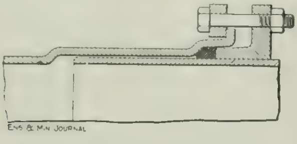


FIG. 2. SECTION SHOWING JOINT FOR COMPRESSED-AIR MAINS

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## Progress of Minerals Separation Process

The Minerals Separation American Syndicate, Ltd., has achieved pronounced success in the application of its flotation process to the porphyry copper ores of the United States, according to a published report of the meeting held in London on June 16, 1913. John Ballot, chairman of the syndicate, reported that the process had engaged the serious attention of the owners of great copper mines in America, and that experiments of an especially interesting nature had been carried out at the property of the Inspiration Consolidated company, of Arizona, where a 50- to 75-ton test plant has yielded recoveries of more than 90% of the contained copper.

All of the minerals containing copper in the Inspiration mine have been successfully treated by the process, except the oxidized capping, and even this material has been handled more successfully than by any other process up to the present time. That problem has been given particular study and it is believed that within the near future it will be treated with a percentage extraction as high as that secured on other classes of ore.

The Minerals Separation process is to have a more thorough trial in a 600-ton unit of a new mill, which is now in course of erection at the Inspiration. If this final test proves satisfactory, the whole 8000-ton mill will be equipped for the use of the process.

Successful use of the process has taken place at the Britannia mines, in British Columbia, where recoveries of more than 94% are being obtained. At the Cuba Copper Mines the output is also treated by the flotation process. It is also stated that the W. A. Clark mines, Elm Orlu and Colusa-Parrot have obtained license to use the Minerals Separation flotation system.

It is freely announced that additional copper saving, amounting to from 20 to 30%, may be obtained from copper ores now concentrated by other processes. An instance of a test is mentioned, omitting the name of the property, in which a production of 2,852,515 tons of 1.69% copper ore, produced 65,881,116 lb. of copper, or 68.25%, by ordinary processes, whereas by the Minerals Separation system, the same ore yielded 85%, which, on the quantity treated, would have increased production by $933,639 net, with copper at 14c. per lb. In general, the opinion is that the Minerals Separation process is thoroughly successful and has been so carefully tested that practical working results will be favorable to the company.

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## Nevada-Douglas Copper Co.

The report of the Nevada-Douglas Copper Co., for the year ended Dec. 31, 1912, has been submitted. The company owns 33 lode-mining claims, a smeltery site and water privileges, all located in the Mason mining district, Lyon County, Nev., also one-half of the capital stock of the Nevada Copper Belt Railroad Co. Production during the year amounted to 120,908 wet tons, an average of 331.3 tons per day. In dry weight there were 106,483 tons which produced 9,020,640 lb. of copper, or an average of 84.71 lb. of copper per dry ton of ore. During the same period leasers shipped 551 wet tons. There was employed, in the extraction of this ore, a monthly average of 243 men whose daily wage averaged $3.41. The tonnage mined and shipped during the past year has been produced from all sections of the Ludwig and Douglas Hill mine.

The development accomplished by the company during the year amounted to 2087 ft. of sinking, 6128 ft. of crosscutting, 4503 ft. of raising, and 8623 ft. of drifting, a total of 21,362 ft. of development.

The gross operating revenue of the company was $824, 891, while operating expenses were $390,077, leaving a gross operating profit of $434,814. Deducting from this the expenses for mine depreciation and for fixed charges, amounting to $164,657, there remains a net profit of $270,157 for the year.

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## Microscopy in Economic Geology

In the communication from Prof. Wadsworth under the above title in the JOURNAL of July 5, 1913, p. 31, the microscopic sections numbered 8000 instead of 800 as printed. We take this opportunity of correcting the typographical error.

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**The Tata Iron & Steel Co., of Bombay, India,** which has for three years past been developing an iron deposit and building furnaces near Bombay, has begun to sell iron in Japan. Some trial sales were made last year, and now the Mitsui Co. has contracted to take 30,000 tons of Tata pig.

## Johannesburg Correspondence

Some anxiety has been caused by the action of the government in prohibiting the further importation of natives from north of lat. 23°, Portuguese East Africa. There are about 25,000 working on the mines at present and the stoppage of this supply will affect 8½% of the present annual supply. The reason for the action was the high death rate, which in January and February was 44.6 and 64.1 per 1000, and in March, 71.8 per 1000 on the mines; but it became known that in addition to these figures, of 4597 of these natives who passed through the central compound (where they remain about 22 days to become acclimated before starting work) some 88 died (mostly from pneumonia) or 19 per 1000 per month. There is some hope that the investigations of Sir Almroth Wright may lead to the discovery of an anti-pneumonia serum, which would cut down the mortality and allow the resumption of recruiting.

The season has been a dry one and the mine reservoirs along the reef are only about 40% full. This may cause a water shortage before spring. The Springs Mines, which lie three miles southeast of Geduld mine, on the East Rand, and are the most easterly "deep" mine, recently struck the reef, as reported, in No. 1 shaft. A bore hole from the bottom of No. 2 shaft has now struck the reef at a depth of 3696 ft., assaying 11.5 dwt. over 38½ in.

Prospects have improved at the Witwatersrand Deep mine. The water which hindered development in the lower levels, has been reduced from 2½ million to 1¼ million gallons per day, and rich ore has been disclosed on the lower levels. The ore reserves amount to 1,492,257 tons, valued at 6.83 dwt. over 52 in. The Witwatersrand mine, Knights, is one of the oldest mines on the field and the first to erect a 100-stamp mill. Owing to its holding 200 deep-level claims, it still has a life of 15 to 20 years, and is now making large profits and erecting five tube mills.

The management of the Premier Deep is making a gallant fight to render the mine a payable one. The ore reserves are 1,436,693 tons of a recovery value of $4.27; its working cost last year on a monthly tonnage of 52,000 tons was only $3.98, which for a mine working at between 3000 and 5000 ft. in depth is remarkable. In February, 1913, 60,150 tons were treated at a cost of $3.49. It is hoped to procure sufficient layout to allow the plant to be increased to a capacity of 75,000 tons per month, to reduce costs still further. The ore reserves of the Jupiter, the neighboring mine, are 1,270,000 tons of a value of 4.4 dwt. Unfortunately, development in depth of both these mines shows no sign of entering a richer zone. The total exports of the Union of South Africa in 1912 were valued at £61,000,000, and of this, £47,500,000 were the product of gold and diamond mines.

Metallurgical results continue to improve and costs to decrease for the last four months of 1912. Reduction costs on the Village Deep were 84.3c. per ton, with 96% recovery, residues assaying 0.276 dwt. per ton. The mill on the City Deep is now working well and reduction costs are 89.8c. per ton. The New Modderfontein and City Deep, both high-grade mines, recovered 97½ and 96.7%, respectively, of the value of the ore crushed.

A diamond of 460 carats of good value was discovered in the 200-ft. level of the Premier mine. Another diamond trust, with £1,000,000 capital, has been formed by Lewis & Marks, to work several smaller diamond mines in Orange Free State.

The City Deep Gold Mining Co. has agreed to sell 15 claims, lying on their northwestern boundary, to the City & Suburban for £100,000. This will add some two years' life to the older mine, and the money will be spent in sinking a 18-ft. diameter circular shaft on the north boundary of the City Deep to a depth of 2000 ft. to improve the ventilation and working conditions. This is the first acknowledgment of errors made in laying out such a mine with two vertical shafts, which struck the reef dipping 40° several thousand feet from the western boundary, leaving some seven million tons in a block on the rise to the boundary. It was proposed to back stope this ore. It has been found impossible to ventilate or work this area economically, hence the property is to be robbed of 15 claims (or some 600,000 tons of ore), to remedy mistakes of the past. These account for the high working cost of $5.84 per ton prevailing in the past, and the inability to keep the mill supplied with ore. The Crown Mines has also decided to sink a similar shaft to ventilate its western areas. It seems needless to mention that to supply air currents to make use fully and efficiently of shafts of this size, no less than five drives or winzes, 5x10 ft. in section, must communicate with them at the bottom and this takes no account of greater resistance along drives. There is nothing like thoroughly correcting a mistake!

## Inspiration Consolidated Copper Co.

The Inspiration Consolidated Copper Co., Miami, Ariz., states that, during the year 1912, the underground work consisted of 25,355 ft. of drifting, 4676 ft. of raising, 2348 ft. of shaft sinking and 454 ft. of miscellaneous work. No drilling was done during the year, except for 1795 ft. on the boundaries of the Live Oak property, which did not add to the ore reserves. The record of the drilling to date shows for the Inspiration orebody an average thickness of capping of 354 ft. and an average thickness of ore of 142 ft., and for the Live Oak orebody 435 ft. of capping, and 114 ft. of ore. The ore estimate remains the same as at the time of the consolidation, namely, 45,000,000 tons, running 2%. In one block of ore, the regular mine samples of the underground work were checked against the estimate for the block calculated by Mr. Krumb from the results of the churn drilling and a second careful independent sampling of the same block was also performed underground, the three results being almost identical in respect to tonnage and to grade.

It is hoped that by some leaching process, auxiliary to the regular sulphide concentration, the 8,000,000 tons of oxidized and semioxidized ore above the sulphide orebodies, which averages 1.4% copper, may be made to yield net returns above the reduction costs. No mining method, except one relatively expensive, can give a clean ore and it is believed that greater net returns will follow the use of a cheaper method, although the admixture of waste and low-grade capping will reduce the grade of the mill ore below that previously estimated.

The ore from the mine will be hoisted in two main shafts, 104 ft. apart, located on the Gift claim in Webster Gulch, outside the known orebody. The shafts have reached a depth of 585 ft., this giving a suitable distance below the second and lowest level of the Inspiration mine. Surface construction has included the erection of steel headframes at the two Live Oak shafts; the enlargement of the temporary power plant and shops at the mouth of the Inspiration tunnel; the erection of a supply house at that point and another at the junction of the Inspiration R.R. with the Arizona Eastern R.R.; the building of a dam and excavation for a pumping plant at Wheatfields on lower Pinal Creek, to provide milling water; the joint construction with the Miami company of an emergency hospital; the construction of housing quarters; road building; grading for the mill site; and work on the 4½-mile Inspiration Railroad.

Work on the concentrator building is held up, pending possible changes in methods. A 10-year contract has been made with the U. S. Reclamation Service for hydro-electric power from the Salt River project. A mill site has been acquired a mile and a half below the main shaft, where ample storage room for tailing exists. Plans for a 750-ton concentrator have been drawn by H. K. Burch, comprising a coarse-crushing plant at the shaft, which will reduce the ore to one inch, rail transportation to the fine crushing plant at the mill, and ore bins with a total capacity of 40,000 tons. The 1½-mile railroad from the mines to the mill will have a grade in favor of the load of 0.3%. While good results for water concentration were promised by the experiments conducted under the direction of Mr. Callow, further experiments are now under way with the flotation process of the Minerals Separation Company.

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## Granulation of Slag by Compressed Air

In a paper read before the German Metallurgical Association, G. Juntzen describes a method of granulating slag by means of a jet of air. It has been employed for more than a year at the Buderus works, which produce 100 tons daily. The slag run from the furnace is passed through a conduit to a rotating drum 45 ft. long and 6 ft. in diameter. On entering this drum it is met by a jet of compressed air, which hurls it against the sides, which are kept cool by an exterior circulation of water, the slag always encountering cooled surfaces. Scrapers conveniently disposed within the drum prevent the adhesion of the slag, which finally comes out at the bottom end of the cylinder in small grains, without lumps. The granulated slag is then elevated to the bins, whence it is taken as required to the cement furnaces. At the end of the drum is a flue to carry off the smoke and gases. For cement making the slag thus reduced is better than that granulated by water. In the water-granulated slag the adherent moisture has to be eliminated before it can be employed in the manufacture of cement, while the slag granulated by air is very dry and also much more dense. It can also be employed as sand.

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## Splicing Transmission Rope

Hemp or manila rope is often used for transmitting power, but its application does not seem to be as wide as its advantages merit. Several objections are made to the use of this rope as a transmitter of power, but it is probable that at least 90% of the trouble complained of in rope drives are directly caused by bad splicing, notwithstanding that to make a proper transmission splice is a very simple operation, the idea having once been grasped. The essential points in such a splice are: First, that its diameter be absolutely the same as that of the original rope; second, that it be smooth and free from lumps; third, that the original lay of the strand and yarns be disturbed as little as possible; and, fourth, that where several strands are rejoined, each fastening or tuck should be made in such manner as to prevent its wearing away and the rope unstranding.

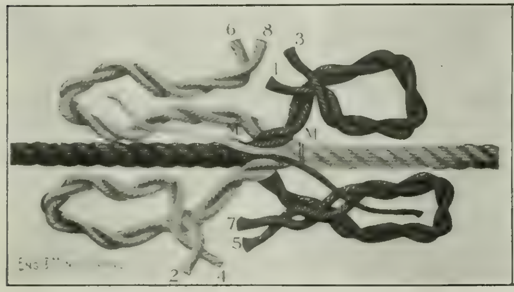

Fig. 1

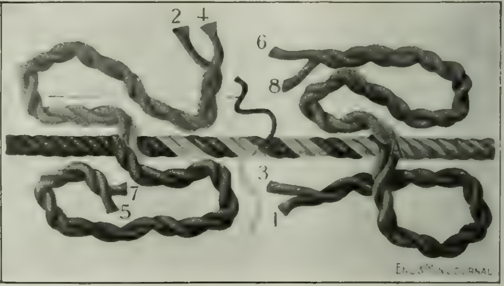

Fig. 2

There are many different splices now in use, but after a careful consideration of each the conclusion is reached that all of the best features are combined only in what is called the English transmission splice, and experience has proved it the best now known. In describing this, a four-strand rope 1¾ in. in diameter, spliced on the sheaves, is taken for example. The rope is first placed around the sheaves, and, with a tackle, stretched and hauled taut; the ends should pass each other from 6 to 7 ft., the passing point being marked with twine on each rope. The rope is then slipped from the sheave and allowed to rest on the shafts, to give sufficient slack for making the splice.

Unlay the strands in pairs as far back as the twine, *M*, *M′*, Fig. 1. Crotch the four pairs of strands thus opened, the cores having been drawn out together on the upper side. Then having removed the marking twine *M*, unlay the two strands 6 and 8, still in pairs, back a distance of 2 ft., to *A*; the strands 1 and 3, also in pairs, being laid in their place. Next unlay the strands 5 and 7 in pairs, to *A'*, replacing them as before with 2 and 4. The rope is now as shown in Fig. 2.

The pair of strands 6 and 8 are now separated, and 8 unlaid 4 ft. back to *B*, a distance of 6 ft. from the center, strand 6 being left at *A*. The pair of strands 1 and 3 having been separated, 3 is left at *A*, as companion for 6, strand 1 being carefully laid in place of strand 8 until they meet at point *B*. The two pairs of strands 2, 4 and 5, 7 are now separated and laid in the same manner, every care being taken, while thus putting the rope together, that the original twist and lay of the strand is maintained. The protruding cores are now cut off so that the ends when pushed back in the rope, butt together. The rope now appears as shown in Fig. 3, and after the eight strands have been cut to convenient working length, about 2 ft. long, the companion strands are ready to be fastened together and tucked. This operation is described for strands 2 and 7, the method being identical for the other three pairs.

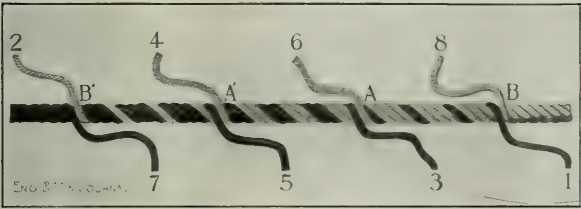

Fig. 3

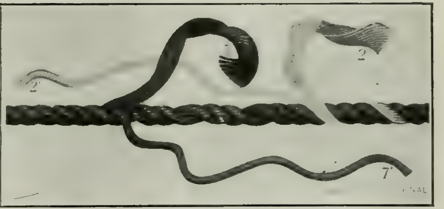

Fig. 4

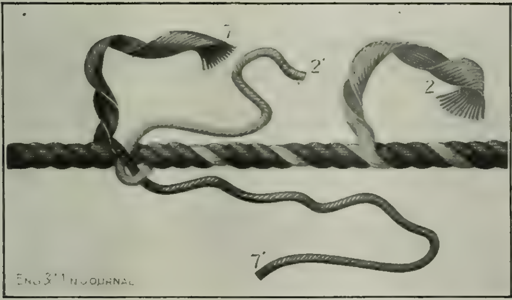

Fig. 5

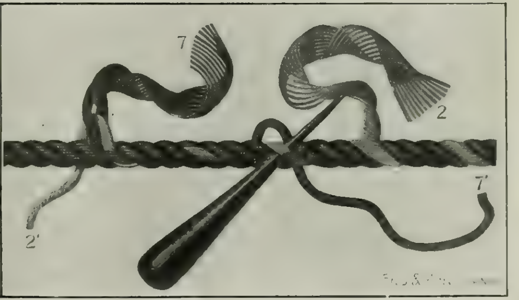

Fig. 6

Unlay 2 and 7 for about 12 to 14 in., divide each strand in half by removing its cover yarns, as shown in Fig. 4, whip with twine the ends of the interior yarns 2' and 7'; then, leaving cover 2, re-lay 2' until near 7 and 7', here join with a simple knot 2' and 7', as shown in Fig. 5. Divide the cover yarns 7, and pass 2' through them, continuing on through the rope under the two adjacent strands, avoiding the core, thus locking 2', as shown in Fig. 6. In no event pass 2' over these or any other strands.

The half strand 7' must now be taken care of; at the right of the knot made with 2' and 7', 2' is slightly raised with a marlin spike, and 7' passed or tucked around it two or three times, these two half strands forming in this way a whole strand. Half strand 7' is tucked until cover 2 is reached, whose yarns are divided and 7' passed through them and drawn under the two adjacent strands, forming again the lock. The strand ends at both locks are now cut off, leaving about 2 in., so that the yarns may draw slightly without unlocking.

This completes the joining of one pair of strands, as shown at Fig. 7. The three remaining pairs of strands are joined in the same manner. After the rope has been in service a few days, the projecting ends at the locks wear away, and if the tucks have been made carefully, and the original twist of the yarns preserved, the diameter of the rope will not be increased, nor can the splice be located when the rope is in motion.

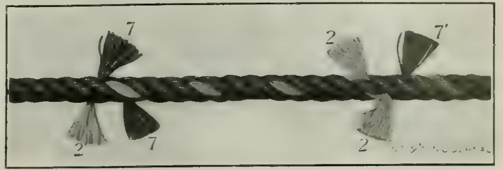

Fig. 7

This method of splicing transmission rope has been developed and perfected by the American Manufacturing Co., of 63-65 Wall St., New York, and is published in its catalog.

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## Largest Fluorspar Production

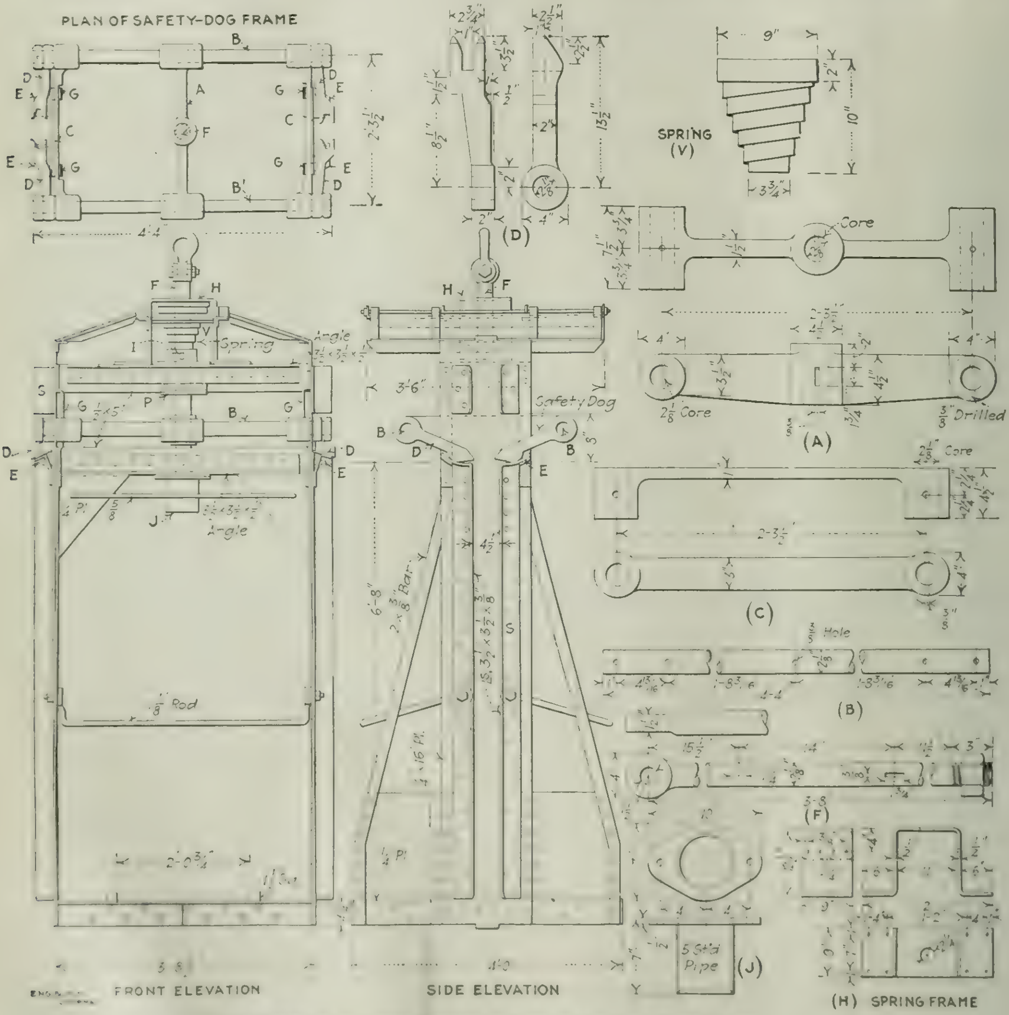
All records for fluorspar production in the United States were broken in 1912 when 99,285 short tons of domestic gravel spar, valued at $578,294, were marketed. The total quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in 1912 was 116,545 short tons, valued at $769,163.

Fluorspar was produced in five states: Illinois, Kentucky, Colorado, New Hampshire and New Mexico, in the order named. A considerable decrease of imports was noted, notwithstanding higher cost of the domestic spar, which was $5.82 against $5.74, duty paid, for the foreign product. The freight on the domestic spar is considerably higher than that on the foreign from dock to works. Its consumption is probably due to the Illinois producers offering a higher and more uniform grade of spar than that imported.

Fluorspar is used in the manufacture of glass, and of enameled and sanitary ware, the electrolytic refining of antimony and lead, the production of aluminum, the manufacture of hydrofluoric acid, and as a flux in blast furnaces and in [illegible] openhearth steel furnaces. About [illegible] of the American production, the gravel spar, is used in openhearth steel making.

# Cage with Munzner Safety Catches

Cages fitted with the Munzner type of safety catch have been in use for 15 years in the shafts of the Doe Run Lead Co., of southeastern Missouri. This safety catch was designed by F. A. Munzner, in Germany, about 1893, and is largely used in Saxony. Its action consists of thrusting pointed knife edges into the guides by a toggle action. The shape of the dogs used in the Doe Run mines was worked out by Karl Kley, in Saxony, and was adopted, as being the most satisfactory, by O. M. Bilharz, general manager of the Doe Run company. The dogs offer the advantage as against the ordinary type of toothed-cam safety-dog, of stopping the cage with a slower, braking action instead of with a sudden grip and they more perfectly fulfill the requirements of a good



The Munzner Safety Device as Applied to Doe Run Cages safety catch, namely, that it be positive and reliable, quick to come into action, but slow to complete its action, and capable of acting on guides of varying thickness. It is urged against the cam dog that it acts so quickly as to tend to injure the men riding on the cage and to tear out the guides. It also is likely to fill with wood and possibly thus become inoperative. The use of the double knife edge minimizes the danger of splitting the guides and while it cuts and damages them somewhat more than a single blade, this is a point of minor importance.

On one occasion at the Johannes shaft in Freiberg, the Munzner attachment stopped a cage so gradually after the cable broke, that the men riding did not realize but that it had been stopped by the engineer. In demonstrating the reliability of the device to the Doe Run miners, when it was first proposed to install it, Mr. Bilharz and his master mechanic mounted the cage 40 ft. from the ground in an experimental tower, cut themselves loose and were stopped immediately. In the 15 years' use of the Munzner catch in the Doe Run mines, the only instance in which it failed to work was on one occasion when the rope broke with the cage 20 ft. from the shaft bottom and the catches were unable to take care of the extra weight of cable and stop the cage in that distance. Usually the cage stops in three or four feet. In a German test, a cage weighing 3440 lb. was allowed to fall about 1.5 ft., when the safety dogs came into action and sank $1\frac{1}{4}$ in. into the guides, stopping the cage after a groove about a foot long had been cut.

On the Doe Run cages, the spring is placed above the actuating frame instead of below, an improvement on the original design. The details of the device are shown in the accompanying drawing. The dogs $D$ are carried loose on the ends of the shafts $B$. The shafts are pinned to the crosshead $A$ and crossbraces $C$, making a rigid frame, which moves with the drawbar $F$ to which $A$ is keyed. The dogs are held on the shafts by collars and rest on and move over the plates $E$. The spring $V$ is held under the strap $H$.

When the pull comes on the drawbar, it moves up, and the collar $I$, keyed to it, compresses the spring $V$ until $A$ strikes the plate $P$ fastened to the cage frame and thus gives a positive stop to upward motion of the drawbar and the frame. This motion tends to pull the points of the knives $D$ away from the guides. If the rope breaks or the tension is otherwise released, the frame is thrust down, relative to the cage, by the spring $V$ and the dogs revolving on $B$ and lying on $E$ are forced with a toggle motion to engage the guides. It is necessary to keep the knives always sharp.

The bottom of the drawbar is protected by a cylindrical hood $J$ to prevent pinching the hands of the men riding. The motion of the frame and the dogs is controlled by the vertical guides $G$. The original design had stops to limit the inward motion of the dogs. These are here omitted. The guides in this case are 4x6 in. The spring is a volute, $9x9\frac{1}{2}x2x\frac{3}{8}$ in., made by the A. French Spring Co., of Pittsburgh, and has proved satisfactory. The spring should not take the whole load of the cage before the frame catches $P$, or the device will be too sensitive. A sharp fluctuation in speed might tend to make the dogs catch and the jumping of the cage after stopping would bring them into action. Probably the adjustment should be such that the spring will take about 80% of the weight of the empty cage before the positive pull comes on the frame. The best springs will deteriorate and should be frequently tested to determine their strength quantitatively.

The weight of the cage illustrated is 2400 lb. and it cost, as shown, about $425, erected in the company's shops. One difficulty with the design is the obstruction of the top of the cage, which interferes with loading timbers, pipe and rails. The knife-edge principle, however, should be applicable to a cam dog with satisfactory results; possibly in such case, the edges should be toothed slightly at the points where they begin to grip.

# Gasoline Locomotives for Mine Use

For a considerable time, German and Austrian companies have been engaged in the work of applying the internal-combustion motor to the work of mine haulage, and there are now a large number of these engines working in various parts of the globe. They offer advantages over other means of transport, especially in localities where both coal and water are scarce. *Mining Engineering,* June, 1911, makes this comment on the use of the internal-combustion motor for underground haulage and continues by stating that when compared with steam locomotives, these machines show advantages in that they are always ready for use, consume no fuel during stoppages, require only one man for attendance, possess no boiler to require inspection or renewal, and are of considerably less dead weight than a steam locomotive with its tender laden with coal and water.

There are further special circumstances in which it is practically impossible to employ a steam locomotive, as, for example, in dry forest or grassy country, timber yards, paper mills, and the like, where there is a constant danger of fire, this being also the case in mines where naked lights are prohibited on account of the presence of explosive gases. Compared with electric locomotives, working with an overhead trolley wire, these engines have the advantage of requiring no central power station, and are independent of any breakdown in the same, and afford considerable economy in first cost over electrical installation, and in addition the haulage system and output are capable of instant extension by simply employing more locomotives as the output requires.

The correct location of shafts has a very important bearing upon the satisfactory and systematic installation of underground mechanical haulage, says the *Journal* of the Transvaal Institute of Mechanical Engineers, August, 1910. It is hardly possible to install at once mechanical haulage systems underground where the mines have not been opened with that idea in view. Drifts are likely to be small, both narrow and low, and the track installed is likely to be too poorly constructed, having light rails carelessly laid and insecurely joined which will not do at all to support the heavy burden and fast movement of heavy locomotives and the large heavy trucks required to transport large quantities of ore economically.

Straight or gently curved trackways fitted with heavy rails, frogs and crossings laid on good ties with a well packed roadbed ballasted in the best possible manner in the mine, would permit the use of heavier trucks and allow the discarding of hand labor in tramming.

Hand labor requires one man for every truck, is slow, requires the use of light trucks, to be within the limit of operation of one man, and permits and condones careless and unsatisfactory track installations which are to be found at present in most mines not using the mechanical haulage method. Locomotives and mechanical haulage systems are used underground at the present time, almost entirely in the coal-mining industry, there being few installations in metal mines. However, the use of these locomotives is becoming more frequent, and some progressive companies are beginning to take them up. There are quite a number of them in use for surface haulage and their advantages in this use have led to the extension of the practice to underground work. Perhaps, the greatest objection to the use of underground locomotives is, as has been heretofore stated, the necessity of the mine being opened with the express idea of using systems of the kind. If this has been done, great economies will result.

A study of the underground use of internal-combustion motors has been made by M. Barjot in *Annales des Mines de Belgique*, Vol. 18. This problem is studied in detail and the advantages and disadvantages of its use shown. It is stated that one of the most important objections to the use of internal-combustion motors underground is the odor which they give forth, which is not only disagreeable, but is positively noxious. Where ventilation is well accomplished, this objection can be reduced to a minimum, but where ventilation is insufficient, it seems reasonable to believe that the product of gas combustion would be decidedly objectionable. In coal mines, unless great care were taken to prevent the exhaustion of burning gases, there would be great danger in those mines which produce gas. This is also true in respect to the electrical connections which are used for producing a spark in the motor. These must be most carefully made in order to avoid presenting a naked spark or flame to the air in the mine.

In metal mines, of course, this objection does not usually exist, and the objections would be principally the discomfort caused by the formation of gas in the mine, coming from the locomotives, and the bad effect it might have on the workmen.

In spite, however, of these objections, there are a large number of gasoline motors being used underground, and it is quite likely that this number will increase until large hauling questions have been solved. There is no doubt of the economy of moving material underground on a large scale, just as there is no doubt that it is more economical in surface transportation to move in large units with small high-powered machines. The gasoline locomotive is somewhat expensive, but not more so than the total installation required for either steam or electrical transportation, and is probably considerably less than in the latter case.

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## U. S. Sulphur Production

The production of sulphur in the United States in 1912 was 303,472 long tons, compared with 265,664 long tons in 1911, according to W. C. Phalen, of the U. S. Geological Survey. The sulphur came from Louisiana, Nevada and Wyoming, the production of Louisiana being the dominant factor in the domestic sulphur industry.

During the last 12 years the growth of the sulphur industry in the United States has been phenomenal, and the last seven years has seen the dethronement of Sicily from the dominating position so long held in the world's sulphur market.

In 1900 the sulphur production of the United States amounted to 3147 tons; the imports during that year were 167,696 tons, of which 166,825 tons were classified as crude sulphur, chiefly from Sicily. Thus the domestic production in 1900 amounted to not quite 2% of the sulphur consumed. During 1912 the domestic production constituted more than 91% of the consumption and the imports amounted to less than 9%. Moreover, the imports of sulphur from Italy were only 8.7% of the total importation, and Japan was the leading exporter of sulphur into the United States, 91% of the foreign sulphur admitted having come from that country.

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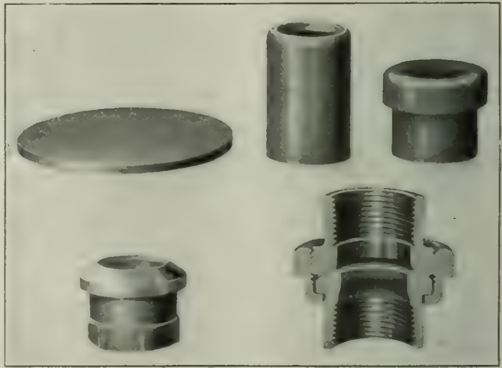
## Pressed-Steel Screw Union

A screw union recently put on the market is unique in being pressed from sheet steel. It is composed of the usual three parts with an additional soft-brass ring to serve as a seat or gasket.

In the process of manufacture, sheet-steel strips are cut into blanks which are then pressed into cups and the bottoms punched out. The end of the cylinder thus formed is rolled back on itself and upset as shown. The piece is then pressed into its final shape and threaded, the threading follows Briggs' standard and so is tapered, unlike standard fittings. The steel pieces are sherardized.



Stages in Pressing Screw Unions from Steel Sheets

It is claimed for the fitting that, being made of the same material as pipe, it expands equally with the pipe and so diminishes the tendency to leak. Furthermore, the processes of manufacture eliminate the possibility of defects being carried through into the finished piece. The piece bearing against the brass seat has received a high polish and finish by the pressure, and has been hardened so that a tight joint is possible. The union is made by the Mark Manufacturing Co., of Chicago, Illinois.

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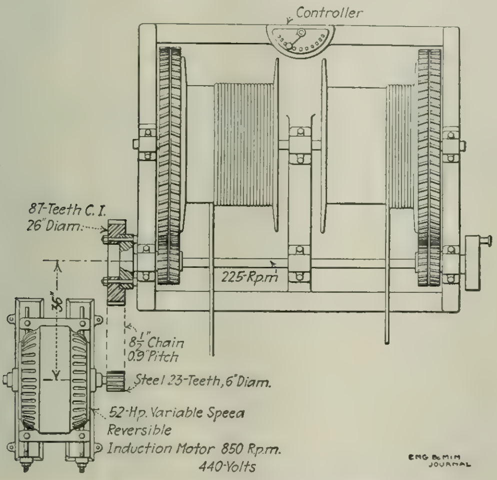
**The Largest Ingot in the World** weighing 150 tons was recently cast at the Grimesthorpe Works of Cammell Laird & Co., Ltd., Sheffield, England. It is 24 ft long, 7 ft 1 in mean diameter over flats and 7 ft 6 in mean diameter over corners. It is acid openhearth steel and destined for admiralty purposes.

# DETAILS OF PRACTICAL MINING

## Chain-Driven Convertible Hoist

By E. E. Carter*

A steam-driven, double-drum, geared hoist at the Gold Hill mine, at Quartzburg, Idaho, was changed into an electric hoist by disconnecting the driving and valve rods and substituting a gear on the crank disk. With this combination the hoisting speed was 450 ft. per min. The motor ran at 850 r.p.m., and both motor and hoist were operated considerably below rated capacity. Steel and rawhide pinions were tried and found unsatisfactory. Both gear and pinion gave constant trouble from excessive wear, the teeth in the case of the steel gears becoming crystallized and falling out. Furthermore, the vibration was carried to the motor and thus resulted in the motor connections shaking loose, making it necessary to keep an extra one on hand for frequent changes.



Steam Hoist Arranged for Electric Drive

This arrangement was a constant source of expense, as well as a loss of time, so, therefore, the following arrangement was tried with success: An 8½-in. silent-chain drive was substituted for the gears, set at 36-in. centers, and arranged as shown in the accompanying sketch. This drive has been in operation sufficient time to prove its efficiency. No sign of wear is apparent and no time has been lost because of mishap to the hoist since its installation. The hoist picks up its load much easier than it did with the gears or even better than it did with steam. There is no trouble with the "flop" of the chain, when reversing, as was anticipated.

The cost of the chain installation was practically the same as for the original gear drive. Experience elsewhere has shown that the wear on these chains is confined almost entirely to the pins. As the chain lengthens because of wear and the pitch becomes greater, the chain will ride higher on the gears and thus give warning a long time before it is necessary to put in new pins. The cost of new pins is nominal and they may be put in easily. We expect the chain to last between three and four years before repairing with new pins.

The 52-hp., variable-speed, 440-volt, alternating-current motor is set on a concrete foundation with a sub-base and suitable slide to allow adjustment of the chain. The chain is run comparatively loose. A hoisting speed of more than 600 ft. per min. is now the rule instead of 450 ft. as formerly. The chain is removed at intervals and cleaned thoroughly with gasoline. It is allowed to dry, and is lubricated with Albany, Keystone or a suitable cup grease, which has previously been warmed so that it will work in around the pins. Any excess is wiped off. It is lubricated at intervals as required with the same lubricant. Mica axle-grease or graphite should not be used. As it is possible to disconnect the gear from the crank disk and replace the driving rods, etc., it allows a change from electric to steam or air power within a short time, which is desirable when power troubles are frequent.

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## Safety Rules—Hoisting Engineers*

(1) It shall be the duty of every master mechanic of every mine having a hoisting engine to appoint and designate as hoisting engineers one or more men who shall be able to speak and read the English language readily. Where men are hoisted or lowered, such hoisting engineers shall not be less than 21 years of age, and otherwise they shall not be less than 18 years of age. They shall be familiar with the details and workings of a hoisting engine. No one, other than such duly appointed hoisting engineers, shall be permitted to run such engine or hoisting machinery, except that with the consent of the master mechanic, specified apprentices may be taught its operation at such times and under such restrictions as the master mechanic may determine to be free of risk to life and limb.

(2) The hoisting engineer shall familiarize himself with and use the signal code for hoisting and lowering, and a copy of the signal code shall be posted in the engine house and at the collar of the shaft and at all stations in the mine.

(3) He shall not run his engine unless it is properly provided with brakes, indicators and distance marks on hoisting ropes or cables or drums.

(4) He shall exclude every person from the engine room, except those whose duties require their presence therein and visitors authorized by the superintendent of the mine.

(5) He shall hold no conversation with anyone while

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*Manager, Gold Hill & Iowa Mines Co., Quartzburg, Idaho.

*From Inland Steel Co.'s book of rules.

his engine is in motion, or while attending to signals.

(6) He shall run his engine with extreme caution whenever men are being hoisted and lowered. If signals are not understood, he shall wait until they are repeated, before obeying.

(7) He shall not hoist men out of or lower men into any mine or shaft at a speed greater than 500 ft. per min. and he shall not lower them by the brake alone.

(8) All hoisting machinery and safety appliances connected therewith, and all ropes and hoisting apparatus shall be inspected as directed by the mine superintendent and reports shall be made to him as to any defects found therein.

(9) After any stoppage of hoisting exceeding in duration one hour, the official in charge shall have the hoisting engineer run a cage or other conveyance, unloaded, up and down the working portion of the shaft, at least once, and shall not permit the cage or other conveyance to be used until the hoisting machinery and shaft are found to be in safe condition.

(10) No hoisting shall be done in any compartment of a shaft while repairs are being made in that compartment, excepting such as may be necessary to make the repairs.

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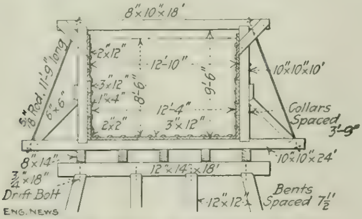
## Wooden Flume with Tie-Rods

The accompanying cross-section illustrates the manner of constructing the flume in use on the hydro-electric installation of the Braden Copper Co. in Chile. The canal system, which takes the water to the forebay, is designed, below the rocks and sand-elimination devices, for a net capacity of 500 sec.-ft. The system includes earth canals, tunnels and six flumes, of which the longest is, says C. G. Newton (*Eng. News*, May 22, 1913), 730 ft.



Cross-Section of Braden Flume

The noteworthy feature of the design is the use of ⅝-in. tie-rods between the caps and the sills. The object of this is both to bind up the structure, making it tighter and more rigid, and to keep the posts from lifting out of the sills.

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## Ditches in Frozen Ground

The fact that a large part of the ground in the Seward Peninsula consists of frozen muck or ground ice, renders special methods and precautions necessary in constructing water ditches (Water Supply Paper No. 314, U. S. Geological Survey). This material, when thawed, leaves a soft residue which may be only 25% of the original volume. Water flowing across such material causes thawing, which must be controlled. Near the surface the material contains more earth and frequently just below the moss a layer of blue clay. The material near the surface is less decayed and therefore more solid and tenacious. If allowed to remain in place, the ditch being constructed over it by building up the lower bank of sod, and material stripped from the top, good results can be obtained. When stripping is carried to exactly the right depth, the water causes a little thawing, the bottom settles a few inches, and the ditch practically builds itself, so that eventually the water is carried in a section entirely below the surface of the ground and the ditch cannot leak, because the sides are all of soft and finely divided material, mostly muck and clay, backed by solid and impervious frozen ground. In some cases where proper precautions were not taken, thawing has settled the ditch three or four feet and in some portions the bottom practically sank out of sight, so that the water cut under the lower bank and made bad breaks. In ditches of this character the grade must be low so as to give the water a low velocity. In some cases 2½ ft. per mile should be taken as a maximum. The ditch can then be built with a shallow cut and will make itself at small expense, besides being permanent and durable on account of the low velocity.

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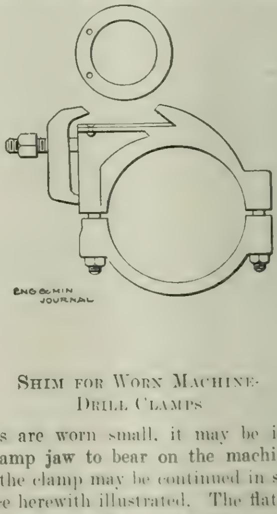
## Repairing Worn Clamp for Machine Drill

By George E. Addy*

When the gripping portion of a machine-drill clamp or saddle becomes worn large, or when the saucer bases of the machines are worn small, it may be impossible to bring the clamp jaw to bear on the machine base. In such a case, the clamp may be continued in service by using the device herewith illustrated. The flat ring is fastened to the clamp, so as to act as a shim, and by slightly raising the base of the machine, enable it to be gripped by the jaw. In the drawing the ring is shown as riveted by countersunk rivets through the overhanging edge of the clamp. If this overhang does not exist, countersunk screws can be substituted. They are better, except that they require more labor to put in.



Shim for Worn Machine-Drill Clamps

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**The Golden Rule for Blocking Shaft Timbers,** according to C. B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture) is to cut the blocks to suit the shape of the ground against which they will rest, and always wedge between the block and the set, never between the block and the rock.

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*Park City, Utah.

## Tests on Structural Paints

Priming paints on structural steel are usually red lead. Red lead sets so rapidly that it cannot be used ready-mixed unless "suspenders," such as china clay, silica, chalk or asbestine are added. The effect of these suspenders on the quality of the paint has been a subject of dispute. To determine this point, experiments were undertaken by Westinghouse, Church, Kerr & Co., and the results are given by Cloyd M. Chapman (*Eng. News,* May 8, 1913). Ready-mixed red-lead paints, 42 in number, from various manufacturers, were tested, together with five paints mixed from red-lead pigment alone and six mixed from red-lead pigment with asbestine or china clay added. Litharge paints were also mixed and tested, two of straight litharge and six with asbestine or china-clay suspenders. With each paint, six plates were painted, one with one coat, one with two coats and the remaining four in turn with one coat of the priming paint and a second coat of iron oxide, artificial graphite, carbon or tar-product paint. The 318 plates were exposed to the weather on the top of a New York building for 21 months. Tests were also made on the oxide, graphite, carbon and tar coverings by themselves without primers. The results are instructive. They show that after one year, the ready-mixed red-lead paints made the poorest showing, while those locally mixed with suspenders, made the best. After 21 months, the locally mixed pure red-lead paints showed the most deterioration and those mixed with suspenders were still better, relatively. The best showing of all, however, was made by the litharge paints, although no advantage lay with those containing suspenders.

Examination of the effects on the protective paints showed that the tar paint was far superior. However, the general run of hydrocarbon (tar and asphalt) paints offers poor protection as a steel covering and the experiments should be taken as indicating only that a superior paint can be prepared from such materials.

⁂

## Derrick for Sinking 557 Feet

Shaft No. 6 of the St. Louis Smelting & Refining Co. in southeastern Missouri was sunk to a depth of 557 ft. with a boom derrick. The derrick is rather generally used in Missouri and Michigan for starting sinking operations, but 100 ft. has usually been the limit of depth to which it is applied. Considerations of cost and convenience led to its adoption in this instance.

The derrick was set opposite the center of the long side of the shaft and 38 ft. back from the center line. It was steadied by six guy lines. The mast was 40 ft. in height and the boom 44 ft. An elevation of the derrick is shown in Fig 1, and a plan of the whole layout in Fig. 2. The bottom of the mast was carried by the footstep casting, shown in Fig. 3, to which it was bolted. This footstep rotated in a bearing block made of 10x10-in. timbers bolted together as illustrated in Fig. 4, with a hole in the center fitted to the footstep shaft. The top of the block carried a 4½-ft. square plate around the center bearing hole. The block was bolted to the frame structure supporting the derrick. Rotation of the derrick was ob-

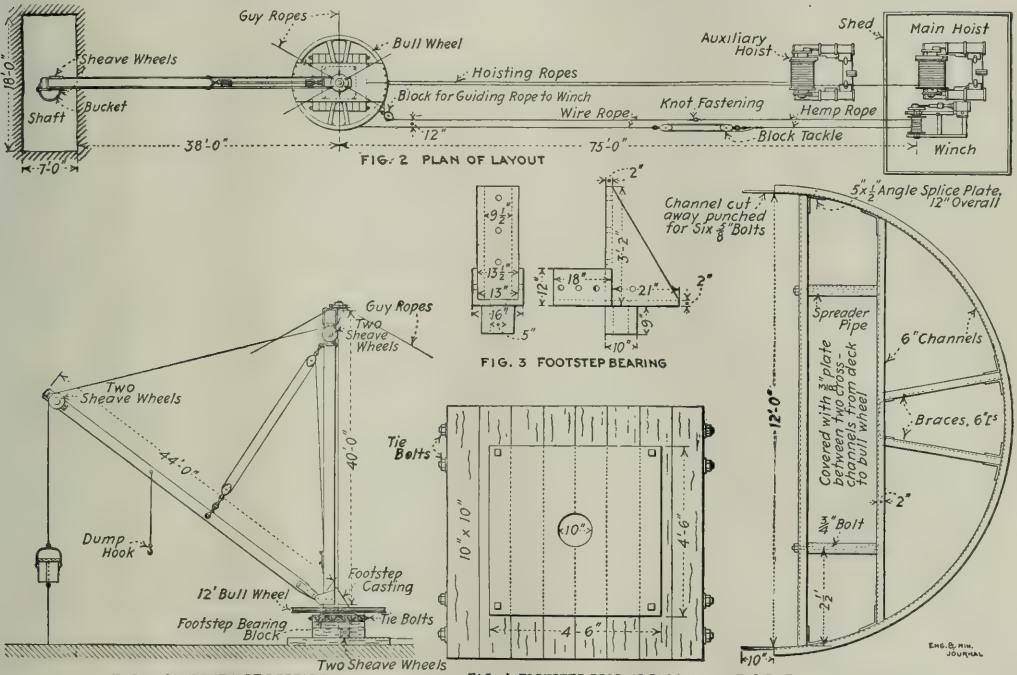


FIG. 1 SIDE VIEW OF DERRICK FIG. 2 PLAN OF LAYOUT FIG. 3 FOOTSTEP BEARING FIG. 4 FOOTSTEP BEARING BLOCK FIG. 5 PLAN OF HALF BULL WHEEL

Layout and Details of Sinking Derrick

tained through the 12-ft. bullwheel, the construction of which is shown in Fig. 5. It was built of 6-in. channels, one forming the circumference and the others acting as braces. The wheel was attached to the cast footstep. The circumferential channel was turned with the ribs out to form a trough for the rotating rope.

Two hoists and a winch were employed in conjunction with the derrick. The winch was used for rotating the bullwheel. A small wire rope was wrapped several times around the bullwheel and one end brought back as a tangent to a point near the winch. The other end was brought around to a point near the first end and turned in the same direction by a block and also brought near the winch. On the 12-in. winch drum a hemp rope was used to avoid bending the wire rope to so small a radius. This rope had its ends attached to the ends of the wire rope, one attachment being brought through a block and tackle for taking up slack.

The main hoisting cable passed over a sheave on the end of the boom and another on top of the mast, down through a 5-in. hole in the footstep casting, over another sheave attached to the supporting framework and thus to the hoist. By this arrangement the swinging of the derrick did not interfere with the operation of the rope. The rope to the auxiliary hoist followed through a similar series of sheaves placed on the opposite side of the boom and mast. The slope of the boom was changed by hand when necessary, using a block and tackle from the top of the mast to a point near the center of the boom. But the bucket usually operated in the shaft center and for that reason the slope of the boom was seldom changed.

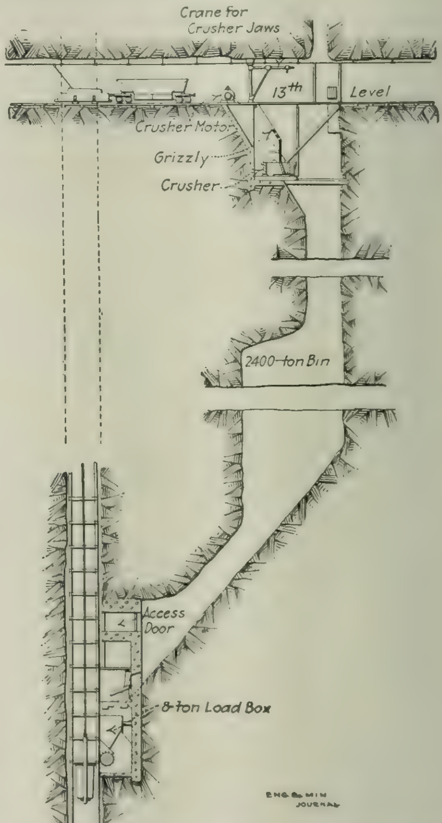
The arrangement of the hoists is shown in the plan, Fig. 2. The winch was near the main hoist so that the engineer had easy control over both; each hoisting operation of course necessitated a turning of the derrick. Usually it was not necessary to operate both the auxiliary and main hoists at the same time, but when it was, a topman could manipulate the auxiliary, as it was used only for material. The main hoist had a 4-ft. drum and 15x18-in. cylinders. The auxiliary had a 30-in. drum and 8x10-in. cylinders. The winch had a 4x4-in. engine.

The bucket was unguided in the shaft, but no difficulty was experienced from spinning. It was dumped in the usual manner by the rope and hook shown in Fig. 1. An unusual piece of equipment was a platform on which the men worked while timbering, placing pipe or barring down the sides. This so-called "butterfly" was handled by the main hoist, being attached by four ⅞-in. ropes from the main timbers of the framework. It was a great convenience, giving opportunity for spreading out the tools while working and being capable of swinging to any desired corner of the shaft.

Advantages attendant on using a derrick are: (1) All surface work is done away with near the collar of the shaft and the danger of objects falling on the men at the bottom is reduced. The men themselves were unloaded at least 35 ft. from the collar. (2) There is no structure near the shaft collar to be injured by flying rock while blasting the upper sections of the shaft. (3) The derrick is cheap to erect and on the completion of any one job is available for another. (4) By the use of two hoists, one for men and one for material, the work of pipe and timber erection is greatly faciliated. (5) By rotating, a great deal of lifting is avoided both in the shaft and around the collar on the surface.

## Underground Crushing and Loading Station

The 13 level is the main haulage level for the No. 5 shaft of the Crown Mines, Ltd., and a large ore bin and a crushing plant are necessary in connection with the shaft on this level. The accompanying drawing, from an article by R. C. Warriner in the "Journal of the South African Institute of Engineers," April, 1913, illustrates diagrammatically the arrangement used. The capacity of the bin is 2400 tons. The front is built of ferro-concrete lined on the inside with 60-lb. rails. Loading boxes holding a skip load are provided.



Bins and Crusher at 13 Level of Crown Mines

The underground crushing was installed to save the labor involved in breaking the large rocks by hand at the grizzly and to prevent the bin chutes from choking. Two 21½x39½-in. jaw crushers were installed under the main track on the 13 level, and above the main ore-bin. The grizzlies above these crushers are set to 8-in. spaces at 15°. The crushers are driven each by a 60-hp. motor set on the 13 level out of the dust and dirt. The arrangement has proved cheap, the power cost being about 0.026c. per ton. Two light cranes over the crusher pit are used to facilitate repair work on the crushers.

# DETAILS OF METALLURGICAL PRACTICE

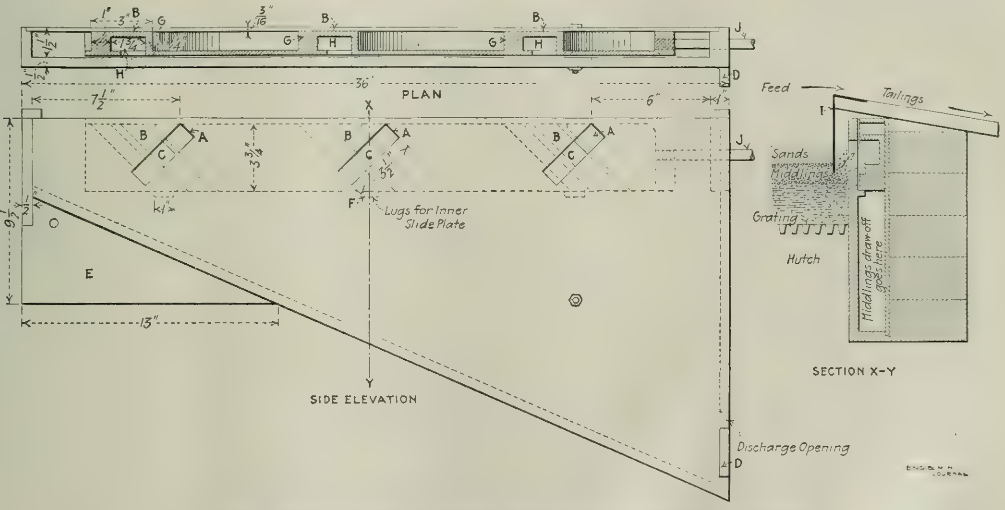
## Adjustable Draw-Off for Jig Middlings

The devices commonly used to draw off the middlings from a jig bed have the height of the opening fixed. A draw-off patented by C. E. Knowles and used in some of the Joplin mills permits the opening through which the middlings pass, to be raised or lowered. It consists of a fixed casting set across the lower end of the jig compartment with three slots *A* cut at 45° in the upright face and of another casting set inside the fixed casting and capable of movement across it, with three similar slots *B* inclined in the opposite direction. The faces carrying the slots are in contact and where the slots cross, a diamond-shaped opening *C* is formed, through which the concentrates pass. As the movable casting slides back and forth, the opening is raised and lowered.

The fixed casting is in the form of a box, a cover plate forming the vertical side which does not carry the slots. The dimensions and shape are as shown. The middlings fall to the sloping bottom and are discharged at the lower end. A lug *D* and a bolting bracket *E* are provided for holding the box in the jig compartment. Lugs *F* are cast on the face carrying the slots in order to support the sliding casting.

The sliding casting is made with inclined lugs *G* on the back which follow down so as to correspond to the slots in the face and bear against the cover plate of the fixed casting. They are hollow, connected with the slots and are of a size, so that the chutes *H* which they form are somewhat larger than the slots. The middlings passing through the diamond-shaped holes slide down these small chutes and fall to the sloping bottom of the fixed casting. The top of the sliding piece is a plate to fit the inside of the fixed casting. The movement of the piece is controlled by the rod *J*, which is screwed into its end and projects through the side of the jig.

In setting this discharge device in the jig compartment, a hood *I* is brought down from the tail-board discharge between the discharge device and the jig bed to such a point that the middlings only can pass under it and be drawn off. This is illustrated in the cross-section of a compartment end.



Middling Draw-Off for Jig with Adjustable Height of Opening

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## Treatment of Zinc Muffle Residues

These residues often contain, apart from unconsumed cinders, considerable quantities of metals, such as Zn, Pb, Fe, Ag and metal sulphides, though the Pb contents are usually less than 1%, and the Ag contents no more than 40 or 50 grams per ton (*Min. Journ.*, June 14, 1913). The recovery of these metals, which presents great difficulties, has been the object of exhaustive experiments by Mr. Lindt, who adopted, as a preliminary to wet reduction, the electro-magnetic method. The residues experimented upon contained 3.8% Zn, 0.56% Pb, 18.9% Fe, 4.73% S, and 39 grams Ag per ton. Of the total mass, Mr. Lindt separated electro-magnetically 26%, containing 3.8% Zn, 0.16% Pb, 59.6% Fe, 3.65% S, 116 grams Ag per ton. The nonmagnetic portion (74% of the total) carried 3.8% Zn, 0.71% Pb, 4.6% Fe, 5.12% S and 16 grams Ag per ton. In the nonmagnetic portion the Zn is present as sulphide, and the sulphur contents are just sufficient to bind the other metals as sulphides and concentrate them to regulus. Of the original silver contents by far the greater part segregates in the magnetic portion, and can easily be reduced by the wet process, while the small quantity remaining in the nonmagnetic portion combines with the lead. Mr. Lindt also describes how the process can be applied to the recovery of the unconsumed cinders.

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## Safety Rules—Instructions to Foremen

(1) You will be held responsible for accidents to your men, whether they are working directly under you or your subforeman.

(2) When a man is being placed to work on a new job where there are special dangers (such as oiling, operating a machine, handling hot metal, etc.), instruct him thoroughly and let him be broken in by a man familiar with the work.

(3) Do not put men to work on any job until you have inspected everything and satisfied yourself that the place is safe. Warn the men of any danger that may come up in the course of doing this work. If you see a man violating your instructions or taking chances that place him liable to injury, deal with him so as to make it certain he will not again disobey orders. When you finish a job replace the safeguards and remove all loose material.

(4) Use judgment at all times in placing men on jobs; heavy, slow men should not be placed on jobs where light, quick men are required. Slow-thinking, unintelligent men should not be placed around machinery or in places where presence of mind is required.

(5) Employ the best men you can get and try to keep them. Never have a man in your employ to whom no one in the gang can talk.

(6) If possible, engage only English-speaking men for operation of machines.

(7) Drill your men to notify you immediately when injured, no matter how slight the injury may be, and send them to the doctor at once.

(8) Do not allow injured men to go to the doctor unassisted, where the injury is other than of a minor nature.

(9) Report and discuss with the foreman on the other turn acidents you have had, with a view to preventing their repetition.

(10) When one of your men is injured, immediately notify the safety department, and leave the conditions unchanged until photographs have been taken or an O. K. received from the department. Preserve and mark any material, tools or pieces of machinery involved in the accident.

(11) Investigate every accident thoroughly and try to prevent its repetition.

(12) Fill out a foreman's accident report for every accident in accordance with instructions and mail immediately. Give the names of all witnesses.

(13) Watch out for men who are hurt frequently, and put them where they will not get hurt.

(14) When it is necessary for men to work above or below other men, both parties shall be notified, and covering provided to protect men below.

(15) Do not allow machinery to be started before the safeguards have been replaced. If it is necessary to start machinery for testing be sure that every one is out of danger.

(16) Carefully inspect all appliances, and if machinery, tools or other appliances are dangerous, do not continue to use them, but call your superintendent.

(17) Have a thorough understanding of all the rules in this book. Until you know them all, and are living up to them, you are not doing your full duty.

(18) Exercise care for the safety of "loaned" men. See that they are not exposed to any unknown danger and are not taking any unnecessary chances.

(19) Do not allow material to be piled under crane ladders or so as to interfere with trimming of lights.

(20) Do not allow men to use switch boxes for lockers or for any other purpose than that for which they are intended.

(21) If lights do not burn when it is necessary to use them, report to the electrical department at once.

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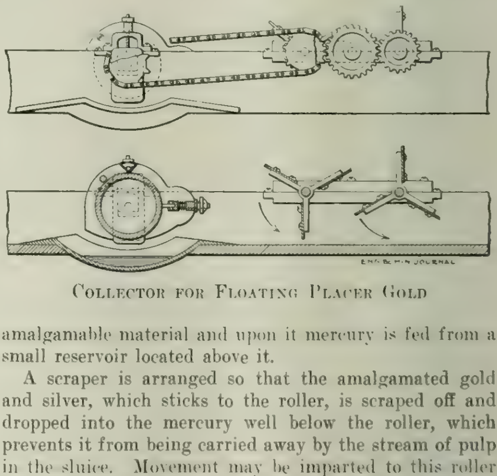
## Float-Gold Collector

An apparatus for collecting float gold in placer mining has been invented by Lawrence C. Gray, of Boston, and patented under U. S. pat. No. 1,056,652. The device consists of a roller placed in the sluice, through which the pulp is passing, this roller being placed above a slight depression in the bottom of the sluice, which depression contains a small quantity of mercury. The roller is of amalgamable material and upon it mercury is fed from a small reservoir located above it.



Collector for Floating Placer Gold

A scraper is arranged so that the amalgamated gold and silver, which sticks to the roller, is scraped off and dropped into the mercury well below the roller, which prevents it from being carried away by the stream of pulp in the sluice. Movement may be imparted to this roller by a pair of impulse waterwheels in miniature. The accompanying drawing explains in full the action of the machine.

Another apparatus designed by the same inventor and patented under 1,056,633, is for the same purpose and accomplishes the object by placing in the sluice a mercury well of such peculiar shape that it gives a whirling motion to the pulp, and causes the heavier solids to be precipitated against the surface of the mercury, thereby producing conditions favorable to the amalgamation of any precious metals present.

⁂

**Screen Tests Are an Essential** part of the preliminary experiments on an ore, but no standard method has been agreed upon for making the tests. They can be made dry or wet, the dry method taking more time and a great deal more care to carry it out correctly. By the wet method the material may be rapidly passed through the series of screens, but care has to be taken to avoid loss in splashing and leaking.

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[*] From Inland Steel Co.'s book of rules.

# THE COST OF DOING THINGS

## El Oro Costs

During the year ended June 30, 1912, the El Oro Mining & Railway Co., El Oro, Mexico, treated 302,698 tons of ore and 84,459 tons of tailings in its mill and cyanide plant. The mill averaged 8.88 tons of ore per stamp per 24 hr. The average assay value of ore treated was $6.36 gold and $1.30 silver and tailings re-treated averaged $2.68 gold and 88c. silver, a combined average of $5.581 gold and $1.212 silver per ton. Theoretical extraction of contents of ore and tailings treated was: 87.98% of the gold and 69.58% of the silver, or a total of 84.68%. The actual extraction by bullion was 87.51% of the gold, 74.23% of the silver and 85.14% of both, based on the assay value of the heads. The costs were made up as follows: Mining, $1.89 per ton mined, development, 83c.; milling, 18c. per ton milled; cyaniding, 93c. per ton treated; water supply, 1c.; general expenses, 22c., and taxes, 23c.; other expenses, 10c., making a total of $4.39 per ton.

## Alaska Treadwell

The Alaska Treadwell costs are always interesting as they represent the result of high efficiency, excellent management and modern practice. The annual report for year ended Dec. 31, 1912, shows that 861,973 tons of ore were stoped, 892,192 tons crushed by the two mills and 12,578 ft. of development work performed. The average grade of the ore mined, as indicated by the mine assays, was $3.22 per ton. The average of the ore milled, obtained by adding the tailing value to mill returns was $2.67 per ton.

The total net returns from the mill amounted to $2.4724 per ton, indicating a saving of 92.5%, figured by tailing plus product. The operating expenses and construction charged amounted to $1.2208 per ton milled, leaving a profit of $1.2506 from the ore. Miscellaneous profits of $0.0605 credited made a total of $1.3111 per ton from operations. Depreciation written off profit and loss amounted to about 69.5c. per ton milled.

COST OF MINING, ALASKA TREADWELL

| | Development 12,578 Ft. Cost per Ft. Developed | Stoping 861,973 Tons Cost per Ton Stoped | Tramming 892,192 Tons Cost per Ton of Ore Trammed | Hoisting 892,192 Tons Cost per Ton of Ore Hoisted | Pumping Cost per Ton Milled | Total Cost per Ton Milled |
|---|---|---|---|---|---|---|
| Direct Labor— | | | | | | |
| Machine drillers | $3.188 | $0.143 | | $0.000 | $0.000 | $0.183 |
| Hand miners | | 0.003 | | | | 0.004 |
| Laborers | 1.551 | 0.114 | 0.026 | 0.000 | 0.000 | 0.158 |
| Powdermen | 0.072 | 0.010 | | | | 0.011 |
| Tool carriers | 0.018 | 0.001 | | | | 0.001 |
| Engineers, skipmen, oilers | | | 0.003 | 0.020 | 0.000 | 0.023 |
| Cagemen | | 0.000 | | 0.004 | | 0.004 |
| Chutemen | | | 0.015 | | | 0.014 |
| Trainmen and trammers | | | 0.029 | | | 0.030 |
| Track and stablemen | 0.069 | | 0.003 | | | 0.004 |
| Pumpmen | | | | | 0.003 | 0.003 |
| Foremen, shift bosses | 0.177 | 0.009 | 0.002 | 0.000 | 0.000 | 0.014 |
| Blacksmiths, tool sharpeners | 0.153 | 0.006 | 0.001 | 0.000 | | 0.008 |
| Machinists, pipemen | 0.056 | 0.002 | 0.000 | 0.000 | 0.000 | 0.003 |
| Carpenters, timbermen | 0.244 | 0.003 | 0.001 | 0.001 | | 0.007 |
| Watchmen | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 |
| Contractors | 1.241 | | 0.003 | | | 0.020 |
| Timekeeper | 0.025 | 0.001 | 0.000 | | | 0.001 |
| Total direct labor | $6.816 | $0.292 | $0.083 | $0.025 | $0.003 | $0.489 |
| Direct Supplies— | | | | | | |
| Powder | $1.239 | $0.146 | | | | $0.157 |
| Fuse and caps | 0.120 | 0.016 | | | | 0.017 |
| Candles | 0.078 | 0.006 | | | | 0.007 |
| Machine drill supplies | 0.131 | 0.006 | | | | 0.008 |
| Iron and steel | 0.122 | 0.003 | 0.001 | 0.000 | 0.000 | 0.006 |
| Steel rope | | | 0.001 | 0.008 | | 0.009 |
| Lumber and timber | 0.095 | 0.003 | 0.000 | 0.001 | | 0.006 |
| Lubricants | 0.007 | 0.000 | 0.001 | 0.001 | 0.000 | 0.002 |
| Blacksmith coal | 0.001 | 0.000 | | | | 0.000 |
| Stable | | | 0.003 | | | 0.003 |
| Fuel oil | 0.031 | 0.001 | 0.000 | 0.000 | 0.000 | 0.001 |
| Miscellaneous | 0.192 | 0.002 | 0.003 | 0.001 | 0.001 | 0.009 |
| Total direct supplies | $2.016 | $0.183 | $0.009 | $0.011 | $0.001 | $0.225 |
| Subsidiary Accounts of Mixed Labor and Supplies— | | | | | | |
| Building repairs | $0.022 | $0.001 | $0.000 | $0.000 | | $0.002 |
| Electrical repairs | 0.049 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 |
| Mechanical repairs | 0.169 | 0.002 | 0.002 | 0.008 | 0.000 | 0.015 |
| Power | 0.236 | 0.007 | 0.001 | 0.040 | 0.003 | 0.054 |
| Train service | 0.041 | 0.002 | 0.000 | 0.000 | 0.000 | 0.003 |
| Assaying | 0.013 | 0.001 | | | | 0.001 |
| Surveying | 0.052 | 0.001 | | | | 0.002 |
| Douglas Island general expense | 0.675 | 0.031 | 0.008 | 0.004 | 0.001 | 0.051 |
| Compressed air | 0.494 | 0.018 | 0.001 | 0.000 | 0.001 | 0.027 |
| Electric lights | | | 0.000 | | | 0.000 |
| Steam heat | 0.019 | 0.001 | 0.000 | 0.000 | 0.000 | 0.001 |
| Blacksmith shop | 0.137 | 0.005 | 0.001 | 0.001 | 0.000 | 0.008 |
| Total mixed labor and supplies | $1.907 | $0.069 | $0.013 | $0.053 | $0.006 | $0.166 |
| | $10.739 | $0.544 | $0.105 | $0.089 | $0.010 | $0.880 |
| Less credits | 1.803 | | 0.000 | 0.001 | 0.002 | 0.028 |
| Total cost | $8.936 | $0.544 | $0.105 | $0.088 | $0.008 | $0.852 |

The tables given herewith show the details of mining and milling costs:

COST OF MILLING—240 STAMP MILL

**371,308 Tons Ore Crushed.** **6,838.63 Tons Sulphurets Saved**

| | Crushing Cost Per Ton | Tramming Cost Per Ton | Stamping Cost Per Ton | Concentrating Cost Per Ton | Total Cost Per Ton |
|---|---|---|---|---|---|
| Direct Labor— | | | | | |
| Feeders | | | $0.025 | | $0.025 |
| Amalgamators... | | | 0.015 | | 0.015 |
| Vannermen | | | | 0.016 | 0.016 |
| Sampler | | | 0.000 | 0.001 | 0.001 |
| Foremen | | | 0.003 | 0.002 | 0.005 |
| Oilers | | | 0.003 | 0.003 | 0.006 |
| Stationary engineers | | | 0.006 | | 0.006 |
| Total direct labor | | | $0.052 | $0.022 | $0.074 |
| Direct Supplies— | | | | | |
| Shoes | | | $0.012 | | $0.012 |
| Dies | | | 0.004 | | 0.004 |
| Cams and camshafts | | | 0.000 | | 0.000 |
| Tappets and keys | | | 0.001 | | 0.001 |
| Mortars | | | 0.001 | | 0.001 |
| Mortar extras | | | 0.004 | | 0.004 |
| Screens | | | 0.002 | | 0.002 |
| Quicksilver | | | 0.002 | | 0.002 |
| Lubricants | | | 0.001 | 0.000 | 0.001 |
| Vanner belts | | | | 0.003 | 0.003 |
| Belting | | | 0.001 | 0.000 | 0.001 |
| Vanner rollers | | | | 0.001 | 0.001 |
| Miscellaneous | | | 0.002 | 0.002 | 0.004 |
| Total direct supplies | | | $0.030 | $0.006 | $0.036 |
| Subsidiary Accounts of Mixed Labor and Supplies— | | | | | |
| 240 tailing | | | $0.001 | $0.001 | $0.002 |
| Ore crushing | $0.025 | | | | $0.025 |
| Tramming to mills | | $0.016 | | | 0.016 |
| Pumping salt water | | | 0.001 | 0.001 | 0.002 |
| Building repairs | | | 0.011 | 0.001 | 0.012 |
| Electrical repairs | | | 0.000 | 0.000 | 0.000 |
| Mechanical repairs | | | 0.009 | 0.002 | 0.011 |
| Power | | | 0.019 | 0.009 | 0.028 |
| Train service | | | 0.002 | | 0.002 |
| Assaying | | | 0.001 | 0.001 | 0.002 |
| D. I. general expense | 0.001 | 0.001 | 0.006 | 0.002 | 0.010 |
| Steam heating | | | 0.002 | 0.002 | 0.004 |
| Compressed air | | | | 0.001 | 0.001 |
| Electric lights | | | 0.000 | 0.000 | 0.000 |
| Miscellaneous | | | 0.001 | 0.002 | 0.003 |
| Total mixed labor and supplies | $0.026 | $0.017 | $0.053 | $0.022 | $0.118 |
| Total cost... | $0.026 | $0.017 | $0.135 | $0.050 | $0.228 |

Chrome-steel consumption in shoes used was one pound per 2.78 and 2.58 tons of ore respectively in the 240- and 300-stamp mill, compared with 5.12 and 4.24 tons of ore per pound of iron in dies. About one assay was made for the mines for every 200 tons of ore mined and one for the mill for every 147 tons milled or a total of one assay for every 78.5 tons milled. The average number of men employed was 745 and the average wage, $3.47 per day. This indicated about 1195 tons per year per man.

COST OF MILLING—300 STAMP MILL

520,884 Tons Ore Crushed 10,558.54 Tons Sulphurets Saved

| | Crushing Cost Per Ton | Tramming Cost Per Ton | Stamping Cost Per Ton | Concentrating Cost Per Ton | Total Cost Per Ton |
|---|---|---|---|---|---|
| Direct Labor | | | | | |
| Laborers | | | $0.002 | $0.001 | $0.003 |
| Feeders | | | 0.017 | | 0.017 |
| Amalgamators | | | 0.010 | | 0.010 |
| Vannermen | | | | 0.011 | 0.011 |
| Samplers | | | 0.000 | 0.000 | 0.000 |
| Foremen | | | 0.002 | 0.002 | 0.004 |
| Oilers | | | 0.002 | 0.002 | 0.004 |
| Carpenters | | | 0.002 | 0.001 | 0.003 |
| Watchmen | | | 0.001 | 0.000 | 0.001 |
| Total direct labor | | | $0.036 | $0.017 | $0.053 |
| Direct Supplies | | | | | |
| Shoes | | | $0.012 | | $0.012 |
| Dies | | | 0.005 | | 0.005 |
| Cams and camshafts | | | 0.003 | | 0.003 |
| Tappets and keys | | | 0.002 | | 0.002 |
| Mortars | | | 0.004 | | 0.004 |
| Screens | | | 0.002 | | 0.002 |
| Quicksilver | | | 0.003 | | 0.003 |
| Lubricants | | | 0.000 | 0.000 | 0.000 |
| Vanner belts | | | | 0.002 | 0.002 |
| Belting | | | 0.001 | 0.000 | 0.001 |
| Vanner rollers | | | | 0.000 | 0.000 |
| Miscellaneous | | | 0.005 | 0.003 | 0.008 |
| Total direct supplies | | | $0.037 | $0.005 | $0.042 |
| Subsidiary Accounts of Mixed Labor and Supplies— | | | | | |
| 300 tailing.......... | ...... | ...... | $0.002 | $0.003 | $0.005 |
| Installation pump | | | 0.000 | 0.000 | 0.000 |
| Ore crushing | $0.024 | | | | 0.024 |
| Tramming to mill... | ...... | 0.015 | | | 0.015 |
| Pumping salt water | | | 0.000 | 0.001 | 0.001 |
| Building repairs | | | 0.003 | 0.000 | 0.003 |
| Electrical repairs... | | | 0.001 | 0.000 | 0.001 |
| Mechanical repairs. | | | 0.006 | 0.001 | 0.007 |
| Power | | | 0.012 | 0.005 | 0.017 |
| Train service | | | 0.001 | | 0.001 |
| Assaying | | | 0.001 | 0.000 | 0.001 |
| D.I. general expense, proportion of..... | 0.001 | 0.001 | 0.004 | 0.002 | 0.008 |
| Steam Heating | | | 0.001 | 0.003 | 0.004 |
| Electric Lights... | | | 0.000 | 0.001 | 0.001 |
| Compressed air | | | | 0.000 | 0.000 |
| Miscellaneous... | | | 0.001 | 0.002 | 0.003 |
| Total mixed labor and supplies.. | $0.025 | $0.016 | $0.032 | $0.018 | $0.091 |
| Total cost... | $0.025 | $0.016 | $0.105 | $0.040 | $0.186 |

⁂

## Cost of Mixing and Placing Concrete

The costs in the accompanying table do not include excavation, forms, steel, or miscellaneous items, the costs of materials including only cement and aggregates. The figures were obtained from actual jobs and are given in Taylor and Thompson's "Concrete Costs." Wages range from 15 to 25c. per hr. The costs include an allowance for superintendence, overhead charges and general expenses, but do not include home-office expenses or profit. These costs are approximate only and are suitable for nothing but preliminary estimates. They are given in dollars per cubic yard.

APPROXIMATE LABOR AND TOTAL COSTS FOR MIXING AND PLACING CONCRETE

| | Labor only | | Labor and Material | |
|---|---|---|---|---|
| | Range | Average | Range | Average |
| Mass-dams, foundations, etc. ........ | $0.75 to $2.50 | $1.25 | $3.00 to $9.00 | $5.50 |
| Tunnels and conduits | 1.00 to 3.00 | 2.00 | 4.50 to 8.00 | 6.25 |
| Reservoirs and standpipes ....... | 0.75 to 3.00 | 1.50 | 3.50 to 13.00 | 7.00 |
| Buildings .......... | 0.75 to 4.00 | 1.50 | 4.50 to 9.00 | 6.50 |
| Bridges ........... | 0.50 to 2.50 | 1.50 | 4.00 to 8.00 | 6.00 |
| Sewers ............ | 0.75 to 1.75 | 1.50 | 3.50 to 8.00 | 6.00 |

⁂

## Esperanza Costs

The Esperanza Mining Co., El Oro, Mexico, as shown by its report for 1912, mined 135,002 tons of ore for $3.34 per ton, consisting of: $1.08 for development; $1.70 for ore breaking; 49c. for hoisting and placing in mine bins; and 7c. for moving ore from mine to mill bins. The cost of milling was $1.61 per ton milled; shipping and selling, 23c.; general expenses, 56c., and renewals, 26c. Total cost for mining and milling was $6 and profits amounted to $1.30 per ton. Construction not charged to expenses was equal to 3.9c. per ton mined.

⁂

## Dredging Costs

According to the annual report of the Colorado Gold Dredging Co., Breckenridge, Colo., during the dredging season of 1912, 1,270,476 cu.yd. were dredged, giving a total yield of $208,248, or an average of 16.391c. per cu.yd. The average cost was 5.296c. per cu.yd. and administration and general expenses 0.263c. per cu.yd., a total of 5.559c. per cu.yd., leaving a profit of 10.832c. per cubic yard.

⁂

**Lining Costs** at one of the modern basic-lined converter installations are understood to have been brought down to 8½c. per ton of blister produced.

# NEW PUBLICATIONS

EXPORTERS' ENCYCLOPEDIA, 1913. 5½x8¼, pp. 1023; $7.50. Exporters' Encyclopedia Co., New York.

NORTH CAROLINA—BIENNIAL REPORT OF THE STATE GEOLOGIST, 1911-12. Pp. 118. Joseph Hyde Pratt, State Geologist, Chapel Hill, N. C.

AN EXPENSIVE EXPERIMENT. The Hydro-electric Power Commission of Ontario. By Reginald Pelham Bolton. 5¼x8¼, pp. 281, illus. The Baker & Taylor Co., New York.

RECURRENT TROPIDOLEPTUS ZONES OF THE UPPER DEVONIAN IN NEW YORK. By Henry S. Williams. Pp. 101, illus. Professional Paper 79, U. S. Geological Survey, Washington.

ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1911. By John McLeish. Pp. 316. Canada Dept. of Mines, Mines Branch, Ottawa.

THE MAGNETIC IRON SANDS OF NATASHKWAN, COUNTY OF SAGUENAY, PROVINCE OF QUEBEC. By George C. Mackenzie. Pp. 57, illus. Canada Dept. of Mines, Mines Branch, Ottawa.

SURFACE WATER SUPPLY OF THE UNITED STATE, 1910. Part XII, North Pacific Coast. By F. F. Henshaw, E. C. La Rue and G. C. Stevens. Pp. 685, illus. Water-Supply Paper 292, U. S. Geological Survey, Washington.

DIE ANWENDUNG HOHER DRUCKE BEI CHEMISCHEN VORGAENGEN UND EINE NACHBILDUNG DES ENTSTEHUNGSPROZESSES DER STEINKOHLE. By Friedrich Bergius. 9¾x6½, pp. 56, paper; 2.80 marks. Wilhelm Knapp, Halle a. S., Germany.

JAHRBUCH DER ELEKTROCHEMIE UND ANGEWANDTEN PHYSIKALISCHEN CHEMIE, XIII. JAHRGANG. Berichte über die Fortschritte des Jahres 1906. By Heinrich Danneel and Julius Meyer. 6¾x10, pp. 868, illus.; 23 marks. Wilhelm Knapp, Halle a. S., Germany.

THE PETROLOGY OF THE SEDIMENTARY ROCKS. Vol. II of "Textbook of Petrology." By F. H. Hatch and R. H. Rastall. With an appendix on the Systematic Examination of Loose Detrital Sediments, by T. Crook. 5x7½, pp. 425, illus.; 7s. 6d.; George Allen & Co., Ltd., London, Eng.

ELECTRIC FURNACES IN THE IRON AND STEEL INDUSTRY. By W. Rodenhauser and I. Schoenawa. From advance sheets of the second German edition; authorized translation and additions by C. H. vom Baur. 6x9¼, pp. 419, illus. John Wiley & Sons, New York.

While this work treats especially of electric furnaces for steel-making and iron-ore smelting, it goes into principles in general and is as satisfactory a treatise on the subject as any whereof we know. To metallurgists interested in the electric furnace for iron and steel it may especially be commended.

THE BASIC OPENHEARTH STEEL PROCESS. By Carl Dichmann; translated and edited by Alleyne Reynolds. 5½x8½, pp. 334, illus.; $3.50. D. Van Nostrand Co., New York.

This is a book upon the theory of the openhearth steel process and, therefore, fills a want which has existed for a long time. More particularly does it fill this want because, although theoretical, it is written by an experienced man in a practical way with a view to the problems likely to be met with in actual operation. The author's own description of the situation is given in the following words:

> During more than 20 years' practical experience in openhearth furnace management, I have frequently been faced with problems to which I was unable to find satisfactory solutions. A pause in such practical activity has enabled me to investigate these questions as a whole, and in this connection I have taken advantage of all available literature on the subject which was at my disposal. The gaps remaining I have endeavored to fill in to the best of my ability.
>
> This was the origin of my book, and in now giving it to the public I do so on the plea that the literature relating to the openhearth process is very meager, in spite of the daily increasing importance of the process, and because I hope to enlist further workers in clearing up the abstruse problems involved.

There is little but praise to be said of the German text from which this book was translated; such a discussion was needed; the author had at his command, from practical experience and study, means of filling the need and he applied his abilities with skill and judgment to the making of an excellent book.

The English translation unfortunately follows too literally the German text even to the extent of bodily translating German idioms into English, with the result that the language of the English text is so crude and at times even ridiculous that the mind is occasionally tempted away from the author's thought to a consideration of the language in which it is clothed. A single example will serve to make this condition evident (pp. 154, 155):

> Therefore, the entrance of iron protoxide into the iron must be profited by, which can only be achieved by adding to the latter substances, which do not permit protoxide of iron in their presence, but convert it into metallic iron. For fulfillment of this proviso, only reducing agents are suitable, of which some are always present in all classes of iron technically employed. They are dissolved in the melted metal and have a disposition to an equalization of their division in the entire mass of iron, and, therefore, also present at the place from which the permeation by the protoxide of iron takes place, namely, the contact surface of metal and slag.

The first 16 chapters (embodying about 136 pages) are taken up with the study of openhearth fuels from the theoretical and practical standpoint, but chiefly the former. Part 2 (embodying chapters 17 to 24, inclusive, and covering 166 pages of the text), is devoted to the chemistry of the basic-openhearth process. Commencing with an elementary chapter on reduction and oxidation processes the author then discusses the chemical action of flame, including the formation of slag, the elimination of impurities from the metal and a study of the relative volume of oxidation by means of flame and slag. This chapter has the unusual quality of being elementary and of becoming more and more valuable in proportion to the experience of the reader. This same favorable characteristic applies to all the theoretical discussions in part two. Chapter 19, the work done by heat in openhearth furnaces (11 pages), contains much valuable material, clearly and simply expressed. Chapter 20 (22 pages), the enhancement of the oxidizing action of the flame, is a useful elaboration and extension of this subject, which has been discussed several times before. Chapter 21, the occurrences in openhearth furnaces and their judgment (16 pages), is full of information of much practical value, and the same is equally true of Chapter 22, the principal methods of working in the basic-openhearth process, which contains 68 pages. Indeed, students and those entering upon their experience with the openhearth process will probably find it most desirable to read the last two chapters of the book first, but should not neglect to re-read them later in the light of the theory given in the discussions appearing earlier in the volume.

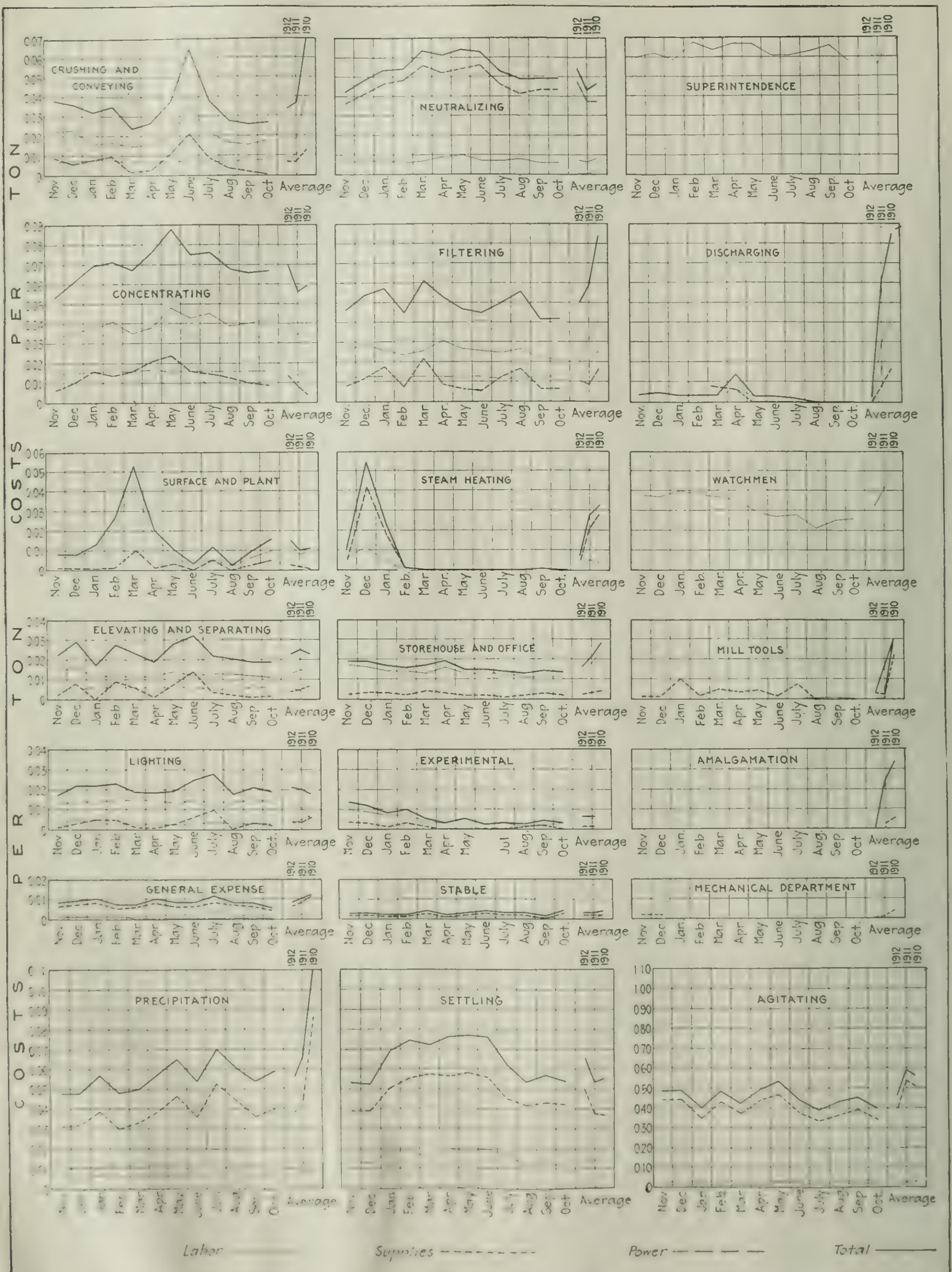
Taken altogether, this is one of the most useful and interesting discussions of the most important steel process of the industry, and it is only to be regretted that the translator and the publishers permitted it to appear in such crude and unattractive English. The tables are numerous; the illustrations are excellent and comprehensive, and the general make-up and typography of the volume are good.

BRADLEY STOUGHTON.

PETROLEUM IN SOUTHERN CALIFORNIA. Compiled by Paul W. Prutzman. 9½x6, pp. 430, illus. Issued by the California State Mining Bureau, San Francisco, California.

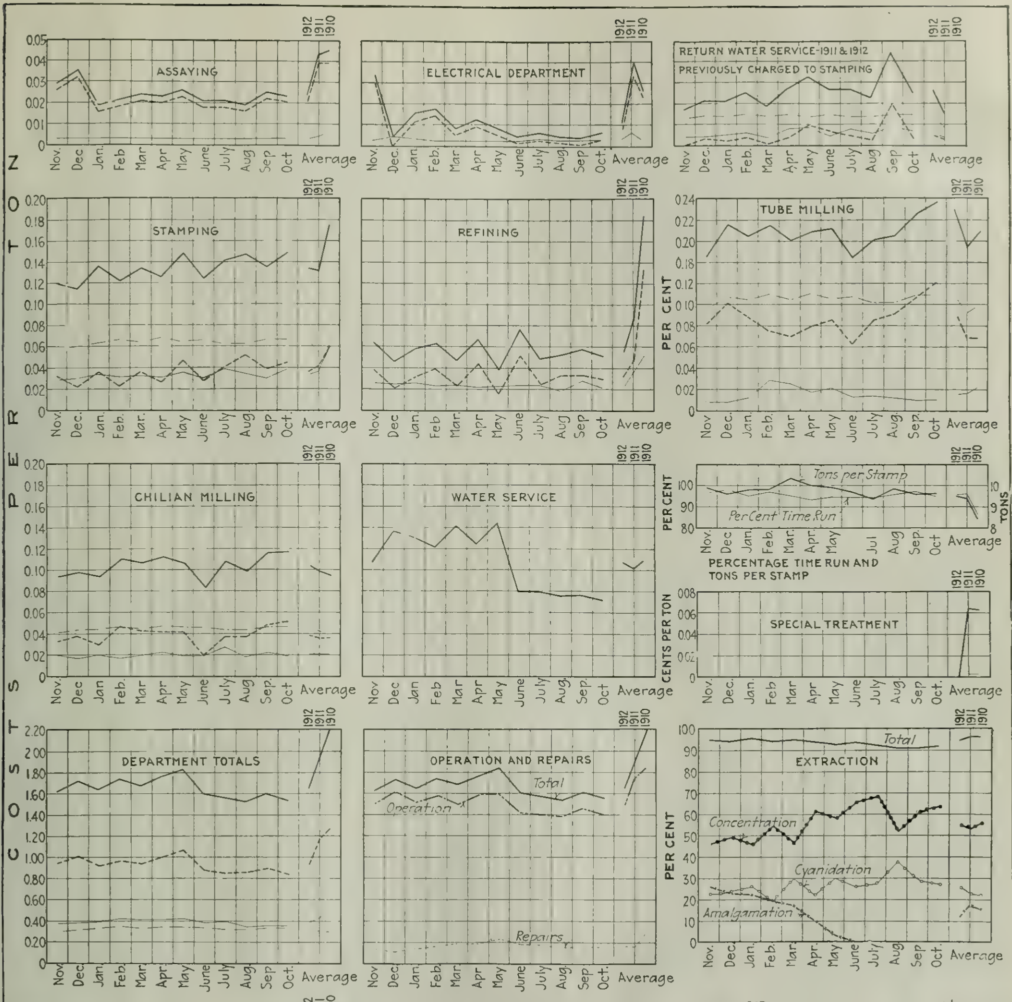
In this bulletin a great deal of data have been brought together. The different areas are described as well as their topographical and geological characteristics. The methods of oil analysis followed are given, together with drawings of some of the different forms of apparatus used. The different fields are taken up showing, in many cases, drawings of the geological structures, maps, photographs and analyses of petroleum from many of the wells. However, a careful examination of the analyses presented would seem to indicate in some cases that the interpretations of the distillations into yields of commercial products were not even approximately accurate. The results obtained by treating the lubricating oils from the distillations with sulphuric acid have no doubt in some cases been taken too literally; for in the manipulation of the acid treatment of such products, slight variations in the process give widely different results. On page 69, analysis 5462 of the South Well of the Union Oil Co., Tar Flat, the indications are, from the results given, that this oil contains from 2 to 3% of paraffin wax. The statement is made in speaking of the lubricating stock obtained from this distillate—"The latter is pasty with paraffin at 60° temperature, and the reduced stock sets solid at 70° F., making it useless for the manufacture of engine oil, as the paraffin from these oils does not crystallize." In several cases the statement is made that the lubricating stock contains too much paraffin to be of much value for lubricants. Probably if such products were redistilled once, using steam, the paraffin would be rendered crystalline, and could be easily separated by refrigeration and filter-pressing, or the lubricating stock may have to be cut out at a higher gravity and then redistilled. In many cases the probable yield of D grade asphalt has been calculated from the yield of coke obtained by distillation. This method can, at best, be only roughly approximate, and may in some cases be the cause of condemning a good oil. It is unfortunate that steam reductions to certain fixed residues were not made in some cases, as there is evidence in some of the analyses that by proper refining methods good cylinder oils, similar to those obtained from Pennsylvania crude, could be manufactured. In general, the book is well arranged, simple and direct in style, and contains a good deal of data of value to those interested in petroleum and its products.

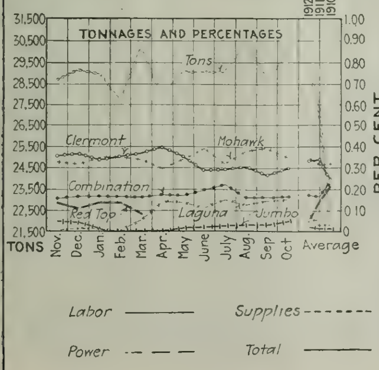
T. T. GRAY.



**MILL COST DATA OF THE GOLDFIELD**

ENG. & MIN. JOURNAL





PER CENT.

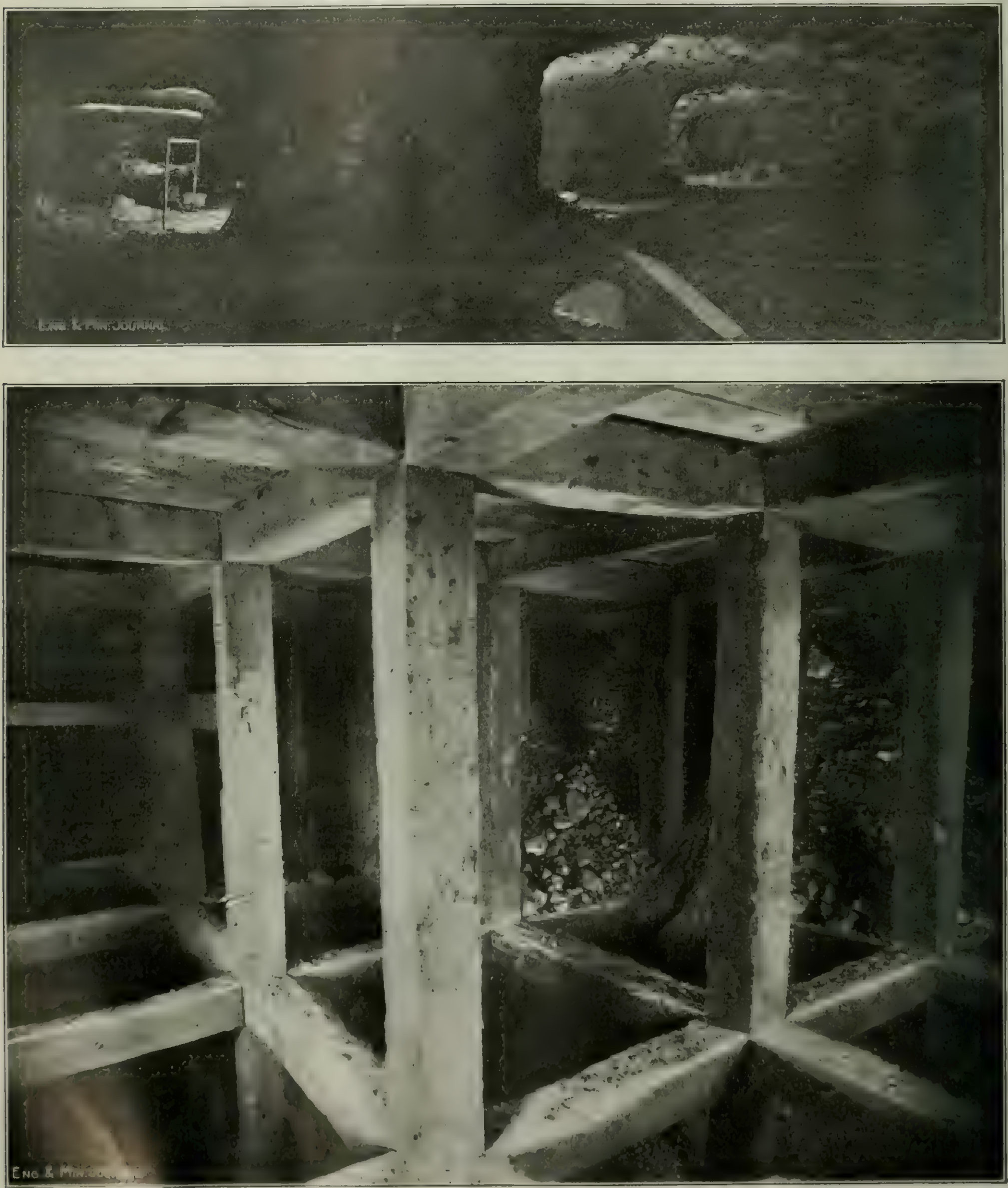
| SUPPLIES | 1911 Nov. | Dec. | 1912 Jan. | Feb, | Mar. | Apr | May | June | July | Aug | Sep | Oct | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyanide | 0.390 | 0.393 | 0.312 | 0.388 | 0.319 | 0.348 | 0.383 | 0.305 | 0.260 | 0.290 | 0.280 | 0.273 | 0.328 |
| Zinc | 0.029 | 0.028 | 0.031 | 0.030 | 0.027 | 0.034 | 0.038 | 0.034 | 0.045 | 0.042 | 0.036 | 0.034 | 0.034 |
| Lime | 0.071 | 0.077 | 0.086 | 0.093 | 0.111 | 0.098 | 0.105 | 0.108 | 0.088 | 0.082 | 0.083 | 0.083 | 0.091 |
| Lead Acetate | 0.041 | 0.048 | 0.034 | 0.040 | 0.048 | 0.080 | 0.069 | 0.064 | 0.072 | 0.072 | 0.064 | 0.064 | 0.058 |
| Water | 0.107 | 0.136 | 0.131 | 0.122 | 0.141 | 0.124 | 0.145 | 0.080 | 0.080 | 0.077 | 0.078 | 0.073 | 0.108 |
| Belting | 0.004 | 0.010 | 0.016 | 0.018 | 0.008 | 0.009 | 0.011 | 0.017 | 0.003 | 0.007 | 0.012 | 0.004 | 0.013 |
| Lubrication | 0.010 | 0.003 | 0.002 | 0.008 | 0.007 | 0.009 | 0.009 | 0.008 | 0.008 | 0.011 | 0.003 | 0.006 | 0.007 |
| Borax | 0.003 | 0.000 | 0.005 | 0.004 | 0.007 | 0.013 | 0.003 | 0.013 | 0.006 | 0.007 | 0.006 | 0.005 | 0.006 |
| Litharge | 0.013 | 0.000 | 0.005 | 0.011 | 0.000 | 0.019 | 0.000 | 0.019 | 0.005 | 0.014 | 0.016 | 0.011 | 0.009 |
| Pig Lead | 0.004 | 0.007 | 0.007 | 0.007 | 0.003 | 0.002 | 0.004 | 0.005 | 0.002 | 0.005 | 0.003 | 0.003 | 0.004 |
| Shoes and Dies | 0.025 | 0.019 | 0.029 | 0.014 | 0.026 | 0.022 | 0.027 | 0.020 | 0.023 | 0.029 | 0.023 | 0.024 | 0.023 |
| Pebbles | 0.053 | 0.087 | 0.072 | 0.060 | 0.049 | 0.048 | 0.053 | 0.055 | 0.050 | 0.056 | 0.069 | 0.071 | 0.060 |
| Tube Mill Lining | 0.023 | 0.015 | 0.013 | 0.007 | 0.013 | 0.029 | 0.000 | 0.000 | 0.027 | 0.030 | 0.031 | 0.037 | 0.019 |
| Chilian Steel | 0.017 | 0.026 | 0.021 | 0.027 | 0.020 | 0.031 | 0.020 | 0.000 | 0.021 | 0.021 | 0.032 | 0.031 | 0.022 |
| Screens | 0.007 | 0.008 | 0.007 | 0.011 | 0.007 | 0.005 | 0.010 | 0.005 | 0.006 | 0.002 | 0.005 | 0.003 | 0.006 |
| Filter Cloth | 0.003 | 0.005 | 0.003 | 0.000 | 0.007 | 0.000 | 0.008 | 0.000 | 0.006 | 0.000 | 0.000 | 0.005 | 0.003 |
| Assaying | 0.025 | 0.032 | 0.016 | 0.018 | 0.021 | 0.020 | 0.023 | 0.018 | 0.018 | 0.017 | 0.022 | 0.020 | 0.021 |
| General Stores | 0.117 | 0.119 | 0.131 | 0.114 | 0.123 | 0.111 | 0.164 | 0.124 | 0.133 | 0.101 | 0.138 | 0.102 | 0.121 |
| Total Supplies | 0.942 | 1.013 | 0.921 | 0.972 | 0.937 | 1.002 | 1.072 | 0.875 | [illegible] | 0.863 | 0.900 | 0.849 | 0.933 |
| Labor | 0.378 | 0.393 | 0.393 | 0.415 | 0.413 | 0.410 | 0.417 | 0.389 | 0.391 | 0.345 | 0.360 | 0.352 | 0.388 |
| Power | 0.304 | 0.318 | 0.330 | 0.345 | 0.330 | 0.350 | 0.336 | 0.339 | 0.320 | 0.320 | 0.342 | 0.341 | 0.331 |
| Total Costs | 1.624 | 1.724 | 1.644 | 1.732 | 1.680 | 1.762 | 1.825 | 1.603 | 1.571 | 1.528 | 1.602 | 1.542 | 1.652 |

COST OF INDIVIDUAL MILL SUPPLIES

## CONSOLIDATED MILLING & TRANSPORTATION CO.

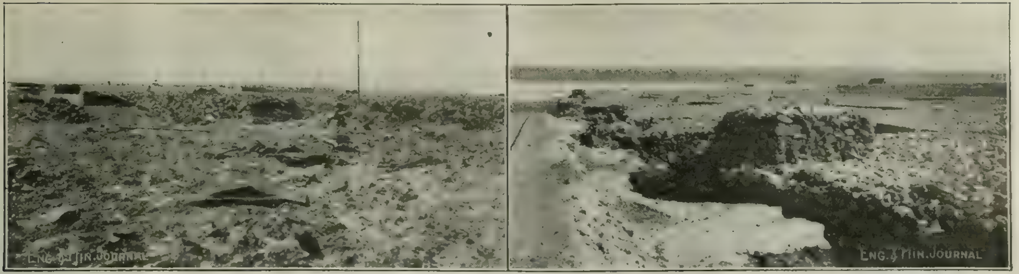
ENG.&MIN.JOURNAL

# PHOTOGRAPHS FROM THE FIELD



Mount Morgan Mine, Queensland, Australia

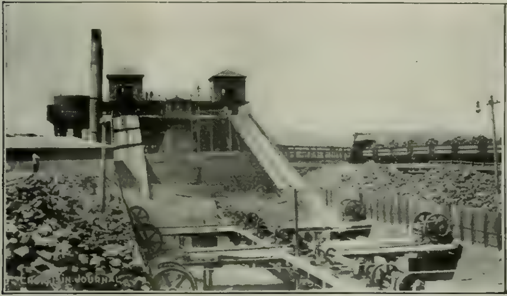
An open drift on the 850-ft. level is shown in the upper illustration; a square-set stope in the lower. It will be noticed that the ore tends to break fine.



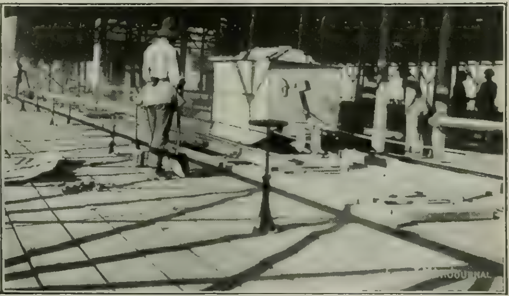
GENERAL VIEW OF NITRATE WORKINGS

Home-made powder shown on sack in foreground.

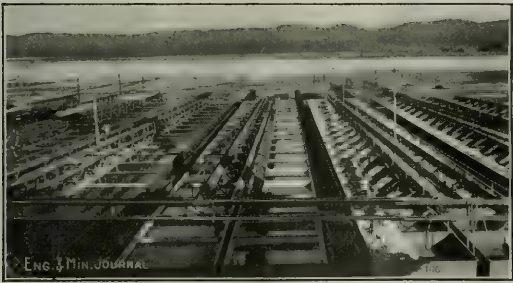
"Caliche" ready to be taken to nitrate plant.



GENERAL VIEW OF NITRATE PLANT, CRUSHERS IN FOREGROUND.

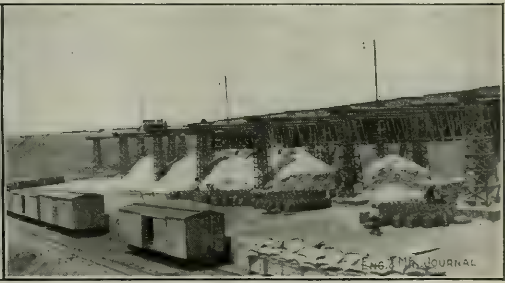


A CAR OF "CALICHE" READY TO BE DUMPED INTO THE "CACHUCHOS."



"BATEAS" IN WHICH THE NITRATE CRYSTALLIZES

Crystallized nitrate shown at right.



NITRATE READY FOR BAGGING AND SHIPMENT

Nitrate is brought from bateas in steel cars.

THE HARBOR AND CITY OF TALTAL, A TYPICAL NITRATE PORT

Chilean Nitrate Industry

Photographs furnished by Walter S. Tower, University of Chicago, and published by courtesy of Pan-American Union.

## Operations of Murex Magnetic Co., Ltd.

At the third general meeting of the Murex Magnetic Co., Ltd., held in London, June 19, the chairman, Lionel Holland, gave a résumé of the operations of the company.

First in explaining the necessity for a reorganization of the company, the chairman (*Min. Journ.*, June 21, 1913) enumerates the non-revenue-producing units erected. The option over Murex rights at Broken Hill has not been exercised. Further, due to a report by Professor Carlyle that there is no ore suitable for concentration at the Mazapil mines in Mexico, the plant installed there is being dismantled and transferred to fulfill another contract. A plant in the Pyrenees is also idle due to a dispute with mine owners.

Returns from other operations, in the opinion of the chairman, establish and prove the worth of the Murex process in treating sulphides in any gangue.

At the Malines mines, France, two units are successfully handling about 1000 tons per month of blende in a barytes gangue and producing a concentrate assaying 45 to 50% zinc, with an extraction over 90%. A silver-lead ore in a barytes gangue is being treated equally successfully at the Grund mine in the Harz mountains. During 12 months, under the direction of the Minister of Mines of the Prussian Government, an extraction of 80% in form of concentrate assaying 65% lead and 95 oz. silver per ton, has been made treating slimes.

### TREATS OXIDIZED ORES.

Tests at the Whim Well mines in Australia are stated to prove the value of the process for a copper carbonate ore containing no sulphide. An ore composed of copper glance and copper carbonate will be treated at the Avino mines in Mexico. The ore handled at Cordova, Spain, is a chalcopyrite and oxidized copper. Six Murex units are operated at these mines.

Contracts covering Murex rights for Chile and Peru have been consummated and tests are being made by the Bogoslowski company, a Russian company holding extensive deposits. These facts seem to warrant favorable opinions of the future of the company and a reorganization is being effected with a view of raising the necessary working capital.

⁂

## Arizona Mineral Production

Figures compiled by V. C. Heikes, of the U. S. Geological Survey, show a notable increase in production of both precious and common metals, especially of copper, in Arizona in 1912.

The production of gold was $3,762,310, an increase of $331,807, and the output of silver increased from 3,276,571 fine oz. to 3,190,387 oz. The greater part of the gold production was derived from siliceous ores treated at gold mills, and a large part of the remainder came from copper ores. Mohave County alone supplied $1,899,131 of the gold production, against $1,547,663 in 1911. Of the silver output 2,378,593 fine oz. came from copper ores treated at smelters. Cochise County alone produced 1,962,614 oz. in 1912, against 1,946,319 oz. in 1911.

The copper production increased from 306,141,538 lb., in 1911, to 365,63[illegible]49 lb. in 1912, and maintained Arizona as the leading copper state of the country. Cochise County, including the great Warren or Bisbee district, produced 147,654,661 lb. in 1912, against 132,290,007 lb. in 1911. Greenlee County, embracing the Copper Mountain and Greenlee districts of the Clifton-Morenci region, produced 76,848,299 lb. in 1912, against 70,926,330 lb. in 1911. Yavapai County, including the Verde district, produced 34,043,005 lb., and Gila County, including the Globe district, yielded 63,969,423 lb. in 1912. In Pinal and Gila counties the low-grade so called "porphyry" ores (which include deposits in schists) produced 76,848,299 lb. in 1912, against 30,666,515 lb. in 1911.

The output of lead, produced mainly in Cochise and Mohave counties, decreased from 10,274,552 lb. in 1911, to 6,806,443 lb. in 1912, but the output of zinc (figured as spelter), mainly from Mohave County, increased from 4,562,984 lb., in 1911, to 8,758,243 lb. in 1912.

There were 444 mines producing gold, silver, copper, lead and zinc in Arizona in 1912, against 397 in 1911; and the total quantity of crude ore sold and treated in 1912 was 6,840,082 short tons, an increase of 2,272,943 tons over the output of 1911.

⁂

## June Oil Dividends

Although only one quarterly dividend was paid in June, says the *San Francisco Chronicle*, July 6, 1913, that of the Standard Oil Co. of California, for $1,125,000, that one was greater by nearly $315,000 than the total dividend disbursements of the previous month, which included the California Oil Fields, Ltd.'s payment of over $361,000 made in England. If this last item were excluded from the May list, the Standard's big dividend would equal more than two and a half times the total May dividends. Following is the table of June payments in detail:

| | Par Value | Rate | Dividends |
|---|---|---|---|
| Amalgamated | $100 00 | 1 25 | $62,500 |
| Am. Petroleum pfd. | 100 00 | 0 50 | 8,225 |
| Am. Petroleum common | 100 00 | 0 33⅓ | 17,100 |
| Maricopa Queen | 1 00 | 0 005 | 4,960 |
| Claremont | 1 00 | 0 01 | 4,500 |
| Dome-Pinal | 1 00 | 0 01 | 4,000 |
| Home (Coalinga) | 1 00 | 0 01 | 10,000 |
| Mount Diablo | 1 00 | 0 0075 | 7,500 |
| Record | 2 00 | 0 05 | 10,000 |
| Rice Ranch | 1 00 | 0 05 | 3,000 |
| S F & McKittrick | 10 00 | 0 10 | 5,000 |
| Sauer Dough | 0 50 | 0 015 | 2,993 |
| Section 25 | 1 00 | 0 50 | 20,000 |
| Standard Oil of Cal. | 100 00 | 1.25 | 1,125,000 |
| State Consol | 1 00 | 0 01 | 5,000 |
| Union | 100 00 | 0.60 | 184,754 |
| Union Prov | 100 00 | 0 60 | 91,103 |
| United Petroleum | 100 00 | 0 60 | 48,451 |
| West Coast pfd | 100 00 | 1 50 | 15,000 |
| Western Union | 100 00 | 0 50 | 5,000 |
| W K | 1 00 | 0 02 | 10,000 |
| Total California companies | | | $1,644,416 |

These are, however, only the dividends of listed companies.

⁂

**Mississippi Is Soon to Have Its First Iron Mine** and its first blast furnace. The Memphis Mining & Manufacturing Co., Potts Camp, Miss., is now assembling the materials necessary for the construction of a cold-blast charcoal furnace at Winborn, 2½ miles southeast of the place named, and on the main line of the St. Louis & San Francisco R.R. The furnace is to have a daily capacity of 10 tons. The construction work and the subsequent management of the furnace will be in the hands of J. W. Flannery, of Wisconsin, who has had long experience in the manufacture of cold-blast charcoal iron. The company owns over 16,000 acres of ore and timber land, its ores analyzing 60% in metallic iron, 1.40% manganese and 0.6% phosphorus. An abundance of hardwood timber is on the property and more can be had within a radius of 50 miles, giving a supply of charcoal for many years. The intention of the company is to make a high-grade iron, to be sold exclusively on analysis. A. C. Jones is president of the company, W. S. Allen, vice-president, and Marion Allen, secretary and treasurer.

# CORRESPONDENCE AND DISCUSSION

## Relationship of the Geological Survey to the Mining Geologist

The following correspondence, between F. L. Ransome, geologist in charge, Section of Metalliferous Deposits, U. S. Geological Survey, and George E. Collins, has been forwarded with the following letter:

Can you give space in the JOURNAL to the attached correspondence? As you will note it is an entirely friendly discussion of certain relations between federal geologists and mining men. As an explanation of statements made by Mr. Collins in an address published in part in the JOURNAL of May 10, and as the expression of a desire on the part of the Geological Survey to coöperate generously and cordially with all who are interested in the study of ore deposits it should, I think, be presented to the JOURNAL readers.

F. L. RANSOME,

Washington, D. C., July 8, 1913.
Mr. George E. Collins,
Denver, Colo.

In your paper on "Ore Shoots in Veins" (ENG. AND MIN. JOURN., May 19, 1913, p. 942), the paragraph[1] in which the members of the U. S. Geological Survey are taken to task for ignoring the work of others, naturally attracted my attention. There is certainly no convention "which forbids its members to refer to the observations or acknowledge the assistance of any but their own colleagues" and I am sure that both as an organization and individually the Survey has no intention of slighting any contributor to our knowledge of ore deposits. As the Survey's work in Western mining regions has been placed under my supervision I am naturally much concerned in this matter and earnestly desire that, if the complaint is well founded, all basis for similar protest in the future shall be removed.

Of course, as would be expected in a general address, you do not particularize your charges. The average reader, however, is uncritical in that respect and is all too likely to accept without investigation the statement that the members of a large organization ignore individual workers. I cannot, therefore, believe that you would make charges reflecting so injuriously on the Geological Survey unless you know of some definite instances of failure on the part of its members to give due credit to others. If you will furnish me with specific memoranda of all the actual cases of such failures as have come to your attention and which you had in mind when writing your paragraph, this information will be sincerely appreciated. As they stand, your charges injure without being helpful. This I am certain is not your intention.

There are some aspects of the relation between superintendents or mine foremen and geologists which I should like to discuss with you but this perhaps had better be deferred until you shall have given me the concrete instances requested.

F. L. RANSOME,
Geologist in charge, Section of Metalliferous Deposits.
Washington, D. C., May 24, 1913.

Mr. F. L. Ransome,
Washington, D. C.

I think you misread the extracts given in the JOURNAL from my presidental address, if you took them as constituting charges against the Survey.

I have heard many individual complaints and much unfavorable comment on the part of engineers who considered that their published or unpublished studies had met with insufficient acknowledgment; but I fear that those who made them would by no means thank me for giving particulars of such cases. The rôle of "unrecognized genius" is a thankless one, and most men will hesitate before making a formal complaint which would seem to place them in that light.

Nor would I care, myself, to state—or argue the merits of—any individual case. The scientific value of any man's observations, or their novelty, is only a matter of opinion after all. Most of us recognize the superior "weight of metal" carried by many of the Survey men, past and present, and in any individual case are ready to concede the probability that, if credit is denied to an outside observer, it is because less credit is due than was supposed. What makes the case serious, and in my opinion justifies the conclusion which I expressed, is the cumulative value of such complaints. I am ready to concede that in any individual instance they may be unfounded, but the cases are too numerous for all to be brushed aside. A perusal of the Survey reports gives the impression that three-fourths of the results accruing from investigation into American mining geology are to be credited to the Survey; but it is incredible to me that such a condition should fairly represent the facts of the case.

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[1] The paragraph referred to and its preceding paragraph, are as follows: "In an examination of any such deposit, we can merely see what happens to be exposed in drifts, raises, and so forth, at that particular moment. Even of these, only a small proportion, in most mines, is open for examination at any one time; and the openings themselves form only part of the total area. The visiting geologist or engineer therefore sees only a small fraction of the entire deposit, and it is natural enough that in many cases the really significant piece of evidence escapes him. The man who has the best opportunity to study the deposit is he who is familiar with it throughout the entire period when it is being worked; who sees the freshly broken face of each drift, and the developments from day to day in every working place. A relatively less degree of ability so applied may be expected to yield greater results than an occasional brief visit from an eminent scientific authority. The greatest progress in the study of ore deposits may be looked for when these men become conversant with the fundamentals of economic geology; when the mine superintendent and the mine surveyor have been trained in the methods of the field geologist, to observe accurately and to record their observations.

"Even now I do not believe for one moment that the men who do the actual work of underground mining are as unobservant or as incapable as one might suppose, judging from the comparative absence of mention of their observations in the modern literature of ore deposits, and especially in the publications of the United States Geological Survey. I prefer to conjecture that their work has somehow failed to become adequately recognized in the publications; and that many of the luminous observations recorded are really due to the careful study of some unnamed foreman or mine superintendent who conducted the distinguished visitor through the mine. It would almost seem as if there is some convention in the U. S. Geological Survey which forbids its members to refer to the observations or acknowledge the assistance of any but their own colleagues, past or present."

My statement should, therefore, not be considered as a charge, but as a matured expression of opinion, which will carry more or less weight, according to the degree of confidence with which my readers regard my judgment.

Certainly, to injure the Survey, among which I count several warm friends, is as far from my mind as anything can be. The actual sentence which you quote was "wrote sarkastic," somewhat in the vein of Mr. Dooley's reference to Colonel Roosevelt's "Alone in Cuba"—yet I think that if the Survey men can take it in the spirit in which it was intended, and adopt a more generous attitude toward the men of inferior training who are most closely in touch with ore deposits, the result will be beneficial to both sides.

Perhaps you would be sufficiently interested to read the entire address?

George E. Collins.

Denver, Colo., May 31, 1913.

Mr. George E. Collins,
Denver, Colo.

I am, of course, gratified to learn that you had not intended to bring charges against the Geological Survey and that you were merely contributing your quota to the cumulative value of such complaints as our correspondence relates to. Is not the present instance, therefore, an apt illustration of how slight that value really is, and how rapidly adverse criticism of an organization may grow from the vague impressions it feeds on? Inasmuch as parts of your address have been given wide publicity it might be well, if it meets with your approval, to publish our correspondence in one of the mining journals. It would, I believe, be conducive to a better understanding between geologists of the Survey and mining engineers, and would emphasize what I know to be the earnest desire of the director, of my colleagues, and of myself, to give all due recognition to other workers in economic geology.

Every Survey geologist who studies a mining district is, of course, greatly helped by the intimate knowledge of resident mining men who bring to his attention facts that he would have to spend much time in finding out for himself, although he would undoubtedly discover most of them ultimately. Such guidance is usually acknowledged and is deeply appreciated. The information given, however, must always be critically examined and verified by the geologist himself before it is admitted into his select body of ascertained facts and naturally the local man sometimes feels that his own observations have not been accorded that importance which they seem to him to deserve. Even with the most scrupulous care on the part of the geologist to give credit where it is due, some dissatisfaction now and then is unavoidable in certain quarters where there is only a partial conception of the actual study that a trained geologist devotes to a district under investigation, of the thought that goes into the preparation of a good monographic report, or of the difficulties involved in arranging and drawing conclusions from a voluminous mass of observations. While there may be cases in which Survey men have not adequately recognized previous workers, I believe that such instances are not numerous and I hope that they will be extremely rare in the future.

F. L. Ransome.

Washington, D. C., June 6, 1913.

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## Extinguishing Fires with Sawdust

Referring to the article "Extinguishing Fires with Sawdust," in the Journal of June 7, I believe a note of caution should be sounded. In the use of sawdust for the purpose mentioned, of extinguishing fires in lacquer, wood alcohol, benzine or gasoline, the statement is made that "sawdust itself is not very easily ignited, and when it does become ignited, burns without flame. . . . . The character of the sawdust, whether from soft wood or hard wood, appears of little or no importance. The amount of moisture contained in the sawdust is apparently not a factor. The dry sawdust . . . . . was evidently as efficient as the untreated sawdust."

A few years ago a manufacturer who was using wood of various kinds, became suspicious as to the inflammability of the fine dust which gathered about the shop. He submitted samples of this dust to the Bureau of Mines for tests of its inflammability or explosibility. These tests were made, and it was found that this fine, dry wood dust not only gave higher pressures per unit than the standard Pittsburgh coal dust, but that the inflammation accompanied by pressures, started at a much lower temperature of the igniting coil. Three kinds of dust were tested, pine, oak and mahogany; these are mentioned in the order of their inflammability or explosibility, the mahogany dust giving the highest pressures. While in many cases, and undoubtedly in the tests cited in the article herein mentioned, the sawdust was coarse, there may be times when fine wood dust collects, and if this were thrown on a flame when dry, it is entirely conceivable that a rapid inflammation, or low order of explosion might result. In general, it would seem far safer to treat the sawdust with sodium bicarbonate, as suggested, which, as the author states, would further decrease danger of fire from the sawdust itself.

George S. Rice.

Chief Mining Engineer, Bureau of Mines.

Pittsburgh, Penn., June 19, 1913.

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## Principles and Methods of Ore Testing

Important as the subject of ore testing is, it is too much to expect exhaustive treatment in a short article. I would, however, call attention to one point which, as presented by Mr. Laucks, in the Journal of July 12, 1913, might be misleading. While it is undoubtedly correct to determine the point of finest grinding at which leaching is practicable, it should be remembered that economy is promoted by determining the coarsest grinding compatible with satisfactory extraction. That point should be determined.

Henry A. Marvin.

Yonkers, N. Y., July 14, 1913.

# EDITORIALS

## Copper Statistics, Prices, Etc.

The refiners' statistics for June did not throw any great new light upon the situation. The immediately available stock of copper in Europe and America has dwindled to what is, relatively speaking, a small figure indeed, but buyers have continued to be conspicuous by their absence. In this respect the copper market is at present much like the stock market, but there is the difference that nobody has to buy stocks unless he wants to, while manufacturers must buy copper if they are going to continue in business. Their abstention from the market for so long indicates that at the time of the last buying movement they contracted for more than was commonly supposed. In view of the present situation in finance and commerce they are obviously now going to put off buying until the last possible moment, considering that every day of delay works in their favor. So far this theory has been good, copper being purchasable today at materially less than a week ago.

Of course the recent weeks of dullness have not been devoid of business. On the contrary there has been a lot of hand-to-mouth buying all the time by consumers who have supplied themselves from what are contemptuously called "second hands." In fact these "second hands" comprise agencies, producers, dealers, and brokers. The accurate definition of "second hands" is "everybody except the Amalgamated, Guggenheims, and Calumet & Hecla." It is thought that some of them, even, do not hesitate to put copper into the hands of dealers upon occasions.

The public through the newspapers, Wall Street tickers, etc., is treated habitually to a lot of misinformation about the copper market. Thus, the papers reported last week a cut in copper prices and gravely commented that the stock market manifested indifference. Such indifference was but natural, inasmuch as the conditions whereof the reporters had just learned had in fact transpired at least a week previous.

The actual situation was that the Amalgamated and Guggenheims had been for some weeks maintaining an asked price of 15c., i. e., they would have liked to sell at that price and would therefor have delivered the copper in Europe or Connecticut and would have allowed certain times, discounts, etc. There were no buyers at that price and what the askers would have accepted if anybody had come forward with overtures to trade can't of course be told, that being something that did not happen. In the meanwhile prices were crumbling from day to day on the transactions of "second hands," whom we have previously defined. After awhile the two big agencies began to invite business, abandoning their "asked" price and intimating that they would consider trading. In other words they came down to the market price previously established by those who were willing to trade. There was no cut in price, inasmuch as the market had been slowly crumbling for many weeks previous, and there was no change in the policy of the two agencies at the time reported inasmuch as they had been seeking business, one of them at least, as early as July 2.

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## The Sense of Proportion

The world has been experiencing a great financial strain, there's no doubt about that, but the pessimists who can't see anything but halting business for years to come lose sight of the world's wonderful power of recuperation. War is waste, but probably the cost of all the gunpowder, etc., that has been spent in the Balkans and the cost of feeding and clothing the people while they are getting ready to work again is not very much more than that of a Grand Central railway station. Senator McCumber has just been telling his fellow statesmen, especially the Democrats, that if the American people would cut in half their liquor bill, their tobacco bill, their candy bill and some other frivolous, though popular expenditures, they would save a couple of billions or so per year and there would be no need to try to reduce the cost of living by reducing the tariff, incidentally reducing and ruining the North Dakota farmers.

Besides the economies which Senator McCumber has so ingenuously pointed out to us, we know from the conservationists about the billions that the nation could save by cutting down the fire loss, the rat loss, the health loss and many others. But in spite of all the frivolities, extravagances, wastes, etc., here comes the Commissioner of Internal Revenue telling us that the corporations of the United States earned $3,304,000,000 above expenses in 1912, surpassing all previous records by $400,000,000, and he knows because he has collected the taxes upon it. There were about 310,000 corporations in 1912, which was an increase of about 7% over 1911 and they made their increased earnings in spite of the increased wage scales, which by the way have been one of the grounds of the recent pessimism. The financial skies are not clear, we'll admit, but there ought to be some attention to the proofs coming repeatedly from the statisticians that the world and the United States are still doing business.

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## Exploration Company Experiences

The exploration department of the United States Smelting, Refining & Mining Co., under Sidney J. Jennings, is an active organization. Its record during the last three years has been as follows:

| Year | A | B | C | D |
|---|---|---|---|---|
| 1910 | 684 | 124 | 46 | 2 |
| 1911 | 921 | 144 | 28 | 1 |
| 1912 | 694 | 121 | 36 | 4 |

Column *A* gives the number of mines offered to it, *B* the number deemed worthy of a preliminary examination and *C* the number of which detailed examination, i.e., measurement and sampling of the orebodies, was made. Column *D* gives the number of purchases. These figures show: (1) That there are many mines in North America that are for sale; and (2) that there are not many good ones. However, the ratio of good mines is not precisely determined by the formula $D:A$, or even $C:A$. Many of the mines in column $C$ were, no doubt, good mines, but the seller and buyer could not come to terms. The Canadian Mining & Exploration Co. in 1912 had 428 offers and made no purchases, but that company being new in the business was, no doubt, tendered all the mines on the market that previously had been rejected by everybody else.

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## New Construction in Chile

There has been a good deal of talk about the contracts for the plant of the Chile Copper Co. going to German manufacturers rather than to American. The stories are only partly true, inasmuch as the German contracts cover only the electrical and power plants, which is, however, a big item, amounting to about $3,000,000. The Siemens people, who have had special experience in South American construction, were able to underbid everybody else. The remainder of the contracts, which will comprise wire, tracks, railway material, steam shovels, crushing machinery and hundreds of odds and ends, will probably be placed in the United States. Construction work is going right ahead. The company has about completed its railway connection and is about ready to fetch in its mining and milling material.

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## Goldfield Consolidated Cost Curves

Accurate records of cost are kept by many large companies but they are not usually available for publication. When they are, their extreme value makes their publication an event of importance. We are indebted to J. W. Hutchinson, superintendent, for the interesting cost curves of the Goldfield Consolidated mill which appear in this issue. Beside being accurate, they are in convenient form for ready reference and will be doubly appreciated for their extreme clarity. No explanation of them is necessary. Operating engineers are fortunate in being able to get this important information. A similar set of curves referring to the cost of treating concentrate at the same mill will be published in our issue of July 26, 1913.

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## The Shale Oil Industry

The Scotch shale oil industry is an example of a small business which has managed to survive in the face of what appears to be overwhelming competition. The business of distilling oil from the Scotch shale was hardly started when discoveries of petroleum in the United States and elsewhere brought into the market supplies of cheap oil of apparently unlimited extent. The Scotchmen stuck to their business, however, and have kept it going to this day with varying fortunes but generally with success, mainly because of their close attention to details and careful saving of byproducts. After two lean years, 1912-13 has proved a fortunate one, and the four companies into which the smaller producers were gradually consolidated, paid dividends ranging from 15 to 35%. The gain was due to the better prices of oil, and an increased demand for tar and sulphate of ammonia.

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When the coinage of silver rupees in India was stopped and arrangements for a gold standard completed, no one supposed that in the precious metals absorbed by that country gold would displace silver to so great an extent as has proved to be the case. Statistics recently published in London show that in the 10 fiscal years 1885-1895 the net imports of gold into India were $54,220,500; in the next 10-year period, 1895-1905, the amount had increased to $189,504,500; while in the five-year term the net imports were $195,722,500, or more than in the ten years previous. That the demand for gold is still increasing is shown by the fact that the net imports for 1911-1912 were $79,919,000. Thus India took over one-sixth of the world's total production of gold; and as, with gold as with silver, the metal thus taken is not returned but absorbed, the practical disappearance of 15 or 20% of the world's gold production is rather a serious question.

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The zinc smelters have so reduced their operations, putting furnaces out of commission because they were unprofitable or to take advantage of the unfavorable situation to make needed repairs, that the present production of spelter must be at a much less rate than a few months ago. Consequently when the largest consumer recently manifested a willingness to buy some spelter there was a prompt rally in the price. It does not seem likely, however, that there can be any strong appreciation in the market so long as it is likely that the duty will be reduced to 10 to 15% *ad valorem* in the course of a few months and so long as there is a large accumulation of unsold spelter in Europe. This accumulation seems to be growing rather than diminishing, and until its absorption is well under way it will be a menace to the markets, both European and American.

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The *Evening Post* points out that financial conditions in Europe are improving and says:

> The "midsummer settlements," for which all kinds of complications were predicted, have passed off so uneventfully that Lombard Street and the Continent hardly knew they were in progress. With this achieved, comes a whiff of reviving confidence; Berlin stops its urgent bid for gold, and other countries begin to remit to London. The importance of all this lies in the inference which people will draw regarding predictions of severe money stringency in the autumn.. It cannot be too often pointed out that it was in Europe where the present troubles began; that Europe was hit hardest by them, and that it is Europe, therefore, where the first distinct rift in the clouds overhanging the whole world's financial horizon should be seen.

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A distinguished mining engineer, who is now engaged on some professional work in a famous old camp west of the Rocky Mountains, said in a recent letter, "I am having a lot of interesting work this summer. There are remarkable developments in this camp. I should like to see a lot of these Western camps and study the developments. As I get older, I am surprised to see how much bigger the really strong mineralizations are than anybody supposed them to be 10 years ago. 'Ore in sight' seems like a trifling measure to take of a big mining property."

## BY THE WAY

The United States Mints in the fiscal year ended June 30, 1913, turned out 186,626,871 coins, a pretty good year's work. The face value of these coins was $37,496,530, but this amount was rather unevenly distributed, $30,058,228 being in gold coins, $3,448,200 in silver and $3,940,102 in copper and nickel. In number, however, the copper coins had even more preponderance than the gold coins had in value, since there were 170,068,761 of them, against only 4,221,400 of the gold pieces.

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The greatest difficulty encountered in attempting to decrease accidents in mining is the inborn carelessness of the miner himself. We note a case in point from the *Spokane Spokesman Review*, which reports an accident occurring May 23 to J. R. Jones, a miner at the Morning mine in the Cœur d'Alenes, who had his skull crushed apparently by a rush of waste from a bin in his charge. He was alone at the time, so that the exact nature of the accident is indeterminable. The habit of miners, however, of poking their heads and shoulders inside of chute mouths to see what makes the ore hang up is so general as to make it a safe guess that such was the cause of Jones' death. To eliminate carelessness like this is a long and difficult process, and can be accomplished only by the creation of an entirely different viewpoint among the body of miners. Legislation can stimulate the creation of this new point of view, and employers' liability laws in particular will encourage companies to educate their men along safety lines.

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A dispatch from Oroville states that the honor of producing the earliest ripe peaches in California has been accorded to James H. Leggett, who on May 27 consigned a box of perfectly ripened fruit to the East. The peaches were grown on leveled dredge tailings and were reported to be large and luscious examples of this fruit. Last year the earliest Tokay grapes in California were produced by Mr. Leggett. His orchards on dredged land have attracted widespread attention among horticulturists because there is apparently no soil in the cobbles now superimposed on the fine gravel. When the trees are planted, a shallow place is excavated in the rock tailing and filled with good soil; the young trees are then planted with the usual ball of earth around the roots. Frequent irrigation is required until the roots penetrate the moist zone of gravel and sand underlying the cobbles. Grapevines, orange, fig, peach, almonds and eucalyptus trees have been transplanted and grown by Mr. Leggett on the old tailings left by the gold dredges. The early ripening of the fruit is ascribed by him to the fact that the rocks retain the sun's heat longer than does the usual soil.

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The Civil Service Commission announces an examination for editorial clerk, men only, Aug. 6 and 7, 1913, to fill a vacancy in the Geological Survey, Washington, D. C., at a salary ranging from $1500 to $1800 per year. The appointee to this position should have such a knowledge of English, printing, and bookmaking, elementary geology, and geologic nomenclature as will fit him to criticize and correct the manuscripts of the Survey's report; to prepare them for printing; to carry along the proofreading, and to prepare satisfactory indexes to the reports. The subjects will have the weights indicated: (1) English (correction of expression), 40; (2) French and German footnotes (translation into English), 10; (3) Proofreading and indexing, 30; (4) Elementary geology and geologic nomenclature, 20. Applicants must have reached their twentieth but not their fortieth birthday on the date of the examination. Persons who desire this examination should at once apply to the United States Civil Service Commission, Washington, D. C., for application Form 304 for editorial clerk, No. 752.

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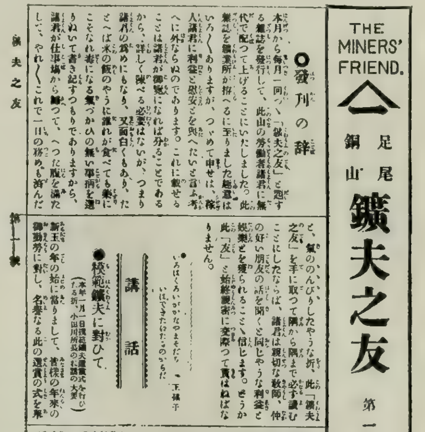
The Furukawa Mining Co., operating the famous Ashio copper mines in Japan, of which M. Otagawa, who is well known among metallurgists of the United States, where he resided for several years, is general manager, has just inaugurated the publication of a monthly paper, *The Miners' Friend,* with a view of promoting the interests of the Ashio miners. We give herewith an illustration (half-size) of the first page of the first number. The edition is to be 6000 to 7000, in order that the paper may be freely given to the miners of the company. The first number contains these departments: Miners' Ethics; Rules and Regulations of the Ashio Mines; Maxims and Mottoes; Biographies of Self-Made Men; Current News of the Mines; Lest We Forget; Hygienic and Sanitary Topics; Literary Column. Mr. Otagawa has asked us if there be any such publication among our American mines. We do not know of any such and consider our Japanese friends to be more enterprising in this respect than we are. If we are mistaken, we hope our readers will inform us.



THE MINERS' FRIEND.

足尾銅山

鑛夫之友

第一號

大正二年五月十五日

## PERSONALS

F. D. Burtt has left San Francisco for Seward, Alaska.

F. C. Alsdorf is visiting the Cobalt district in Ontario.

J. Parke Channing is expected home about the end of July.

C. T. Brown has returned to Socorro, N. M., from an extended trip in the field.

Homer L. Carr is in the Dominican Republic on an examination of alluvial gold deposits.

J. R. Finlay is in Utah on professional business. He expects to return to New York about the end of July.

Prof. Fayette A. Jones, of Albuquerque, N. M., was, on July 15, elected president of the New Mexico State School of Mines.

Wilber Judson has returned from the Southwestern States and from the west coast of Mexico, and is in Lansing, Michigan.

Robert Linton has been in New York for a few days. His business address in New York henceforth will be 25 Broad Street.

H. Foster Bain left San Francisco last week for Denver and the East. He will attend the International Geological Congress in August.

J. B. Tyrrell, of Toronto, Ont., is making a short visit to the Hurricanaw district in Northern Quebec to investigate some recent gold discoveries.

Thos. A. Varden, of Butte, and Wm. Orem, state mining inspector, of Helena, visited the Corbin Copper Co.'s property at Rochester, Mont., recently.

J. A. Holmes, director of the Bureau of Mines, sailed from Seattle last week with a party of engineers, on his way to examine the Matanuska coalfields in Alaska.

W. N. Sawyer and G. H. Hulett, president and vice-president of the Wellman-Seaver-Morgan Co., Cleveland, Ohio, have gone to Panama on a short business trip.

Professor S. B. Christy has been visiting the mines of Porcupine, Cobalt and Sudbury. He will spend the remainder of his vacation in visiting other mining districts.

H. V. Winchell has gone to Utah and Nevada on professional business, which he expects to complete in time to attend the Geological Congress in Canada in August.

John O. O'Keefe, superintendent for some years of the Sharon works of the American Steel & Wire Co., has retired on a pension, and has been succeeded by August Mann, formerly of the Anderson works.

Peter Eyermann, engineer of construction of the Witkowitz Steel Works, Witkowitz, Austria, which is extending its works, is in the United States for a four weeks' trip, including various steel work centers.

W. Weston, of Denver, Colo., who for seven years was mining engineer at the head of the industrial department of the Moffat road has been retained as consulting engineer by a Belgian party visiting the coalfields of northwestern Colorado with the object of purchase and development.

President James A. Farrell, of the United States Steel Corporation, is making a tour of the Mesabi range mines of the corporation, visiting also the new steel plant at Duluth. In the party are President James A. Hatfield, of the American Bridge Co., of New York, and J. Robertson Dunn, Liverpool, England.

Recently officials of the Jones & Laughlin Steel Co., Pittsburgh, inspected its ore properties on the Mesabi range. The party included B. F. Jones, president; Henry M. Laughlin, vice-president; W. L. Jones, general manager, and D. M. Philbin and E. F. Bradt, the latter two having charge of the properties.

John Howard Evans, who has been with the Peirce-Smith Converter Co. since its inception, returned recently from Norway and after visiting the principal copper-smelting works of this country will sail from San Francisco on July 29 for Australia, where he has accepted an engagement with Great Cobar, Ltd., for two years.

Ralph H. Sweetser, who has been superintendent of the Columbus Iron & Steel Co., Columbus, Ohio, since 1907, was elected president and general manager of the Thomas Iron Co., Hokendauqua, Penn., July 3, succeeding B. F. Fackenthal, Jr., resigned. Mr. Sweetser was graduated from the Massachusetts Institute of Technology in 1892 and has had wide experience in blast furnace work, starting at Everett furnace in 1897 as assistant superintendent.

## OBITUARY

Henry C. Mount, an oil operator from Mexico, was fatally hurt in New York, July 11, by some unknown companions with whom he had quarreled.

Frederick W. Gordon died at his residence, Fort Washington, Penn., July 11. He was a mining engineer and metallurgist of standing in Philadelphia.

Arthur B. Canfield, who was largely interested in oil operations in California, was killed July 2 in a collision between his automobile and an electric car.

Robert Mannesmann, a large iron operator in Germany and an inventor of several well known machines, died July 10 in Morocco, while on a visit to mines owned by him in that country.

Henry Burton, of Montclair, N. J., a young engineer, who was employed in building a dam in the Conchas River in Mexico, was killed July 10 at Santa Rosalia, in an encounter with rebel soldiers.

Gen. E. Burd Grubb, who died at Newark, N. J., July 7, aged 62 years, had been actively identified with the control and development of the Cornwall ore banks in Lancaster County, Penn., which at one time were owned exclusively by his family. His great grandfather, Col. Peter Grubb, owned the Cornwall ore banks, the title to which was received direct from William Penn. Gen. Grubb's father, Edward Burd Grubb, who was a native of Lancaster, Penn., succeeded to these iron properties and became an extensive miner of iron ores and a manufacturer of pig iron. He died in 1867, at Burlington, N. J., where he had resided many years. Upon the death of his father, Gen. Grubb assumed the management of the family iron interests in Dauphin, Lancaster and Lebanon counties. He lost his fortune in 1885, but two years later a brother died and left him considerable property, with which he resumed his activiites in the iron business. Later the iron firm of Kauffman & Co., of which he was a member, failed. Gen. Grubb, personally, assumed the obligations of the firm and pledged his property to that purpose. After several years of trying struggle, he was successful and, to a considerable extent he rehabilitated his personal fortune. At one time, he was president of and operated the blast furnace of the Lebanon Valley Furnace Co., at Lebanon. Title to most of the Cornwall ore banks is now held by the Pennsylvania Steel Co. and by several other iron and steel manufacturers. Gen. Grubb served in the Civil war and was breveted brigadier-general for his record before Petersburg. He was an unsuccessful candidate for governor of New Jersey in 1889. He served as minister to Spain in President Harrison's administration.

## INDUSTRIAL NEWS

The H. W. Johns-Manville Co., of New York, has recently opened a branch office at Charlotte, N. C. The new office, which is located in the Commercial Bank Building, is in charge of E. U. Heslop, who is assisted in covering the western section of North Carolina by P. J. McCusker and Paul W. Whitlock.

The Inspiration Copper Co. has purchased two double-drum hoists from the Nordberg Mfg. Co., of Milwaukee, Wis. Each hoist is designed to lift the following load: Ore, 24,000 lb.; skip, 12,000 lb., rope, 1¾ in. This load is to be lifted in balance from the present working depth of 650 ft., at a hoisting speed of 750 ft. per min. Each hoist will have two drums, 10 ft. in diameter by 65-in. face, grooved for 1000 ft. of 1¾-in. rope. One drum will be keyed to the shaft, the other equipped with the Nordberg axial clutch. Both drums will be equipped with Nordberg post brakes with parallel-motion supports. Clutch and brakes will be actuated by Nordberg air-operated thrust cylinders with oil-cataract cylinders and the Nordberg floating-lever mechanism, for flexibility of control and positive locking of brakes for any position of the operating lever. The normal hoisting rate will be 30 trips per hr. or 5000 tons of ore in 14 hr. for one hoist. The hoists will be driven through Wuest herringbone gears by G. E. direct-current motors operated by an Ilgner motor-generator set.

# EDITORIAL CORRESPONDENCE

## SAN FRANCISCO—July 9

**Dredging Land in Yuba River Basin** is being contested in the Superior Court of Yuba County, in the title suit of the Yuba Investment Co. against the Yuba Consolidated Goldfields. The land is situated near the town of Hammonton. It was conveyed to the United States Government by James O'Brien Sr., of Smartsville, in 1901, for the sole purpose of constructing thereon a settling basin for the débris of Yuba River. The plans of the Government were not successfully carried out. It was found that the proposed settling basin would prove a menace instead of a benefit to the farms along the river. The Government in 1911 surrendered its right to use the land for the purpose set forth in the agreement. Mr. O'Brien then made claim that the land reverted to him, but the Secretary of War decided adversely and the land was sold at auction to the Yuba Consolidated. In April, 1912, O'Brien made a conveyance of title to the land to the Yuba Investment Co., a corporation organized to carry on the suit now being tried. After the Government had sold the land to the Yuba Consolidated, that company and the Marysville Gold Dredging Co. entered into a contract with the Government to build retaining walls for straightening the channel and preventing the flood waters from overflowing adjacent farms and other lands. These retaining walls were constructed of tailing from dredges operated by these two companies. Some of the land in the present contest is valuable for dredging; a portion of it may be reclaimed for agricultural purposes. The case is set for hearing Sept. 30.

**Two Dredges Are Out of Commission** in the Natomas Consolidated field. No. 5 was sunk, June 8, in about 50 ft. of water, when a hole was punched in the starboard side of the hull between the center and the stern. The boat turned over, starboard side down and was practically under water within 10 min. from the time it began listing. The water has been taken out of the pond and it is expected that the boat can be righted and repaired so that it can be used to finish dredging its present territory. This boat was built for the Folsom Development Co. and began operation in December, 1905. It is equipped with 9-cu.ft. Bucyrus type buckets and Bucyrus machinery. It was built to dig 44 ft. below the water line, but the general depth of digging has been from 50 to 60 ft. No. 6 dredge is on the drydock for repairs to the hull and for general overhauling. The boat will be ready for flotation some time in July. The hull is practically being rebuilt. This was the last dredge put in operation by the Folsom Development Co. and went into commission in March, 1908. This dredge and others built for the same company were taken over by the Natomas Consolidated of California when that corporation was organized. This is also a 9-cu.ft. Bucyrus-type dredge rated to dig about 40 ft. below the water line and has been digging a maximum of about 60 ft. The driving machinery and operating parts are in good repair and with a new hull and the necessary overhauling now in progress it is likely that No. 6 dredge will be in operation for another five or six years. The necessity for reconstruction and repairs on these two dredges will strengthen the demand for steel hulls; but in these two instances the requirements of the dredges in the territory they are now working would not warrant the expense.

## DENVER—July 12

**From the Platoro District** another important strike is reported on the Alamosa river about two miles above Stunner. It was made by Lewis and Zangmeister who are said to have discovered a quartz vein 30 ft. in width.

**The New Taxation Law** divides mining property into two classes, producing and non-producing. A producing claim is defined as one which has a gross production of $5000 or more for the calendar year. A nonproducing claim is one that produces less than $5000 yearly. The assessed value of a producing claim for the year is fixed at 50% of the gross output, plus all the net output. The gross output is defined as the total mill or smelting return, not allowing any deduction for costs of treatment, transportation or operation. A nonproducing claim cannot be assessed at more than the least producing claim in the same neighborhood.

**In the La Plata District** the two richest mines, the May-day and Idaho, are maintaining normal production and the latter is credited with producing daily ore worth $1000. The orebody is 8 ft. wide and is of smelting grade; the shoot has been developed for a length of 80 ft. The Eagle Pass mine, on Lewis Mountain, is to install complete mining equipment. The Bonnie Nell is to resume operations, as a fine shoot of ore said to assay $50 per ton has been opened. The Columbus crosscut is being driven ahead; a new compressor and Waugh drill being used. It is expected that the old workings will be reached at a depth of 400 to 500 ft. by autumn. It is claimed that in these workings, which have been under water for years, 60,000 tons of ore is blocked out.

**In the San Juan Region** the construction of the big mill of the Junta Consolidated company, near Telluride, is well under way and part of the machinery purchased in Denver is on the way in. When completed the mill will have a capacity of 300 tons per day. It is thought that by Nov. 1 crushing will be begun. In the Morning Star group at Mount Wilson, an air line is being put in so that machine drills may be used in development work. The Bagley tunnel at Animas Forks, near Silverton, which is operated by the Frisco Tunnel company has continued shipping at the rate of one carload per day since June 1. The tunnel is nearly one mile long and cuts several veins at depths of 900 to 1500 ft. below the surface. The ore is being mined in the Morgan vein, the Red Cloud, and the Dakota. It is lead-zinc sulphide carrying silver and gold to the value of $10 per ton; the ore concentrates four into one. Four carloads of a trial ore shipment have been made from the Allerton mine, at Silverton, and the president and other officers of the company are in Silverton inspecting the recent strike of ore in the lower workings.

## BUTTE—July 12

**A Rival to the Yogo Sapphire Mines** may be developed in the Dry Cottonwood Gulch district in Deer Lodge County, between Warm Springs and Philipsburg. Several years ago two gold dredges were operated in the gulch, but they proved unprofitable and were abandoned. Later D. A. Jacobi and Charles B. Bennett, of Philipsburg, discovered that the ground contained sapphires. They repaired the dredges some months ago and are operating them in recovering the gems from the gravel.

**A Gold Nugget Was Discovered** recently while drilling a well on the premises of Frederick Feilke, on the outskirts of Twin Bridges. A good-sized nugget and several smaller particles of gold were found at a depth of 60 ft. Several layers of gravel had been passed through and the one in which the gold was found is believed to lie close to bedrock. Having occasion to pull the drill from a depth of 60 ft., the driller found the gold lodged in the valve. The find caused considerable local excitement and it is probable that further tests will be made to determine the extent of the deposit. It is looked upon as not improbable that gold may be found in paying quantities, as it is believed that the entire lowland, from the Big Hole River to the rim of the east bench, is an ancient river bed.

## SALT LAKE CITY—July 12

**Measures for Improving Sanitary Conditions in Bingham Cañon** were considered by the county commissioners July 9. The cañon and town, as is well known, are woefully lacking in this respect, and a sewage system to cover the territory from Highland Boy to a point below the town is being considered. Arrangements were recently made for garbage wagons to handle the garbage and keep the streams clean, which has improved things to some extent. Dr. T. B. Beatty, of the state board of health, has taken up the matter with the Salt Lake county commissioners, and a visit of inspection will be made.

**Park City Ore Shipments for the First Six Months of the Year** amounted to 41,095 tons of crude ore and concentrates. This is approximately normal, the usual output of the camp varying from 80,000 to 110,000 tons a year. During the second half of the year, road and hauling conditions are much better, and the tonnage sent to market will undoubtedly be increased. The Silver King Coalition, Daly West, Daly-Judge, Ontario Co. and lessees, American Flag, Silver King Consolidated, Thompson-Quincy, and small zinc plants, treating tailings below the town, are the principal shippers. The monthly production ranges between 6000 and 8000 tons.

### HOUGHTON, MICH.—July 9

**A Referendum Vote of the Western Federation of Miners** in the Lake Superior district, indicates a large majority in favor of demands which embody shorter hours and a minimum wage of $3 per day. Union officials will undertake to arrange a conference with representatives of mining companies some time next week.

**Reduction in Ahmeek Dividend Rate** is not surprising. Ahmeek has ahead considerable construction work, mostly at the stamp mill where plans now are being put into execution for additional stamps, and this work is expensive. At the same time there is a general belief that the reduction likewise reflects Calumet & Hecla opinion that the metal price for the future output is not likely to be as close to 17c. per pound as to 15c. At the mine, preparations for additional production are working out satisfactorily. The two additional shafts at the North Ahmeek are being sunk rapidly and the surface equipment for handling this heavy addition to the rock tonnage is getting into shape. In fact the mine will be ready to supply the larger rock tonnage before the mill is ready to handle it, to judge from the situation at present. The two North Ahmeek shafts continue to open good-looking average Kearsarge lode rock, by no means as rich as the general run of the Ahmeek shafts, Nos. 1 and 2, but quite the equal of the general run of this lode as opened at various properties on the Calumet range. Sinking and drifting continue in average rock. To date the Ahmeek has been a marvellous dividend producer, considering its size and the capitalization. In the two shafts from which the main rock tonnage comes there is undoubtedly the richest streak on the Kearsarge lode, even better than the rich zone which the Wolverine opened, and the management has made the most of an excellent opportunity for demonstrating practical results and low costs. It must be remembered, however, that while the North Ahmeek shafts will be in shape, in another year, to double the output of the Ahmeek company as a whole, the shareholders must not anticipate a doubled copper production; for the general run of the North Ahmeek rock is more like that of the Mohawk than the Wolverine and certainly not up to the grade of the rock produced at the main Ahmeek shafts. The Ahmeek record is unprecedented in the history of copper mining. For years the property remained idle. Even after the Stantons went down into that then discredited section and opened the Mohawk shafts on some of the old Fulton territory from which Ernst Bollman had cut off the timber, it was impossible to interest the Hyams-Bigelow syndicate in the possibilities of this Ahmeek tract. It is true they maintained a corporate organization and kept things shipshape, but their little preliminary exploration work done some years before had been unsatisfactory and they had no idea of spending any more money on question marks. This preliminary exploration conisted of sinking two shafts on the Kearsarge conglomerate. Commercial copper was not found. In 1902, operations were resumed on the ground that "there is no reason why the Ahmeek should not bear the same relation to the Mohawk as the Tamarack does to the Calumet & Hecla." That possible relationship hoped for 10 years ago has been found to exist, excepting that the order is reversed and now the hope and expectation of the Mohawk is that the shafts to the south will open the same rich ground that the North Ahmeek shafts have. In 1902 the shaft was sunk to cut the Kearsarge amygdaloid. From the first the work was successful. Practically from the grass roots, or the bed of the swamp, to be correct in reference to the commencement of this work, this shaft opened commercial copper. When the first trial shipment was sent to the Tamarack mill it was so rich in copper that they doubted the correctness of the figures. From that time on the Ahmeek has paid its own way, without increasing its capital, without borrowing funds, without selling bonds, without calling further assessments, and to date it has paid nearly $2,000,000 in dividends in two years. The best opinion is that the Ahmeek's future is bright. Of course there are few who expect to see the general average of refined copper remain at 25 lb. per ton. That would be out of all reason, for the history of the Lake Superior district would indicate that the main shafts will show a falling off in the copper returned as depth is reached. It would be unreasonable to expect the new shafts to maintain anything like that figure.

### MARQUETTE—July 2

**The Jones Step Process** was the invention of John T. Jones, a metallurgist of Iron Mountain, who for several years has been experimenting with a process of treating low-grade iron ores; he has transferred his activities to the Cuyuna range. It is reported that the inventor and his associates have become interested in several properties and that the step-process furnace erected at Republic, on the Marquette range, will be removed to the new Minnesota field and given an exhaustive test there. Mr. Jones is quoted as declaring that the treatment of Cuyuna ore is a simple proposition.

### PHOENIX—July 12

**The State Tax Commission** has completed a tabulation of the returns made by the various producing mining companies of the state for taxation purposes for the year 1913. The total valuation for the state is $113,713,154, which does not include the nonproductive, patented mines, improvements on mining claims, smelting or reduction works. Although the exact figures have not been secured as yet, it has been estimated that the total valuations, including the exceptions noted, will amount to $140,000,000. The Copper Queen Consolidated Mining Co., of Cochise County, makes the largest return. In its group "A" mines the valuation is $28,505,865. To this figure should be added the value of the group "B" Copper Queen property which was returned at $23,508, making a total of $28,529,373 for the Copper Queen properties. By counties the total mining wealth of the producing mines of the state is as follows: Cochise, $51,275,224; Gila, $14,734,073; Greenlee, $21,192,723; Maricopa, $22,467; Mohave, $4,067,930; Pima, $224,104; Pinal, $8,478,010; Santa Cruz, $194,079; Yavapai, $13,524,544.

### SPOKANE—July 12

**Construction and Development at Granby Bay Is Progressing Rapidly,** and on July 1 there were 1125 men on the payrolls. Equipment for the machine shops is being placed. The brick plant is ready for the machinery, which is arriving, and the ground has been stripped and the railway sidings laid, so that it will be ready to begin making brick soon. The steel for the furnaces and converter rooms is on the ground, except the roof trusses, which were too long to be handled by the boats plying between Vancouver and Granby bay, necessitating the purchase of a vessel to deliver them. This is being loaded now and will be towed to the site in a few days. Delay in delivery of this material has retarded operations a little, but it is planned to have everything ready to operate by Jan. 1, 1914. The hotel, a 40-room structure, modern in every respect, is completed and will be occupied July 15, and the hospital, which is uptodate in every particular, is under construction. The infirmary will have six private wards and one large ward, together with operating and dressing rooms, culinary and storage departments, and will provide every facility for caring for the sick and injured. The recreation hall, to be erected and maintained by the company for its employees has in the basement, bowling alleys, a gymnasium anl plunge and shower baths, on the second floor billiard and card rooms and a library, on the third floor quarters for attendants and hotel employees. A modern town is being built at Granby Bay; the streets have been graded, sidewalks laid, electric lights and a telephone system installed, and a sewage system, for the greater part of the town, is nearly completed. There are 100 dwellings built for use of married employees at a nominal rent, containing two to six rooms each, with bath, lavatory, hot and cold water and electric lights. The company store, housed in a three-story building, is operating and doing an average daily business of $1000. It is equipped with a cold-storage system, supplied with ice from a local plant, and all meats and other perishable food are shipped in refrigerator vessels, and transferred immediately to this department. A drug store is run in connection with it. The Canadian government has established a post office, and also has appointed a police magistrate and stationed a detachment of the government constabularly there.

### TORONTO—July 12

**The Hole River and Rice Lake Gold Camp** just east of Lake Winnipeg and within 100 miles of the city of Winnipeg, has attracted the attention of a large number of prospectors and mining men this season. Gold was discovered about a year ago, and three companies had a total of 52 men at work all winter. The Independence company, one of these, has just engaged an additional force of 20 experienced miners and is putting down a 200-ft shaft. H. A. MacDonald, formerly of Cripple Creek, Cobalt, and Porcupine, is in charge. The Independence, Gabriel and Big Four Section mines have on their dumps altogether 500 tons of ore running from $15 to $50 per ton awaiting the erection of stamp mills.

# THE MINING NEWS

## ALASKA

GOLDSTREAM (Fairbanks) and its tributaries show the greatest activity in a placer way of any of the creeks of the camps. On Pedro and upper Goldstream there are many outfits working by the opencut method, principally scraping. Gius, Atwood, Deruchia, Gilmore & McPike, Mallinson and Bleeker are sluicing, using scrapers. Henry Wagner has two outfits stripping the overburden from the pay gravel and expects to begin sluicing soon. On lower Goldstream the depth to bedrock is greater, and the pay dirt is extracted by drift mining. Our claim No. 11, A. G. Johnson and E. P. Short are working. On the old Aubert-Voegtlin ground on 12 and 13, Casalegno Brothers & Bosco have a fair-sized crew at work. The large dump taken out during the winter on the Biglow bench is rapidly disappearing into the sluice boxes. Peterson, Craig and Johnson are working 80 men in good pay on claim No. 17.

RUBY DISTRICT—The early cleanups returned a total of $120,000, on which basis the probable output for the entire season is estimated at $700,000. Many small outfits are sluicing and much prospecting is being done.

CARIBOU CREEK—A stampede has begun to the new diggings, where gold assaying about $18.40 per ounce has been found. It is round, shotty and fairly coarse. The locality is in the Valdez Creek country. The trail runs from Knik up the Matanuska, and then over the hills to Caribou. About 100 prospectors are on the scene.

HIRST MINE (Sitka)—This property at Mine Cove, Chichagof Island, is employing a small force of men. A tunnel and crosscut have been run and drifting on the vein is in progress. It is hoped soon to reach the oreshoot discovered in the upper tunnel, 165 ft. above the present workings. Bernard Hirst, merchant, of Sitka, owns the property.

MIZPAH (Fairbanks)—Work has been resumed on the Mizpah claim, on the left limit of Fairbanks Creek. A boiler and hoist will be installed and two stopes will be opened on the 80-ft. level. The ore mined will be crushed at the Willis or at the Fursteneau mill at the head of Fairbanks Creek.

NEWSBOY (Fairbanks)—The mill was started June 9 after an idleness of several months. There are 100 tons of ore broken and it is hoped that the stopes will supply sufficient to keep the mill running all summer. Underground, work is progressing steadily on the 150- and 215-ft. levels. The oreshoot has shown no sign of diminishing in size or in value. Work will soon be resumed on the 315-ft. level, and if the orebody developed in the upper levels is found there, a crew will be put to work to deepen the shaft to the 500-ft. level.

CRITES & FELDMAN (Fairbanks)—The adit on the Helen S. claim has been driven 300 ft. At a distance of 250 ft. from the portal of the adit, a raise was run to the surface, a distance of about 80 ft. It is the intention of the operators to continue the tunnel and at the same time to work two stopes from the raise. All ore taken out is separated into first and second grade. The first grade will be crushed at the Willis mill on Chatham Creek and the second grade will be stored on the dump to await the installation of a mill.

RELIANCE MINING CO. (Fairbanks)—Two recent cleanups from the Spalding-Ronan lease netted more than $4000, an average of about $100 per ton. The ore was taken from the 50- and 100-ft. levels on the Wild Rose vein. As the lessees are limited to a depth of 100 ft., no attempt has yet been made to sink deeper. The working shaft on the MacGillivray-Treml lease on the Wild Rose claim has reached a depth of 20 ft. The vein is small, but panning tests show it to be rich. It is the intention of the lessees to sink to a depth of 50 ft., and if the ore proves satisfactory so far, to install a hoist and continue the shaft to the 100-ft. level.

## ARIZONA

### Cochise County

COMMONWEALTH EXTENSION (Pearce)—A modern 350-ton cyanide plant is in process of building and will be ready for business Sept. 1. Edgar A. Collins is general manager.

HEFFERN MINING CO. (Douglas)—This company has just completed its reorganization and A. Heffern, the general manager, is preparing to put several men to work cleaning out the old workings and start development.

LEADVILLE MINING CO. (Courtland)—This property was recently bonded to A. Fuller and O. L. Neer, but owing to a misunderstanding has reverted back to the company. Mr. Neer has another deal on the property pending.

TEXAS GROUP (Douglas)—This group, owned by August Baron, has been purchased by Tennessee people represented by B. Frank Murphy through whom the deal was made. The property contains eight claims carrying silver, copper, lead and zinc; the price paid is said to be $100,000.

### Gila County

McMILLEN (Globe)—Preparations for the resumption of work are almost concluded and arrival of diamond-drilling equipment is being awaited.

APACHE (Globe)—Shipments have been resumed by Pfeister Brothers, of Globe, to the Old Dominion plant. The ore comes from a contact of limestone and quartzite and is said to carry 25% copper.

INSPIRATION EXTENSION (Miami)—At the Inspiration Extension, work is finished on the erection of a 40-ft. headframe and of a hoist building and on the installation of a 25-hp. gasoline engine. The roadway between the hoist and the Inspiration ranch, whence the new shaft will secure its water supply, has been thoroughly repaired, and work on the shaft will begin within a few days.

INSPIRATION (Miami)—Beyond the grading for the mill site, which will be completed about the middle of August, there is little surface work in progress at the Inspiration, and underground work has slackened considerably since institution of the Keystone's suit to restrain the Inspiration from driving its main transportation drift through the former company's ground. On the fourth level the laterals, or "turnouts," are being started westward through the Colorado orebody and considerable drifting toward the main east and west shafts is in progress. Last month's underground development totaled 2600 ft. In the inclined shaft, 212 ft. were cut in June. It is now 90 ft. below the fourth level, three compartments being carried from the tunnel level downward. It will be sunk to a depth of 90 ft. below the sixth level, the extra 90 ft. to be used as a 180-ton pocket. West of the concentrator site, the rock crusher to be used in supplying material for the concrete construction work is finished. Although some preliminary concrete work may be begun early next month there will be no material construction started until all grading is finished.

MIAMI COPPER CO. (Miami)—At the Miami mine satisfactory progress is being made in the work of reopening the caved ground in the northwest section of the orebody. Superintendent Lawton thinks he will have it restored to normal condition by August. Since there are 2,000,000 tons of ore in that block, the discovery that the pillars were not materially damaged pleased the management. Although some of the drifts and stopes were wholly closed and many of them partly filled, most of the previous development work was found intact. The greatest obstacle to steady progress in the work of rehabilitation is the condition of many of the raises, which are found filled with loose ground. In such cases, rather than risk starting the loose ore, the drift is carried around the former course until firm ground is again encountered. Despite the fact that all this work in the caved ground is charged to mining expense, development work during July reached 7285 ft. The mine is furnishing more than 3300 tons of ore to the mill daily. The Captain shaft is again the scene of considerable work. A raise was lifted from the 420-ft. level to connect with the bottom of the shaft 220 ft. below the surface. Now the shaft is being timbered and the narrow raise from the 220-ft. point is being enlarged as the timbering is carried downward. At the bottom, the Captain shaft will be well below the Captain orebody, which contains about 4,000,000 tons, thus insuring permanency of the tramming level as it will be when completed at that point. The shaft will be used to lift the waste rock taken from that section of the mine in working the Captain orebody, and will also serve as a needed air-channel and an extra outlet for men in emergencies.

### Maricopa County

SUNFLOWER CINNABAR MINING CO. (Phoenix)—A retort for the reduction of the quicksilver ore will be installed at an early date. Col. Fred Bowler is superintendent.

### Mohave County

ARKANSAS & ARIZONA (Jerome)—Three boilers weighing 20,000 lb. each are being installed on the property of this company. The boilers are part of the hoisting equipment.

OAK SPRING—Work has been begun on the new concentrating plant to treat the tungsten ores. The mine is well developed, insuring a large and steady production. Preliminary tests show that the concentrate will carry 70% tungstic acid.

BROOKLYN-ARIZONA (Dewey)—The United States supreme court has decided that the silica deposit near Dewey belongs to C. C. Miller and not to the Brooklyn-Arizona company. It is expected that operations will now be resumed on the property.

ARIZONA SOUTHWESTERN (Yucca)—The mill is being tried out preparatory to being put into commission. The new plant is one of the most uptodate in the Southwest. The building is steel and concrete and all units are driven by separate motors. A new electric hoist and large compressor are being installed at the shaft.

### Pinal County

CALUMET & ARIZONA (Superior)—The shaft is now nearing the 500-ft. mark and the pump station at the 400 level is completed. Drifting eastward into the mountain will be begun from the shaft soon. The shaft and the main tunnel have been connected at the 180-ft. level.

REYMERT—At this property, recently bonded by the Gunn-Thompson mining interests, Superintendent Thomas Tighe is getting ready for an active campaign of development. A 40-hp. gasoline hoist is being installed and a crew of shaft men has gone to the property. Road building and other preliminary work has been finished and the water supply has been developed sufficiently to serve all present needs.

### Pima County

CHESTERFIELD—Payment on the company bonds being in default, the property has been closed down and the business placed in the hands of the courts.

OCEANIC ([illegible])—Work has been suspended temporarily pending the settlement of financial difficulties, Albert Steinfeld & Co., of Tucson, having filed a suit for the recovery of $[illegible]

CORNELIA—Claims constituting the Cornelia group in the Ajo district have been formally deeded to the Calumet & Arizona. The nominal consideration was $1 It is reported that the purchase price was $800,000.

### Santa Cruz County

FOUR METALS (Patagonia)—Considerable activity is being shown at this mine, 16 miles from Patagonia. More than 150 men are employed. Construction work is being rushed and everything about the camp indicates prosperity. The concentrator is now assured and several other new buildings are contemplated

### Yavapai County

WAKOTA DEVELOPMENT CO (Congress)—This is a reorganization of the Coronado Gold Mining Co. A 5-stamp mill is being built on the new Grasshopper property. Little development work has been done, but about $60,000 worth of free-milling gold ore assaying about $100 per ton is, according to the manager, already blocked out. This work has been done in addition to the continuation of work on the old Coronado property. A diversion ditch from Sand Creek to the reservoir has just been completed, and will supply water to both properties and a ranch owned by the company L. G. Ochsenreiter, of South Dakota, is president and W. T. Sawyer, formerly of Cripple Creek, Colo., is manager.

HARQUA HALA (Prescott)—The Yuma Warrior Mining Co. is preparing to develop this property extensively along modern lines. The plant erected by the company will be in operation within 60 days

## CALIFORNIA

### Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—It is reported that the repair work is completed and that the plant is in operation

**LIGHTNER (Angels Camp)—Repairs on the stamp mill are in progress while waiting for new transformers. Extraction** of ore will begin in levels above the 700-ft. point.

**UTICA (Angels Camp)—Work has been resumed in the Cross shaft and the Stickle mill is again in operation. The** recent shutdown was due to the need of repairing seven miles of flume that carries water for milling, and for domestic use in the town. The work on the flume was begun in April.

HOMESTEAD (Georgetown)—The tunnel has intersected the pay shoot at a distance of 150 ft. at the point where it was disclosed by the shaft. A winze is being sunk. A 2-stamp mill has been installed for development purposes; water power is used The property is situated on Carson Creek above the Georgia Slide mine

**REINER (Angels Camp)—Divers have been employed to** assist in the lifting of two skips from the shaft. The skips were caught on the clutches at a depth of 200 ft., and it was necessary for the divers to work under about 10 ft. of water to release them No damage was done either to the skips or the shaft by the lodging of the skips.

### Lassen County

CALIFORNIA-UTAH MINING CO. (Doyle)—The mine is shipping about 100 sacks daily of selected ore of high grade. The ore goes to the Murray, Utah, smelting plant. The company is controlled by Salt Lake and Chicago men.

### Modoc County

HESS (Alturas)—The new hoist is completed and will be in operation upon the receipt and installation of a 25-hp. gasoline engine for driving the stamp mill. The cyanide tanks are being put in place and will soon be ready for operation Work will begin on the 300-ft. level.

SPEARMINT (New Pine Creek, Ore.)—The shaft is 75 ft. deep, and drifting has been started. The surface water from melting snow has somewhat retarded underground work The snow is rapidly disappearing at High Grade camp, and the road to New Pine Creek is now opened to wagon traffic.

### Nevada County

NORTH STAR (Grass Valley)—The first quarterly dividend for 1913 amounting to $75,000 or at the rate of 30c per share has been paid The company has disbursed a total of $3,861,989 in dividends

LE DUC MINING CO (Grass Valley)—The entire plant, including blacksmith shop, dry house, engines and blowers was destroyed or damaged by fire June 20 The plant was at the entrance to the Osborne Hill tunnel

### Placer County

JARVIS (Forest Hill)—The tunnel is in 2250 ft. and under the red gravel, with good indications of pay gravel Washing only will be required, as the gravel is not cemented

BEAVER (Loomis)—The dredge has been remodeled and the tailing is now run through sluices and the tailing pile is leveled, leaving the land practically in the same condition as before being dredged

REUBEN (Last Chance)—The tunnel has been advanced to the 7[illegible]-ft. point It is expected to cut the vein at 600 ft from the surface. A new stamp mill with crusher and rolls equipment is contemplated

ASSOCIATED MINERS (Loomis)—A new method of hydraulicking has been adopted by which it is expected that the water may be used continuously, enabling the operators to use the same water over again until exhausted by waste or evaporation

### Plumas County

BELLEVUE (La Porte)—The cleanup from this channel mine, amounting to $2000, was recently stolen Two men, believed to have stolen the gold, were trailed to Onion Valley, but there the trail was lost. Several efforts had previously been made to rob the mine.

INDEPENDENT (Quincy)—This property has been sold to Charles L. Spangler and Joseph M. Anderson, of Sacramento It is understood that development will be immediately undertaken.

### Shasta County

BLACK HAWK (Whiskytown)—A 10-stamp mill is being built at this mine. It is expected to begin dropping stamps in July. A good strike of ore which developed extensively is reported to have warranted the installation.

PITTSBURGH & MOUNT SHASTA (Keswick)—This company, owning the Little Nellie mine situated between Keswick and Iron Mountain, has given a trust deed to the Real Estate & Trust Co., Allegheny, Penn., to secure payment of promissory notes aggregating $125,000

HEROULT (Heroult)—The Redding Iron works has received 60,000 lb. of iron from this electric smeltery, which was made in the new furnaces recently installed.

## COLORADO

### Lake County

EUREKA—The Eureka and Saturday Night group of claims in Lackawanna Gulch, is reported by J. McAlpime, the manager, to have a strike of rich gold ore. The group is owned by a New York company.

### Montrose County

FIVE CARLOADS OF VANADIUM ORE were shipped last week from the Placerville station of the Rio Grande Southern Ry., one being from the Standard Chemical Co., one from Curran & Hudson and three from the Primos Chemical Co., of Newmire.

### San Miguel County

TOMBOY (Smuggler)—The mill ran 28 days in June and crushed 11,500 tons of ore, yielding bullion to the extent of $22,600 and concentrate worth $50,500. Profits from mining operations were $35,100.

### Summit County

THE SECOND CLEAN-UP FOR JUNE, as reported from Breckenridge, gave returns of $30,975, shipped by the Colorado Gold Dredging, French Gulch Dredging and the Reliance Gold Dredging companies.

### Teller County

DEEP DRAINAGE TUNNEL—The flow of water from the portal is now about 7000 gal. per min. and the recession in the deep shafts, for June, was 6½ ft.

VINDICATOR (Independence)—It is proposed by the company to erect a small testing plant of about 10 tons daily capacity for the treatment of its low-grade ore and dump material.

ELKTON (Elkton)—The output is about 3000 tons per month. The August dividend will be passed, the rumored cause being that the company contemplates a large expenditure in building a mill. The condition of the treasury is as good as ever.

EL PASO—So far as can be learned no date has been set by the directors of the El Paso Consolidated Gold Co. for taking action on the dividend. The disbursement was due on June 30, but payment was deferred on account of the heavy and not anticipated expenditures incurred in connecting the Nichols shaft with the main shaft. It is said, however, that it is the intention of the management to pay the full 10% on the stock by the expiration of the company's fiscal year, which ends Dec. 31, next.

## IDAHO

### Idaho County

MOUNT MARSHALL MINES LTD. (Resort)—This was formerly the Rapid River Reducing Co. An 800-ft. tunnel which cut two veins will be continued to cut other veins. The important contents of the ores are gold and silver. Total development includes 1734 ft. of work. The reduction plant is a six-stamp, 30-ton Merralls mill, with two Wilfleys and two Frue vanners. George A. Wales is president; W. Waugh, secretary; H. M. Brugger, treasurer and Edward Luzaddor, general manager.

### Coeur d'Alene District

GETTYSBURG-INDEPENDENCE (Mullan)—It is believed that F. Augustus Heinze will soon begin development on this property It adjoins the Morning mine on Chloride Hill.

INTERSTATE-CALLAHAN (Wallace)—The new 300-ton concentrator has been in operation since June 1 The survey for a Northern Pacific extension to the plant has been made An aerial tram connects the mine with the mill

## MICHIGAN

### Copper

LA SALLE (Calumet)—The railroad connections into this property have been completed and the rock shipments to the Calumet and Hecla mills have been started At the present time, about 100 tons daily is being handled, but this will be materially increased

NEW ARCADIAN (Houghton)—The shaft is down to the 750-ft. level and the station will soon be cut preparatory to starting crosscuts east and west to two other parallel formations Payments of the assessment called July 1 are being made, which provide funds for the continuations of the exploratory work.

NEW BALTIC (Houghton)—Work of extending the crosscut at the 500-ft. level has been discontinued at a point about 2000 ft from the shaft and a diamond drill will be placed in commission to put in a horizontal hole to test the formation further on. In driving the crosscut, two favorable formations were opened and about 100 ft. of drifting has been done on one of these with encouraging results.

SOUTH LAKE (Lake Mine)—The shaft is bottomed at this property at a depth of 500 ft. where a station is being cut. At the 300-ft. level, the crosscut should soon reach the lode that was found at a depth of 40 ft. in the shaft and that showed good copper content.

CONTACT COPPER CO.—A special meeting of the company will be held Aug. 1 to authorize the sale of its timber holdings in order to provide funds to carry on work of exploring the company's lands. President Fay says: "Many of the government sub-divisions of our 2400 acres are heavily timbered and it is believed that a large part, if not all, of this timber can be sold at an advantageous price without detriment to the company's interests. If such a sale is made it will will obviate the necessity of calling an assessment, and should provide the company with funds to carry on its diamond drilling investigations for a considerable time. The results thus far obtained from our diamond drilling, while not disclosing any lode of marked value, convince us that the work should be continued and the lands of the company thoroughly explored by this method."

### Iron

STRUTHERS FURNACE CO. (Crystal Falls)—This Cleveland company which recently took over the Hilltop and Victoria properties at Crystal Falls has encountered difficulty on account of questions regarding the title to the Victoria property. A small body of ore is known to exist in the two properties which adjoin.

CASCADE MINING CO. (Negaunee)—The Isabella shaft has been sunk to a depth of about 200 ft. and sinking will be continued for 600 ft. more before drifting will be started to open the orebody. It is thought that this mine will commence shipping next year and the Chicago & Northwestern Ry. is now laying a track to the property.

## MINNESOTA

WEYERHAUSER INTERESTS are again resuming exploratory work on the Cuyuna Range. They control a considerable acreage of prospective mineral land, in addition to several iron ore deposits, and resumption of activities on their part means much to the district in general.

CUYUNA-DULUTH IRON CO. (Ironton)—The company has drifted 85 ft. on the 200 level. New skips and increased boiler capacity have been installed, and shipping will begin soon.

JONES & LAUGHLIN—Vice-president, William Larimer Jones, and party, made an inspection trip over the Cuyuna range recently. It is understood that at least one option was taken, and that drilling operations would start soon. Capt. Thomas Walters, of Ishpeming, Mich., accompanied the party. This marks the probable entrance of one more large consuming interest into the Cuyuna range district.

## MISSOURI

### Joplin District

DELTA (Spring City)—New drifts have been cut in the mine and the mill now is being operated regularly. Some new orebodies have been developed, it is said.

BEAR CAT (Sarcoxie)—Operations at this property, near Sarcoxie, have been suspended pending development work. Some time ago there was considerable drilling done on the lease, and the company will prove up the strikes, made at a depth of 250 and 280 feet.

HARDY (Webb City)—A company composed of Joplin, Carthage and Webb City operators has been organized to prospect the Hardy tract, situated south of Webb City. It is virgin territory. The drill now has reached 125 ft. Several holes will be put down.

ISHERWOOD—This mine last week produced ore running 25% in zinc sulphide, the rich ore making it one of the best in the Carl Junction camp. The company has a lease on 80 acres and has been operating the mine but a few weeks since striking the ore. J. I. McClaren of Galena and A. M. Gaines of Joplin are the operators.

QUAKER—This mine has been leased by a new company and is in operation after several years' idleness. It is situated in the Chitwood camp, where much of the one-time producing territory has been worked out. The shaft is being sunk deeper and a drift at a deep level will be cut to a point where the operators believe there is a good orebody.

HARTFORD (Galena)—The Empire Zinc Co. has begun sinking the shaft and will go to a depth of 300 ft., an unusual depth for Joplin district mines. Drilling is said to have shown a 50-ft. face of zinc ore, ten holes having been put down. The mill, of 300-ton capacity, has been shut down temporarily for repairs.

ILLINOIS LEAD & ZINC CO.—Thomas Coyne of Webb City has taken a lease on this tract, which several years ago was one of the best producers in the Galena district. Ten drill holes have been sunk, five of which showed ore, Mr. Coyne says. The lease contains several old shafts, some of which are to be sunk deeper. A contract has been awarded for a 200-ton concentrating plant, to be completed in October.

LU LU V (Joplin)—A 200-ton mill is being erected at this mine. Henry L. Timmonds of Kansas City and Harry Peiffer of Spring City own the lease. The ore formation is found at the 185-ft. level, with a 20-ft. face of both lead and zinc. The lease was worked by another company, which was forced to abandon it, before the ore was reached, on account of insufficient funds.

MEXICO-JOPLIN—Drill prospecting on this land has been followed by the sinking of two shafts. Both lead and zinc ore were found in several holes. The drilling was done on leases formerly held by the Katy Mining Co. and the Richinore company. On the Katy lease, ore was found at a depth of 130 ft. and continued to 165 ft. A good run of lead was encountered at the 127-ft. level in one hole on the Richinore lease, while zinc was found in the other holes.

## MONTANA

### Beaverhead County

PENOBSCOTT MINING CO. (Melrose)—Good progress is being made on the construction of the new 20-stamp mill at the Hecla mine, 15 miles west of Melrose. From 60 to 75 men are engaged in the work and they expect to complete the mill in 60 days. The plant will be operated by electricity obtained by a transmission line from the Big Hole dam.

### Jefferson County

CENTER REEF (Elkhorn)—The Ballard brothers are preparing to resume work at this mine. The ore is rich but the mine is situated on the top of Old Crow Mountain where the season is short, allowing work to be done during only a few months each year.

SOUR DOUGH (Elkhorn)—John Rothfus, the owner of this mine, one of the Golden Curry group of claims, has announced his intention of working the mine again. The Elkhorn Mining Co. was formed last winter to operate the property under a lease and bond, but on account of bad roads little has been done, and Mr. Rothfus is dissatisfied with the progress made up to date.

### Madison County

BEDFORD (Sheridan)—The mill at this gold property near Mill Creek is being operated steadily, about 40 men being employed in mine and mill.

BONANZA (Sheridan)—At this group of claims near the head of Mill Creek, ore assaying from $30 to $50 per ton, principally in gold, is being mined and placed on a stockpile; it will later be shipped to the Washoe smelting works. A tunnel is being driven on the vein.

MONTROSE (Rochester)—James Miller, Isaac Hansen and John Mahoney, owners of this mine, are doing considerable development and opening a good body of ore. A tunnel has been driven 160 ft. on the vein, the ore assaying well in gold and silver. A shaft being sunk on the vein has reached a depth of 60 ft. and will be continued some distance further before drifting is started.

## NEVADA

### Comstock Lode

SAVAGE (Virginia City)—Work has been resumed on the surface-tunnel level through both the upper and lower tunnels, and sampling indicates that much ore of milling grade is in prospect.

SIERRA NEVADA (Virginia City)—A north drift has been started across the fault plane from the top of the raise from the intermediate level, for the purpose of intercepting the vein. High-grade ore existed on the intermediate.

C. & C. SHAFT (Virginia City)—The Comstock Pumping Association has made rapid headway in reopening the old drifts from the 2500 shaft station, and 700 ft. of old workings has been recovered, which will be used as a drainage adit from the Ophir-Mexican winze. Changes have also been made in the shaft, looking to more economy in operating.

### Humboldt County

BORLAND PROPERTY (Rochester)—A car of good-grade ore is ready for shipment.

QUEEN (Gold Circle)—A gasoline hoist has been installed and sinking is now being done.

LINCOLN HILL (Rochester)—This property has recently made a shipment to the Thompson smelting plant.

ROCHESTER HILLS (Rochester)—The two-compartment shaft is now down 200 ft., or about 75 ft. below the tunnel level.

BADGER (Rochester)—It is reported that a discovery of rich ore has been made on this property in the Indian Creek section.

NEVADA-PACKARD (Rochester)—This property is now shipping regularly to the Hazen sampler. The last car of ore mined by the lessees assayed $60 a ton.

PEERLESS CLAIM (Rochester)—Free gold has been struck in the bottom of the 16-ft. shaft. The Forvilly Rochester Mining Co. is half owner in this claim which is now being worked by lessees.

CODD LEASE (Rochester)—The compressor has been installed and the air drills are in operation; 35 men are employed. An average of one car of ore per day is being shipped. The production will be greatly increased as soon as the Silver Belt railroad is in operation. H. C. Zulch is superintendent.

### Nye County

TONOPAH MERGER (Tonopah)—The west drift on the 1070-ft. level, which is now out nearly 600 ft. from the shaft, is assaying from $19 to $30 per ton, and is apparently entering a new oreshoot. In the North Star mine the east drift on the MacDonald vein on the tenth level is now out over 120 ft., the vein having ranged for this distance from 5 to 8 ft. in width; the ore is of high-grade shipping class. The drift on the parallel vein is out 165 ft. on 2½ ft. of very good shipping ore, and another drift being run on a cross vein shows from 12 to 18 in. of ore assaying from $200 to $400 per ton.

## NEW MEXICO

### Socorro County

TRI-BULLION (Kelly)—Operations of the company have been indefinitely suspended.

GERMANY (Kelly)—This mining and development company has resumed drifting south from its Sleeper tunnel to a conjectured orebody.

GRAPHIC (Kelly)—The Ozark company, subsidiary of Sherwin-Williams, is operating the new mill. Reports state that the plant is making 30 tons of concentrate per day from 100 tons of ore.

## OREGON

### Baker County

GOOD LUCK (Sparta)—Some fine ore has been encountered at this mine, assaying as high as $90 per ton. Charles Eisner is in charge.

CANYON MOUNTAIN—Equipment for a 10-stamp mill has been delivered at this property. The plant will be in operation at an early date.

### Josephine County

MAMMOTH (Sumpter)—Work has again been resumed at this property, and some fine ore has been uncovered.

CHAMPLAIN DREDGE—It is stated that this dredge on Foots Creek, the only dredge in the county at present, will be put into commission again on the bars in the river. This dredge has been idle for several years, although the ground is good. The dredge and property are owned by the Champlains, of Chicago.

### Jackson County

BEAVER CEMENT CO. (Gold Hill)—About 200 men will be employed during the summer building the large plant on the Rogue River. The plant will be in operation next year, and will be one of the largest of its kind on the coast.

## UTAH

### Juab County

GRAND CENTRAL (Robinson)—Water has been encountered at about the 2400 level, and work has been discontinued for the time being. A pumping plant may be installed.

NORTH SCRANTON (Eureka)—A cave containing ore similar to that found in the Scranton mine in North Tintic has recently been encountered here. The North Scranton is controlled by Lehi men.

YANKEE CONSOLIDATED (Eureka)—Drifting south of the shaft on the 2000-ft. level has opened a 4-ft. vein, carrying bunches of silver and copper ore. The fissure is strong and well defined. Eight cars of zinc ore were marketed in May from upper workings, and brought approximately $500 per car.

## WASHINGTON

### Ferry County

BUTTE-CHEWELAH (Chewelah)—A hoist and compressor are to be installed at this mine. A winze will be sunk on the ore to a depth of about 400 ft.

SAN POIL (Republic)—Operations of the mill are in full swing again at double capacity. The 250-hp. Corliss engine, installed recently, went into commission last week and the entire mill began operating satisfactorily. Having about 25% reserve power, it is estimated the engine will cut the milling costs 50% by reason of the increased tonnage and the increased economy of the engine. During the period of suspension in the mill a considerable volume of better ore is said to have been blocked out in the mine.

UNITED COPPER (Chewelah)—Electric energy for the mine and new mill will be available by the latter part of July. With the electrification of the mine and concentrator, the operating force, now numbering 100 men, will be increased and the output largely augmented. A long tunnel is being driven from the base of the mountain on the west side of the mine to tap the main vein a mile in and at a vertical depth of 1000 feet; it is expected to reach the orebody by the first of next year. The shaft is now down 600 ft., several stringers of high-grade ore having been encountered at unexpected places. A drift 500 ft. long has been driven on the vein at the 500-ft. level, exposing the highest grade ore ever encountered in the property. Shipments at present average 26 tons of crude ore and five to six tons of concentrate daily.

## CANADA

### British Columbia

HEDLEY—Production figures for five months to June 1 are: Ore crushed, 29,180 tons; value of gold recovered, $377,483, an average of $12.95 per ton.

CONSOLIDATED—During the first half of 1913 there was smelted in this company's works at Trail, 162,000 tons; with a gross value of metal content of $4,232,000.

SALT DEPOSIT—Further particulars are now available regarding the newly discovered salt bed in Kwinitsa, Mile 46, on the Grand Trunk Pacific main line, east of Prince Rupert. The property, consisting of 1000 acres, is situated within 200 ft. of the railway and within 400 ft. of the Skeena River. An uptodate drilling plant has been installed as well as a small testing plant consisting of three evaporating pans. So far, five holes have been drilled at considerable distances apart, some more than a mile from the others, and all have struck salt at depths varying from 50 to 350 ft. In all, 8 tons of salt have been scooped from deposits. The owners and discoverers expect to have a plant in operation with a capacity of 50 tons per day within the course of a few months.

### Ontario

PEARL LAKE (Schumacher)—An explosion of powder at this [illegible] caused by bush fires, did considerable damage to the property, but no one was injured.

COBALT FRONTENAC (Cobalt)—This company has let a contract to William H. Pritchard, of Hamilton, for sinking a shaft to a depth of 200 ft. on its property at Elk Lake.

CHAMBERS-FERLAND (Cobalt)—The financial statement for the year [illegible] Apr. 30 shows total receipts of $75,741, and a balance [illegible] forward of $196,743. The cash in hand amounted to [illegible].

COCHRANE (Cobalt)—Drifting is being done in both directions on the [illegible]-ft. level on a calcite vein showing native silver, this level having been reached by a winze from the [illegible] level where the vein was [illegible].

HUGHES (Porcupine)—The shaft has been sunk to the 3[illegible] ft. level, on which a quartz vein about 10 ft. wide showing free gold has been encountered. Tentative plans for a 150-ton mill are being prepared, but the treatment of the ore has not yet been finally determined.

SWASTIKA (Swastika)—In pursuance of the action recently taken by the shareholders, the directors are offering 500,000 shares of stock at 6c. per share to present stockholders pro rata. In case any portion is not taken up the directors are authorized to sell on such terms as they consider advisable.

JUPITER (Schumacker)—The annual report for the year ended Mar. 31, shows that $175,482 has been expended on development work. The cash remaining in the treasury amounted to $40,841. A raise from the 300- to the 200-ft. level has been finished in which some of the best ore so far opened up was encountered. A winze is being put down from the 300-ft. level.

SILVER CLIFF (Cobalt)—On account of the poor recovery made by the mill it is proposed to put in a new chilean mill and six slime tables at a cost of $8000. There are 3000 tons of milling ore in the stopes and a vein of high-grade ore has been encountered in the crosscut from the bottom of the shaft.

## MEXICO

### Chihuahua

THE CHIHUAHUA SMELTING WORKS was looted by rebels June 29. In fear of another attack American women and children moved into the city. The plant is closed.

### Durango

PENOLES (Mapimi)—The report in the JOURNAL of May 3 to the effect that the Peñoles smelting plant was closed was a mistake. It was in operation at that time and on June 9. A letter of the latter date has just been received.

### Sonora

NACOZARI CONSOLIDATED COPPER CO. (Douglas, Ariz.)—A 10-in. streak of high-grade silver-lead-copper ore has just been struck in the breast of the long tunnel and a 12-in. streak of low-grade ore alongside. The company contemplates building a mill. The property is located about nine miles east of Nacozari and about two miles from Pilares.

CON VIRGINIA (Moctezuma)—A California company has just secured an option on this property from the owner C. C. Soto of Douglas, Ariz.; the terms call for no payment down but specify that 1000 ft. of development must be done inside of nine months. This property is considered a good low-grade deposit; it lies about 50 miles east of Moctezuma, Sonora.

CINCO DE MAYO (Esqueda)—This property recently confiscated by the Constitutionalists is being worked by them. At the time it was taken there was said to be $1,000,000 worth of ore blocked out for shipment. It has now been worked for about two months and two cars of high-grade ore shipped to Douglas, the better grade being smelted in adobe furnaces and the bullion sent to California. At present the smelters will not handle the ore, fearing trouble with Col. Garcia, the owner of the mine, who is now the Governor of Sonora for the Huerta government.

## SOUTH AMERICA

### Colombia

EL ZANCUDO—April production was $32,000, and May, $29,000.

LA CLARA (Amalfi)—The mine produced in May, $9000, paying a dividend of $200 per share.

LA CONSTANCIA (Anori)—The May production was $7000, a dividend of $150 per share being paid.

LA BRETANA (Sonson)—The mine produced about $10,000 in May, without counting returns from the cyanide plant.

LA UNION (Manizales)—A first-class cyanide plant is to be put in. Recent reports give exceptionally fine results from new development work.

THE ANDES DISTRICT is again coming into note as an important quartz region, the most important mine there being known as the Chaquiro.

VIBORITA MINING CO.—This company, near Amalfi, has completed its long tunnel for dumping into the Porce River, and is opening up the mine.

BREITUNG MINES CORPORATION—The report of the existence of a suit against this corporation involving the title to its properties is wholly unfounded and incorrect.

LA CASCADA (Manizales)—The production in May was $18,000; a dividend of $400 per share was distributed. One share sold recently for the sum of $13,200, 28 being the whole number issued.

PATO—Flattering reports are heard regarding the operations at the mines near Zaragosa, where dredging has proved successful. It is said that the company is drilling new ground in the same vicinity.

PORCE RIVER—About everything on the river has been closed down on account of high water. A new enterprise representing Colorado capital has begun the construction of a hydraulic elevator plant on the Rio Grande, a branch river.

## AFRICA

### Transvaal

GOLD PRODUCTION IN JUNE shows a falling off. The total was 747,077 oz., which is 17,229 oz. less than in May, and 6859 oz. less than in June, 1912. For the six months ended June 30 the total output of gold was 4,543,127 oz. in 1912 and 4,640,421 oz.—or $95,917,502—in 1913; an increase of 97,294 oz. this year. The July production will show the full effect of the strike, which barely touched the June working.

## AUSTRALIA

### Western Australia

The Chamber of Mines reports the gold production of Western Australia in June as follows: Exported, 5112 oz.; delivered to mint, 108,373; total, 113,485 oz. For the six months ended June 30, the total output was 627,849 oz. in 1912, and 628,631 oz.—or $12,993,800—in 1913, an increase of 782 oz. this year.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—July 16

The metal markets have remained generally rather quiet, and changes in price have been for the most part declines, though only moderate in amount.

MONTHLY INDEX NUMBERS

| Month | 1912 | 1913 | Month | 1912 | 1913 | Month | 1912 | 1913 |
|---|---|---|---|---|---|---|---|---|
| Jan.. ........ | 111 | 126 | May.. | 118 | 126 | Sept........ | 127 | ... |
| Feb.......... | 109 | 125 | June. | 117 | 117 | Oct........ | 133 | . . |
| March....... | 111 | 125 | July.... .. | 114 | ... | Nov.... | 129 | . . |
| April......... | 115 | 124 | Aug.. | 120 | ... | Dec... ..... | 129 | ... |

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

## Copper, Tin, Lead and Zinc

**Copper**—The market during the last week was rather curious. The two big agencies had apparently been looking forward to favorable statistics and the manufacturers promptly coming to them. The statistics were as favorable as was expected, but insofar as inspiring a buying movement was concerned, they fell completely flat. As soon as this was recognized something like demoralization overtook the market, all sellers joining in the movement of soliciting bids. However, as rapidly as the leading agencies reduced their intimations of what would be accepted, competing agencies and other sellers promptly undercut. At about 14c., delivered in Europe, corresponding to about 13.80c. cash, f.o.b. New York, sales amounting to some millions of pounds were made to Europe, and offerings of more at that price, both for European and domestic delivery were freely made.

The Lake market is much less competitive than the electrolytic, and at present none of the producers of this kind experience any urgency to sell. Consequently, buyers who insist on Lake copper have to pay what is asked. Some appeared during the last week who paid from about 14.70c. for a special brand down to about 14.40c. for ordinary brands, the bulk of the business reported to us being at the latter price. The willingness of some buyers to pay these prices while the sellers of electrolytic were inviting business at large concessions was one of the remarkable features of the week.

At no time during the week did domestic buyers figure to any important extent, although perhaps there was a little more inquiry from them. It is thought that their stocks are now nearly depleted and that they must soon of necessity buy copper, but undoubtedly they will postpone their buying until the last possible moment and then limit it to the minimum quantity. It is equally probable that many of them will overstay this bear market.

At the close we quote Lake copper at 14¼@14½c. and electrolytic at 13.75@13.80c. for cakes, ingots and wirebars. Casting copper is quoted nominally at 13½@13⅝c. as an average for the week.

The London market, which on July 10, was £63 for spot and £63 3s. 9d. for three months, declined 5s. on July 11, and was down to £62 2s. 6d. for spot and £62 7s. 6d. for three months on July 14. On July 16, the market was stronger, and closes at £63 for spot and £63 5s. for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 15¾c. per lb., for carload lots at mill.

Exports of copper from New York for the week were 6249 long tons. Our special correspondent gives the exports from Baltimore at 2551 tons for the week.

**Tin**—The reluctance on the part of eastern interests to meet the low prices established in the London market and fair orders which were placed on this side gave a strong tone to the London market the latter part of last week. Quotations advanced about £11 from the low point, only to drop again to the extent of about £8 10s. on Monday of this week. A bear attack is given as the reason for this abrupt decline. Since then the market steadied, but closes dull at £181 15s. for spot and £182 5s. for three months, and about 39¾c. per lb. for July tin here.

Messrs. Robertson & Bense report arrivals of tin ore and concentrates at Hamburg, Germany, in June, at 3134 tons; of which 29.5 tons were from South Africa and 3104.5 tons from Bolivia.

**Lead**—The market is quiet and lead at St. Louis is quoted 4.17½@4.22½; New York, 4.32½@4.35 cents.

The foreign market is firmer, Spanish lead being quoted £20 and English lead £1 higher. The supplies abroad continue scant, due to the falling off in shipments from Mexico.

**Spelter**—The market is dull. The demand is being freely met at slightly lower prices. At the close, we quote St. Louis 5.05@5.10c., and New York 5.20@5.25 cents.

In London good ordinaries are quoted £20 10s and specials £21 per ton.

The price of zinc sheets is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

**Cadmium**—The latest quotation from Germany is 725@750 marks per 100 kg. f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

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DAILY PRICES OF METALS

NEW YORK

| | | | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| July | Sterling Exchange | Silver | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 10 | 4.8680 | 58¼ | 14.30<br>@14.50 | 13.90<br>@14.00 | 39½ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 11 | 4.8680 | 58⅜ | 14.30<br>@14.50 | 13.75<br>@13.85 | 40⅝ | 4.30<br>@3.35 | 4.17½<br>@4.20 | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 12 | 4.8675 | 58¾ | 14.30<br>@14.50 | 13.75<br>@13.85 | 40¾ | 4.30<br>@4.35 | 4.17½<br>@4.20 | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 14 | 4.8670 | 58⅜ | 14.25<br>@14.50 | 13.75<br>@13.80 | 39¼ | 4.32½<br>@4.35 | 4.17½<br>@4.22½ | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 15 | 4.8675 | 58⅜ | 14.25<br>@14.50 | 13.75<br>@13.80 | 39⅞ | 4.32½<br>@4.35 | 4.17½<br>@4.22½ | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 16 | 4.8660 | 58½ | 14.25<br>@14.50 | 13.75<br>@13.80 | 39¾ | 4.32½<br>@4.35 | 4.17½<br>@4.22½ | 5.20<br>@5.25 | 5.05<br>@5.10 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

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LONDON

| | | Copper | | | Tin | | | |
|---|---|---|---|---|---|---|---|---|
| July | Silver | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | Lead, Spanish | Zinc, Ordinaries |
| 10 | 26⅞ | 63 | 63 3/16 | 68½ | 179 | 179¾ | 19⅜ | 20½ |
| 11 | 26 15/16 | 62¼ | 62⅞ | 68¼ | 185 | 185¾ | 19½ | 20½ |
| 12 | 27 1/16 | | .... | .... | ... | .... | .... | . .. |
| 14 | 26 15/16 | 62⅛ | 62⅜ | 67¾ | 179½ | 180¼ | 19½ | 20½ |
| 15 | 26 15/16 | 62 7/16 | 62⅝ | 67¾ | 182 | 182¾ | 20 | 20½ |
| 16 | 27 | 63 | 63¼ | 67¾ | 181¾ | 182¼ | 20 | 20½ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅓c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—Business is still somewhat unsettled. Current quotations are a little lower, 23@23½c. per lb. being quoted for No. 1 ingots, New York. Foreign metal is still quoted at 19@19½c. in bond.

The Senate amendments to the tariff bill propose to make the duty 2c. per lb. on ingots and 3½c. per lb. on sheets and wire.

**Antimony**—Business has been small and prices are a shade easier. Quotations are 8.50@8.60c. per lb. for Cookson's, 8@8.15c. for Hallett's, 7.50@7.75c. for Chinese, Hungarian and other outside brands.

**Quicksilver**—The market has been quiet and prices are unchanged here at $40 per flask of 75 lb., with 60c. per lb. for small orders. San Francisco, $39.50 for domestic orders and $37 for export. London £7 10s. per flask, with £7 2s. 6d. asked from second hands.

**Bismuth**—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

**Magnesium**—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

**Nickel**—Shot, block and plaquettes are quoted at 40@45c. per lb., according to quality and size of order. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—Producers of this metal quote large lots at $2.75@3.50 per lb., according to size of order; while as high as $4.50@5.50 is paid for retail lots.

Included in exports from Baltimore for the week were 880 lb. selenium to Hamburg.

## Gold, Silver and Platinum

**Gold**—There was no change on the open market in London, prices remaining at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was some demand for Paris and Berlin. In New York $3,000,000 more gold has been taken for export to Paris.

Imports of gold at New York week ended July 12 were $831,118, from Mexico, Central and South America; exports were $5,057,572, nearly all to Paris.

**Iridium**—There has been no improvement in supplies and dealers are still quoting about $85 per oz., New York.

**Platinum**—The market is rather quiet but remains very steady. Dealers continue to ask $45@46 per oz. for refined platinum, and $49@52 for hard metals.

Our Russian correspondent writes under date of July 3 that the market is quiet; no sales have been made. The position can be warned as an expectant one, the business having been confined to negotiations. Sellers have avoided selling, not consenting to reduce prices. Buyers expect lower prices, owing to the increase of the offer by the starateli of new metal. The quotations are: at Ekaterinberg, 9.75 rubles per zolotnik; in St. Petersburg, 37,700 rubles per pood. These prices are nominal and subject to negotiations. They are for crude metal, 83% platinum, and are equal to $36.66 and $36.95 per oz., respectively.

**Silver**—The market has continued quiet and steady, with slight fluctuations. Reports of the Monsoon situation in India are favorable, while on the other hand, currency returns indicate that the Indian government will not be a buyer of silver for the present.

Exports of silver from London to the East, Jan. 1 to July 3, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| India. | £3,549,700 | £4,012,000 | I | £462,300 |
| China | 933,500 | 417,000 | D | 516,500 |
| Total | £4,483,200 | £4,429,000 | D | £ 54,200 |

Exports of silver from New York week ended July 12, were $980,601, mainly to London; imports were $163,147, chiefly from Mexico.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—July 12

The base price paid this week for 60% zinc ore was $43@45 per ton. The base price paid for 80% lead ore was $52@5[illegible] per ton.

SHIPMENTS WEEK ENDED JULY 12

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,497,800 | 117,700 | 1,241,[illegible]00 |
| Year to date | 78,214,630 | 3,811,780 | 33,455,440 |

Shipped during week to separating plants, 1,535,000 lb. zinc ore.

### JOPLIN, MO.—July 12

The high price of zinc blende is $47, the base per ton of 60% zinc ranging from $43 to $45, an advance of $1 to $2. Calamine was advanced $2 to a base of $22@24 per ton of 40% zinc. The average of all grades is $42.26 per ton. With no diminution of the demand for lead and an output restricted by two days' holiday last week prices continue firm at $52.50 per ton of 80% metal contents and an average of all grades $52.42 per ton.

SHIPMENTS WEEK ENDED JULY 12

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week | 9,582,840 | 468,710 | 1,521,560 | $252,320 |
| Totals 28 weeks. | 303,663,200 | 21,204,020 | 50,553,300 | $8,426,637 |

Blende value, this week, $206,918; 28 weeks, $6,825,038.
Calamine value, the week, $5507; 28 weeks, $274,287.
Lead value, the week, $39,895; 28 weeks, $1,327,312.

# IRON TRADE REVIEW

### NEW YORK—July 16

No material change can be reported in the finished steel markets. Mills are generally busy and shipments are good, but new orders come in slowly. Steel makers, for the most part, do not seem disturbed. They do not expect much this month or in August, but there is a general belief that a good buying movement will come with September, before present contracts are worked out. It is significant that early July holidays have been cut short almost everywhere, and only the absolutely necessary repairs are being made.

July shows only a slight curtailment in pig iron production, much less than had been expected. Prices seem to have reached the bottom point, but it can hardly be said that they have commenced to go up. The larger demand is for basic pig, but there are inquiries for foundry pig for early requirements. On the whole there is more disposition to place contracts for pig iron than has been shown for some time.

**Pig Iron Production**—The monthly reports of the blast furnaces, as collected and published by the "Iron Age" show that on July 1 there were 282 coke and anthracite furnaces in blast, having a total daily capacity of 88,000 tons; a decrease of 2200 tons from June 1. Making allowance for the charcoal furnaces the total production of pig iron in June is estimated at 2,663,600 tons; for the six months ended June 30 it was 16,558,000 tons. Of this total 11,469,300 tons, or 69.3%, were made by furnaces owned or operated by steel companies.

**The United States Steel Corporation** reports the total unfilled orders on its books June 30 at 5,807,317 tons of material. This is a decrease of 517,005 tons from the report of May 31, but a difference of only 29 tons from the report of a year ago.

### PITTSBURGH—July 15

The finished-steel trade has now been stagnant for at least three weeks, with new contracts very light and specifications on old contracts being filed at a rate very small compared with outgoing shipments, which shipments are maintained at practically full capacity. Thus the trade is running down rapidly and without a striking change in buying it will not be many weeks until production is restricted.

Production and shipments by the steel mills in the general Pittsburgh district have slightly increased in the past few days, owing to better weather conditions, the latter part of June and early part of July having seen very hot weather, which always cuts into tonnages. There is a wide diversity in the amount of business actually specified on the books of the different mills. Some mills are well fixed, and are experiencing no cancellations worthy of note, while some other mills have very little tonnage in actual specifications.

Finished-steel prices continue to be very well held, there being no question at all as to the majority of regular steel products, while in sheets and wire products, which showed irregularities some time ago, there has been no further weakness in the past few days.

**Pig Iron**—The heavier buying which has featured the past three or four weeks continues, but is not of sufficient volume to stiffen the market, which is at a practically unchanged level. Buyers of pig iron are covering, but are taking smaller tonnages than usual. The Standard Sanitary Manufacturing Co., which has bought various lots lately, is now inquiring for 1000 tons of No. 2 and 500 tons each No. 3 and forge, for August and September delivery, with the privilege of deferring some deliveries to October. The Pittsburgh Steel Co. has bought part of its July basic iron requirements. There have been few small purchases of bessemer, some of them apparently at slight cuts. We continue to quote. Bessemer, $16, basic, $14.50; malleable, $14.25, No 2 foundry, $14; forge, $13.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh

Interest in the pig-iron market is increased by the contest the Connellsville coke operators are waging for $2.50 coke. The purchases a fortnight ago for July at this figure have not been followed by purchases to cover the balance of the uncovered requirements, and some furnaces have banked rather than pay the price, others now threatening to bank or blow out. A $2.50 market for coke firmly established would probably advance pig iron in some districts, while restriction of production ought also to have such an effect, but a break in the coke market is regarded as far from impossible, particularly because the financial strength of some coke interests is questioned since the failure of the First-Second National Bank of Pittsburgh.

**Ferromanganese**—The continued softness in the market has been recognized by a definite cut of $2.50, and we now quote prompt and contract at $58.50, f.o.b. Baltimore, freight to Pittsburgh being $2.16. The market remains quiet.

**Steel**—The market remains firm although quiet, with billets at $26.50 and sheet bars at $27.50, maker's mills, Pittsburgh or Youngstown.

**Sheets**—There is no change in the situation, operations being at 85 or 90% of capacity, and prices fairly well maintained. We quote: Blue annealed, 1.75c.; black, 2.25@3.35c.; galvanized, 3.30@3.50c.; painted corrugated, 2.45@2.55c.; galvanized corrugated, 3.35@3.55c. per pound.

### IRON ORE

Shipments of iron ore from the Lake Superior region in June were 7,974,444 tons, being 406,889 tons more than in June, 1912. For the season to July 1 the shipments were as follows, in long tons:

| Port | 1912 | 1913 | Change |
|---|---|---|---|
| Escanaba | 1,641,948 | 1,800 601 | I. 158,653 |
| Marquette | 918,890 | 1,059,776 | I. 140,886 |
| Ashland | 1,332,801 | 1,509,702 | I. 176,901 |
| Superior | 4,344,331 | 4,677,349 | I. 333,018 |
| Duluth | 2,845,478 | 3,995,948 | I. 1,150,470 |
| Two Harbors | 2,607,223 | 3,081,666 | I. 474,443 |
| Totals | 13,690,671 | 16,125,042 | I. 3,434,371 |

Receipts at Lake Erie ports in June were 6,214,648 tons, or 77.9% of the shipments for the month.

### COKE

There is no change in the situation as to Connellsville coke. Only short contracts for furnace coke have been closed at the $2.50 price, but producers continue to hold firmly for that price.

**Anthracite Shipments** in June were 5,978,047 long tons, a decrease of 221,599 tons as compared with June, 1912. For the six months ended June 30 the total shipments were 26,096,979 tons in 1912, and 34,851,854 in 1913; an increase of 8,754,875 tons, or 33.5%, this year.

**Coal Passing through Sault Ste. Marie Canals** season to July 1, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 224,908 | 1,004,028 | I. 779,120 |
| Bituminous | 3,715,397 | 5,492,091 | I. 1,776,694 |
| Total | 3,940,305 | 6,496,119 | I. 2,555,814 |

Anthracite shipments last year were light, owing to the April-May suspension. The gain in bituminous this year is remarkable.

## CHEMICALS

### NEW YORK—July 16

The full effect of midsummer and the vacation season are seen in the general market, which is exceedingly dull.

**Arsenic**—Business is quiet and sales are few. Quotations are $3.12½@3.50 per 100 lb., but are largely nominal.

**Copper Sulphate**—Sales have been good. Prices are steady at $5.25 per 100 lb. for carload lots, and $5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is still quiet, with only moderate sales. Quotations are unchanged at 2.37½c. for spot and August; 2.35c. per lb. for September and later deliveries.

The half-yearly report of W. Montgomery & Co., London, says: "Nitrate has had a heavy fall during the last few weeks—the belated supply has come too late for the season, and the continued increase in production, notwithstanding the outcry about labor difficulties which persistently came over from Chile makes buyers more chary of entering into new engagements. The consumption of the world during the past three years ending June 30, has been as follows in long tons.

| | 1911 | 1912 | 1913 |
|---|---|---|---|
| Continent of Europe | 1,575,000 | 1,711,000 | 1,666,000 |
| United Kingdom | 129,000 | 132,000 | 125,000 |
| United States | 535,000 | 503,000 | 550,000 |
| Other Countries | 85,000 | 114,000 | 110,000 |
| Total | 2,324,000 | 2,460,000 | 2,451,000 |
| Shipments | 2,322,000 | 2,456,000 | 2,666,000 |

"Visible stocks of nitrate in Europe on June 30, including cargoes afloat, were 405,000 tons, against 318,000 tons a year ago."

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | Feb. | March | April | May | June |
|---|---|---|---|---|---|
| Alaska shipments | 660,250 | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 |
| Anaconda | 21,250,000 | 22,900,000 | 23,800,000 | 25,600,000 | . |
| Arizona, Ltd | 3,000,000 | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 |
| Copper Queen | 6,810,706 | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 |
| Calumet & Ariz. | 4,050,000 | 4,250,000 | 4,500,000 | 4,300,000 | |
| Chino | 3,898,998 | 4,464,723 | 3,925,409 | 3,883,611 | 3,787,157 |
| Detroit | 1,689,277 | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 |
| East Butte | 1,325,000 | 1,400,000 | 1,400,000 | 1,268,595 | |
| Mammoth | 1,661,150 | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 600,000 | 625,000 | |
| Mason Valley | 1,348,070 | 1,608,492 | 1,264,304 | 1,186,560 | |
| Miami | ...... | ... | .. | 1.943,900 | 2,612,000 |
| Nevada Con. | 4,798,537 | 5,555,320 | 5,650,000 | 5,933,275 | |
| Ohio | 380,849 | 591,651 | 690,001 | 650,071 | |
| Old Dominion | 2,381,000 | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 |
| Ray | 3,610,000 | 4,287,000 | 4,379,128 | 4,384,400 | |
| Shannon | 1,152,000 | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 |
| Sonth, Utah | *nil* | 62,224 | 132,267 | 200,000 | |
| Tennessee | 1,600,151 | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 |
| United Verde* | 2,750,000 | 3,000,000 | 3,000,000 | 3,000,000 | |
| Utah Copper Co. | 7,585,303 | 8,248,880 | 9,539,847 | 10,003,227 | |
| Lake Superior* | 19,000,000 | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 |
| Non-rep. mines* | 5,399,849 | 6,203,606 | 6,000,000 | 6,300,000 | |
| Total prod. | 94,951,140 | 102,619,054 | 104,224,079 | 109,824,500 | |
| Imports, bars, etc. | 21,372,292 | 24,215,480 | 25,578,297 | | |
| Total blister | 116,323,432 | 126,834,534 | 129,802,376 | | |
| Imp. ore & matte | 9,459,432 | 11,911,041 | 7,177,363 | | |
| Total Amer. | 125,782,864 | 138,745,575 | 136,989,739 | | |
| Miami† | 2,817,200 | 3,102,200 | 2,312,900 | | |
| Shattuck-Arizona | 1,136,480 | 1,234,450 | 1,158,326 | 1,026,170 | |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 688,312 | 844,735 | 794,000 | . | |
| Granby | 1,740,000 | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,535,680 | 2,204,720 | 2,811,200 | 2,424,800 | |
| Cananea | 4,880,000 | 4,772,000 | 3,581,690 | 272,0002, | |
| Moctezuma | 2,730,914 | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,178,000 | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 |
| Cape Cop., S. Af. | 712,320 | 732,480 | 586,880 | 387,520 | .. |
| Kyshtim, Russia | 1,352,960 | 1,478,400 | 2,544,640 | .... | |
| Spassky, Russia | 1,003,520 | 974,400 | 974,400 | 721,280 | |
| Exports from | | | | | |
| Chile | 5,824,000 | 7,840,000 | 7,616,000 | 3,584,000 | 5,824 000 |
| Australia | 5,512,000 | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 |
| Arrivals—Europe‡ | 8,509,760 | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VI, '12. | 122,315,240 | 66,146,229 | 61,449,650 | 49,615,643 | 117,801,600 | 167,417,244 |
| VII | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ........ | ........ | ...... |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,452,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | ...... | ........ | ........ | 52,904,606 | 71,904,000 | 124,808,606 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Andes, Nev. | July 27 | Aug. 19 | $0.02 |
| Arlington, Ida. | July 3 | Aug. 4 | 0.002 |
| Atlas Wonder, Nev. | July 14 | Aug. 6 | 0.01 |
| [illegible], Calif. | July 21 | Aug. 14 | 0.10 |
| Black Pine, Utah | June 30 | July 21 | 0.005 |
| Blue Bull, Nev. | July 14 | Aug. 18 | 0.02 |
| Blue Star, Ida. | July 10 | Aug. 1 | 0.004 |
| Caledonia, Nev. | June 3 | July 25 | 0.05 |
| Challenge Con., Calif. | July 15 | Aug. 5 | 0.03 |
| Clary Gold, Calif. | ...... | July 31 | 0.05 |
| Con. Virginia, Nev. | July 9 | July 30 | 0.10 |
| Eagle Mountain, Ida. | July 19 | Aug. 16 | 0.0005 |
| Empire, Ida. | July 12 | Aug. 12 | 0.002 |
| Gould & Curry | July 14 | Aug. 5 | 0.03 |
| Imperial M. & M., Ida. | June 2 | July 21 | 0.02 |
| Iron Mask, Ida. | July 11 | Aug. 11 | 0.002 |
| North Bunker Hill, Ida. | July 15 | Aug. 16 | 0.02 |
| Overman, Calif. | July 24 | Aug. 13 | 0.05 |
| Rescue Eula, Nev. | July 6 | Aug. 11 | 0.01 |
| Savage, Nev. | July 14 | Aug. 5 | 0.05 |
| Silver Moon, Ida. | June 2 | July 26 | 0.005 |
| Silver Pick, Nev. | June 23 | July 28 | 0.011 |
| Snowshoe, Ida. | July 2 | Aug. 2 | 0.005 |
| Tintic Delmar, Utah | July 16 | Aug. 16 | 0.0015 |
| Umatilla, Nev. | July 14 | Aug. 18 | 0.01 |
| Union Chief, Utah | July 10 | July 31 | 0.01 |
| Utah-United, Utah | July 19 | Aug. 11 | 0.01 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.362 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | | 24.286 | 27.919 | ... |
| August | 52.171 | 61.606 | .... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | .... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ..... | 24.594 | 29.299 | ..... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ..... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | New York, Electrolytic 1912 | New York, Electrolytic 1913 | New York, Lake 1912 | New York, Lake 1913 | London, Standard 1912 | London, Standard 1913 |
|---|---|---|---|---|---|---|
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | . | 17.353 | | 76.636 | ...... |
| August | 17.498 | . | 17.644 | ... | 78.670 | ...... |
| September | 17.508 | | 17.698 | .. | 78.762 | ..... |
| October | 17.314 | ...... | 17.661 | ... | 76.389 | . |
| November | 17.326 | | 17.617 | .. | 76.890 | .. |
| December | 17.376 | .. | 17.600 | .. | 75.516 | |
| Year | 16.341 | .... | 16.560 | .... | 72.942 | .. |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | | 202.446 | ... |
| August | 45.857 | | 208.351 | |
| September | 49.135 | | 223.762 | |
| October | 50.077 | | 228.353 | |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | . | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton.

### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | . . | 4.603 | | 18.544 | .... |
| August | 4.569 | ..... | 4.452 | ...... | 19.655 | ..... |
| September | 5.048 | ... | 4.924 | . . | 22.292 | ..... |
| October | 5.071 | .. . | 4.894 | .... | 20.630 | .... |
| November | 4.615 | .. . | 4.463 | ...... | 18.193 | ..... |
| December | 4.303 | ...... | 4.152 | .. . | 18.069 | ... . |
| Year | 4.471 | ...... | 4.360 | ..... | 17.929 | . . |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | ...... | 6.966 | .. . . | 26.174 | ..... |
| August | 7.028 | ...... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ..... | 7.313 | ..... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ..... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ..... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | ...... | 14.38 | ...... | 14.38 | ...... |
| August | 15.43 | ...... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ...... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | ...... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ...... |
| Year | $16.01 | ...... | $14.93 | ...... | $15.28 | ...... |

# STOCK QUOTATIONS

**COLO. SPRINGS** July 15

| Name of Comp. | Bid |
|---|---|
| Acacia | .02½ |
| Cripple Cr'k Con. | .01 |
| C. K. & N. | .12 |
| Doctor Jack Pot | .05 |
| Elkton Con. | .50 |
| El Paso | 2.50 |
| Findlay | .01½ |
| Gold Dollar | .09 |
| Gold Sovereign | .02 |
| Isabella | .09 |
| Jack Pot | .04½ |
| Jennie Sample | .02 |
| Lexington | ‡.08 |
| Moon Anchor | ‡.005 |
| Old Gold | .01½ |
| Mary McKinney | .52 |
| Pharmacist | .01 |
| Portland | .93 |
| Vindicator | .84 |
| Work | ‡.004 |

**SALT LAKE** July 15

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .06 |
| Black Jack | .08½ |
| Cedar Talisman | .00½ |
| Colorado Mining | .14 |
| Columbus Con. | ‡.07½ |
| Crown Point | .01½ |
| Daly-Judge | 6.30 |
| Grand Central | .50 |
| Iron Blossom | 1.32½ |
| Little Bell | ‡.10 |
| Lower Mammoth | .01½ |
| Mason Valley | 3.00 |
| May Day | .06 |
| Nevada Hills | .92 |
| New York | .00¼ |
| Prince Con. | .35 |
| Silver King Coal'n | 3.05 |
| Sioux Con. | .02½ |
| Uncle Sam | .02 |
| Yankee | .04 |

**TORONTO** July 15

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .07 | Foley O'Brien | .25 |
| Coniagas | 7.35 | Hollinger | 15.90 |
| T. & Hudson Bay | 68.00 | Imperial | .02 |
| Timiskaming | .33 | Jupiter | .34 |
| Wettlaufer-Lor. | .11 | Pearl Lake | .31 |
| Apex | .01 | Porcu. Gold | .10 |
| Crown Chartered | .00½ | Preston E. D. | .02 |
| Dobie | .25 | Rea | .12 |
| Dome | 15.25 | Swastika | .04 |
| Dome Exten. | .08 | West Dome | .15 |

**SAN FRANCISCO** July 15

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 6.10 |
| Belcher | .15 | Jim Butler | .75 |
| Best & Belcher | .05 | MacNamara | .15 |
| Caledonia | 1.47½ | Midway | .52 |
| Challenge Con. | .03 | Mont.-Tonopah | 1.05 |
| Chollar | .01 | North Star | 1.05 |
| Confidence | ‡.21 | West End Con. | 1.27½ |
| Con. Virginia | .13 | Atlanta | .15 |
| Crown Point | .25 | Booth | .02 |
| Gould & Curry | .03 | C.O.D. Con. | .02 |
| Hale & Norcross | .07 | Comb. Frac. | .03 |
| Mexican | .94 | Jumbo Extension | .10 |
| Occidental | .70 | Pitts.-Silver Peak | .45 |
| Ophir | .17 | Round Mountain | .60 |
| Overman | .54 | Silver Pick | .03 |
| Potosi | .01 | Tramp Con. | ‡.01 |
| Savage | .11 | Argonaut | ‡1.60 |
| Sierra Nevada | .12 | Bunker Hill | ‡1.90 |
| Union Con. | .10 | Central Eureka | ‡.10 |
| Yellow Jacket | .20 | So. Eureka | ‡2.00 |

**N. Y. EXCH.** July 15

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 64½ |
| Am. Agri. Chem. | 45 |
| Am.Sm.&Ref.,com | 60½ |
| Am.Sm.&Ref.,pf. | 98¾ |
| Am.Sm.Sec.,pf.B | 80 |
| Anaconda | 32½ |
| Batopilas Min. | 1⅜ |
| BethlehemSteelpf | 65½ |
| Chino | 34¼ |
| Federal M.&S.,pf. | 34 |
| GreatNor.,ore.,ctf. | 32 |
| Guggen. Exp. | 40½ |
| Homestake | 100 |
| Inspiration Con. | 14½ |
| Miami Copper | 21¼ |
| Nat'nalLead,com. | 45 |
| National Lead, pf. | 105½ |
| Nev. Consol. | 14½ |
| Phelps Dodge | 190 |
| Pittsburg Coal, pf. | 74½ |
| Quicksilver, pf. | 4⅛ |
| Ray Con. | 16¼ |
| RepublicI&S,com. | 19 |
| Republic I & S, pf. | 76⅝ |
| SlossSheffi'd com. | 22½ |
| Sloss Sheffield, pf. | 85 |
| Tennessee Copper | 28½ |
| Utah Copper | 42½ |
| U. S. Steel, com. | 53⅛ |
| U. S. Steel, pf. | 104⅝ |
| Va.Car Chem., pf. | 96 |

**N. Y. CURB** July 15

| Name of Comp. | Clg. |
|---|---|
| Barnes King | 1.45 |
| Beaver Con. | .31 |
| Big Four | .42 |
| Braden Copper | 6⅞ |
| B. C. Copper | 2⅜ |
| Buffalo Mines | 2¼ |
| Can. G. & S. | .22 |
| Con. Ariz. Sm. | 5/16 |
| Davis-Daly | 2 1/16 |
| Diam'field-Daisy | .02 |
| Ely Con. | .09¼ |
| Florence | .34 |
| Giroux | 1⅜ |
| Gold Hill Con. | ‡¼ |
| Goldfield Con. | 1¼ |
| Greene Cananea | 5⅞ |
| Greenwater | .06 |
| Internat. S. & R. | ‡109 |
| Kerr Lake | 3¼ |
| Keystone | ‡2 |
| La Rose | 2¼ |
| McKinley-Dar-Sa | 1 1/16 |
| Min. Co. of A. new | 2 5/16 |
| Motherlode Gold | ‡.40 |
| Nipissing Mines | 8⅜ |
| Ohio Copper | 9/16 |
| Pacific Sm. & M. | ½ |
| Puebla S. & R. | 2⅛ |
| South Live Oak | ‡2 |
| South Utah M.&S. | ¼ |
| Stand'd Oil of N.J. | 355 |
| Stewart | 1 9/16 |
| Tonopah | 4¼ |
| Tonopah Ex. | 2 7/16 |
| Tonopah Merger | .85 |
| Tri-Bullion | 1/8 |
| Tularosa | 5/16 |
| Union Mines | ⅛ |
| United Cop., pfd. | 1 |
| Yukon Gold | 2 1/16 |

**LONDON** July 3

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 14s 4½d |
| El Oro | 0 14 9 |
| Esperanza | 0 16 10½ |
| Mexico Mines | 5 7 6 |
| Oroville | 0 5 0 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 7½ |
| Tomboy | 1 5 0 |

**BOSTON EXCH.** July 15

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1⅛ |
| Ahmeek | 267 |
| Alaska Gold M. | 18 |
| Algomah | 1¼ |
| Allouez | 32½ |
| Am. Zinc | 19⅝ |
| Ariz. Com., ctfs. | 2⅝ |
| Bonanza | 32 |
| Boston & Corbin | 70 |
| Butte & Balak. | 1¼ |
| Calumet & Ariz. | 60 |
| Calumet & Hecla | 411 |
| Centennial | 11 |
| Cliff | 1½ |
| Copper Range | 39 |
| Daly West | ‡2⅛ |
| East Butte | 10½ |
| Franklin | 5 |
| Granby | 54 |
| Hancock | 15½ |
| Hedley Gold | 30 |
| Helvetia | .30 |
| Indiana | 4 |
| Island Cr'k, com | 45½ |
| Island Cr'k, pfd. | 80 |
| Isle Royale | 19 |
| Keweenaw | 1 |
| Lake | 8 |
| La Salle | 4 |
| Mass | 2½ |
| Michigan | 1 |
| Mohawk | 44 |
| New Arcadian | 1⅝ |
| New Idria Quick | ‡1⅞ |
| North Butte | 24¾ |
| North Lake | 1¾ |
| Ojibway | .69 |
| Old Dominion | 43½ |
| Osceola | 74 |
| Quincy | 57 |
| Shannon | 7 |
| Shattuck-Ariz. | 22½ |
| Superior | 25⅜ |
| Superior & Bost. | 2¼ |
| Tamarack | 28 |
| Trinity | 3½ |
| Tuolumne | 1 3/16 |
| U. S. Smelting | 35¾ |
| U. S. Smelt'g, pf | 46 |
| Utah Apex | 1⅞ |
| Utah Con. | 8¼ |
| Victoria | 95 |
| Winona | 1¼ |
| Wolverine | 44¼ |
| Wyandot | 65 |

**BOSTON CURB** July 15

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 3 |
| Boston Ely | 45 |
| Boswyocolo | ‡.01 |
| Butte Central | .10 |
| Cactus | .04 |
| Calaveras | 2 1/16 |
| Chief Cons. | 1⅜ |
| Corbin | .91 |
| Cortez | .10 |
| Crown Reserve | 3½ |
| Eagle & Blue Bell | 1 |
| First Nat. Cop. | 2 |
| Houghton Copper | 2½ |
| Majestic | .35 |
| Mexican Metals | .43 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 1¼ |
| New Baltic | 70 |
| Oneco | 85 |
| Raven Copper | .01½ |
| Rhode Island Coal | .02 |
| Smokey Dev. | 3/16 |
| S. W. Miami | ‡1½ |
| South Lake | 4 |
| Trethewey | .33 |
| United Verde Ext. | .58 |

‡Last quotation.

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# New Developments at Jerome, Arizona

*SYNOPSIS—Jerome has been regarded as a one-mine camp, but earnest efforts are now being made to develop other properties. The United Verde Extension has money guaranteed for exploration in depth, on promising showings. Other mines also being pushed.*

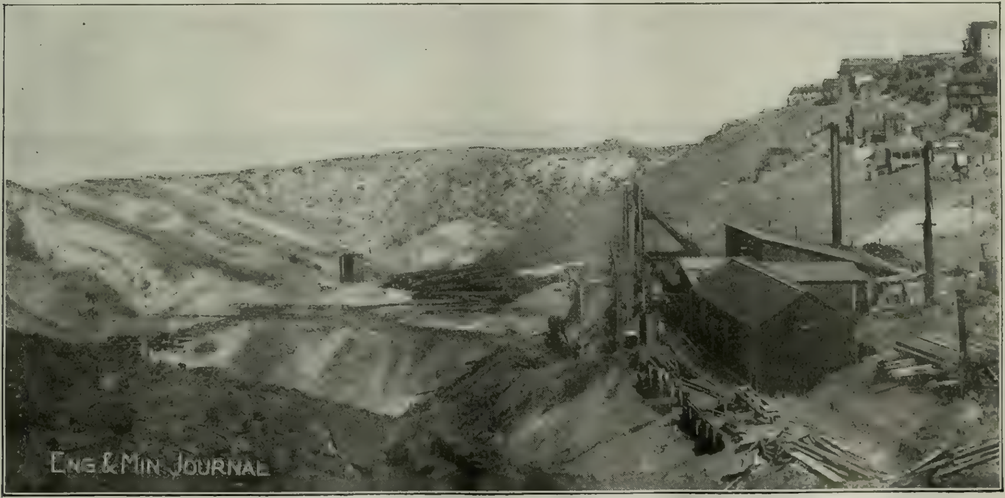
⁂

An era of earnest development is now in progress in the Jerome district and a number of properties are being prospected thoroughly at depth to determine whether commercial orebodies underlie the favorable showings in the oxidized zone. Many prospects in the district have disclosed oxidized ores in the upper portions of the property but the work was not carried to sufficient depth to find out if a sulphide zone of commercial size existed below the oxidized showings.

As a result of the stock-selling schemes inaugurated after the success of the United Verde, the lay public—and even the mining public—gradually ceased to be interested in Jerome, assuming that it was a one-mine camp. The work of the promoters' organizations, when the money was actually spent at the property, rarely went far enough to disclose whether commercial orebodies lay beneath the oxidized showings, and the work of the local people of the district has been hampered by lack of capital. Mining people, generally, held aloof and thus for over 20 years the camp, outside of the United Verde, has stood unproved and, in recent years, almost inactive. Only within the last year or so has this condition been changed. The entrance last winter of a group of successful mine operators of the Southwest with the announced intention of sinking to a depth of 1600 ft. or more, directed attention to the lack of deep exploration and its possibilities. Several other organizations are sinking steadily and it is hoped that their efforts will be justified by conditions at depth.

## The United Verde Extension

Prominent among the new developments in the camp is the work being done by the reorganized United Verde Extension Copper Co., which owns the Little Daisy fraction and four other claims immediately east of the United Verde. When the United Verde Extension company was reorganized last winter, James S. Douglas and George Tener, of Philadelphia, together with John C. Greenway, W. H. Gohring, Dr. L. D. Ricketts, George Kingdon, Maj. A. J. Pickerill, and other Southwest copper men, agreed to provide sufficient funds to explore the ground to a depth of 1600 ft. or approximately the dis-



United Verde Extension Property

(The new shaft will be in the low saddle at the left of the illustration.)

tance the formation is assumed to have been thrown by the big fault northeast of the United Verde main workings. The Extension company has optioned the adjoining property of the Jerome-Verde Copper Co., augmenting its holdings to about 600 acres. There are about 2000 ft. of workings on the Extension ground, about 800 ft. of which has been done by the new management. The shaft on the Little Daisy is down 800 ft., and the old drift has been continued to the southeast under Bitter Creek to prospect the fault-line conditions. A winze is being sunk by three shifts to reach a depth of 400 ft., where a crosscut will be driven to explore the quartz formation passed through in the upper workings. From the 800-ft. level, a branch of the drift has been driven easterly to intersect the low saddle on the Iron Carbonate claim, opposite the town of Jerome. If ground conditions are found satisfactory, a shaft will be sunk a distance of 1600 ft. or more, it being the intention to sink 1200 ft. before any crosscutting is done. The exploration already done in the Extension ground has disclosed the typical oxidized formation, occasionally copper stained, and while some ore might be taken out in places, no commercial quantities have yet been opened and no attempt is being made to develop oxidized ore, it being the intention of the management to sink with the idea of finding commercial sulphide ore. The leading officials are well satisfied with the present conditions at the Extension property, which is now assured of a thorough prospecting under competent direction. David Morgan is in immediate charge of the prospecting, and about 35 men are employed.

### Arkansas and Arizona

The Arkansas & Arizona Copper Co. has the most elaborate development operation in the district; it has been spending from $14,000 to $15,000 per month and is fortunate in having ample funds assured to prosecute its work to a depth of 2000 ft. The company has already done about 5000 ft. of work, having sunk a two-compartment shaft to 1100 ft., with long crosscuts intersecting the north-south fault at the 600- and 1100-ft. levels; to the west of the fault on the 1100 level, a winze has been sunk 300 ft. and a crosscut driven easterly to intersect the mineralized schist encountered above and to get under the line of the shaft at the 1400-ft. level. Here a station is being cut and a three-compartment shaft will be raised to the 1100-ft. level, from which point another compartment will be added to the present two-compartment shaft. The shaft will also be sunk to 1700 ft. at an early date, and later to 2000 feet.

The property comprises 14 claims lying to the north of the United Verde. The principal mineralization so far disclosed is in the schist along the north-south fault; this was found to be mineralized where cut on the 1100-ft. level and on the 1400 level it has widened to over 100 ft., of which about 85 ft. is mineralized with chalcopyrite. While some of this could be sorted and shipped, no general sampling has yet been made to determine the average content of the entire mineralized portion. A new Allis-Chalmers 18x36 in. double-drum corliss hoist was scheduled to be shipped to the property from Chicago on June 20; this hoist will have a capacity of 3000 tons in 24 hr. from a depth of 2000 ft.; three new 150-hp. return tubular boilers will supply steam for new hoisting and pumping equipment that will be installed during the next few months. A railroad, about a mile in length, is being surveyed to connect with the Verde Tunnel & Smelter Rd., which would thus give the company direct connection with the new smelting works at Clarkdale. The A. & A. company, as it is locally known, is backed by Little Rock and Memphis capital, and the property is managed by J. E. Leeper.

### Haynes Copper Co. Is Sinking

The Haynes Copper Co. owns 161 acres, northwest of the United Verde, and in former operations, a 700-ft. 2½-compartment shaft was sunk and about 2000 ft. of drifting and crosscutting was done following diamond-drill explorations. The property was closed in December, 1910, but was reopened in November, 1912, by a new management representing the leading stockholders. The company plans to sink the shaft to 1200 ft. and then to crosscut northeast and southwest to explore at that depth the showings encountered above. The shaft has been unwatered and is being sunk by three shifts about 70 ft. per month. It was 886 ft. deep on June 18. The property is equipped with an Ottumwa double-drum geared hoist, Erie City boilers, and a two-stage Ingersoll-Rand compressor supplying 700 cu. ft. of air per minute at 90-lb. pressure to Rand drills. All water is pumped from the 700-ft. level by a Goulds triplex pump, a Cameron No. 7 sinker delivering to the Goulds pump the water coming into the shaft below the 700 level. About 25 men are employed at the property under the superintendence of Thomas E. Campbell.

### The Hull Properties

The Hull and Cleopatra Copper companies own an important area west of the town of Jerome and bordering the United Verde on the south and west. The control of these properties is held by ex-Mayor G. W. Hull, one of the pioneers of the district. Mr. Hull's individual claims together with the holdings of these two companies constitute one of the largest and most important areas in the Jerome district. The exploitation of the property on a large scale, however, has been held back by the inability to interest capital on the bases offered.

To develop these holdings, an adit has been driven from Deception Gulch for a distance of about 5000 ft.; a number of veins have been cut by this adit and on the Cleopatra, there is an open cut near the top of the mountain showing a good vein of carbonate ore with a sprinkling of chalcocite. Considerable amounts of sulphide and carbonate ores have been shipped from these properties to the Swansea and Humboldt smelting works and elsewhere, yet, comparatively speaking, the properties have had only a picayune development. The showings on the properties are probably the best in the district but there has been no development commensurate with these showings nor with the area represented. In the hands of a strong company, the property might be developed into an important shipping mine, but, instead, it has been operated in a small way for over 20 years without demonstrating the value of the property. It is now difficult to interest capital on a satisfactory working basis as the combined capitalization of the two companies is $20,000,000, none of which is in the treasury.

The Calumet & Jerome Copper Co. is a local organization controlling five claims to the south, near Senator Clark's North and South Venture. This company is proceeding slowly, working only two men in an adit now in 670 ft. At the top of the hill, the company originally sank a shaft 100 ft., encountering a schist containing chalcopyrite and pyrite; a crosscut was run for about 60 ft. in the schist and the adit is now being driven to tap the schist at a depth of 500 ft. George W. Avery is manager. Farther to the south, the Pittsburgh-Jerome Copper Co. has a number of men at work on its group of 21 claims. There are numerous other properties in the district on which assessment is annually done, that have favorable "showings" in the oxidized zone, but few of them have done enough work to determine whether the properties are valuable.

### Copper Chief Has Important Development

To the southeast in the Black Hills Range, but outside the Jerome district proper, the Copper Chief Mining Co. has developed several hundred thousand tons of ore that are reported to average about $10 in gold and silver, little copper being present in the oxidized ore; copper-bearing iron sulphides were encountered above the 280-ft. level, but not enough work has yet been done on the sulphides to determine whether there is a sufficient body of same to smelt the oxide ores. The oxidized orebody is wide, varying from 80 to over 100 feet.

The shaft on the property has been sunk to 400 ft., where connection has been made with an adit now being driven to tap the sulphides at greater depth. Above the 400 level, about 2500 ft. of work has been done practically all of which is in ore at the 100-, 160-, 220- and 280-ft. levels. Excepting the United Verde, the Copper Chief has more ore blocked out than any property in the Black Hills Range, but it is not in a position to utilize same until more sulphide ores have been developed. The oxidized ores are not rich enough to ship to any distant point, but there is a good wagon road to the property from the Verde Valley and the ores could readily be sent to the new Clarkdale works when it is completed.

The mine was examined a few months since by engineers representing the Guggenheims. The property adjoins Senator Clark's Iron King mine and was the subject of litigation for several years. It comprises 23 claims, of which 11 are patented, and is owned by the Hayden and Migeon estates of Torrington, Conn., Franklin Brooks, of Colorado Springs, Colo., and Arthur Hendey, of Prescott, Ariz. Two men are regularly employed at the property driving the 400-ft. adit to cut the sulphide ore at greater depth; this adit is now in about 900 ft. Resumption of work on a larger scale is now under consideration by the company.

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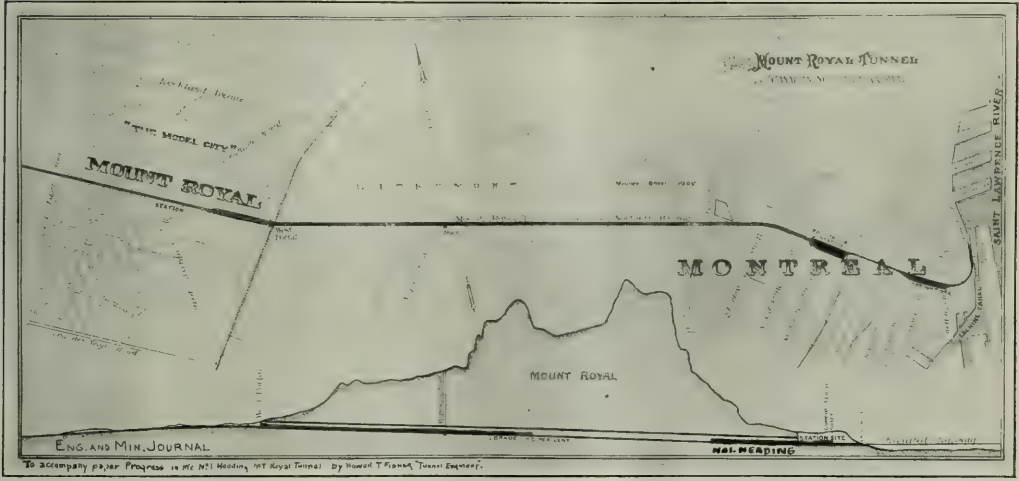
## Progress in the Mount Royal Railroad Tunnel

By Howell T. Fisher*

A double-track tunnel about 3¼ miles long through Mount Royal will bring the Canadian Northern Ry. into the main business section of the city of Montreal, where passenger and freight terminals will be built. It is being constructed by Mackenize, Mann & Co., Ltd., which also represents the Canadian Northern Ry. The progress in the No. 1 heading, which is under the superintendence of Edward Duffy, has been such that I believe a description of the organization and methods will be of interest.



Plan and Profile of Mount Royal Tunnel, Montreal

The speed at which a heading can be driven is often a controlling factor in estimating the time of completion of any project which includes a tunnel. The material penetrated should always be considered when a record for tunnel driving is stated in distance and time.

The No. 1 heading from the Dorchester Street shaft was started in September, 1912. It was driven slowly while in proximity to buildings and main thoroughfares and blasting was restricted in order to cause as little annoyance as possible to the public. At first the surface of the Trenton limestone rock was sometimes above and sometimes beneath the top of the heading. Near this surface the rock was in places found to be shaly and disintegrated and some timbering was necessary. As the tunnel advanced the distance from the top of the heading to the surface of the rock increased. Toward the end of April the heading had advanced so far under the mountain that shooting at night was allowed. The rock in the heading was a hard, dark-gray limestone.

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*Tunnel engineer, Mackenzie, Mann & Co., Ltd., 411 Dorchester St., Montreal, Que.

Many dikes were encountered, which are cracks and fissures in the original limestone completely filled with an igneous rock which is even harder than the limestone and is known as camptonite, bostonite, etc. Whenever the drills were started in such rock there was a profusion of sparks. The rock from the heading is taken directly to a crushing plant, crushed and used for concrete. It was during the 31 consecutive working days from May 1 that the progress shown on the table was made.

The accompanying incomplete table, obtained from printed records, gives some idea of what has been accomplished and will facilitate a comparison and estimation of the value of the methods in force at the Mount Royal tunnel:

RECORDS OF WELL KNOWN TUNNELS

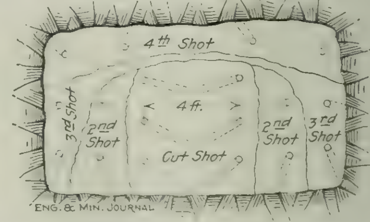
| Tunnel | Size of Heading | Distance, ft | Time | Material | Drills |
|---|---|---|---|---|---|
| Arlberg | | 641 | 1 mo | Gneiss | Brandt |
| Simplon | 6.5x9.5 | 685 | 1 mo | Hornblende and Mica Schist | Brandt |
| Gunnison | 6x10.5 | 824 | 1 mo | Dry shale | Jeffrey coal augers |
| Loetschberg | 6.5x10 | 1013 | 1 mo | Triassic limestone | Meyer |
| Red Rock | 8.0x9.0 | 1061.6 | 1 mo | Sandstone | Coal augers hand drills |
| Laramie | 7.5x9.5 | 653 | 1 mo | Granite | Leyner |
| L C & N | 6.5x9.5 | 683 | 1 mo | Slate, shale, 4-in. coal seam | Ingersoll-Rand |
| Ariz copper | 8x8 | 799 | 31 days | Granite porphyry sufficiently hard to make good drilling | Ingersoll-Rand No. C 110 |
| Mt Royal | 8x12 | 810 | 31 days | Hard limestone and dikes of igneous rock. | Sullivan FF 12 water drill |

Every inch of the advance had to be blasted and every inch of drilling had to be done with compressed-air drills. The face of the heading was hard rock throughout. No thin seams of soft material assisted progress. The men worked in three eight-hour shifts from 4 p.m. until midnight, midnight until 8 a.m. and 8 a.m. until 4 p.m. When the men started their shift, the departing gang had fired their last shots, leaving the heading smoky, but smoke which was fast being diluted with the fresh air from the pipe which furnished air to the drills. From 20 to 30 cu.yd. of loose rock was ready to be handled by the muckers.

A regular routine was followed, beginning with an electrician putting up a string of lights upon wood thrust into drill holes. Drill runners and helpers scaled down the loose rock while muckers carried in the 4-in. air and 2-in. water hose and manifolds, placing them upon old drill steels thrust in holes in the side of the heading at about 5 ft. above grade. Pipe fitters connected the hose to the main air and water lines, and the muckers, after putting up the hose, pushed an empty car toward the muck pile. Four muckers then cleaned up the muck which had been blown out along the track, and three others transferred the material from the face, where the pile was high, back toward them.

After scaling was done the drill-runners cleaned a little muck back from the face where their horizontal cross bar was to be placed across the heading and, together with these helpers, the nipper and the barman, brought in the long bar, the drills and steel. The nipper and one helper then connected the air and water hose to the manifold. The hose was placed on bars thrust in the sides so that they were out of the way of the muckers while the drill runners, helpers and barman set up jacks and wedged the bar into position. A paint mark set from the engineer's line by the inspector showed center line and grade of tunnel. The bar was set with reference to these marks. The drill runners and helpers then fastened their machines on the bar, connected the air and water hoses to them, oiled them and started drilling. This preparation took between 30 and 50 minutes.

Drilling then continued until the proper depth of holes was attained. During the drilling time the muckers were continually at work shoveling into the cars. They shoveled from slick sheets and were able to handle all the muck by the time drilling was completed. The horizontal drill bar used was 11 ft. long, and the screw was usually extended about 6 in. further to the blocking. The heading was nominally 8x12 ft., and made about 3.5 cu.yd. per foot advanced. The average advance per shot was about 4½ ft., which gave 15.75 yd. of solid to handle at each advance. This would amount to about 27 cu.yd. of loose material per shift to be handled by the muckers in less than four hours. As during most of the time three muckers were passing the muck back from the face, the other four loaded most of it from the slick sheets into the cars, say, 6 yd. to a man or 12 yd. per man per shift. These sheets were placed by the muckers just previous to the blasting and were covered with some muck to weigh them down and prevent them from being blown backward.



Drilling Diagram of Mt. Royal Tunnel

When these were clean they were advanced and track laid. The storage-battery locomotive brought in two muck cars a trip, shunted them to the muckers as needed and pulled out the loaded ones. Drilling usually commenced about ¾ hr. after the blasting and continued about 2½ hr., while blasting took about ½ hour.

When once blocked up the horizontal bar was not moved. The drills were attached to short arms which gave sufficient radius for the drills to reach the position for drilling top or bottom holes. About 18 to 22 holes were drilled. The cut holes were usually about 7 ft. and the side holes about 6 ft. deep. When they were completed the drills were disconnected from the bar, the hoses were carried back by drill runners and helpers, steel was carried out by the nipper and manifolds by the muckers, empty cars were loaded with hammers, bars, shovels and other tools, and drawn out of the blasting range. Oil torches were lighted, powder was brought in, the cut-holes were loaded, the wire was connected. The pipe fitter opened the compressed-air valve and when everybody was out of range the signal was given to fire. After this the various side rounds were fired. The holes were drilled and shot about as shown by the accompanying diagram. "FF12" Sullivan water drills were used The steel used was Fjab and was very satisfactory. About 500 steels were dulled each day.

A bonus of 7% of their daily pay for every foot of advance over 14 ft. per day was paid to the men. This and friendly rivalry tended to make the men eager to secure good advances. They would not tolerate a poor worker in their midst. The distances driven in 31 consecutive working days at the Loetschberg, the Red Rock, and the Gunnison tunnels have been greater than the distance driven in the same time at the Mount Royal tunnel. The record of the Arizona Copper Co.'s tunnel approaches it closely. The Triassic Limestone at the Loetschberg was ideal for making distance. In both the Red Rock and Gunnison coal augers were used as the rock was soft. In the Arizona Copper Co.'s tunnel the material is officially described as "granite porphyry sufficiently hard to make good drilling." To make the distance in the materials through which these tunnels were driven it required hard work with good drills and good methods.

DAILY REPORT, MAY 6, 1913, ON MT. ROYAL TUNNEL

| | 4 p.m. to 12 Night | | 12 night to 8 a.m. | | 8 a.m. to 4 p.m. | | Total 24 hr. |
|---|---|---|---|---|---|---|---|
| Heading boss | 1 | | 1 | | 1 | | 3 |
| Muck boss | 1 | | 1 | | 1 | | 3 |
| Drill runners | 4 | | 4 | | 4 | | 12 |
| Drill helpers | 4 | | 4 | | 4 | | 12 |
| Jap driller | 1 | | 1 | | 1 | | 3 |
| Bar-man | 1 | | 1 | | 1 | | 3 |
| Nipper | 1 | | 1 | | 1 | | 3 |
| Muckers | 7 | | 7 | | 7 | | 21 |
| Car wranglers | 1 | | 1 | | 1 | | 3 |
| Electricians | 1 | | 1 | | 1 | | 3 |
| Pipe-fitters | $\frac{2}{3}$ | | $\frac{2}{3}$ | | $\frac{2}{3}$ | | 2 |
| Drill repairer | $\frac{2}{3}$ | | $\frac{2}{3}$ | | $\frac{2}{3}$ | | 2 |
| Dinkey skinner | 2 | | 2 | | 2 | | 6 |
| Brakemen | 2 | | 2 | | 2 | | 6 |
| Wranglers at shaft | 1 | | 1 | | 1 | | 3 |
| Signalmen | 1 | | 1 | | 1 | | 3 |
| Powder monkey | 1 | | 1 | | 1 | | 3 |
| Rounds | 1 | 2 | 1 | 2 | 1 | 2 | |
| Sticks of powder, 60% | 155 | 154 | 125 | 104 | 129 | 96 | 763 |
| Caps, 30 grains | 23 | 22 | 20 | 22 | 32 | 22 | 141 |
| No. of holes | 20 | 22 | 19 | 20 | 20 | 19 | 120 |
| Total feet drilled | 120 | 132 | 114 | 120 | 120 | 114 | 720 |
| Hours actually drilling | 2 : 00 | 2 : 10 | 2 : 15 | 2 : 00 | 2 : 30 | 2 : 10 | 13 : 05 |
| Cars dumped | 20 | 20 | 20 | 21 | 17 | 16 | 114 |
| Advance | 4.4 | 5.0 | 5.3 | 4.1 | 4.9 | 5.0 | 28.7 |

Remarks: During 12-8 shift 1 extra helper; during 8-4 shift 1 extra runner and 1 extra helper.

The appended copy of the daily report for Tuesday, May 6, 1913, is a typical one and shows the force employed. It does not include the time given by the two walking bosses, the superintendent, or the general staff.

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## The Cement Business

According to the *Journal of Commerce,* hesitancy in the undertaking of constructive enterprises on a large scale is making itself felt in the portland-cement industry. The total production of cement mills in the United States in June fell 2% behind that of June, 1912, and on July 1 less than 60% of the cement kilns in the country were in operation.

Owing to the accumulation of orders earlier in the spring shipments for the month continued large, approximating 8,000,000 bbl., about the same as a year ago and about 1,000,000 bbl. in excess of the output. The surplus stocks at mills on July 1 totaled 10,000,000 bbl., an increase of 6% over last year.

The significance of the cut in production may be better realized from the fact that for the first six months of the year the production of 39,000,000 bbl. was nearly 25% ahead of last year, while shipments were 14% larger than the first half of 1912. Surplus stocks increased nearly 3,000,000 bbl. in the half year.

The Lehigh district, which turns out about one-third of the cement in the United States, appears to be following the trend of orders more closely than a few years ago, when market conditions were so chaotic. Production in this district in June fell 10% per cent. below last year, while shipments increased 3%. Seventy-five per cent. of the Lehigh kilns were active on July 1, but the surplus stocks at mills on that date, amounting to 3,000,000 bbl., were only 4% larger than last year, compared with a 6% increase for the entire country.

Producers in the Lehigh district have evidently learned a lesson from the disastrous experiences of recent years and are taking steps to prevent market demoralization by reducing their output. Prices are being fairly well maintained as a result of this policy.

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## Condition of Rhodesian Mining

The annual report of the British South Africa Co. contains material of interest to the mining industry. The report covers the year ended Mar. 31, 1912, but the metal production for the calendar year of 1912 is also given. The principal items of production are: $13,157,813 worth of gold; 176,532 oz. of silver; 216,140 tons of coal; and 69,260 tons of chrome iron ore. The tabular representation of Rhodesia's gold production shows rapid annual increases from 1898 to 1908 and comparatively small increases from that point onward.

It has been the consistent policy of the companies to increase their ore reserves for the purpose of creating greater stability in the industry and providing material to maintain output for several years in advance. The reserves of the important mines, as given by the Rhodesia Chamber of Mines, were something over 6,000,000 tons, valued at about $65,000,000. The year 1911 witnessed an appreciable falling off in the number of small workers and tributors in the gold-mining industry. At the end of the period covered by the report, however, there was an increase in the number of these operators, which was gratifying as indicating a tendency on their part to work their properties rather than to attempt to sell them or dispose of them under option. The principle of helping these small workers by technical advice furnished by engineers of the British-South Africa Co. was revived and it is further suggested that if financial assistance be extended to such men when needed and justifiable, substantial advantages may be gained.

Rhodesia, like Australasia and our Rocky Mountain States, seems to be in need of more energetic prospecting. It is hoped and expected that the geological survey will aid in opening up the new districts for prospecting. The activities of the survey have been largely directed toward mapping and some assistance was rendered to the tin prospectors. There was a small increase in the number of native laborers employed in the mines, due largely to the fact that the recruiting bureau was reorganized. New regulations governing the health and treatment of native laborers were put in force, and a rigid system of inspection is practiced.

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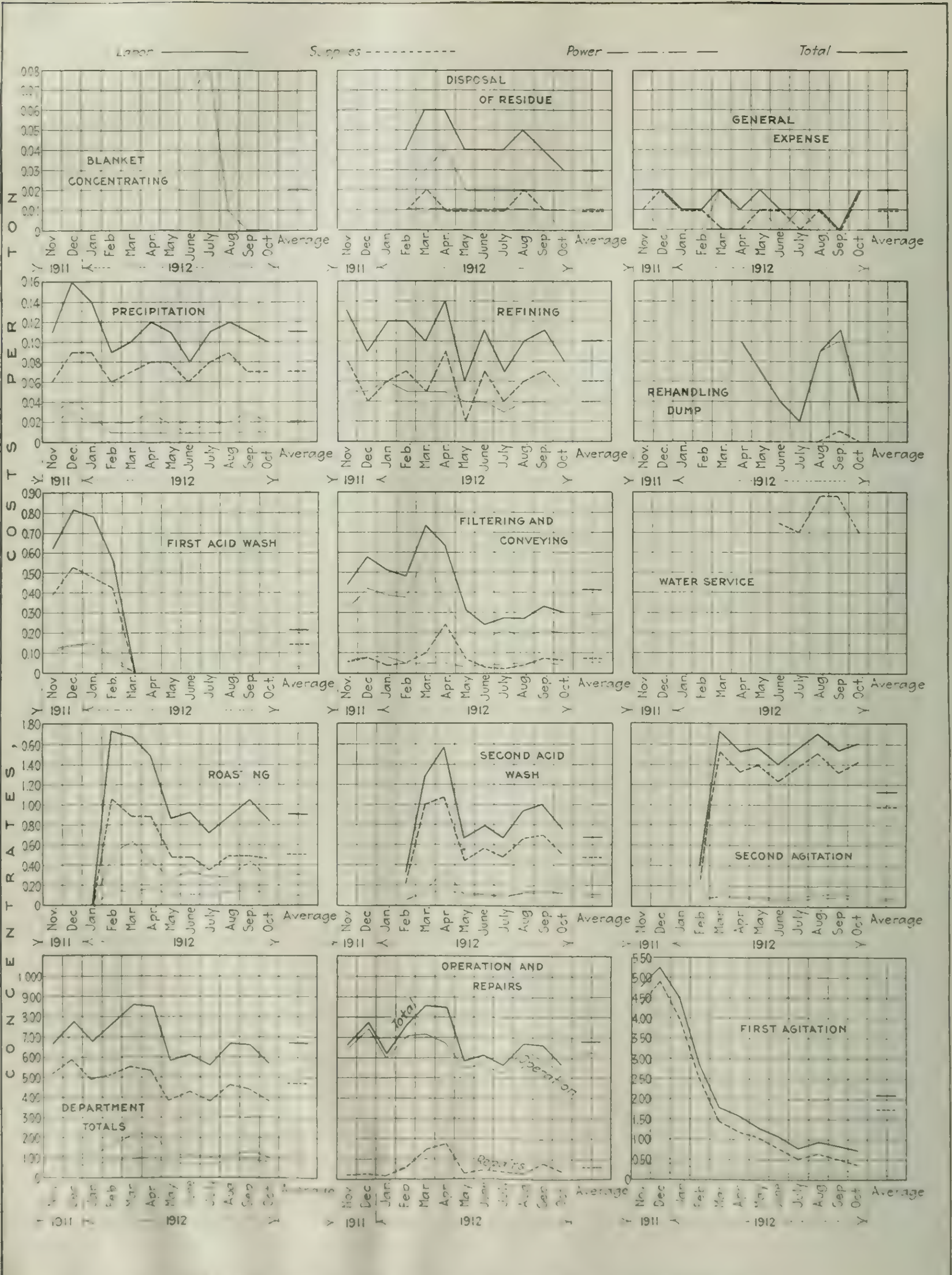
**The Poro Nickel Mine, New Caledonia, Was Sold** on Apr. 29, 1913, at public auction for 150,000 fr., after spirited bidding by la Société le Nickel, and la Société des Hauts Fourneaux, says "Echo des Mines." This property, on which an upset price of 25,000 fr. had been set, covers 1214 hectares in the midst of the charms of the rival companies.



CONCENTRATES PLANT OF THE GOLDFIELD

ENG. & M. J. JOURNAL

## Regulation of Well Drilling through Coal

An outline of regulations proposed to govern the drilling of oil and gas wells which may penetrate workable coal strata, was drawn up by a committee, composed of representatives from the coal interests, natural-gas interests, petroleum interests, state geologists, state mine inspectors and the Bureau of Mines.

The code of regulations as published (Bureau of Mines Technical Paper 53, Petroleum Technology 12), is intended to obtain accurate location and record of wells which are to be drilled; coöperation of the well and the coal interests; the casing of wells penetrating coal seams or open workings in coal mines, so that gas may not leak from the well into the workings; the plugging of abandoned wells so as to prevent the entrance of gas into mines, and the entrance of water into gas and oil sands; and a system of inspection to control the drilling and the plugging of all such wells.

It is provided that where the well passes through a coal seam or a mine working that an extra casing shall be inserted surrounding the true well casing for at least 30 ft. above and 30 ft. below the coal bed, and the space between filled with puddled clay or cement. This is intended to prevent the entrance of gas into the mine and at the same time shut out water from the oil and gas sands; to allow a vent to the atmosphere; to retard corrosion of the inner casing, and to prevent the intermingling of various waters from different horizons.

It is further provided that when wells are abandoned, they shall be filled tightly from top to bottom. The bottom of the hole is to be filled with a compact material up to a hard stratum below the lowest oil- and gas-sand and then plugged with three wooden plugs, each of which shall be at least 3 ft. long and driven into place. Above the third plug must be placed 10 ft. of tamped clay. Below the seat of every string of casing a similar plug is to be driven and all spaces between the plugs must be solidly filled with compact material, such as rock sediment, sand or clay. This method, while expensive, allows no pocket for the storage of gas under pressure which might break through into mine workings; shuts out gas, oil and water from the coal beds; prevents intermingling of gas and oil; and is tight enough to resist heavy pressure.

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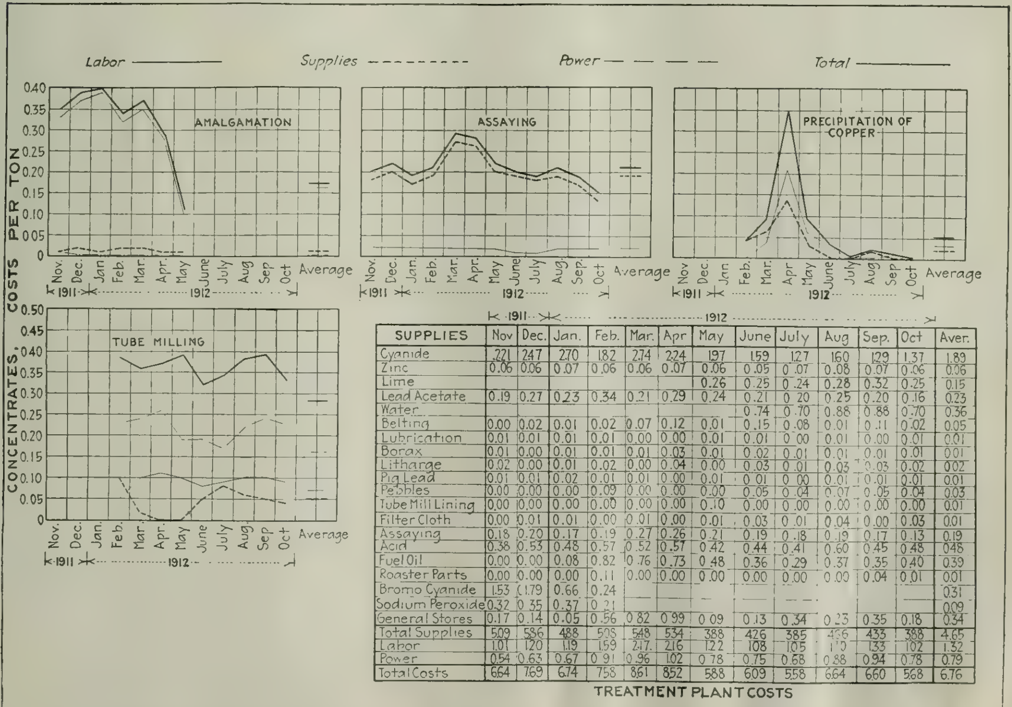
## Goldfield Consolidated Cost Curves

Concentrate-treatment costs at the Goldfield Consolidated Milling & Transportation Co., Nevada, are shown in diagram on these pages. Similar information plying to mill operations was given in the issue of July 19, 1913, p. 124. The facts embraced in these diagrams is of decided value to the metallurgical profession, presenting, as they do, an actual record of work done by competent operators at a famous property. Favorable costs over short periods are easily shown, but are not always to be depended upon. Annual company reports, while usually reliable, are seldom in sufficient detail to be valuable to the technical man. These Goldfield facts are both; an epitome of successful practice.



| SUPPLIES | Nov | Dec. | Jan. | Feb. | Mar. | Apr | May | June | July | Aug | Sep. | Oct | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyanide | 2.21 | 2.47 | 2.70 | 1.82 | 2.74 | 2.24 | 1.97 | 1.59 | 1.27 | 1.60 | 1.29 | 1.37 | 1.89 |
| Zinc | 0.06 | 0.06 | 0.07 | 0.06 | 0.06 | 0.07 | 0.06 | 0.05 | 0.07 | 0.08 | 0.07 | 0.06 | 0.06 |
| Lime | | | | | | | 0.26 | 0.25 | 0.24 | 0.28 | 0.32 | 0.25 | 0.15 |
| Lead Acetate | 0.19 | 0.27 | 0.23 | 0.34 | 0.21 | 0.29 | 0.24 | 0.21 | 0.20 | 0.25 | 0.20 | 0.16 | 0.23 |
| Water | | | | | | | | 0.74 | 0.70 | 0.88 | 0.88 | 0.70 | 0.36 |
| Belting | 0.00 | 0.02 | 0.01 | 0.02 | 0.07 | 0.12 | 0.01 | 0.15 | 0.08 | 0.01 | 0.11 | 0.02 | 0.05 |
| Lubrication | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 |
| Borax | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.03 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Litharge | 0.02 | 0.00 | 0.01 | 0.02 | 0.00 | 0.04 | 0.00 | 0.03 | 0.01 | 0.03 | 0.03 | 0.02 | 0.02 |
| Pig Lead | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 |
| Pebbles | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.05 | 0.04 | 0.07 | 0.05 | 0.04 | 0.03 |
| Tube Mill Lining | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Filter Cloth | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.03 | 0.01 | 0.04 | 0.00 | 0.03 | 0.01 |
| Assaying | 0.18 | 0.20 | 0.17 | 0.19 | 0.27 | 0.26 | 0.21 | 0.19 | 0.18 | 0.19 | 0.17 | 0.13 | 0.19 |
| Acid | 0.38 | 0.53 | 0.48 | 0.57 | 0.52 | 0.57 | 0.42 | 0.44 | 0.41 | 0.60 | 0.45 | 0.48 | 0.48 |
| Fuel Oil | 0.00 | 0.00 | 0.08 | 0.82 | 0.76 | 0.73 | 0.48 | 0.36 | 0.29 | 0.37 | 0.35 | 0.40 | 0.39 |
| Roaster Parts | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.01 |
| Bromo Cyanide | 1.53 | 1.79 | 0.66 | 0.24 | | | | | | | | | 0.31 |
| Sodium Peroxide | 0.32 | 0.35 | 0.37 | 0.21 | | | | | | | | | 0.09 |
| General Stores | 0.17 | 0.14 | 0.05 | 0.56 | 0.82 | 0.99 | 0.09 | 0.13 | 0.34 | 0.23 | 0.35 | 0.18 | 0.34 |
| Total Supplies | 5.09 | 5.86 | 4.88 | 5.08 | 5.48 | 5.34 | 3.88 | 4.26 | 3.85 | 4.66 | 4.33 | 3.88 | 4.65 |
| Labor | 1.01 | 1.20 | 1.19 | 1.59 | 2.17 | 2.16 | 1.22 | 1.08 | 1.05 | 1.10 | 1.33 | 1.02 | 1.32 |
| Power | 0.54 | 0.63 | 0.67 | 0.91 | 0.96 | 1.02 | 0.78 | 0.75 | 0.68 | 0.88 | 0.94 | 0.78 | 0.79 |
| Total Costs | 6.64 | 7.69 | 6.74 | 7.58 | 8.61 | 8.52 | 5.88 | 6.09 | 5.58 | 6.64 | 6.60 | 5.68 | 6.76 |

TREATMENT PLANT COSTS

CONSOLIDATED MILLING & TRANSPORTATION CO.

ENG & MIN. JOURNAL

## Depreciation Charges on Mines

WASHINGTON CORRESPONDENCE

Among the important changes made by the Senate Committee on Finance with reference to the deductions to be made in computing and reporting income for taxation in the new tariff bill, a report on which was made by the committee during the past week (July 11), is a deduction permitted from income on mining property which is as follows: ". . . . a reasonable allowance for the exhaustion, wear and tear of property arising out of its use or employment in the business, not to exceed, in the case of mines, 5% of the gross value at the mine of the output for the year for which the computation is made; provided, that no deduction shall be allowed for any amount paid out for new buildings, permanent improvements, or betterments, made to increase the value of any property or estate."

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## The Rand's Ore Reserves

BY A. COOPER KEY*

The table presented herewith shows the quantities of ore in reserve at the principal Rand mines, at the end of 1912, or the latest date to which the estimates apply, as well as at the end of 1911. It is noticeable that many companies have changed the basis of estimate, the figures being now in mining tons instead of milling tons, the former standard. This has been decided upon, owing to the variability in amount of sorting or discarding of waste rock, which it is possible to perform. With an ample supply of labor, it is feasible to break ore in proportion to the quantity it is possible to mill and to sort this so as to send only fairly clean ore to be crushed; but if labor be short, it is difficult to keep the mills fully supplied, and there is a natural tendency not to be so particular as to the nature of the rock crushed.

The three great consolidations have enormous reserves of ore, for instance, it may be calculated that the Crown Mines has over £15,000,000 developed, the Randfontein Central something like £10,000,000, and the East Rand Proprietary roughly, £8,500,000. The Randfontein Central was able to add nearly 1,000,000 tons to its reserves last year, and the Crown Mines, half that quantity; the East Rand Proprietary, however, enroached on its reserves to the extent of 700,000 tons.

On the far East Rand, the Brakpan increased its reserve by over 500,000 tons, the value being maintained, while the New Modder not only augmented its aggregate by an even greater quantity, but increased the value of its entire 4,000,000 tons by ½ dwt., a most remarkable result. The Van Ryn Deep, which is shortly to commence crushing, had at the end of March increased its total to 1,500,000 tons, with a mine value of 7.6 dwt. The Consolidated Langlaagte accomplished an enormous amount of development last year, preparatory to starting the new battery to deal with rock from the sunken section, and the Village Deep records an increase both in total and in value.

The engineer of the Barnato group explicitly states the value of the reserves in terms of recovery and in the case of the Van Ryn Deep besides the mine value (as shown in the table) gives the estimated recovery. This value is also shown in the case of mines of the Goerz group, and this plan is certainly of advantage to shareholders.

CHANGES IN ORE RESERVES OF RAND COMPANIES ENGAGED IN CRUSHING

| | December, 1911 | | | December, 1912 or Latest Date | | |
|---|---|---|---|---|---|---|
| | Tons | Dwt | Inches | Tons | Dwt | Inches |
| Aurora West | 315,600 | 5.85 | 36 | 556,162 | 5.1 | 43 |
| Bantjes Cons. | 772,201 | 7.3 | | 840,800 | 7.0 | 41 |
| (pillars) | 123,886 | 7.6 | | | | |
| Brakpan | 1,925,346 | 6.73 | 58 | 2,457,000 | 6.74 | 61 |
| Cinderella Cons. | 740,157 | 6.73 | | 573,000 | 6.7 | 46 |
| partial | | | | 304,000 | | |
| City Deep | 1,941,883 | 8.1 | | 1,914,540 | 8.7 | 58 |
| | 136,992 | 8.2 | | 209,110 | 8.6 | .. |
| City & Suburban | 789,000 | 7.6 | 51 | 773,300 | 8.4 | 55 |
| Consolidated Langlaagte | 397,017 | a5.9 | | 2,069,630 | a6.4 | .. |
| deep level | 1,222,630 | a6.9 | | | | |
| Consolidated Main Reef | 516,890 | 6.7 | .. | 610,680 | 7.2 | .. |
| Crown Mines | 10,124,072 | 7.25 | | 10,607,670 | 7.1 | 62 |
| Durban Roodepoort | 1,018,140 | | | | .... | .. |
| Durban Roodepoort Deep | 965,650 | 6.6 | .. | 965,300 | 6.7 | .. |
| (pillars, etc.) | 322,421 | 7.2 | .. | 340,800 | 7.3 | 52 |
| East Rand Prop. | 6,716,605 | 6.9 | 55 | 6,013,000 | 6.8 | 54 |
| Ferreira Deep | 1,837,808 | 9.7 | 64 | 2,070,900 | 9.4 | 61 |
| Geduld Proprietary | 607,300 | 8.18 | 44 | c1,475,000 | 6.98 | 53 |
| indicated | 190,500 | 9.08 | 42 | 116,000 | 5.79 | 53 |
| Geldenhuis Deep | 2,262,840 | 6.2 | | 1,904,700 | 6.3 | 49 |
| Ginsberg | 367,646 | a6.8 | | 346,681 | a6.9 | .. |
| Glencairn | 925,000 | a3.5 | | 761,000 | a3.5 | .. |
| Jupiter | 1,089,000 | 5.74 | | 1,270,000 | b4.4 | .. |
| | | | | 101,000 | 4.0 | .. |
| Knight Central | 644,300 | 6.60 | 62 | 647,000 | 6.1 | . |
| Knights Deep | 1,650,000 | 5.2 | .. | 1,477,414 | 4.47 | |
| Lancaster West | 472,700 | 6.65 | .. | 335,500 | 6.1 | 39.5 |
| Langlaagte Estate | 1,281,307 | | .. | 1,370,639 | | |
| Luipaard's Vlei Estate | 432,000 | 5.2 | . | 500,471 | 5.7 | |
| partial | 142,000 | 5.3 | .. | . | | |
| Main Reef West | 627,260 | 7.0 | 55 | 685,720 | 6.3 | |
| May Consolidated | 212,707 | | .. | 133,000 | 6.64 | 52 |
| pillars | | | | 25,000 | 8.49 | 53 |
| Meyer & Charlton | 347,000 | 9.09 | .. | 341,735 | 12.0 | |
| Modder B. | 2,355,700 | 7.5 | 51 | 2,594,000 | 7.2 | 54 |
| New Goch | 962,600 | 5.06 | 63 | 957,600 | 5.1 | 89 |
| New Heriot | 569,716 | 8.4 | 46 | 590,742 | 8.1 | 46 |
| New Kleinfontein | 1,146,531 | 7.49 | 44 | 1,190,663 | 7.59 | 46 |
| New Modderfontein | 3,341,830 | 7.6 | 56 | 3,900,000 | 8.1 | 59 |
| New Primrose | 422,311 | a6.7 | | 413,033 | a6.5 | |
| New Rietfontein | 361,484 | a6.1 | .. | 135,887 | a6.5 | |
| | | | | 130,107 | ... | |
| New Unified | 288,343 | a6.73 | .. | 275,028 | a6.4 | |
| Nourse Mines | 2,050,000 | 6.6 | .. | 1,969,000 | 6.6 | |
| Princess Estate | 656,500 | 7.26 | 27.4 | 637,000 | 7.24 | 27.7 |
| Randfontein Central | 6,637,271 | 6.63 | .. | 7,600,000 | 6.2 | |
| Robinson | 1,526,661 | 11.4 | 73 | 1,130,600 | 11 | 75 |
| | | | | c242,500 | | |
| Robinson Main Reef | 1,307,000 | 4.2 | | 1,160,800 | 4.3 | |
| Robinson Deep | 1,140,000 | 7.2 | | 1,114,000 | 6.7 | |
| Roodepoort United | 448,800 | 5.49 | 42 | c379,283 | 5.08 | 41 |
| partial | | | | 100,000 | 6.34 | 38 |
| Rose Deep | 3,670,160 | 6.0 | 57 | 3,695,100 | 6.1 | 56 |
| Simmer & Jack | ...... | .... | .. | 2,680,000 | 6.2 | .... |
| partial | | | | 438,000 | 5.3 | |
| Simmer Deep | 1,312,000 | 4.9 | .. | 1,430,693 | b4.2 | |
| partial | | | .. | 144,296 | 4.08 | |
| Van Ryn | 1,655,910 | 6.4 | .. | e2,064,500 | 6.42 | |
| partial | 86,872 | 5.76 | | 89,365 | 5.24 | |
| Village Deep | 2,159,792 | 6.1 | .. | 2,235 300 | 6.9 | 52 |
| Village Main Reef | 1,775,175 | 9.2 | | 1,418,754 | 8.8 | |
| West Rand Cons. | 1,003,000 | 5.25 | 49 | c1,116,733 | 6.02 | 49 |
| partial | 118,000 | 5.25 | 49 | 326,500 | | |
| Witwatersrand | 1,225,084 | a6.65 | | 1,331,540 | a6.1 | |
| Witwatersrand Deep | 1,136,000 | 6.79 | 49 | 1,492,257 | 6.83 | 50 |
| Wolhuter | 808,800 | 6.45 | 52 | 832,977 | 6.48 | 50 |
| ORE RESERVES OF DEVELOPING MINES | | | | | | |
| Mexico | 258,060 | 6.5 | 54 | 496,438 | 6.18 | 59 |
| Rand Collieries | 374,200 | 5.4 | 12 | | | |
| Van Ryn Deep | 603,716 | 7.2 | .. | 1,278,003 | 7.1 | 51 |

Partial means partially developed or probable ore.
a Estimated recovery value.
b Mine grade.
c Mining tons instead of milling tons in 1911.
d Old workings, stope and shaft pillars.
e As at June 30, 1912.

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*Editor, South African Mining Review, Johannesburg, South Africa.

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## Variation in Hoist Design

In the JOURNAL of July 5, p. 2, an article entitled "Variation of Hoist Design" mentioned one of the three large hoists of the Newport Mining Co. as being a simple, slide-valve engine. The hoist, as a matter of fact, is of the corliss type and the assumption that it was of the slide-valve type was unwarranted on our part. The Nordberg company builds only corliss engines for hoisting purposes and does not care to be accused of going back to the dark ages by manufacturing slide-valve hoists.

# What Has Been the Fume Damage in California?

By L. H. Eddy

*SYNOPSIS—All smelting plants but one moved from Shasta County or closed. No such damage to crops as claimed. Present agitation unjustifiable. Decline in precious-metal production followed closing of smelting plants. State-created commission expected to settle difficulties.*

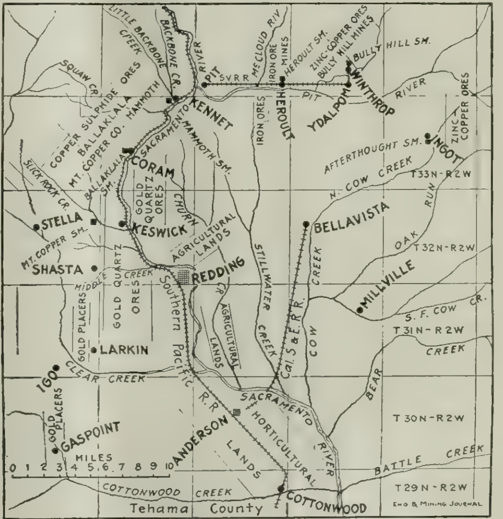
The present situation and recent history of copper and gold mining and smelting in relation to the farming interests in Shasta County, Calif., are greatly misunderstood, as the entire matter has been grossly misrepresented. Development in agriculture and horticulture has been not only contemporaneous with, but dependent upon the development and operation of copper and gold mines. Likewise the development of a large proportion of the gold mines has depended entirely upon the operation of copper mines and the establishment of smelting works in the county. This statement is based on personal knowledge and investigation. My first visit to Shasta County was in 1899, when the Mountain Copper Co., Ltd., was operating the plant at Keswick and mining copper ores at Iron Mountain, employing 1200 men at mine and reduction works.

### Keswick Plant Removed in 1906

The Keswick plant was established in 1895 and was closed down permanently in 1906 on account of complaints made by the farmers and the Department of the Interior that the fumes from the open-air roasting were destroying trees, crops and other vegetation. The company now operates at Martinez, on San Francisco bay, shipping ores from Iron Mountain by rail. In the period named there was comparatively little farming in the county, on a commercial scale. In the earlier years of this smelting operation farmers hauled firewood to Redding and sold it at $3 per cord and returned with baled hay purchased at Redding. In recent years the farmers have been busy farming, the price of wood is $6 per cord, and there is no demand for baled hay, as the farmers grow their own.

The Bully Hill works began operation in 1901, the Mammoth in 1905, the Afterthought in 1905, the Balaklala in 1907. The Bully Hill was closed down by the Forest Reserve in 1910 and has since been experimenting with methods for the recovery of zinc from the Bully Hill ores and treating copper and gold as byproducts. The Afterthought had operated only nine months, closing down on account of the presence of zinc in the ores. Experiments are being made at this plant also for the recovery of zinc and the treatment of copper and gold as byproducts. This plant did not smelt long enough to give the Forest Reserve or the farmers much chance to complain. Neither this nor the Bully Hill plant is situated in agricultural or valuable forest districts.

The complaints of the farmers were so insistent, following the closing of the Keswick, Bully Hill and Afterthought, and the effort was so strong to compel the Mammoth and the Balaklala to close down permanently, that the Mammoth installed a baghouse which went into commission July 6, 1910 and the Balaklala closed temporarily in July, 1911, and is still out of commission. The capacity of the Mammoth plant was reduced from 1500 to 1000 tons of ore per 24 hr., and the number of employees from 1200 to 800. About 800 tons of the ore now treated is sulphide extracted from the Mammoth mines, and about 200 tons is obtained chiefly from the gold mines in the vicinity. Notwithstanding the Mammoth has satisfactorily reduced the fume to a minimum, the farmers have continued their complaints. In April another effort was made to secure unity of action in the Farmers Protective Association and bring legal action against the Mammoth; but failing in that they petitioned the supervisors of the country for an appropriation of money to aid them in the prosecution. The board of supervisors declined to make the appropriation, on the ground that the farmers had not proved that their crops were being damaged. Failing in this they appealed to the grand jury, composed solely of farmers, which early in May reported to the Superior Court and recommended that the district attorney bring suit against the Mammoth Copper Co. on a charge of maintaining a nuisance, and based their recommendation on a purported examination of county hospital lands which they declared in the report had been damaged and the crops ruined by fume.



Mining Map of Shasta County, Calif.

### No Damage Visible on County Farm

I visited Shasta County in the latter part of May, making a 60-mile trip through what is known as the "smoke belt," and interviewed a number of farmers, some of whom were members of the farmers' association. I visited the county hospital lands and saw growing oats, potatoes, alfalfa, fruit and flowers equal to any in the county and excelling some in other sections. The fact is that neither the land nor the crops at the county hospital had been damaged in the slightest degree and besides the visible evidence I was credibly informed that there was absolutely no damage done at the time the members of the grand jury made their visit. Owing to the long hot and dry spell there was some discoloration at the points of blades or leaves of the oat stocks, which is common in any farming section during a hot and dry period. There was absolutely no damage done to these crops from any cause, nor to any of the crops in all the farming sections in the vicinity of Anderson, Cottonwood, Happy Valley, Churn Creek and Balls Ferry. These sections are south of Redding and distant from the Mammoth smeltery 20 to 30 miles.

I also visited the hay ranches north of Redding and saw the heaviest crops of alfalfa that I have seen in the state during the present season, in travel that included eight other farming counties. I interviewed farmers and others interested in farming indirectly, particularly as to any damage that may have been done by fume in the past two or three years. All of them admitted that whatever damage had been done in that period was of slight consequence, and none of them could point to any ill effect from fume upon his crops in the present season. The evidence was plain that the present crops over the entire county will exceed all other years, and it is of record that 1912 was the best year up to that period and that 1911 was a great improvement on former years.

It is conceded that in the years the Mountain Copper Co.'s works was operated and in the years when the Bully Hill, Mammoth and Balaklala were simultaneously operating, and before the Balaklala had adopted the Cottrell system and the Mammoth had installed the baghouse, there was some damage done to some of the crops by fume; but this damage was not of an extent that should have caused the closing down of the smelting plants, and it would have been willingly paid for had the farmers been reasonable in their demands. A great deal of the so called fume damage was the result of frost or of hot north winds; but it made no difference to the farmers what the cause might be, they endeavored to make it appear that the smelters were to blame.

### SHASTA COUNTY RICH IN AGRICULTURE DESPITE FUMES

In the period of 14 years since my first visit to Shasta County I have made other visits and traveled over almost the entire county, in both mining and agricultural sections. The growth of agriculture and horticulture has advanced to a surprising extent. New lands have been cultivated and old lands that were supposed to be barren have been brought under cultivation, and Shasta County is today one of the richest in agriculture and horticulture in the state. This advancement has been made not in spite of the smelters, but because of them. When the Mountain Copper Co. first began at Keswick to smelt ores extracted from the Iron Mountain mines, in 1895, the mine and works employed about 200 men. With the establishment of other smelting works and the development of copper and gold mines the number of men employed directly and indirectly on account of the advancement in mining in the county, reached a minimum of 5000 and a maximum of 10,000. The farmers themselves acknowledged that this great advancement in mining has created a large market for their crops and been the direct inducement for improving their lands and establishing a large and profitable agricultural and horticultural industry.

The production of copper in Shasta County increased, from the beginning in 1895, to 21,385,863 lb. in 1899. In 1900 the production of copper was 25,736,473 lb. In 1908 with the Mountain Copper Co. out of commission as to smelting, and the Bully Hill, Mammoth, Balaklala in commission, the copper production amounted to 33,852,842 lb. This was increased in 1909 to 50,013,511 lb. During the year 1910, when the Bully Hill was closed down by the Forest Reserve the complaints of the farmers against the Mammoth and the Balaklala increased, and the copper production for that year decreased to 40,397,284 lb. In 1911 the Balaklala was closed down in July, and the copper production of the county was reduced to 29,618,032 lb. With the decline in the production of copper there naturally followed a decline in the production of gold and silver, although the operation or closing of the smelting plants did not affect the milling and concentrating ores in the western part of the county; the mines in that section have developed and prospered without regard to the development of the copper region.

In 1909, when the highest mark for copper production was reached, the gold production was 77,423.65 fine oz.; silver, 1,414,346 fine oz.; the total value of gold, silver and copper was $8,836,706. That was an increase in 10 years of $4,202,751. The total value decreased in 1911 to $5,222,988. In the early history of copper smelting in Shasta County there was a large demand for siliceous ores used for fluxing. A number of mines in the vicinity of Keswick, Coram and Kennett carry large bodies of low-grade white quartz and small shoots or veins of sulphuret ores. The white quartz could not be milled profitably; the sulphuret ores could only be profitably treated by smelting or cyanidation; at that time the cyanide process had not been developed to treat this class of ores because of the presence of copper. The smelters created a demand for both grades of ores from these mines. When the Mountain Copper Co. plant went out of commission and the other works began operating the demand for these ores continued to increase up to 1909, after which year the smelteries gradually were forced to close until the Mammoth plant was the only one remaining in operation. At the present time there are only two of these quartz mines that are assured of a positive and regular market for ores of this character. The Mammoth Copper Co. operates the Quartz Hill mine on a royalty lease, using 15,000 tons minimum ore a year; and buys ore from the Reid mine. These two mines furnish the greater part of the necessary fluxing ores, but the company buys or treats ores from other mines, including the Little Nellie, McCarthy, Silver King and some from the Delta district, also some ores from southern California and Idaho.

In the period when the plants were all smelting, a large number of small gold mines were developed, and there was a large amount of development and exploration on the copper belt. The Golinsky, the Trinity, the Stowell and other copper properties were practically ready for the extraction and treatment of copper ores. Had the progress in mining reached in 1909 continued and advanced, as the conditions warranted but for the interference of the farmers, the mining and agricultural prosperity of Shasta County would today be fully and safely established.

### Zinc and Iron Smelting Not Interfered With

The development of the iron-mining and smelting industry has not been interfered with by the farmers, and no complaints have been made of the experiments in zinc smelting. The Noble Electric Steel Co. recently installed three new furnaces and is producing a good quality of iron at Heroult; and the Bully Hill should soon be producing commercial zinc, with the Afterthought following closely. These industries and the continuance of the Mammoth works, together with the active gold mines in the western part of the county, have saved the mining industry from complete abandonment.

The mining congress, representing northern California and southern Oregon, which was held in Redding in May, appointed an investigating committee which reported back resolutions condemning the farmers for their attack on the smelting industry.

The recent session of the legislature passed an act creating a commission composed of the state veterinarian, the secretary of the State Board of Health and the state horticultural commissioner to investigate complaints of injury to animal life and vegetation by smeltery wastes and report to the governor, and empowering the attorney general to prosecute. This action on the part of the state should result in a settlement of the differences between the farmers and smelters on a sane basis and prevent recurrence of the past troubles.

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## Iron-Ore Resources of Brazil

There is no greater authority on the mineral resources of Brazil than George Chalmers, the general superintendent of the St. John del Rey Gold Mining Co., says the *Iron and Coal Trades Review*, June 27, 1913. In connection with its gold-mining operations, the company has acquired considerable areas of iron-ore lands. Since 1903 the company has been gradually buying small portions worthy of purchase until its estate now amounts to over 90,000 acres. This property is, of course, only one out of the many which exist in Brazil, but as giving some indication of the resources of iron ore in the Minas Geraes district, we reproduce the following remark from Mr. Chalmers' report, relating to the properties of his company:

> In one direction for a distance of 23 miles one can travel almost entirely on canga or crust, rubble ore or outcrops of iron. In another direction something like 16½ miles can be covered, over the same wealth of iron. In numerous places, beginning with those close to the mine, there are extensive areas of canga or crust, one million to one million and a half square yards in area with masses of solid hematite in places. Some years ago a little exploration was done on these crusts to ascertain the thickness, tons, etc., but what little was done went to show that it averaged about 60% iron and was rather high in phosphorus, while the hard solid hematite went from 60 to 67% and was low in phosphorus. Although the presence of the lodes beneath the crusts was known, estimates in the absence of proper explorations could only be based on what was in sight. In November, 1911, sanction was obtained to begin explorations with the object of obtaining some reliable data as regards the orebodies beneath the crust. What has been done in the way of exploration during the year is sufficient to show that the lodes beneath the crust are in some cases not only infinitely more valuable than the crust and rubble ores referred to, being of higher content and low in phosphorus, but as regards tonnage, great as the former may be, there is practically no comparison. In one deposit alone in which Mr. Chalmers originally estimated the crust, or surface ore in sight, as under 30 million tons, showing an average content of 60%, he now confidently estimates that the tonnage below, from the crust down to the portion explored by tunnels, is at least 160 million tons. Of the continuance of the lode to a great depth there is little doubt, but even from the lowest point at which it could be explored by tunnels in the side of the mountains to where it would be possible to extend the railway, ore would be laid open that would more than treble that tonnage. Crosscuts that have been put into the lode measure in all 1589 ft., and the average assay derived from 570 samples taken at equal distances throughout that length amounts to 67.3 iron and 0.053 phosphorus. Exceptional as these results may appear to be, there is still another feature in the ore which will recommend itself as one of great importance to the mining engineer, namely, that the tunnels have been driven rapidly through the ore with only light blasting; at the same time no timbering has been necessary, with the exception of points where lines of yellow ochre have been passed through. From this important fact it will be gathered that the ore is admirably adapted for economical stoping, while at the same time it would appear not too friable for transport.

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## Buffalo Mines

The Buffalo Mines, Ltd., in the year ended Apr. 30, 1913, shipped 726 tons of concentrates from the low-grade mill, and 35½ tons of high-grade ore direct from the mine, yielding 1,147,966 oz. of silver. Including material on hand, the total production for the year was 2,235,853 oz., valued at $1,385,474. Income from other sources amounted to $6432. Operating expenses were: Mining, $122,753; treatment, $119,415; depreciation, $28,881; increased by other items to a total of $310,280. Administration expenses were $57,391. Transportation and treatment expenses were $133,042. The net income was $891,193. Dividends of $650,000 were paid during the year.

. Development during the year comprised 1762 ft. of drifting, 30 ft. of raising, and 25 ft. of station cutting. Broken ore to the extent of 25,767 tons remained in the stopes, and untreated slime tailings on the surface contained 12,000 oz. Ore reserves developed were approximately 57,330 tons of ore, containing about 30 oz. of silver.

There was broken and hoisted during the year 10,221 tons, as the result of development operations, 44,352 tons from stoping, and 3224 tons of broken ore. Of the total 57,797 tons hoisted, 2014 tons were sent to the waste dump, and 55,783 tons were milled. The ore milled averaged 45.83 oz., and gave a total recovery of 82.64% in the concentrator, 39,798 oz. being recovered as metallics, 982,697 oz. as jig concentrate and 1,090,189 oz. as table concentrate. The cyanide plant treated 10,320 tons of slime concentrate, averaging 15.45 oz. and recovered 74.70%., or 119,160 oz. of silver.

A new amalgamating and refining plant was put in commission in the latter part of November, and during the remainder of the fiscal year treated 222 tons of table concentrate, 182 tons of jig concentrate, and 35 tons of high-grade ore. There was also refined 1438 lb. of metallics from the low-grade mill, 8012 lb. of precipitate from the cyanide plant, and 821 lb. of base bullion. The total production of refined bullion was 764,030 oz. of silver. Considerable silver still remains in the residue.

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**Gas Engines Are Most Economical** for metallurgical establishments, in spite of higher first cost, is the conclusion of Mr. Gercke, in "Stahl und Eisen," after examining the claims of steam turbines, gas engines and Diesel and other combustion motors.

# The Coeur d'Alene Mining District

By F. R. Ingalsbe*

*SYNOPSIS—Brief history and outline of nature of deposits in the Coeur d'Alenes, Idaho. Surface prospecting difficult. Mining industry in vigorous and healthy condition. Future promise is excellent. Development should take place in copper and zinc.*

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The Cœur d'Alene mining district is situated in the mountainous Panhandle of Idaho. It lies in a timber belt on the west slope of the Bitter Root Range, within the Cœur d'Alene national forest. As mapped by the U. S. Geological Survey the district has an area of about 400 square miles, and is rectangular in shape; there are, however, a few small mines outside this rectangle. The streams have a general westward course from the Montana-Idaho divide where the elevation is less than 7000 ft. above sea level, to the lowest point, about 2200 ft., which is on the North Fork of the Cœur d'Alene River where it leaves the district near its northwest corner. The country is mountainous, but not extremely rugged. Much of the area within easy reach of the mines has long since been denuded of its timber, but comparing the Cœur d'Alene with other Western camps of like importance, it is favored with a good supply of cheap timber for mining purposes.

### CLIMATE AND SITUATION FAVORABLE

The annual precipitation varies greatly in different parts of the district but averages high, and there is a heavy snow fall, sometimes equaling 200 in. in a winter. The wettest months are usually October, November and May, while the dryest months are July, August and September. The average temperature in the valleys is not far from 45° F., and the annual range is from a few degrees below 0° to something less than 100°. There is considerable agricultural land in and near the district, so that supplies of fresh fruits and vegetables are plentiful and fairly cheap. Railroad facilities are good and are being improved and extended as rapidly as developments warrant. The Oregon-Washington R.R. & Navigation Co. and the Northern Pacific Ry. Co. are competing for traffic, and it is reported that the Chicago, Milwaukee & St. Paul may cross the district in the near future. Wagon roads are good and practically all parts of the district can be reached over them.

### DISTRICT OPENED BY LIEUTENANT MULLAN

John Mullan built the first road across the Cœur d'Alene Mountains about 50 years ago.[1] This invasion aroused the hostility of the Cœur d'Alene Indians, although there had been a colony of Jesuits on the St. Joe River for a number of years. The first prospectors from the East entered the district via Thompson Falls and Prospect Creek on the Montana side of the divide. This "Old Mullan Road," as it is locally called, traversed what has proved to be the most productive part of the district, but the valuable deposits of lead-silver ores were not uncovered until several years later.

Although the first product of the district was placer gold, the first known mineral location was a quartz lode located some four years previous to the discovery of gold in 1882. This discovery was followed by a rush to the North Fork of the Cœur d'Alene River early in 1884, giving rise to Eagle, the first town of the district.

### LEAD-SILVER DEPOSITS ATTRACT ATTENTION

In 1884 the lead-silver fissures on the South Fork of the Cœur d'Alene began to attract attention and the town of Wallace had its beginning. About this time Murray became the largest town and the county seat of Shoshone County. Several rich orebodies were opened during 1885, and a second rush took place to the South Fork country, this time from the placer camps on the North Fork. Ore began to be shipped out by wagon, and prospecting went on vigorously. In 1887 a railroad was built from a shipping point on the Cœur d'Alene River as far as the place where Kellogg now stands.

Mining now became highly remunerative and development went on at an accelerated pace. Silver brought a good price and only first-class ore, averaging close to $100 per ton was taken out. With the advent of mills and better railroad facilities the district began to draw attention as a producer in the early '90s. Wages were $3.50 per day and have remained almost stationary up to the present time, although in 1892 and 1894 attempts were made to cut wages, resulting in serious strikes and great loss to the largest producers.

The period from 1892 to 1899 was one of more or less trouble between the operators and the miners, who were strongly organized, but from 1900 to the present time the camp has been an open one; all labor is procured through a bureau maintained at Wallace by the principal operators. Good labor has continued to be fairly plentiful and no strikes or other labor troubles have taken place for about 14 years.

### ACTIVITY SHOWN AT PRESENT

The present is a period of expansion on the part of the larger companies. The Federal Mining & Smelting Co. has recently purchased two large adjacent properties at Burke and Mullan which have been idle for a number of years, and there is an interlocking ownership of this and the Hercules company. The Bunker Hill & Sullivan is developing an extensive acreage of new ground on the south side of Kellogg Mountain and interest in the Sunset Peak properties has been renewed.

### STEADY INCREASE IN METAL PRODUCTION

The first two years of recorded production, 1884-1885, saw only gold taken from the ground; the next year saw something over $100,000 in lead and silver shipped to the smelters. The largest gold production is recorded for 1894; much of this came from the mines above Murray where the Golden Chest company was carrying on extensive operations on its lode claims. Today the entire gold output comes from the lode mines and most of it is a by-product from the copper and lead-silver ores. In 1911 Shoshone County produced $16,306,680 in lead, silver, zinc, copper and gold, practically all of it coming from this district.[2] For this year Idaho stood second in lead production (being surpassed only by Missouri), fifth in silver, and ninth in gold, copper and zinc. There has been a steady and healthy increase in production of these metals since their first recorded production, excepting, of course, periods of marked depression in price. It is notable that many silver camps in the Northwest died sudden deaths during the early '90s, while there was only a small depression in the Cœur d'Alene production curve. This should be regarded as an indication of vigor and long life for the district.

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*Missoula, Mont.

[1] Capt. John Mullan, U. S. A., "Report on the Construction of a Military Road from Fort Walla Walla to Fort Benton."

### District Prevailingly Sedimentary

Both igneous and sedimentary rocks occur, the latter type being much more abundant and older. The Cœur d'Alene is a sedimentary district, the basal complex never having been reached within the mining area. On the shore of Cœur d'Alene Lake, gneisses and schists outcrop which are supposed to underlie the Prichard slates, the lowest exposed formation within the district. These slates are arenaceous and not always easily recognized, even by the trained eye. Above is the Burke quartzite, a light-gray, fine-grained, indurated sandstone with some greenish shales interbedded. The distribution of this formation is pretty well understood by the prospectors because it is the source of several of the large orebodies. Above the Burke lies a more massive quartzite known as the Revett, which also is a producer.

Next in order come the limy shales of the Wallace and the flaggy sandstones of the Striped Peak formation. The lines of demarkation between these horizons are not easily located on the ground, since the change from one to the other formation is gradual and almost imperceptible. There are no known unconformities within the series. The total thickness is given by the U. S. Geological Survey as 17,200 ft.[3] It is to be remarked that the Prichard slate is known to be 8000 ft. thick, but its base has never been found, so far as I am aware; hence its total thickness is greater than these figures, but how much greater remains for the geologist or mine operator to determine. All of these formations are pre-Cambrian in age. The Striped Peak formation is overlain locally with high terrace gravels, glacial deposits, and alluvium, and the district as a whole is under a mantle of soil, or talus, of sufficient general distribution to limit natural outcrops to vertical cliffs, and the backbones of a few ridges.

### Igneous Rocks Show Little Relation to Ore

The igneous rocks consist of irregular, more or less massive intrusions of monzonite, syenite, and basic dikes. Of these, the basic dikes occasionally accompany oreshoots. The massive, more acid, intrusions apparently have no relation to the lodes, although they have been encountered in several of the smaller mines.

The country is intensely faulted in the vicinity of the producing mines. During the period of upheaval, lateral pressure and gravity folded, crushed and faulted the entire system and it was probably during this process that the intrusions took place. There are two prevailing fault trends: About N 70° W and about north and south.

### Quartzites Produce Most of Lead-Silver and Zinc Ores

The Burke and Revett quartzites are the most important sources of lead-silver and zinc ores. There are a few small producers within the St. Regis and Prichard and it is only fair to state that there is considerable difference of opinion in some instances as to what formation the ore lies in. The Prichard slate is the home of the gold-bearing lodes. The opinion is quite common among many of the mining men of the district that the area about Murray, known as the north country, will never develop any important producers; although there are several good-looking prospects and small producers there, the orebodies, so far as developed, are all small. This country is supposed to be largely Prichard, nevertheless, it is probable that a readjustment of the geological map would result from a careful study of recent developments.

The prevailing strike of the producing lodes is N 60° to 85° W, while the dips are about evenly divided between north and south. The Bunker Hill lode which strikes N 45° W and dips about 40° southwest, is a marked exception to the above statement; it is the flattest lode of importance known in the district, and it is, also, the largest.

### Large Faults Usually Barren

The ores have been deposited in and along small faults and fractures, while the larger faults like the Osburn have not produced up to the present. As a rule, the fault fissures are filled with crushed and decomposed rock sometimes accompanied with vein quartz and are important ground-water courses. The fragments of country rock have often been replaced by ore and occasionally, as in the Bunker Hill lode, the country rock itself has been replaced to a considerable distance from the main fissure.

All the geological evidence supports the common theory that the ore solutions were forced upward through more or less open fissures and deposited largely as replacements. It seems logical to suppose that the larger faults, as well as the smaller, should be producers and I know of no rational explanation of this exception having been made. On the other hand, there have been a few "blind" fissures opened which have been the source of rich oreshoots. For example, the shoot in the Tyler workings above Wardner is not known to have an outcrop, which suggests that the deep-seated fissures with limited upward range are favorable for exploration. It is possible that the large open fissures did not supply the requisite pressure or did not retain sufficient of the exuded gases to precipitate the sulphides from their aqueous solution.

### Basic Intrusions and Ore Sometimes Associated

In cases where basic dikes are associated with the ore, it is apparent that the intrusion took place during the period of mineralization; hence it seems that the ore-bearing solutions may have come from the same differentiated magma which expelled the material of the dike. The intrusion had no marked effect either upon the nature of the mineralization or upon the gangue material of the lode; in other words, intrusion was coördinate with mineralization, was effective during a shorter period, and was apparently accidental, with no definite relations which can be traced to cause or effect.

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[2] Mineral Resources of the U. S., 1911, I, p. 28.

[3] Prof. Paper No. 62, p. 25.

Oreshoots vary extremely in dimensions, horizon and regularity, and the engineer experiences difficulty in predicting their extensions; speaking of the district as a whole, perhaps their most marked characteristic is lack of law and regularity.

### ALMOST ALL ORE IS SULPHIDE

The Cœur d'Alene ores are sulphides with argentiferous galena as the predominating mineral. The ratio of silver to lead is by no means constant throughout the district, nor even in different shoots on the same lode. Different mines vary from about 35 oz. silver per ton of lead to about 115, the Gold Hunter standing close to the latter figures. Sphalerite is important in several of the large mines, but in others, such as the Bunker Hill & Sullivan, it occurs in negligible quantities.

In the upper parts of the lodes there are, of course, carbonates, cerussite being the most important, but the production from this source is extremely small. Pyrite, pyrrhotite, siderite, quartz and occasionally barite, together with talc-like material and crushed country rock are associated with the ores of the lead-silver mines. In the copper district east of Mullan, bornite, chalcocite and chalcopyrite are original while the oxidized minerals, cuprite and malchite, make up a good part of the ore. In some instances the chalcocite is probably secondary. The gangue minerals are practically identical with those of the lead-silver lodes, although occurring in different proportion, and, as a rule, the copper ores carry sufficient gold to yield smelting returns. The gold ores of the Prichard in the Murray district consist of native gold, pyrite, galena and sphalerite, associated with a quartz gangue.

### OUTCROPS ARE OBSCURE

In every case observed by me the lodes show undoubted indications of movement and considerable rock alteration. Although it is generally supposed that the larger faults carry no ore, it is a fact that they are often closely paralleled by others of smaller dimensions which have turned out to be profitable mines. The outcrops of the larger faults can be traced on the surface, but the smaller, ore-bearing fissures, cannot; indeed, as stated above, these sometimes have no outcrop at all. When we remember, also, that the country is under a mantle of soil and talus, the difficulty of surface prospecting is readily perceived. It is not surprising that many of the rich orebodies lay for many years almost under daily-traveled trails without their presence being suspected. At the present time most of the effective exploration work is being done underground rather than on the surface. Occasionally sulphide ores are found at the grass roots, but more often they lie several hundred feet from the surface and thousands of dollars in development work is required to bring them to light. The Hercules mine, above Burke, is a typical example of this class of lode. On the other hand, the Bunker Hill lode has a conspicuous outcrop and was naturally one of the first to be discovered.

### FRACTURE ZONE OUTCROPS SHOW INDICATIONS

As stated above, outcrops of the lead-silver lodes consist of fracture zones, showing considerable local alteration of the country rock, carrying a fault breccia, and a clay-like gouge on one wall, sometimes accompanied with vein quartz and iron oxide. The alteration is probably hydrothermal in origin and can be distinguished by the trained observer from ordinary weathering. These are what are called "indications" and are important in directing surface exploration. The trouble comes in locating these indications. It would seem that, having chosen a region otherwise favorable from the geological point of view, the best method to follow would be to conduct surface trenching through the overburden in directions at about right angles to the known direction of local faults. Naturally the chosen place will be on a mountain side well above the valley bottom, where the soil is not excessively deep and where fragments of fault material can be found in the float.

The practice of starting at the valley level to drive long tunnels to indications found a thousand feet or so up the mountain side cannot be too strongly condemned. The prospector should stick to his indications until he is rewarded with something better and then, lacking money, he should permit the company to do the long adit work. Thousands of dollars worth of noneffective labor would be saved every year to the Cœur d'Alene district if this suggestion were followed.

### APEX LAW USUAL NUISANCE

The law of the apex has caused, and still is causing, much litigation, uneasiness and uncertainty, in the Wardner district. A country of extremes in topography, steep slopes and unusual dissection, where the lodes lie at relatively low angles, and where production and exploration by several companies are going on side by side, it is not surprising that the courts are eternally busy straightening out property rights under our antiquated federal mining statutes. In other parts of the Cœur d'Alene district this law is not such a nuisance because, fortunately, the lodes are nearly vertical.

In general it can be stated that in districts of greatly diverse topography and low-dipping veins, the law of the apex, while of some possible benefit in the early stages of development, becomes the source of unending trouble when mining has reached a highly developed stage. The weaker company, obtaining its entire product from a single oreshoot, is always at a disadvantage because of the possibility of injunctions being issued against it, necessitating closing down the entire mine. This is no theoretical conclusion arrived at by the writer, but rather a statement of historical fact. In the present stage of development it is not stretching the truth greatly to say that so far as the extralateral rights statute is operative in the Cœur d'Alene district, it is a source of litigation rather than of justice. As a matter of fact, it is to some extent inoperative either through mutual agreement, or because the verticality of lodes leaves no necessity for extralateral rights, or in localities where the lodes are relatively flat and the operators are coming to depend more and more upon surface rights rather than upon the apex law to substantiate their underground rights and maintain their undisputed titles to discoveries and lode extensions.

### FUTURE DEVELOPMENT WILL INCLUDE COPPER AND ZINC

The district as a whole has not reached its maturity and it is safe to say that production will continue to increase for many years to come, and that prospecting will from time to time open up new orebodies of considerable importance. Few or none of the large shoots have been explored to their lower limits, indeed, the largest mines are yet shallow, comparatively speaking. There are also parts of the district in which geological conditions are favorable, which have not as yet been systematically prospected. Here is a promising field for the stronger mining companies. Prospectors are not being bountifully rewarded for their sacrifices and hard work and naturally they are becoming less active as time goes on. It is only a matter of time when practically all the surface exploration will be done by strong operators, and this is as it should be—those who receive the benefit should bear the burden.

It is altogether probable that gold never will become an important product, but present indications point to an increasing importance of copper and zinc in depth.

### SUMMARY OF SITUATION

Summarizing, the Cœur d'Alene district may be described as consisting of folded and faulted pre-Cambrian sediments in which more or less argillaceous quartzites are the principal horizons for ore. There are a few intrusives with as yet indeterminable relations to ore genesis. Production has continued to increase at a healthy rate since the beginning and will doubtless continue, under past and present industrial conditions, for many years. Mining and milling have reached a high degree of efficiency and all natural conditions are unusually favorable. A considerable part of the district is still in the prospect stage and it will be several years before the ore-bearing areas will be definitely outlined. Operators are employing the best technical advice in the country and prospering thereunder.

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## East Butte Copper Mining Co.

The report of the East Butte Copper Mining Co., for 1912, states that there was mined during the year 99,458 tons of ore, wet weight, of an average assay value of 5.78% copper. Of this amount, 72,865 tons carried 6.98% copper, and 29,593 tons carried 2.48% copper. The reduction plant treated 96,601 tons of company ore, dry weight, and 85,173 tons of custom ore, dry weight, producing 14,709,460 lb. of copper, 370,675 oz. of silver and 16,920 oz. of gold. The gross value of the metals shipped was $2,841,204. This was increased by other items of income so as to give a gross income of $3,155,475. The cost of mining, treatment, freight, selling and refining, and the cost of custom ore purchased was $1,821,060. Charges for miscellaneous operations were $54,679. Interest charges were $231,136. Additions to equipment cost $64,900. The net surplus on operations remained $983,701. An average price of 16.692c. per lb. was received for copper in New York, and an average price of 61.482c. per oz. for silver. Development work for the year consisted of 7130 ft. of drifts and crosscuts. It is planned to sink the main working shaft 600 ft. during the coming year. A sample mill of 1200 tons daily capacity erected during 1912 is giving satisfaction. A pipeline to bring water from Elk Park, for use in the concentrator instead of mine water, was laid. It is planned to increase the plant capacity by enlarging the furnaces during the coming year. The opportunity for custom smelting is stated to be improving.

The company continued the operation of the properties of the Pittsmont Copper Co. under an extension of the agreement of Apr. 8, 1909. Under this agreement company notes aggregating $1,625,575 fell due Dec. 1, 1912, and were met by applying cash surplus to the extent of $1,125,575, and by issuing notes for $500,000, payable in five equal monthly installments. With the settlement of these obligations and the exchange of 111,000 shares of its capital stock, the company secured 800,000 shares of the common stock of the Pittsmont Copper Co., out of a total of 1,000,000 shares issued, together with 200,000 shares, the total issue, of preferred stock of the company. It also secured bonds of the Pittsmont company, amounting to $1,751,333.

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## Nipissing Mining Co.

The annual report of the Nipissing Mining Co., for the year 1912, states that there were shipped during the year: 121.56 tons of high-grade ore, containing 325,247 oz. of silver; 1414.49 tons of low-grade ore, containing 330,991 oz. of silver; 180.61 tons of concentrates, containing 153,373 oz. of silver; and 146.18 tons of silver bullion, containing 4,258,641 oz. of silver. After adding 20,827 oz. of silver from Nova Scotia company bullion and deducting 369,501 oz. of silver from purchased ore, the total Nipissing shipments remain 4,719,578 oz. of silver. The net value received from sales is given at $2,827,300, which includes an item of $674 from sales of cobalt. The average price received for silver was 61.457c. per ounce.

Disregarding shipments, the production in 1912 was 1836.84 tons of material, containing 4,688,261 oz. of silver. General operating expenses for the year were $566,533, equivalent to 12.08c. per oz. This includes an item of $19,293 for hydraulicking, and covers underground, ore sorting and loading, jigging, sampling, technical, administration, boarding house, etc., insurance, taxes, and general and legal expenses. Other costs per ounce distributed over the total production for the year were: High-grade mill, 2.12c.; low-grade mill, 0.66c.; depreciation, 1.12c.; custom milling, 0.87c.; marketing, 1.31c.; corporation, New York office and traveling expenses, 0.30c.; giving a total cost per ounce of 18.46c., reduced by rent and interest receipts to 17.39c. The total cost of production, $815,280, represents 28.14% of the value of the ore and leaves earnings for the year of $2,081,710. Dividends of $1,800,000 were paid.

During the year there was prosecuted 6105 ft. of drifting, 4673 ft. of crosscutting, 1484 ft. of raising, and 758 ft. of sinking. The cubic yards stoped were 15,762. Ore reserves are given as 3304 tons of high-grade, carrying 5,491,343 oz. of silver; 76,247 tons of mill rock, carrying 1,535,071 oz.; and 108,926 tons of ore on the dump carrying 2,616,924 oz.; the total ore reserves being, therefore, 9,643,338 oz. of silver.

The Nipissing Reduction Co. continued to treat the low-grade ore from the Kendall dump, pending the completion of the new plant. There were treated 13,894 tons of dry ore, assaying 13.33 oz. per ton, and there were obtained 144.814 dry tons of concentrate, with a net value of $68,283, of which the Nipissing Mining Co. received $30,106 as profit. A contract has been arranged for the sale of the residue from the high-grade mill, whereby a fair price is received for the cobalt contents. Hydraulic prospecting will be continued this season.

## Waste of Natural Gas

It was not until 15 or 20 years after the first utilization of natural gas that the pronounced decline of production caused producers and consumers to realize that the supply was limited, says the U. S. Bureau of Mines, Technical Paper 38. Because the waste threatens the life of gas fields it has prevented many investors from building plants in the various fields, thereby depriving the localities of increased population and wealth. The geologic occurrence of the gas in the sandstone, sand, or limestone reservoirs is such that the flow of gas from one well causes a decrease in the flow of others and a reduction of the supply throughout the entire field, and instances are common where carelessness and indifference in drilling have resulted in waste of gas from formations penetrated above the regular sand. Furthermore, if the formations are loose, the gas sand fairly shallow, the pressure great, and the proper precautions are not taken in setting the casing, the gas may escape around the casing, loosening the ground rapidly, and ultimately gaining sufficient volume and pressure to blow the casing from the well. Such "blowouts" have happened a number of times in the Texas and Caddo fields. They are likely to occur in the first wells drilled in any field, before the conditions attending the gas pockets are generally known; but there is usually little reason for a second or a subsequent "blowout" in a field, because precautions can be taken to prevent it.

Waste in drilling is not so great as formerly, because at the present time drillers have usually every facility at hand to close a well as soon as completed. By proper preparation most wells can be packed, tubed and shut in within two hours. According to the conservation commission of Louisiana, the waste from the two principal "wild" wells in Louisiana had its beginning more from a lack of knowledge of what precautions would be effective than from negligence or indifference. The waste from the first big gas well encountered in drilling for oil in the Buena Vista Hills field of California was due to the unexpectedness of the great flow and to local inexperience in handling such pressures. This well was controlled only after a Texas operator had been engaged to do the work.

The most notorious waste at present is in Oklahoma, Louisiana and California. The commission on the conservation of the natural resources in Louisiana, after an exhaustive examination of the situation in the Caddo field, found that the waste approximated 75,000,000 cu.ft. per 24 hr., an amount equal to twenty times what the city of Shreveport uses now in the same space of time and equal to 1/20 of the amount consumed by the entire United States. It also found that the value of the gas wasted from a single "wild" well in that state was in excess of $2000 per day. There were three principal wells in the Caddo field from which the greater part of the waste occurred. They were known locally as the "dry gas well," the "mud gas well," and the "salt gas well." Two of these have been closed by the owners, thus proving that closure is feasible. No attempt has been made to close the other, and when visited in February, 1912, it consisted of a crater perhaps an acre in extent, in the center of which the gas was forcing a geyser-like mass of mud and water to a height of 20 to 30 ft. During much of the time the well is burning. The gas from this well has been going to waste for three years. Two other wells having an estimated volume of 20,000,000 or 30,000,000 cu.ft. per day blew out and burned for one or two years. In the Caddo field at least 400,000,000 cu.ft. of gas has at certain times been wasted daily, practically all the waste being preventable. McDowell states that the daily waste of gas in Oklahoma by escape into the air is equivalent to at least 10,000 tons of coal daily, and he states that 80% of this loss is preventable.

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## Tonopah Mining Co.

The report of the Tonopah Mining Co., of Nevada, for the year ended Feb. 28, 1913, shows that the average mining costs for the year were $3.266 per ton of dry ore shipped to the mill and $2.726 per ton of wet ore and waste hoisted. Practically all the segregrated direct costs are lower than those of last year, including 15.6c. in development work, due to smaller tonnage.

Estimated tonnage of ore on Mar. 1, 1913, was 200,702 tons valued at $3,062,661. This amount includes assured, probable, and possible unbroken ore, ore on dump, and ore stored at Millers, Nevada. The estimated value is $15.25 per ton.

Total receipts for the year including mine and mill products sold, receipts on investments of all kinds, etc., amounted to $3,511,304. Disbursements amounted to $4,055,000, of which $1,925,992 was expended in the purchase of bonds and in other investments and in the payment of dividends No. 27, 28, 29 and 30. The excess of disbursements over receipts amounted to $543,696, which was derived from surplus.

During the year there were milled and treated 173,336 dry tons of ore, averaging 0.23 oz. gold, and 21.75 oz. silver, or $18.16 per ton. The total content of the ore milled during the year was 39,825 oz. of gold, and 3,769,669 oz. of silver, of which there were recovered by concentration 1027 dry tons of concentrate, averaging 3907 oz. of gold and 567.07 oz. of silver per ton, or a total smelter gross value of $443,503.

The cyanide treatment yielded 2,925,733.15 oz. of bullion containing 32,273 fine oz. of gold, and 2,789,508 fine oz. of silver. The slags were concentrated by a jig the tailings of which were fed into the stamp battery The contents were recovered in the mill at a cost much lower than by the old plan of shipping as a byproduct. Other byproducts were mixed with and shipped with the concentrate. The cost of marketing the product, including freight, treatment, sampling, and express on bullion and concentrate, amounted to 64,522 or $0.3762 per ton and concentrate, amounted to $64,522 or $0.3762 per ton during the previous year.

The combined extraction of both gold and silver was 89.34 per cent. The mining cost was $3.27 per ton.

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## Alabama Coke Output

Alabama's output of coke in 1912 amounted to 2,975,189 short tons, against 2,761,521 short tons in 1911, according to the U. S. Geological Survey. Alabama retained in 1912 second place in the rank of coke-producing states, having superseded West Virginia in 1911. A large proportion, possibly over 90%, of Alabama's coke is consumed in furnaces owned by the interests controlling the coal mines and coke ovens.

# DETAILS OF PRACTICAL MINING

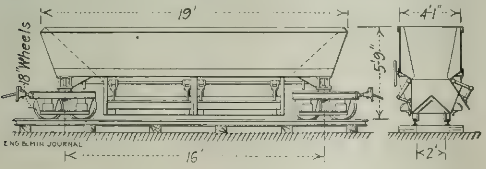
## Cars for Underground Electric Haulage

The accompanying drawing shows the outline of the 12-ton car used for electric haulage on the 13 level of the Crown Mines, Ltd., South Africa. The cars have a side discharge, according to R. C. Warriner (Journ. So. Afr. Inst. of Eng., April, 1913), and are mounted on two trucks, which are spaced 16-ft. center to center and have each two pairs of 18-in. wheels with a 25½-in. wheel base.

The length of the car body is 19 ft., its width, 4 ft. 1 in., and its height over rails is 5 ft. 9 in.; the length of the car over buffers is 22 ft.; the track gage is 24 in. The draw bars are attached to the truck frames instead of to the car body. This permits negotiating the relatively sharp 50-ft. radius curves into the crosscuts without difficulty. In fact, the cars will take a 25-ft. radius curve. A seat at each end of the car is for the attendant who travels with it.

The locomotives that draw the trains, weigh eight tons each and carry two motors, which may be run in series or parallel, giving two speeds without resistance losses. They can exert a drawbar pull of 3200 lb., at 10 miles per hour.

The cars are handled in trains of eight and average about 80 tons per trip. The loading through the arc-type gates, which are used, takes from seven to eight minutes, the discharging from five to seven minutes. The running time depends on the length of the haul, but the complete cycle for a round trip averages about 26 min. Thus, two trains working 16 hr. per day, can handle 5800 tons. The highest point of economy will not be reached until this maximum capacity is attained. The power costs are low, running from 0.1 to 0.2c. per ton, the white-labor cost runs from ½c. to ⅛c.; the colored, from 1.0c. to 1.3c.; supplies from 0.8c. to 1.8c., and repairs from 0.5c. to 1.7c. The total cost over five months, handling 417,000 tons, averaged 4.8c. per ton.



Side-Discharge, Underground 12-Ton Car

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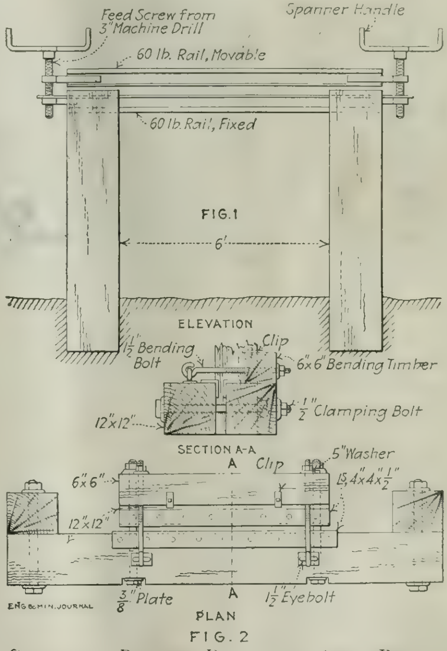
**An Extremely Difficult Underground Connection** was made between two large vertical shafts of the Brakpan mine on the Rand, as described by Charles B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture). Of the two shafts in question one was 3098 ft. deep at the point where it struck the reef, and the other was 3724 ft. deep. The length of the inclined connection made was 4413 ft. No other underground connection existed. The connection holed through to about ⅛ in. in both level and line, a remarkably accurate job, particularly in view of the great depth at which it was necessary to swing the plumb bobs in the shafts.

## Devices for Bending Plates

By Claude T. Rice

It often becomes necessary to bend iron plates in a mine shop. This is particularly true where the mine manufactures its own cars. In the shops of the Desloge Consolidated Lead Co. of Southeastern Missouri, two devices are in use for this purpose.

In Fig. 1 is shown a vise, made of two 60-lb. rails set horizontally, one below the other, with the flanges together. The plate is inserted between these rails, which are tightened together and the bending done by hammering. The lower rail is set on two posts in notches, and projects a few inches beyond each post. The web and head are cut away at the ends and the flange drilled to permit the passage of the vise screws. These screws, made from the feed screws of machine drills, work in nuts, which are under the flange, and have lugs bearing against the posts to prevent turning. Collars are riveted to the web of the upper or movable rail, which is shorter than the lower rail and these collars project sufficiently to allow the screws to work through them. In the drawing the upper rail is shown lifted to admit a plate. The tops of the screws are fitted with double-ended spanners to serve as handles for tightening and loosening. The vise is capable of handling plates up to ⅜ in. in thickness.



Clamp and Bending Device for Steel Plates

An apparatus which includes a bending device and eliminates hammering is shown in Fig. 2, and in the photograph, Fig. 3. It consists of two horizontal timbers side by side, by which the plate is clamped vertically and another timber moving on bolts, which does the actual bending. The clamping timbers are 12x12 in., their upper adjacent edges being bound with 4x4x½ in., angles. Two 1½-in. horizontal bolts with suitable washer plates and nuts on one end, are used for clamping. The opening between the timbers is adjusted by these to any width, so as to control the sharpness and the amount of the bend. Through the fixed 12x12-in. timber are two vertical 1½-in. eye-bolts and linked into these so as to form a hinge are two horizontal 1½-in. eyebolts. These latter pass through the 6x6-in. bending timber, and by means of nuts on their ends, this timber is drawn horizontally against the vertical clamped plate and bends it down. On the top bearing edge of this timber are two clips or buttons, which can be turned out to come over the top of the plate and by swinging the timber up somewhat, the bending of the plate can be started above the clamping line.

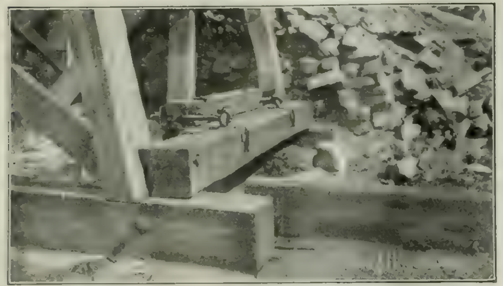


Fig. 3. Clamping Device Installed

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## Seepage Losses in Alaska Ditches

Knowledge of the amount of seepage loss in the ditches of the Seward Peninsula is important, but is difficult to determine since the inflow from small water courses crossed by the ditches cannot be calculated, says the U. S. Geological Survey. Storage methods are not usual in this region, and the ditches run at full capacity only during periods when the ground is well saturated with water. The flow at such times is augmented by the discharge of small streams whose aggregate volume is large. The flow of these streams is too small to measure and furthermore any measurement would not include the underflow through the gravel beds. While during low-water periods these streams are dry, the ditch itself runs lower, and owing to a reduced wetted perimeter, the amount of leakage is smaller; so that although seepage can be determined under such conditions, it will not give true values. The character of the country largely determines the loss by seepage. The use of sod reduces the loss from this source and when ditches are built over frozen muck, seepage is ordinarily small, since these have bottom and sides of fine sediment backed by solid frozen material, rendering them almost impervious. During drought the percentage lost by seepage is much greater than when the water supply is well sustained. During the unusually dry season of 1909, measurements were taken on the Miocene and Seward ditches, which gave results varying from 0 up to something more than 1 sec.-ft. of loss by seepage per mile. In one case where the water was extremely low, the percentage loss was greater than 50. The mean value of the loss on the Miocene ditch for the upper 12 miles was 0.55 sec.-ft. per mile, and on the entire Seward ditch was 0.44 sec.-ft. per mile.

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## Electric Welding

The electric-welding process is applicable to a great variety of work, such as repairing shrinkage cracks and blow holes in castings, repairing broken parts, however large, cutting metal and bending pipes. In operation, the usual practice is to connect the work to be welded with one wire from the electric circuit and to attach the other wire to an electrode handled by the operator. The electrode is first brought into contact with the work, establishing the circuit and then drawn away so as to form an arc. The operator can then move his electrode about the work as required and the arc will follow, thus enabling him to direct and concentrate the heat as necessary.

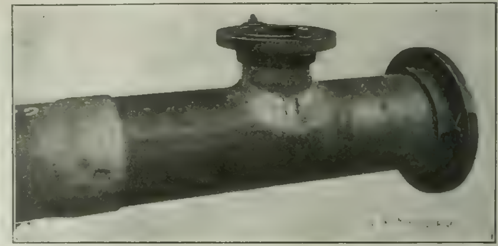


Fig. 1. Joint of Two Pipes and Nipple before Welding

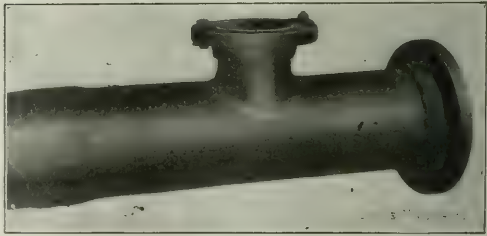


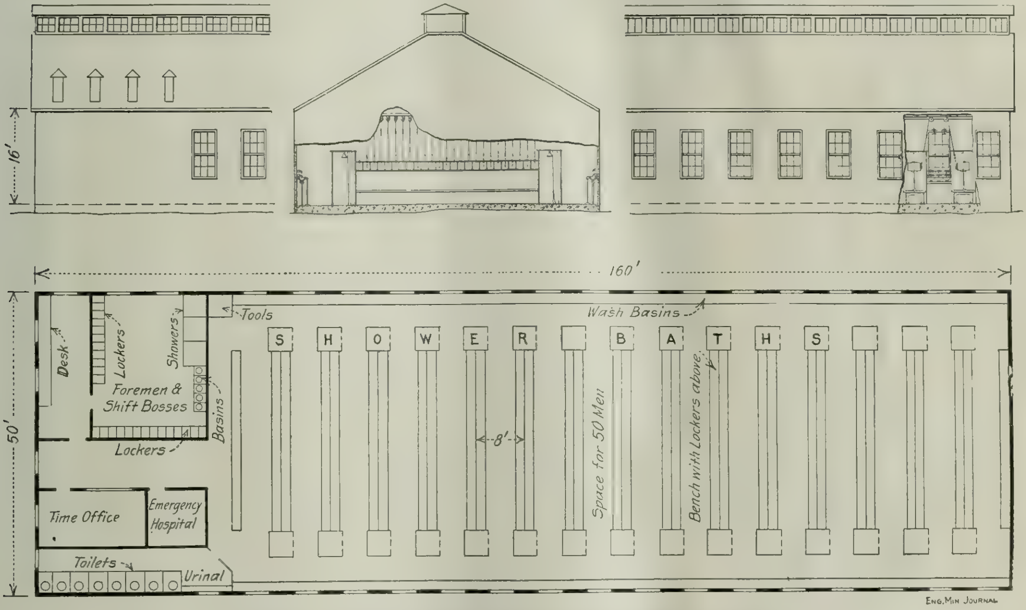
Fig. 2. Pipe and Nipple Joint after Welding

Two different methods of welding may be employed, using either graphite electrodes or metallic electrodes. The method employing the graphite electrode can be used for all kinds of welding, filling in, building up, cutting, etc. The welding metal is supplied from an outside source, either a separate rod of metal or as scrap material. This is reduced to a state of fusion and forms a homogeneous mass with the part under repair. A potential of 50 to 60 volts is required at the arc for this method and a current of 300 amp. or more. The method employing a metallic electrode is most available for closing cracks in large work, particularly on vertical or overhead surfaces. The metal of the electrode melts and forms the material for the weld; all of the metal is deposited on the work and there are no drops of molten material to render overhead work dangerous. It is necessary to interrupt the work from time to time to insert new electrodes and it is important to maintain a uniform potential with this method, for slight voltage variations disturb the arc and produce an imperfect weld. This method uses a lower potential.

Theoretically, any direct current is suitable, but since the arc voltage is only from 10 to 60, it is evident that the utilization of an ordinary circuit by introducing resistance is wasteful. For this reason, as well as to maintain the proper potential and protect the line against short-circuits, an outfit has been devised, comprising a driving motor and a welding-current generator, an automatic controlling apparatus on a proper switchboard, electrode holders and face and hand shields for the operator. These sets are stationary or are mounted on trucks so as to be portable and capable of transportation to any job where it is desired to apply them.

The electric-welding method should find a field in the mining industry, especially around metallurgical plants. One special application is to pipe bending and manipulation. The accompanying figure shows a job on a pipe in which two pieces were joined and welded and a branch nipple also welded in. For welding necks, flanges and joints, the system is said to be at least 50% cheaper and 75% faster than any other welding system.

It is claimed for the system that it gives an intense heat, which, while higher than necessary for melting, is applied so quickly as not to be conducted from the welding point, and thus dissipated and wasted; that it is simple to operate; cheap; and safe as compared to methods employing gas. The apparatus is marketed by the C & C Electric & Manufacturing Co., Garwood, New Jersey.



Change House of the United Verde, Jerome, Arizona

# United Verde's New Change House

The old change house at the United Verde mine at Jerome, Ariz., is soon to be replaced by a modern steel change house embodying the latest ideas in sanitation and privacy, such as chain "lockers" of the Continental type and individual shower baths. This is in keeping with the present era of new construction and reëquipment of its plants, recently inaugurated by the company with a view to greater output and increased efficiency. The United Verde will be one of the few metal mines in this country to use the chain type of locker, suspending the miner's clothes near the ceiling of the change house where excellent ventilation is assured. This type of locker was adopted in the new change houses built by the Copper Queen at Bisbee and by the Butte & Superior at Butte; the new United Verde change house is based on the experience of the above two companies, but certain changes have been made to suit the local conditions and to increase individual privacy.

The building will be 50x160 ft. and will have accommodations for 800 miners and 25 foremen and shift bosses. It will have a steel frame with corrugated-iron sides and roof; the reinforced-concrete floor will be slightly elevated and supported on the steel frame so that the building may be leveled in case of subsidence of the ground. The site is at the mouth of the 50-ft. adit which on completion of the change house will become the main entrance to the mine for the miners.

The mine time office will be situated just inside the entrance to the change house, and adjoining will be an emergency hospital equipped with stretchers and other supplies for first-aid work. The foremen's office and change room will be opposite, and the remainder of the building will be devoted to accommodations for the miners.

The main room of the change house will have a row of 15 double benches and two single benches at each end. The locker system will consist of the chain lockers already mentioned, supplemented by small metal lockers, 15x14⅜x12 in., for shoes, soap, etc. These small metal lockers will be fastened to the back of the benches within easy reach, and the chain suspending the clothes will be locked behind the hasp of the metal locker by a single padlock. The miner's clothes will be suspended from a cast-iron frame having six hooks. Between each of the double benches there is space for 50 men.

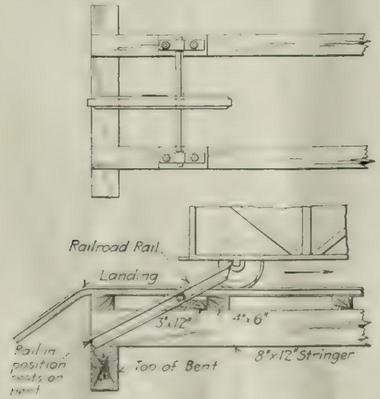
At the ends of the benches there will be shower baths with galvanized-iron sides and a canvas front curtain. Along the sides of the building there are 144 enameled-iron basins equipped with the usual rubber stoppers, and spring faucets to prevent waste of water, which is important here. The basins are arranged in batteries of nine and empty into a trough that serves an entire battery and discharges into a trapped drain pipe. The basins are hinged and may be swung back to permit the cleaning of the trough by an attendant after the miners have left. The concrete floor of this room will be 1½ in. higher at the center and will have gutters along each side so that the floor may be flushed and readily cleaned.

The building will be provided with steam heat, and will be well ventilated through the monitor at the top of the building. There will be an attendant on each shift; these attendants will be trained in first-aid work and will also look after the emergency hospital.

⁂

## Automatic Car Catch at Incline Top

A safety stop for the top of an incline similar to one described in the JOURNAL of Mar. 8, 1913, is illustrated in the accompanying drawing furnished by George M. Brown (*Coal Age*, May 17, 1913). The arrangement needs little description. It consists of a square bar, thrust through a 7- or 8-ft. piece of scrap rail at a point above the center of gravity of the latter, and with its ends rounded so as to turn under two clamps set on timbers, as shown. If it is desired to permit the return of the cars down the same incline, a lever can be attached to the end of the bar.

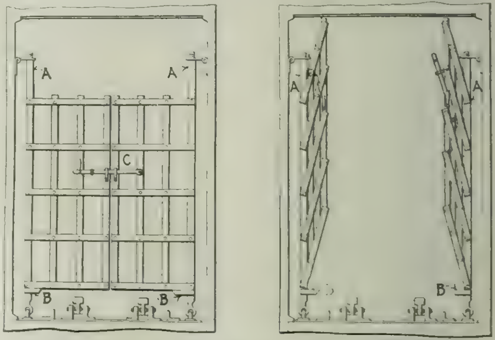


SIMPLE CAR CATCH

## Folding Cage Gate

A mine gate, used at an English colliery, is described in *Mining Engineering*, June, 1913. The gate was made in halves. Each half was attached to an upright piece *A*, which at its lower end was so hinged that it could not only turn about on a vertical center line, but could also be turned into a horizontal position so as to rest on the floor of the cage when not in use. The upper end was supported by a pair of hinged plates, one secured to the side of the cage, the other capable of being fastened to the upright *A*. This top bearing was obtained by machining down *A* to form a shoulder, on which the plate rested. A slot was made in the top of *A*, and an elongated link was secured by a pin which passed through *A* and the link. The width of the link corresponds to the diameter of *A*, so that when it was turned into a vertical position, the hinge might be lifted off. On the other hand, when the link was horizontal, the hinged plate could not be lifted.

Each half of the gate consisted of vertical and horizontal bars pivoted to each other at their points of intersection, as shown. When the gate was in a working position, the bars were held at right angles to each other by the lowermost bar resting upon a bracket *B*, projecting from *A*.



ENG & MIN JOURNAL

COLLAPSIBLE AND RECLINING CAGE GATE

When not in use, the bars could be collapsed and forced into a small space. When the two halves were opened and brought into alignment with each other, they were secured by means of a pivoted catch *C* carried on one-half of the gate and engaging behind projections on the other half; the catch was provided with a hinged extension at its free end, which engaged with a staple and was fastened by a cotter pin.

This gate could be made to open inward and not outward, and to open both ways. When not at work, it was laid down on the floor of the cage deck between the rails and side of the cage, and was kept there by a holding-down clip. It was thus out of the way when sending timber down the shaft.

The height of the gate when working was 3 ft. 11½ in.; width of each half 1 ft. 4½ in.; height of *A*, 4 ft. 3½ in. When closed the total length was 4 ft. 11½ in., and the width only 3½ in. The weight of the gates for one end of a deck was 37 lb. The gates stood back in the cage 1 ft. 4 in.

# DETAILS OF METALLURGICAL PRACTICE

## Helping Out Bucket Elevators

By Claude T. Rice

Often in the life of a mill it becomes necessary to increase its capacity, and while space is generally available for the increase or can be readily made, increasing the capacity of elevators generally necessitates new installation. At the Silver King Consolidated mill, at Park City, Utah, J. W. Thompson, mill superintendent, has increased the capacity of the elevators at that plant in a highly ingenious manner.

The pulp that is to be handled by the elevator is first sent to a settling box and dewatered. The settled product is sent to the bucket elevator and the overflow from the settling box, which contains little that is coarser than 80 mesh, goes to a centrifgugal pump which raises it to the level of the elevator discharge where it joins the underflow from the thickener. As the coarse product has all been removed from the overflow there is little wear on the centrifugal pump and it is often possible in this way not only to decrease the elevator repair bill, but to reduce the power consumed in raising the pulp, as the centrifugal pump can discharge the overflow at a somewhat lower point than is possible with the bucket elevator. Moreover, the fluid comes to the pump at a higher level than is the case with the elevator, owing to the depth of the boot. This method of aiding overloaded elevators has been used at the Silver King mill for over two years and is found to work admirably, decreasing the cost of upkeep on the elevators. The centrifugal pumps are used both to assist the elevators, and also to elevate the tailing before it is discharged.

Some small holes are bored in the bottom of the buckets, the object being to let the coarser sand work through and drop on top of the load in the bucket below. In this way the coarse portion is kept from packing on the bottom. The holes must be of such size that the pulp will barely work through, the object being to keep the bottom sand in the bucket barely moving. No novelty is claimed for the use of holes in the buckets as it is a well known practice, the novelty being the use of a centrifugal pump to handle the thin pulp and an elevator to raise the heavy portion.

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## Solution Meter at the Belmont Mill

By C. S. McKenzie*

The accompanying drawings show a tilt box in use at the Belmont mill, Tonopah, Nev., for measuring solution.

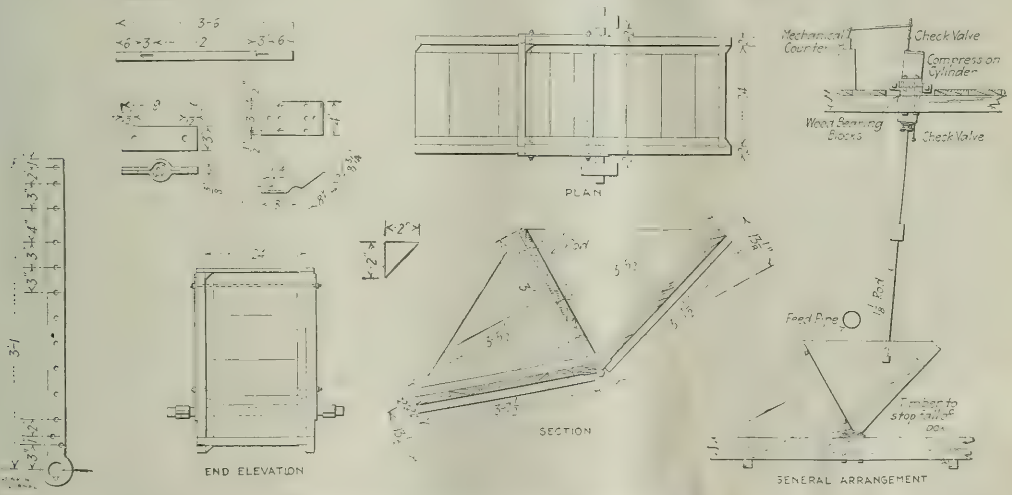

Fig. 2. Details of Solution Meter, Belmont Mill Fig. 1.

Fig. 1 shows the general arrangement of the box with its retarding device, and Fig. 2 gives details.

The box is suspended on timbers over the tank into which it discharges, and is fed from a 6-in. pipe. In Fig. 1 it is in the position it assumes when the right side is filling. As this side becomes full, the weight is sufficient to overbalance the left side, and the box tips to the right, pulling down the piston rod and discharging into the tank.

As the piston rod is pulled down, it pulls the piston in the compression cylinder down, tending to form a vacuum in the upper half of the cylinder, and compressing the air in the lower half. This compression retards the falling box sufficiently to let it down gradually and prevent jarring. Air is drawn through the upper check valve into the upper half of the cylinder as the piston goes down. This air is compressed as the piston is pushed up by the box filling and tipping to the left again, and more air is drawn through the bottom check valve into the lower part of the cylinder, etc.

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*Tonopah, Nev.

To prevent the compression in the cylinder from becoming great enough toward the end of the stroke to stop the fall of the box before the latter has completely discharged, the check valves are allowed to leak enough air to make the rate of fall uniform. The amount of compression can be regulated by the amount of air admitted through the check valves.

As shown in Fig. 1, the compression cylinder is supported at the middle, and the ends travel through arcs as the box tips. A mechanical counter is attached by a rod to the top of the cylinder, and registers each tip. The apparatus was calibrated by counting the tips required to fill the tank beneath, and was adjusted so that it tipped when just full by raising or lowering the timbers which stop its fall.

The box is made of 2-in. Oregon pine lumber, and mounted on a piece of 1⅝-in. shafting . The compression cylinder is an old automobile cylinder, but could be made of a piece of pipe or casing. About 196 gal. of 1.2 sp.gr. solution are handled per minute, and after the intake of air to the cylinder was adjusted, the arrangement works smoothly and without attention.

⁂

## Purifying Drinking Water Supplies

Any mining or metallurgical company considering the installation of a water system using the chlorination process of purification, is recommended to read a series of articles covering that subject, by John Sebroff, in *Industrial Engineering.* The experience of one city is recounted in the June number. It appears that a certain Canadian city, considering the installation of a chlorination plant, sent a committee to investigate the results obtained at a city in New York, where the process was in use. It was found that many people in the latter city refused to drink the water so treated; that a medical association had given its authority to the statement that the water had caused many cases of intestinal and kidney trouble and that it had a bad smell; that the corrosive effect of the water was so great as to ruin domestic piping systems in a year's time or less; and that for the fire engines rain water had to be collected in tanks. Apparently there is another side to the much exploited chlorination-purification process.

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## A Pulp Agitator

A new pulp agitator has been invented by A. W. Warwick, for which he has been granted U. S. patent No. 1,054,629, assigned to A. C. Shenstone, of New York, and now held by his executors.

The patent is based on a central lift pipe to be placed in a tank having a pointed bottom, the lift pipe being open at the bottom and closed at the top, but having holes or slits in the side of the pipe near the top for the escape of the elevated material. Air, centrifugal pump or propeller may be used to force the pulp to rise in the central pipe, the top of which is below the surface of the pulp. A perforated-pipe ring is placed in the cone bottom of the tank in order to avoid settlement of solids, and an annular ring at the level of the top of the lift pipe may be used to form separate cones.

⁂

## Separator for Dry Material

Many devices have been invented for the dry separation of ground ore, but up to the present time none of them has had any remarkable success. Another effort has been made by F. O. Stromberg, of Seattle, Wash., to devise an apparatus of this sort which is illustrated by the accompanying drawing.

The device consists of a fan, or other means of introducing an air blast, which passes through a conical-shaped connection into a box, the bottom of which is divided into separate cone-bottomed receptacles. A screen is placed at the entrance of the box, shown at *A* in the drawing, for the purpose of creating eddies which will permit the greater part of the material to pass through the central slot formed by the movable partitions *B*. These partitions are adjustable and removable, and both the front and rear edges of each partition may be vertically independently adjusted. The arrows in the sketch show that the wind delivered from the fan passes into the inlet of the box and then expands slightly into strata or currents, the central one of which will pass along into and through the inlet without obstruction. Those currents which flow along the top and bottom of the box will set up eddies, as indicated by the fine arrows, and it is the purpose of these partitions to check the tendency to the formation of eddies and to deliver the blasts of air into the box in several strata moving horizontally, and at equal speed. If these screen-panels are used with different meshes, an important bearing will be had upon the amount of air admitted through the slot or opening covered by that particular screen.

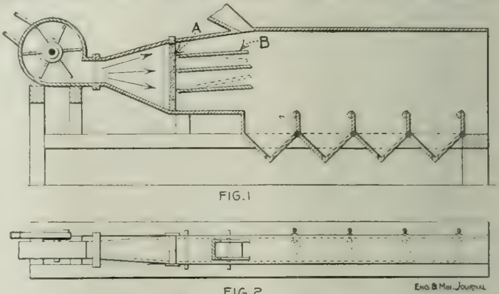

FIG.1

FIG.2

DRY-MATERIAL SEPARATOR

Power is applied to the fan which sets up a blast of air through the trunk, the screen partition and throughout the length of the box to its outlet end. The material fed into the air-current encounters various strata of air which move at different velocities, according as the partitions have been set, and according to the mesh of the screen at the various openings, the larger pieces naturally offer more resistance to blasts of air than the smaller ones, and, therefore, the large pieces will fall into the hopper nearest to the entrance of the long box, while the finer particles will fall into successive hoppers further along until the finest are discharged at the end of the box in the form of dust. This device has been granted U. S. pat. No. 1,042,846.

# NOTES FROM CURRENT LITERATURE

## Mechanical Analysis for Corundum

In an attempt to analyze a hard, crystalline gneiss for corundum, it was realized that chemical analysis was not available, since it would be impossible accurately to recast the quantities of oxides present into the various minerals comprising the gneiss, including quartz, mica, feldspar, garnet and corundum. The method of overcoming the difficulty, as described by W. Spencer Hutchinson ("Bull. A. I. M. E.," June, 1913), consisted of a series of mechanical separations. A sample was first crushed on an iron plate with a hammer, and a portion weighing 500 grams was taken and after adding water, scoured around in an iron bucket with a wooden block to loosen pieces of mica adhering to the corundum. The bucket was repeatedly filled with water and much of the fine, light mica floated off. The remainder of the sample was dried and screened to six sizes, between 4- and 14-mesh. Each portion was then picked over by hand to remove the pure corundum crystals, which were weighed. The reject was reunited with the fine portion of the sample and everything was crushed to 30-mesh. This was panned in a gold pan to produce a garnet-corundum concentrate. The tailing was panned repeatedly until only a negligible amount of concentrate was recovered. This concentrate still contained a small proportion, about 20%, of quartz and feldspar. It was put under an electromagnet, which took off the garnet but left the quartz and feldspar. These latter minerals were finally removed by floating in a heavy solution, of 3.1 sp.gr., made up of potassium and mercuric iodides. The percentage of corundum ranged from 0.4 to 8.6 in various samples thus treated.

⁂

## Unusual Carbonaceous Deposit

A deposit of carbonaceous material which proved baffling to many chemists is described by William Foster (*Econ. Geol.,* June, 1913). The material is found in northwestern New Mexico, about 15 miles northwest of Putnam, and is marked on the old map, Pueblo Bonita. It occurs a few feet below the surface of the undulating country, sometimes liquid, sometimes in a gelatinous condition. Its thickness is unknown, but at one point it was dug through to a depth of 10 or 12 ft. without reaching the bottom; it is sometimes overlain by a stiff white clay.

Analysis shows the stiffly gelatinized material to contain between 53 and 54% of water. After drying it is black, hard and brittle, resembles coal dust when ground. The dry material on analysis shows about 54% of ash, 26% of carbon, 3% of hydrogen, 1% of nitrogen, 16% of oxygen. The ash contains about 53% of silica, 31% of alumina, 9% of soda and 3% each of ferric oxide and calcium oxide. When the material is shaken up with water, a part of it apparently forms a dark-colored solution. However, this is precipitated by adding small quantities of various electrolytes, showing that it is merely a colloidal solution. It is almost insoluble in various organic solvents, which shows that it is not in the nature of an asphalt mineral. No carbohydrates are discovered on test.

It is concluded that the deposit is a mixture of peaty material of vegetable origin so finely divided as to form the colloidal solution with water and of finely divided inorganic material, probably a silicate of aluminum and sodium.

⁂

## New Tin Mines in South China

A company with $375,000 capital is to be formed to acquire an area of 1 square mile in the new British territory, the Kowloon extension, for the purpose of working the tin deposits which have been known for some time to exist there, says Vice-Consul General A. E. Carleton, of Hongkong, in *Daily Consular and Trade Reports,* Mar. 27, 1913. Some 40 shafts have been sunk, and tin has been obtained from every one of them in quantities, it is claimed, that leaves no doubt of the remunerative nature of the enterprise. Samples have been sent to the Straits Settlements and elsewhere for analysis, and the results have been entirely satisfactory—in fact a Straits company is prepared to take any quantity of the unsmelted metal at about $735 per ton.

The mining district is in the valley of Unlong, close to Deep Bay, and the company will not have the question of transportation to face, as junks can approach to within 2 miles of the property. It is thought that by June the extension of the Kowloon-Canton railway will be completed, and this will approach much closer to the concession. In any case the transportation to Hongkong will not cost more than $5 gold per ton, which will make it possible to export tin to Europe and America at a rate with which the other tin mines in Asia can not possibly compete.

The engineers report that there is no doubt as to the richness of the deposits, and say that as they are alluvial they can be worked cheaply. The surface of the paddy fields yields cassiterite in fair quantities, and at the depth of a few feet it has been proved as heavy as 8 lb. per sq. yd. of earth. The main shaft has been sunk to a depth of 41 ft., and the richness of the soil in tin increases with its depth. As soon as the company is formed a dredge to suit the ground will be purchased, and a concentrating table to extract the ore from the sand without the labor of washing will also be installed.

Consul General F. D. Cheshire, of Canton, states that the tin mines at Kochiu in the Province of Yunnan, are owned and worked by Chinese, but the smelting department connected with the mines is under a German engineer who has a German assistant. It is said that a railway connecting the mines will be built by the French. A gentleman who has visited the mines says that the smelting plant is being operated and that about 107,000 lb. of tin are being supplied annually from the mines, all of which is exported. The railway line to connect the tin mines will be built from Mengtze, a distance of about 20 miles.

⁂

## Tungsten Milling in Nova Scotia

In the central part of Halifax County, Nova Scotia, is situated a scheelite deposit which is the only tungsten mine in Canada. The milling at this point is described by Victor G. Hills, in the *Industrial Advocate*, March, 1913. In the mill every possible inexpensive device to prevent sliming is taken advantage of. The ore is dumped over a grizzly before going to the crusher. The roll feed is washed by a spray so that only the clean, coarse material goes to the coarse rolls, which are used for crushing as being probably better than any sort of screen-face pulverizing mill to avoid sliming. While scheelite is more friable than either the quartz or the ankerite gangue, so that, as is usual in the concentration of tungsten ores, the main loss is in the sliming tailing, yet the loss with the Nova Scotian ore is less than with the Colorado black ore. The walls of the vein are slate, which makes a large amount of slime and adds to the difficulties of handling this portion of the material. The vein matter, in addition to the quartz and ankerite and scheelite spoken of before, consists of arsenopyrite with a little pyrite and calcite. The specific gravity of scheelite and arsenopyrite are about the same, and together form the concentrates from the tables. The raw concentrate contains about 45% of arsenopyrite. To get rid of the arsenic it was necessary to roast and treat with a magnetic separator. A Wilfley revolving furnace was used for roasting. The arsenopyrite was prepared for magnetic separation by a high temperature and short exposure. For instance, 1500° for 50 sec. gave better results than 1100° for 90 sec. The best separation of the arsenic can be made by the least possible roasting that will render the iron magnetic, and it is a mistake to attempt to burn off the arsenic. A Ding single-magnet separator was used for the final separation. The magnetic parts carried on an average of 0.72% $WO_3$, with some lots as low as 0.42%. The nonmagnetic products carried 0.34% arsenic. The separator operated at 8 amperes. The mill saving was about 86.8% on a 70% $WO_3$ concentrate.

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## Electrolytic Nickel Deposition

Heretofore it has been difficult to obtain satisfactory deposits of nickel by electrolysis, the plating being usually thin, brittle and easily scaled off. The bath in which this deposition has been carried on consists of the double sulphate of nickel and ammonium. A newly patented process, however, according to *Métaux et Alliages*, May., 1913, produces a thick, compact deposit by using a hot bath of an acid solution of nickel sulphate.

Employing nickel anodes in this process, the tension should be greater than 3 volts with a density of 2 to 4 amp. The inventor recommends an acid bath of 10 to 15° B. The metal thus obtained is homogeneous and its malleability and strength are greater than that formed in the ordinary way.

Nickel tubes may be formed by depositing on hollow mandrels of aluminum, burnishing during the deposition, and afterward dissolving the aluminum base in caustic potash.

## The Antimony Ores of Central Hu-nan, China

According to A. R. Schoeller, in "Journal of the Society of Chemical Industry," May 31, 1913, the Siang-kiang appears to form the eastern boundary of the antimony belt. The district situated between that river and the Yuen-kiang and of which the city of Sin-hoa may be said to be the center, produces the purest and richest stibnite ore, a typical ore assaying 57.64% Sb, and 0.127% As, with traces of Pb and Cu. However, the arsenic is usually well below 0.1%. The gangue amounts to about 15%, and consists of quartz, occasionally mixed with schistose rock. The mineral is most frequently coarse crystalline, showing long, stout prisms, of strong luster. Massive stibnite is not uncommon, and the richest ores are of this variety, with an antimony content of 60 to 65%.

With the exception of one or two mines owned by the Hua-Ch'ang Co., of Chang-sha, there are no mines in the European sense of the term. The workings are merely manholes made in the mountainside; as soon as a certain depth is reached, ground water or the want of ventilation make work impossible, and another hole is dug near-by. In this manner only the surface of the orebody is scratched. The miners sell the ore by the picul to local dealers, who send it to the nearest river, whence it reaches Chang-sha or Yi-yang. At both these places the ore is liquated for crude antimony, while regulus is also made at Chang-sha and Han-yang. The liquation residues, containing 20 to 30% of metal, have accumulated since smelting began, but are being used of late in the manufacture of regulus by the volatiliation process. As the antimony sulphide in the residues coats the gangue and forms a glaze after solidification, it is not possible to concentrate them by mechanical means, as the brittle sulphide slimes after crushing. The slimes from a 27% residue assayed 56.4 per cent.

To the north of the Sin-hoa district the deposits become poorer; near An-hoa there occur ores averaging 18% Sb, with 0.06% As and negligible quantities of lead, copper and zinc. They are of granular texture and present a dull lead-gray appearance. Low-grade ores are also known to occur.

Passing into southwest Hu-peh, the ore deposits show an increased proportion of arsenic, a sample giving 51.75% Sb and 0.13% As. The same may be said of stibnite and crude from the province of Kweichow, some of which finds its way down the Yuen-kiang. Specimens were examined with the following results:

Ore. Sb 62.99%,—As 0.846%,—Pb 0.18%,—Cu, Zn: traces
Crude. Sb 69.85%,—As 0.46%.
Crude. As 0.303%.

The export of stibnite and crude antimony dates back about eight years, when the inflated price of the metal made mining very profitable.

⁂

## Tonopah—Belmont

The Tonopah-Belmont Development Co. and the Belmont Milling Co. report for the quarter ended May 31, 1913, receipts from sales of ore, bullion, etc., $925,885, and mining, milling and administration expenses, $444,053, leaving net earnings of $481,832. Miscellaneous income was $11,875, making a total net income of $493,707 for the quarter.

# Historical Note on Smelting Lead and Silver

*SYNOPSIS—Hoover concludes that the amount of silver owned by the ancients points to a knowledge of reduction of silver and lead ores together, with subsequent separation of the metals. Pliny displays a knowledge of lead metallurgy not again equalled until Agricola's time.*

⁂

The history of lead and silver smelting is by no means a sequent array of facts. With one possible exception, lead does not appear upon the historical horizon until long after silver, and yet their metallurgy is so inextricably mixed that neither can be considered wholly by itself. As silver does not occur native in any such quanties as would have supplied the amounts possessed by the ancients, we must, therefore, assume its reduction by either (1) intricate chemical processes, (2) amalgamation, (3) reduction with copper, (4) reduction with lead. It is impossible to conceive of the first with the ancient knowledge of chemistry; the second does not appear to have been known until after Roman times; in any event, quicksilver appears only at about 400 B.C. The third was impossible, as the parting of silver from copper without lead involves metallurgy only possible during the last century. Therefore, one is driven to the conclusion that the fourth case obtained, and that the lead must have been known practically contemporaneously with silver.

### ONE LEAD RELIC ANTEDATES 1500 B.C.

There is a leaden figure exhibited in the British Museum among the articles recovered from the Temple of Osiris at Abydos, and considered to be of the Archaic period—prior to 3800 B.C. The earliest known Egyptian silver appears to be a necklace of beads, supposed to be of the XII. Dynasty (2400 B.C.), which is described in the 17th Memoir, Egyptian Exploration Fund (London, 1898, p. 22). With this exception of the above-mentioned lead specimen, silver articles antedate positive evidence of lead by nearly a millennium, and if we assume lead as a necessary factor in silver production, we must conclude it was known long prior to any direct (except the above solitary possibility) evidence of lead itself. Further, if we are to conclude its necessary association with silver, we must assume a knowledge of cupellation for the parting of the two metals.

Lead is mentioned in 1500 B.C. among the spoil captured by Thotmes III. Leaden objects have frequently been found in Egyptian tombs as early as Rameses III (1200 B.C.) The statement is made by Pulsifer (Notes for a History of Lead, New York, 1888, p. 146) that Egyptian pottery was glazed with lead. We have been unable to find any confirmation of this. It may be noted, incidentally, that lead is not included in the metals of the "Tribute of Yü" in the Shoo King (The Chinese Classics, 2500 B.C.?), although silver is so included.

After 1200 or 1300 B.C. evidences of the use of lead become frequent. Moses (Numbers xxxi, 22-23) directs the Israelites with regard to their plunder from the Midianites (1300 B.C.): "Only the gold and the silver, the brass [*sic*], the iron, the tin, and the lead. Everything that may abide the fire, ye shall make it go through the fire, and it shall be clean; nevertheless, it shall be purified with the water of separation, and all that abideth not the fire ye shall make go through the water." Numerous other references occur in the Scriptures (Psalms xii, 6; Proverbs xvii, 3; xxv, 4, etc.), one of the most pointed from a metallurgical point of view being that of Jeremiah (600 B.C.), who says (vi, 29-30): "The bellows are burned, the lead is consumed of the fire; the founder melteth in vain; for the wicked are not plucked away. Reprobate silver shall men call them because the Lord hath rejected them."

From the number of his metaphors in metallurgical terms we may well conclude that Jeremiah was of considerable metallurgical experience, which may account for his critical tenor of mind. These Biblical references all point to a knowledge of separating silver and lead. Homer mentions lead (Iliad xxiv, 109), and it has been found in the remains of ancient Troy and Mycenæ (H. Schliemann, "Troy and Its Remains," London, 1875, and "Mycenæ," New York, 1877). Both Herodotus (i, 186) and Diodorus (ii, 1) speak of the lead used to fix iron clamps in the stone bridge of Nitocris (600 B.C.) at Babylon.

### EARLY GREEK OPERATIONS

Our best evidence of ancient lead-silver metallurgy is the result of the studies at Mt. Laurion by Edouard Ardaillon ("Mines du Laurion dans l'Antiquité," Paris, 1897). Here the extensive old workings and the slag heaps testify to the greatest activity. The reopening of the mines in recent years by a French company has well demonstrated their technical character, and the frequent mention in Greek history easily determines their date. These deposits of argentiferous galena were extensively worked before 500 B.C., and while the evidence of concentration methods is ample, there is but little remaining of the ancient smelteries. Enough, however, remains to demonstrate that the galena was smelted in small furnaces at low heat, with forced draught, and that it was subsequently cupelled. In order to reduce the sulphides the ancient smelters apparently depended upon partial roasting in the furnace at a preliminary period in reduction, or else upon the ferruginous character of the ore, or upon both.

Theognis (6th century B.C.) and Hippocrates (5th century B.C.) are frequently referred to as mentioning the refining of gold with lead; an inspection of the passages fails to corroborate the importance which has been laid upon them. Among literary evidences upon lead metallurgy of later date, Theophrastus (300 B.C.) describes the making of white-lead with lead plates and vinegar. Diodorus Siculus (1st century B.C.), in his well known quotation from Agatharchides (2d century B.C.) with regard to gold mining and treatment in Egypt, describes the refining of gold with lead. Strabo (63 B.C., 24 A.D.) says (iii, 2, 8): "The furnaces for silver are constructed lofty in order that the vapor, which is dense and pestilent, may be raised and carried off." And again (iii, 210), in quoting from Polybius (204-125 B.C.): "Polybius, speaking of the silver mines of New Carthage, tells us that they are extremely large,

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Note—This is one of the footnotes from Book IX of Hoover's translation of Agricola.

distant from the city about 20 stadia, and occupy a circuit of 400 stadia; that there are 40,000 men regularly engaged in them, and that they yield daily to the Roman people (a revenue of) 25,000 drachmae. The rest of the process I pass over, as it is too long; but as for the silver ore collected, he tells us that it is broken up and sifted through sieves over water; that what remains is to be again broken, and the water having been strained off it is to be sifted and broken a third time. The dregs which remain after the fifth time are to be melted, and the lead being poured off, the silver is obtained pure. These silver mines still exist; however, they are no longer the property of the State, neither these nor those elsewhere, but are possessed by private individuals. The gold mines, on the contrary, nearly all belong to the State. Both at Castlon and other places there are singular lead mines worked. They contain a small proportion of silver, but not sufficient to pay for the expense of refining" (Hamilton's Trans.).

### Pliny's Knowledge of Lead Metallurgy

Dioscorides (1st century A. D.), among his medicines, describes several varieties of litharge, their origin, and the manner of making white-lead, but he gives no very tangible information on lead smelting. Pliny, at the same period, in speaking of silver (xxxiii, 31), says: "After this we speak of silver, the next folly. Silver is only found in shafts, there being no indications like shining particles as in the case of gold. This earth is sometimes red, sometimes of an ashy color. It is impossible to melt it except with lead ore (*vena plumbi*) called *galena,* which is generally found next to silver veins. And this the same agency of fire separates part into lead, which floats on the silver like oil on water." (We have transferred lead and silver in this last sentence, otherwise it means nothing.) Also (xxxiv, 47) he says: "There are two different sources of lead, it being smelted from its own ore, whence it comes without the admixture of any other substance, or else from an ore which contains it in common with silver. The metal, which flows liquid at the first melting in the furnace, is called *stannum* that at the second melting is silver; that which remains in the furnace is *galena,* which is added to a third part of the ore. This being again melted, produces lead with a deduction of two-ninths."

We have, despite some grammatical objections, rendered this passage quite differently from other translators, none of whom have apparently had any knowledge of metallurgy; and we will not, therefore, take the several pages of space necessary to refute their extraordinary and unnecessary hypotheses. From a metallurgical point of view, two facts must be kept in mind—first, that *galena* in this instance was the same substance as *molybdaena*, and they were both either a variety of litharge or of lead carbonates; second, that the *stannum* of the ancients was silver-lead alloy. Therefore, the metallurgy of this paragraph becomes a simple melting of an argentiferous lead ore, its subsequent cupellation, with a return of the litharge to the furnace.

Pliny goes into considerable detail as to varieties of litharge. The Romans were most active lead-silver miners, not only in Spain, but also in Britain. There are scores of lead pigs of the Roman era in various English museums, many marked "*ex argent.*" Bruce (The Roman Wall, London, 1852, p. 132) describes some Roman lead furnaces in Cumberland where the draught was secured by driving a tapering tunnel into the hills. The Roman lead slag ran high in metal, and formed a basis for quite an industry in England in the early 18th century (Hunt, British Mining, London, 1887, p. 26, etc.). There is nothing in mediæval literature which carries us further with lead metallurgy than the knowledge displayed by Pliny, until we arrive at Agricola's period.

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## Proposed Changes in Metal Tariff

Washington Correspondence

The tariff bill, as reported by the Senate Finance Committee to the Senate on July 11, contains the following new paragraphs relating to steel and iron, which make the additions shown to the free list; iron ore was free by the House bill also:

Iron ore, including manganiferous iron ore, and the dross or residuum from burnt pyrites; iron in pigs, iron kentledge, spiegeleisen, wrought iron and scrap and scrap steel; but nothing shall be deemed scrap iron or scrap steel except second-hand or waste or refuse iron or steel fit only to be remanufactured; ferromanganese; iron in slabs, blooms, loops or other forms less finished than iron bars, and more advanced than pig iron, except castings, not specially provided for in this section. . . . .

Steel ingots, cogged ingots, blooms and slabs, die blocks or blanks, and billets, if made by the bessemer, Siemens-Martin, openhearth or similar processes, not containing alloy, such as nickel, cobalt, vanadium, chromium, tungsten, or wolfram, molybdenum, titanium, iridium, uranium, tantalum, boron, and similar alloys.

Other changes in the bill as reported make reductions varying from 3 to 10% on steel plates, wire and a number of other products. Iron pipe is placed on the free list.

Changes in the proposed metal tariff include the following: Aluminum ingots from 25% to 2c. per lb.; aluminum sheets, etc., from 25% to 3½c. per lb.; miscellaneous manufactures of metal from 25 to 20% *ad valorem*. On the other hand, duties on lead in ore are increased from 0.5c. to 0.75c. per lb.; on zinc ore from 10 to 12.5%; on pig zinc from 10 to 15% *ad valorem.*

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## Reported in New York

The stock of refined electrolytic copper in the hands of American refiners at the end of June was only 28,750,000 lb., which is only about the normal production of seven days. It is commonly reckoned that about 10 days are required to fill specifications for shapes. If consumers were not ordering, of course, the refinery stock might run down to *nil* without causing any inconvenience.

The Journal's statistics of the smelters' production of copper in May, 1913, are 142,559,004 lb., compared to 136,989,739 lb. in April. The refiners' statistics for the same months were 141,319,416 lb. and 135,353,402 lb. respectively.

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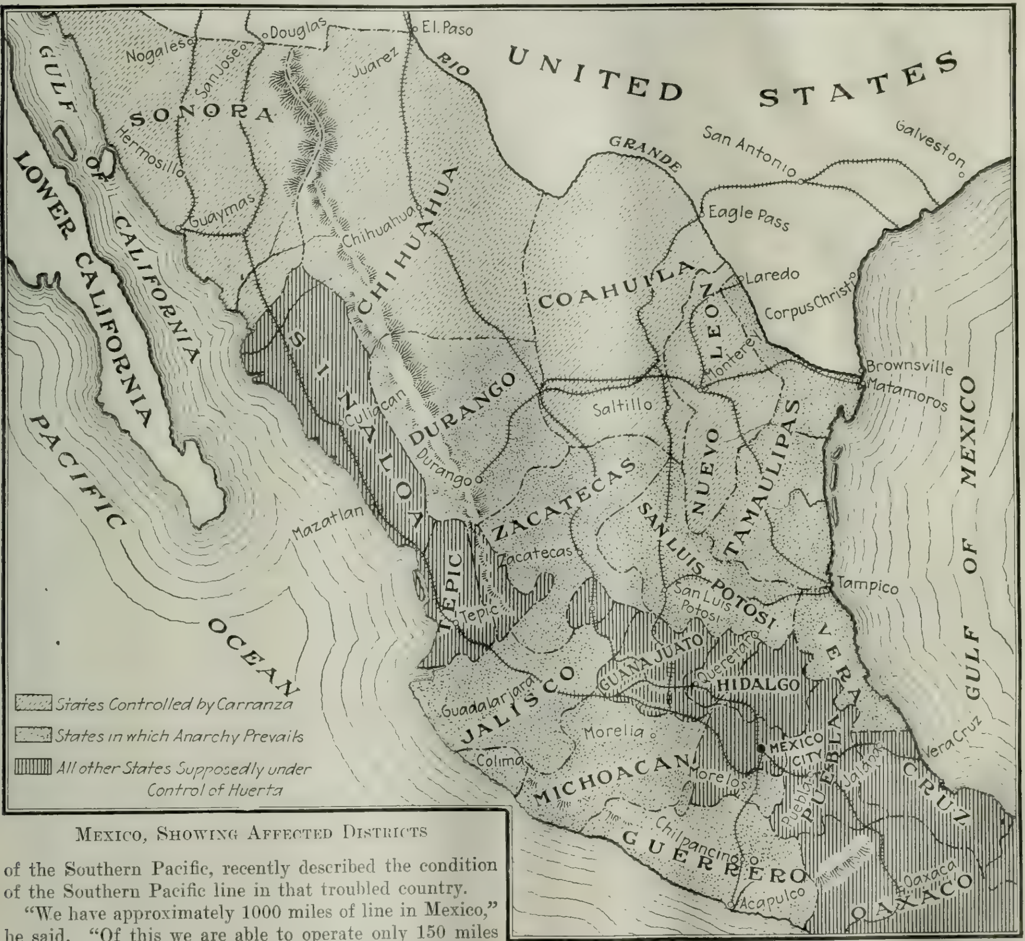
**Leadville's Production** during 1912, surpassed that of any other mining camp in Colorado, both in tonnage and value. Leadville produced $1,132,508 in gold, $1,812,573 in silver, $1,105,980 in lead, $461,272 in copper, and $6,757,360 in zinc ore, sulphide, carbonate and silicate. Cripple Creek's output was mainly in gold and totals $11,055,175 the silver produced being only $40,408 of this. The total production from Leadville was $214,517 more than that of Cripple Creek.

# The Situation in Mexico

The accompanying map, which is redrawn from one that recently appeared in the New York *Sun*, gives an approximate idea of how things stand in Mexico. No one, not even our Department of State, seems to know all about the situation. About all authorities are agreed, however, that things in Mexico have never been worse than now.



MEXICO, SHOWING AFFECTED DISTRICTS

Julius Kruttschnitt, chairman of the board of directors of the Southern Pacific, recently described the condition of the Southern Pacific line in that troubled country.

"We have approximately 1000 miles of line in Mexico," he said. "Of this we are able to operate only 150 miles of line from the border south to the capital of Sonora province and another short branch line of 50 miles from the border to the mines of Cananea—in all 200 miles of operated line out of 1000. The conditions have been this way for the last four or five months.

"The constitutionalists, the insurrectionists and the Federalists are dividing the rest of the line between them to all practical purposes. They have cut the line in two 150 miles south of the border. They have taken the shops and terminals of the line, so that though they do not actually hold all the remaining parts of the line, it is impossible to operate trains over any but the 200 miles I have mentioned.

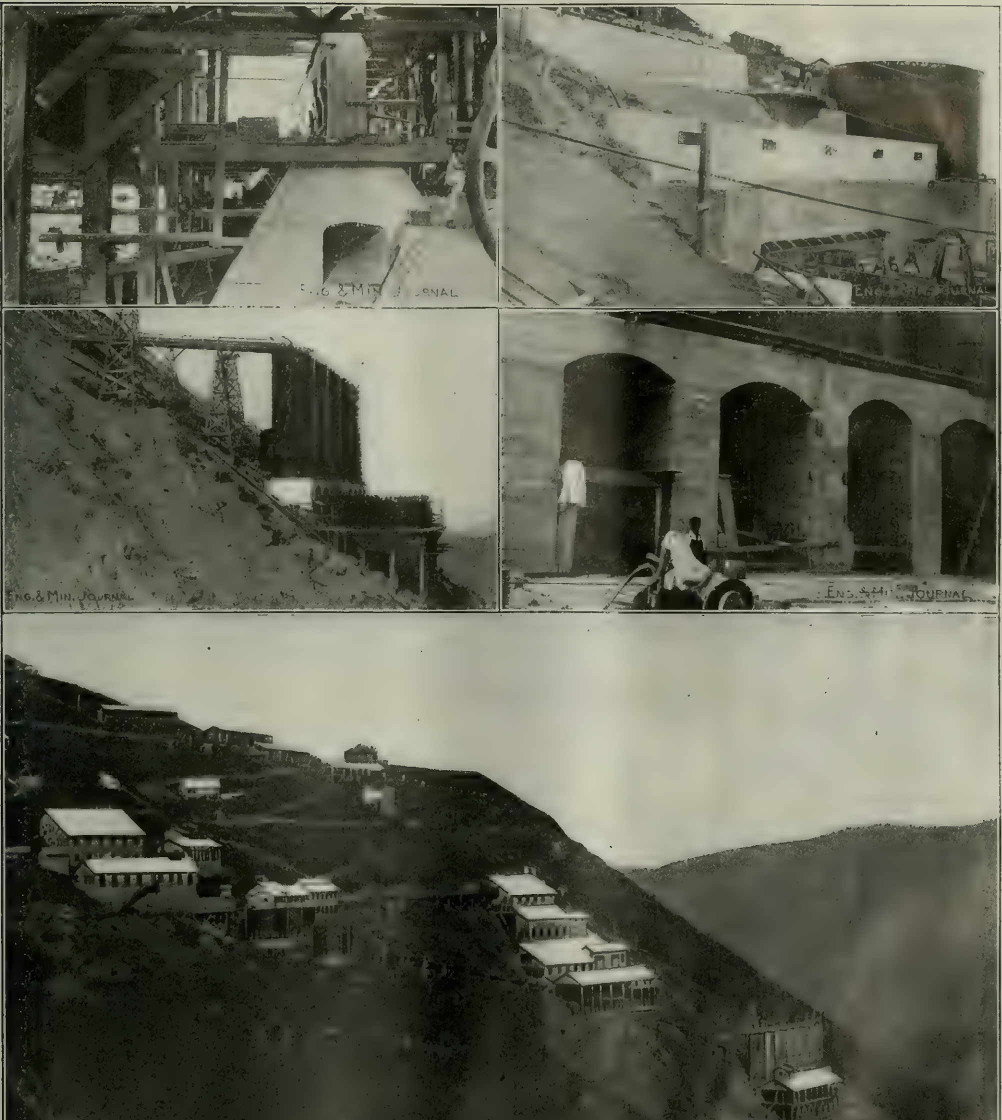
"At Empalme, on the coast, we have shops. There are gunboats in the harbor, and whenever they see a locomotive stir out they take a crack at it. So the result is that not many locomotives are seen.

"We are unable to estimate the loss to the line. They have burned trestles several times over after replacement. In all cases of destruction we have communicated with the State Department and received letters of acknowledgment."

The loss to the National Railways of Mexico has been enormous. Only 47% of its mileage is under operation. In June gross receipts decreased nearly $2,000,000 Mexican currency. For the first week in July gross receipts were only $500,000, Mex., half of what they were two years ago, and less than enough to pay running expenses.

# PHOTOGRAPHS FROM THE FIELD

KENNETT, CALIF., SMELTING PLANT AND NEAR-BY GARDENS AND LAWNS
(The Grove is one-half mile distant. Luncheon [illegible] served to the Mining Congress by the Women of Woodcraft)



New Mill, New York & Honduras Rosario Company, San Juancito, near Tegucigalpa, Honduras

# Johannesburg Notes

SPECIAL CORRESPONDENCE

I have already referred to the prevalence of pneumonia among tropical natives working on the Rand, which caused the government to prohibit further importations. Last year the famous bacteriologist, Sir Almroth Wright, was called in. He prepared a pneumococcal vaccine for inoculation. Results on the Rand have so far been inconclusive, but on the Premier Diamond Mine its use has reduced the death rate per 1000 from pneumonia from 32.08 to 15.84 and the general death rate from 51.11 to 34.83. If similar results can be obtained on the Rand, tropical labor may again become available.

Development is still rapidly pushed in all mines, though there are some 87 million tons of ore developed. The mines on the Rand accomplished 90,098 ft. of development for the month of April and there were employed regularly some 6200 rock drills out of a total of nearly 9000 in commission.

The No. 4 shaft of the government gold-mining areas (Modderfontein) recently struck the reef over a mile east of the Brakpan Mines at a depth of 3580 ft. The reef was slightly faulted, half assaying 16.8 dwt. over 65.3 in., and half, 16.1 dwt. over 45.5 in. The recent strike of 11 dwt. over 38 in. in a bore hole at a depth of 3660 ft. from the bottom of the south shaft of the Springs Mines is some five miles from the nearest mines to the west and north and opens up the prospect of a large area of reef in the East Rand basin proving payable.

The Van Ryn Deep Mines developed during the first four months of the year 231,000 tons, valued at 12.54 dwt. over 48 in. The 80-stamp mill to crush 40,000 tons per month is expected to start work early in July. The ore reserves were at the end of March, 1,263,000 mill tons, valued at 8.9 dwt. per ton, and the higher-grade ore now being developed is further raising the average values.

The Consolidated Langlaagte Mines crushed during 1912-1913 295,072 tons, for a gross profit of £123,938 19s. The new 100-stamp mill is now, however, dealing with 45,000 tons per month, with a monthly profit of £22,250. The ore reserves are estimated at 2,069,630 tons, with an estimated recovery value of 6.4 dwt. Owing to the indistinct character of the South Reef, it is possible to do very little sorting. Residues are 0.218 dwt. or 11d. per ton, but the figure has been reduced in the Princess Estate plant, where 60% of the ore is slimed to 0.157 dwt., which is surely a metallurgical record for ore averaging about 26s. per ton.

Much anxiety is being caused by a strike which has broken out at the New Kleinfontein Mine. The directors of the group controlling this company had to shut down the Apex Mine for want of funds to proceed with development. They had engaged a manager for several years at a high salary and to utilize his services, they instantly dismissed the popular manager of the Kleinfontein Mine, though his results were excellent and costs were low. The new manager and underground manager caused friction by altering the usual working hours of some underground mechanics and dismissed them when they protested. All the workers of the mine, irritated by this, ceased work. This time the engine drivers also struck work, which they had never done before, and apparently without leave from the heads of their union which has a specially favorable agreement with the Chamber of Mines. The reduction workers also struck. After some slight delay the company offered to reinstate all strikers and to return to the preëxisting hours, but by this time outside agitators had come in and persuaded the miners to demand an eight-hour bank-to-bank working day with Saturday afternoon half holiday. In connection with this demand it must be remembered that the white miner does not perform the actual work, but acts as a supervisor to natives and that in some of the mines it takes nearly an hour to reach the working faces, so that the demand is something different to that put forth in other mining districts where six or seven hours of actual physical exertion is as much as men can fairly be asked to perform. The company also refuses to recognize any of the strike committee who are not employees of the company and they refuse to recognize the unions. The strikers' idea at present is to confine the strike to this one mine and get the workers on other mines to support them, but as the New Kleinfontein Company is naturally receiving the support of all the other mines, they can do little unless they call for a general strike. The general feeling about the reef is that a general strike is the last thing the men want or are prepared for.

The strikers are now breaking the Arbitration Act and the government will shortly be forced to intervene as some of the leaders are inciting the men to acts of sabotage and violence. The whole incident is an eloquent commentary on the unsecurity of tenure of men in all grades even when doing good work, and on the strange ignorance of Rand magnates in not realizing that a state of good feeling between manager and men is a valuable asset not to be lightly thrown away. On the Rand if a manager is liked by his men and has established good relations with them, he is liable, no matter how low his costs may be, to become an object of suspicion and to be supplanted in favor of someone with a reputation for stirring things up. This policy is a short-sighted one and ignores the chief elements of human nature.

It is hard at the present time to predict what will happen, as the engine drivers can, if they strike, hold up all the mines of the Rand.

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# Montana Mining Co., Ltd.

The Montana Mining Co., Ltd., of London, operating properties at Edgemont, Nevada, and in Montana, reports that it has settled the litigation which has harassed it for years, by paying £8250 to the St. Louis Co. in full liquidation of all claims. Development and exploitation of the property will be undertaken at once and it is believed that profitable results will follow. The gross production of the property for the 5-year period preceding suspension on account of litigation, was £123,862, yielding a profit of £27,366. This company includes in its property the old Drumlummon mine in Montana, a former famous gold-silver producer.

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**The Next Nitrate-Land Auction** will be on Nov. 17, 1913. The lands to be sold are known as the Santa Laura de Wendel property, and it is estimated to contain 15,000,000 metric quintals of nitrate. It is situated in the Province of Tarapaca. The Government reserves the right to divide the property into two lots if desired. The sale will be held before the Junta de Almoneda in Santiago under the usual terms and conditions.

# CORRESPONDENCE AND DISCUSSION

## The Forest Service and the Prospector

My attention has been called to an article in the JOURNAL of June 21, p. 1255, by J. C. Kennedy, of Manhattan, Nev. Misunderstanding of the Forest Service policy with reference to mining upon the National Forests has become so widespread through repeated misstatements that it appears advisable to inform the public of the facts in the case discussed by Mr. Kennedy.

From the statement made it would appear that instructions published in the "Forest Service Manual" are not universally carried out. This idea is contrary to fact. The regulations, however, must be elaborated as new conditions are encountered and amendments and explanations are made from time to time through the medium of circular typewritten letters. By such a letter, dated Mar. 16, 1912, the forester authorized a modification of the existing procedure with reference to the expert examination of mining claims, under which such examinations could thereafter be made by employees who are qualified through education, experience, and practical knowledge to do the work. This modification was made from a desire to promote the interests of the miners by avoiding delay. Employees considered qualified thereunder are to be made use of only when a mineral examiner is not available. There is nothing secret or confidential about this practice and all correspondence may be seen in the files of any office of the service. It is conceded that not all forest rangers have a knowledge of mining sufficient to qualify them for expert examinations, but it must not be concluded that this is usually the case. Many men of practical mining experience enter the Forest Service as rangers, although this is not one of the qualifications required. Naturally, as in any other business, they are applied on the kind of work to which they are best adapted.

In the case under discussion, the examination was made by Deputy Supervisor R. G. Steele, who is considered fully qualified through experience and practical knowledge to make the investigation. In his report, it is shown that upon one of the claims, viz., the Morning Glory, an expenditure of only $225 has been made. The balance of an alleged expenditure of $14,720 was made upon the adjoining claim. Although claimed to apply in the development of the Morning Glory, this improvement cannot by any honest process of reasoning be construed to develop that claim. This fact alone would prevent the issuance of title to the Morning Glory. The tunnel which the claimant seeks to apply as a common improvement is located on the Pine Nut No. 2 and extends directly opposite from the Morning Glory claim, and nothing in the shape of a ledge disclosed in the tunnel can be found to exist within the limits of the Morning Glory. Drift No. 1 of this tunnel, which is the only portion of the tunnel extending in the general direction of the Morning Glory, would if continued at its present level run out of the hillside approximately 300 ft. from the west-end line of that claim and across a gulch. It cannot, therefore, be considered as tending to develop the Morning Glory claim.

It is not the intention to initiate a contest upon slight technical noncompliance with the law but in this case failure to make one-half the expenditure upon improvements required by law is such a clear indication of bad faith when considered in connection with the lack of discovery that the disregard of the mining laws could not be overlooked.

In applying the instructions, the officer reporting upon this application wisely concluded that so flagrant a disregard of the law warranted a rejection of the application for patent. The suggestion in the instructions that good faith almost necessarily exists when claims are located on untimbered and unwatered lands which control no means of access or rights-of-way, was not accepted by the examining officer in the face of the preponderance of evidence of bad faith manifest through lack of both development work and discovery. It would be difficult to conceive of better proof of discretion lodged in officers of the service or of its exercise.

In this locality mining claims have been located and are being held for a good many purposes other than those contemplated in the mineral laws. Many claims in the vicinity are commonly conceded to have little actual value for mining purposes, others none at all, and some are covered by towns and occupied by business buildings, devoted to various occupations, including hotels, saloons, business offices, shearing plants and dipping vats. It would be difficult to presume good faith on claims in a region where this condition exists when an expenditure has not been sufficient to satisfy the requirement of law and no discovery of mineral has been made.

Free-use permits have not been discontinued as stated, on the Toiyabe National Forest, but the free-use regulations are closely enforced, that is, free-use permits for timber are denied those who may reasonably be required to purchase or have on their own lands or claims, or on lands controlled by them, a sufficient or practically accessible supply of material suitable for the purpose named in the law.

The sort of criticism made by Mr. Kennedy seldom comes from a *bona fide* actual miner or prospector and could never be made by one who had fully informed or honestly tried to inform himself.

In this connection, the following quotation from Vol. 38, "Decisions of the Interior Department Relating to Public Lands," p. 289, may be of interest to the readers of the ENGINEERING AND MINING JOURNAL:

> MINERAL SURVEYOR-REVOCATION OF APPOINTMENT-AUTHORITY OF SURVEYOR-GENERAL
>
> James C. Kennedy
>
> . . . By the record now before the Department it is disclosed that on Jan. 9, 1909, the Surveyor-General cited the appellant to show cause why his appointment should not be revoked, stating that the "action is taken for the protection of the mining claimants of this state, and in the interests of good administration" and reciting not only that four specified

surveys, executed by appellant, "have been [illegible] ously in error," as shown by the appellant's report [illegible] thereon but that the field notes thereof had been [illegible] in the various cases, from two to five times for [illegible] so "that much valuable time of the force of this office [illegible] consumed in checking and rechecking this work" [illegible] an utter lack of scruple on appellant's part "in [illegible] error lines of approved official surveys where [illegible] correct, to correspond and agree with your own [illegible] work," in which connection three cases are cited.

It is the opinion of the Department [illegible] examination of the record, that the pending case [illegible] the application of that rule and the decision of [illegible] is accordingly affirmed.

The Forest Service welcomes honest constructive criticism from whatever source. It could afford to disregard all of the unjust attacks made upon its methods and personnel were it not for the fact that where so much pure mud is thrown some is liable to stick. But there comes a time when patient submission to abuse ceases to be either virtuous or wise.

S. Riley,
District Forester.

Denver, Colo., July 19, 1913.

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## The "Practical" Mining Man and the Mining Geologist

Professor Wadsworth's letter in the Journal of June 28 impels me to ask you to allow me a little space in which to state that I did not intend, in my presidential address to the Colorado Scientific Society, to re-hash the old contention as to the relative merits of the "practical" mining man and the trained geologist. Certainly it was as far as possible from my purpose to slight the latter. I did emphasize the value of continuous study of geological phenomena as developed underground, but at the same time I dwelt on the desirability of geological training for the observer.

May I disclaim, at the same time, any desire to "foul my own nest" by disparaging consulting engineers? No doubt some consulting engineers are incompetent, and others do not keep in touch with developments frequently enough, but this does not justify us in condemning the entire class.

Is it too much to ask those who may be interested in my views on these subjects to refer to the address, and read what I actually did say?

George E. Collins.

Denver, Colo., July 16, 1913.

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## Canadian Lead Bounties

The Journal has been misinformed concerning Canadian lead bounties, to which reference was made in the issue of June 21. Some of the figures given are altogether erroneous. The total amount to be paid, authorized in 1903, was not to exceed $2,500,000 (not $6,000,000). The first Act provided for payment of bounty for a period of 5 years, "the sum to be paid as such bounty shall not exceed $500,000 in any fiscal year;" also that the payments should cease on June 30, 1908. Just before the expiration of the first 5-year-period another Act was passed authorizing payment for another period of equal time, and making the London price of lead at which payment of bounty should cease, a higher one. At the close of the 10-year period, on June 30, 1913, approximately $1,900,000 of the amount originally voted had been paid or was payable, leaving $600,000 still available for bounty payments under the third-period extension lately granted. I have not my table at hand just now, but my impression is that the bounty ceases when the price of lead in London is £17 18s. 9d. As the London price goes down the rate of bounty increases until a maximum allowance of 75c. per 100 lb. is reached. On exhaustion of the $600,000 bounty, payment will cease under the present authorization.

E. Jacobs.

P. O. Box 645, Victoria, B. C., July 2, 1913.

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## Making Copper Wire by Electrodeposition

I am reminded by William E. Gibbs' patent, described in the Journal of July 12, 1913, p. 72, of experiments I knew of several years ago to produce copper wire directly by electrolysis. The copper was deposited on a mandrel as cathode, on which was a spiral ridge. The idea was to strip off the copper in a long strip which was then drawn to wire, thus avoiding melting down the deposited copper cathodes and drawing the wirebars into wires. This process was covered by the Dumoulin patents, I believe.

What I have never seen commented on in the technical journals is that the wires thus produced had a higher conductivity than wirebars made from similarly deposited cathodes, but every now and then the wire would snap short, and it proved impossible to draw long enough strands to be useful. These weak places in the wire were apparently due to small particles of impurity, slime, or extraneous dirt in the electrolyte. At any rate, it proved impossible to eliminate them, and experiments were eventually given up. Mr. Gibbs would appear to avoid this rock.

I have been told that wires drawn from the native masses of Michigan copper will also give a higher conductivity than wire from bars obtained by melting them, a phenomenon analogous to that with the wire from cathodes.

H. A. T.

Newark, N. J., July 19, 1913.

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## Questions and Answers

### The London Price for Lead

If the price for pig lead at London be £20 per ton, what is the equivalent in United States currency? What would it cost to bring lead from London to New York?

J. L. F.

The price for pig lead as quoted on the London Metal Exchange is subject to discounts, which in the aggregate amount to about 4%. Thus, if the rate of exchange causes the quotation of £20 in London to be equivalent to 4.35c. in United States currency, the net cash equivalent would be 4.17c. The cost of carrying lead from London to New York, or *vice versa*, would probably be about 15@20c. per 100 lb., varying from time to time according to ocean freight rates.

# EDITORIALS

## Wages in Mexico

As the result of an exhaustive official examination of the books of a leading mining company, whose activities are in northern Mexico, figures can be presented as to labor data that show changes in rates and efficiency during a period of six years, as well as relative rates paid to natives and foreigners. This space of time covers the era of unrest culminating in the Madero revolution and the subsequent debacle in the political affairs of the Republic; a series of strikes, due to attempted organizations of unions among the laborers, and the duration of a gradual but notable change in the proportion of native to foreign labor.

The figures show, moreover, deductions from wages on account of purchases at the company stores, and are of especial interest in this connection as indicating the percentage of its wage roll that is returned through the medium of the stores. The small proportion so coming back will probably be a surprise to those that have supposed mining companies in Mexico can gage the real cost of labor by the wholesale price of goods in their stores. Of course, the case presented is but one, and cannot be presumed to tally with those of companies operating in small and outlying camps where the company store is almost the only outlet for employees' money.

Labor efficiency has decreased during the six-year period by about 20%, due to political unrest, agitation, and similar causes. But the scale is practically the same as in 1906; some few items have been increased by, say, 25 to 50 centavos, and this is especially true of the underground divisions, while others have been diminished by about the same amounts. In percentages, these changes vary from 6 to 12% either way. The hours of work have been lessened by about 6% in the same time, without any compensating increase of efficiency during the period of labor, i.e., a man working 8.5 hours now will not do as much work as he did six years ago, when he was working nine hours per diem. He does not speed up in Mexico on account of decreased hours, any more than the laborer in the States speeds up when his time is cut, in spite of all the array of arguments that has been adduced to the contrary.

At all its works, and in the various branches of its own and subsidiary enterprises, this company has had from 3500 to 5000 men on its payrolls more or less continuously. Prior to 1906 it employed a proportion of foreigners, chiefly Americans, amounting to from 38 to 40%. In 1906 this proportion was reduced to 34.2%. From that time on there has been a marked and steady diminution in the proportion of foreigners employed in the various activities of the company, beginning in 1907, when it was reduced to 28%. In 1909 the percentage varied from 18.4 to 15%; in 1910 it was from 16.5 to 12.5%; in 1911 from 15.5 to 14.6%; and in 1912 it varied from 13.8 to 12.9%. At the present time the proportion of native labor employed in all departments, and including all classes of employees, is about 87% of the whole. This is a change that the Mexican government looks upon with considerable complacent satisfaction, no doubt.

During the same period the average earnings of native laborers have increased and those of foreigners have shrunken, not relatively, but actually, so that the proportionate employment, measured in terms of dollars, has shown a greater difference than the mere proportion of men employed among natives and foreigners will indicate. The average yearly earnings of natives, prior to 1906, was 1298 pesos per year, while that of foreigners was 3458 pesos. Today these averages are 100 pesos higher for the natives and 100 lower for the foreigners.

Generally speaking, the wage scale for foreigners is a trifle under the same figure, in gold, as that for natives, in Mexican silver. That is to say, that where foreign workers in certain occupations are getting, we will say, from 6 to 7 pesos per day, natives in corresponding occupations are earning from 3 to 3.50; machinemen compare at from 8 to 6.50 with 4.25 to 3.50. But, while there is this difference in the rate of pay, the work done differs in the same proportion. Thus, the company has native and American watchmen. The natives receive 3.50 to 4 pesos per day, and the Americans $3.50 to $4. But the responsibility of the two classes varies as widely as the results secured, and it is well known that the American watchmen really watch, while the Mexicans, like Brer Rabbit in the Uncle Remus tale, simply look on, and make little or no objection if some friend spends his night in lugging off coal or providing lumber for repairs to his house.

This company employs no American miners except as foremen, and no comparison is possible between the pay of natives and foreigners in this occupation.

A rather interesting and illuminating fact is this: That of the corps of mining engineers employed, the average monthly pay is but $160 (gold) while one so classified receives but $100. In the geological corps the average is but $140 per month. These are all foreigners, and mostly Americans. Their pay scale does not present as alluring a picture as many of our mining-school undergraduates, themselves anxiously awaiting calls to similar occupations, would hope to be able to paint. The matron of the rental department, or the manager's chauffeur, or the timekeepers, get as high salaries as the average of these engineers. And almost as much earn the *vaquero* rangers, riding from the company corral in the free life of the brilliant, windswept hills! Telephone-switchboard operators are receiving as high pay as some of the engineers. However, in this connection, one must note that the average of pay to mining engineers is reduced by the fact that several of these men are undergraduates of engineering schools, who are receiving their training and "breaking in."

Chinese inexpert labor, which is all the time increasing in its proportion of the whole, earns from 2.50 to 3 pesos per day, while a Chinese printer, employed in making out *carteras* and *boletas*, and other matter, gets 3.50 against the 6 pesos that is drawn down by his Mexican associate. Mexican machinists, molders, pattern makers, etc., earn 7.50 pesos, and foreigners under the same designations, get the same.

And so the comparisons run, through a long and complicated list, covering almost every line of mining and mechanical activity. It will be useless to detail them further. But it must not be forgotten, in connection with these various relative rates, that the foreign and native workman, though classed identically, may be working under diverse responsibilities, and that the foreigners may be giving more return for his \$5 than the native for his 5 or 6 pesos. One may be sure that the very presence of the foreigner on the payroll indicates that he is giving fully as much as he gets in addition to the rate paid his Mexican associate, or he would not be there at all.

In the last three years store deductions from gross wages earned, that is, the proportion of wages that are turned in to the office to be collected against the employee on account of his store purchases, have been as follows:

| | 1910 | 1911 | 1912 |
|---|---|---|---|
| Average number natives employed .... | 3058 | 2815 | 3760 |
| Average number foreigners employed.... | 573 | 494 | 555 |
| Average yearly earnings, natives, pesos | 1,298 | 1,355 | 1,382 |
| Average yearly earnings, foreigners, pesos | 3,458 | 3,440 | 3,357 |
| % company sales to earnings, natives.. | 20.0 | 19.5 | 17.1 |
| % company sales to earnings, foreigners | 17.6 | 17.6 | 16.0 |

In addition to these payments to the company stores, are certain small charges by hospital, for public service (water and the like) amounting to about 5% of the wages.

In connection with this entire matter it is interesting to note the fact that the gradual weeding out of foreign labor began immediately after a well remembered Mexican mining strike in 1906, and that its first effect was to eliminate from the camp a number of agitators and organizers of the Western Federation of Miners, who had been active for some time previous.

⁂

## The Forest Service and the Miners

The reply of Mr. Riley, district forester, published in this issue of the JOURNAL, to a communication by J. C. Kennedy, which was published in our issue of June 21, is right to the point and consequently effective.

We have published a lot of discussion respecting the quarrel between the foresters and the prospectors; and we have heard a lot more than we have published. Let us give our own conclusions:

1. We believe that the foresters mean well and in general act well. Miners in whom we have complete confidence have informed us that not only have they experienced no obstruction from the foresters, but, on the contrary, have had their friendly coöperation.

2. We believe that the complaints against the foresters emanate largely from persons who have been checked in their attempts to evade some laws, in which the foresters have simply done their duty. If the complainants don't like the laws, they ought to agitate to get them changed.

3. There are probably some cases, relatively few, of vexations and perhaps unfair actions on the part of the foresters, arising no doubt out of ignorance, misunderstanding and officiousness on one side or the other. Such cases ought to be capable of straightening out with no great trouble.

The Forest Service is manifestly irritated and indignant over the abuse that has been directed at it; unjustly to a great extent. For this, however, itself is probably to blame; and the remedy lies in its own hands.

Let complaints receive prompt attention and full investigation. Let it be advertised that such will be the practice. Let red tape be abolished, and bureaucratic insolence, indifference, etc., along with it. Let subalterns, and even heads of departments, who do not conform to these rules of policy be fired as promptly as Civil Service rules will permit.

"But," our friends of the Forestry Service will say, "We do all of that, or most of it, right now."

That may be so, but we suggest the question, "*How* do you do it?" Manifestly not in the right way, else there would not be so much vociferation. We have seen bureaucratic correspondence, which, to our mind, was ample justification of clamor, although the gentlemen who indited it in Washington may have been technically correct. Let the foresters avoid that, let them expose two or three of the greedy grabbers who try to pull wool over their eyes in attempting to locate timber under the guise of an alleged mining claim, let them do these and other things and the people will be with them, as, no doubt, they ought to be.

Insofar as our own columns are concerned, we are going to consider the discussion of this subject as a closed book, the reopening of which will require some very interesting case.

⁂

## Developments at Jerome, Arizona

Some substantial development work is being done on outlying properties in the Jerome district in Arizona and the camp is now having an opportunity to prove whether it can develop another United Verde, or even other mines of more modest producing qualities. For a number of years after the wonderful production of the United Verde mine became common knowledge, the activity in the Jerome district was largely in connection with stock-selling schemes, the promoters of which dilated upon the other "United Verdes" they expected to find. The brokers' circulars disclosed dazzling mathematical calculations of wealth, but as usual most of the wealth was transferred to the promoters' pockets and as comparatively little of it went into the ground, no other United Verdes were found. After "biting" freely for a number of years, the public gradually assumed that Jerome was a one-mine camp, though few districts have been left with less actual development than the one containing the United Verde mine.

Recently an era of different character has been inaugurated and some earnest development is now in progress. The work of local people of the district has in the past been handicapped by lack of funds and has been largely confined to representation work to hold or patent their claims. While many properties had good indications and in most cases some oxidized ore, there was little work done at depth to determine whether the upper showings would develop into commercial orebodies. Development operations are at present being directed toward sinking and exploration at depth. It is important to note in this connection that a group of the successful mine operators of the Southwest have gone into Jerome and decided to sink a shaft 1600 ft. or more. Other companies are sinking and it now seems assured that the district will have a thorough prospecting at depth.

With the building of the new smelting plant at Clarkdale the United Verde company will be in a position to treat more custom ore and it is expected that the developing properties of the district will be greatly assisted by having an outlet for such ore as they are able to produce. Development of a substantial nature is now in progress at a number of properties in the district and never before has the camp had such well based hope of finding more mines, which we trust will eventuate.

⁂

The article by Mr. Eddy, the California representative of the editorial staff of the JOURNAL, on the smoke situation, which appears in this issue, is first-hand evidence. Mr. Eddy, who is a competent observer, went to Shasta County and saw with his own eyes. What he saw is told by himself and need not be repeated here. We may remark, however, that the reports of alleged damage from the smelters' smoke in California have undoubtedly been exaggerated, just as they were in Utah and Montana. In most of the cases the farmers have simply tried to "put one over" on the smelters.

⁂

The Butte meeting of the American Institute of Mining Engineers promises to be the most successful in the history of that organization.

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The index of the ENGINEERING AND MINING JOURNAL, for the period from January to June, 1913, is ready. It will be sent to any address on receipt of a post card requesting same.

## BY THE WAY

The St. John del Rey Mining Co., of Brazil, is trying an interesting labor experiment, having imported 107 Japanese recruited from the mines and quarries of Japan. The operations of the company have lately been retarded by deficiency of miners in Brazil.

⁂

Thomas E. Rush, attorney in inheritance-tax matters, for the State of New York, has given permission to the executors of the estate of J. P. Morgan to release various securities for transfer and removal. The list comprises only two mining items, viz., $268,000 of Cerro de Pasco bonds and 5500 shares of the Cerro de Pasco Investment Co.

⁂

A partner in a mining stock exchange firm which usually carries from 200 to 500 accounts on its books was lunching with a friend, says the *Boston News Bureau*. The broker ordered an elaborate meal, remarking that he didn't care how long he stayed away from the office. "How's that?" his companion asked. "Oh, our customer is sick!"

⁂

In the year 1900 the sulphur consumption of the United States was made up of 98% imported and 2% domestic material. In 1912, the domestic production supplied 91% of the demand for brimstone and imports 9%. Moreover these imports were nearly all of Japanese sulphur on the Pacific Coast. Louisiana sulphur has practically replaced the Sicilian, so that the arrival of a cargo from Sicily is an event unusual enough to cause comment.

⁂

Towns on the Minnesota iron ranges may count on preserving their names but not always their local habitations. Iron ore must be taken out whether there is a town over it or not. Sparta and Eveleth are examples of towns which have been moved, the latter twice; and we believe Biwabik also has done some migration. Now it is Hibbing, a place of 12,000 people and the largest town on the Mesabi, which will have to give place to the steam shovel before long.

⁂

At Mine La Motte, Mo., in the early days, a few "Cousin Jacks" were employed. The mine captain contracted the driving if a drift to a little "Cousin" who stood about 4 ft. 6 in. He started to work, but the captain did not go near the drift for a week or so. When he did go he had to bend nearly double to enter the drift. He then proceeded to jack the miner up, telling him that he was supposed to cut the drift man high, to which the "Cousin" replied: "Ell wot ee' kickin about? Hits man igh now."

⁂

In the course of a somewhat enthusiastic advertisement offering for sale the stock of a mining company in northern Minnesota, the president of the company says: "The famous Mallman wrote very high of this half section. He said 11 years ago that the company's property was selected years ago and that such a rich selection could not be made now; that the company's island has the same iron indications as was over the Pioneer, Zenith, Savoy and Sibley mines, and could be mined just as cheaply as those because the rock is a felt rock and will not leak." Also that the four mines above mentioned have 300,000,000 tons of ore, worth $1.75 a ton, add it up, and it makes $525,000,000, which is adjacent to the east line of the —— Steel Co.'s property now for sale at $1 per share.

⁂

The Arizona Venture Corporation, which says that it owns mining property in Arizona, has been inviting subscriptions to its stock in a circular in which it presents a "report from a mining expert who knows his business." Of course, an expert ought to know his business, but there are many so called experts who do not know what they profess. The Arizona Venture Corporation's expert is B. F. Holcomb. He describes a mine opened by a tunnel 150 ft. long, attaining a maximum depth of about 120 ft., which shows 5 ft. of ore in the breast, the value of the ore, "as determined by numerous conservative samplings," being $38.48 per ton. Mr. Holcomb says: "Cut this to one-half and there is a handsome average value left to pay handsome profits." He remarks, furthermore, that "By extending the tunnel about 80 ft. further there should be encountered . . . a tremendous body or 'chamber' of ore of unusual richness, fully 20 ft. wide." An expert who is able to see into the ground undoubtedly possesses valuable gifts, even if he assists himself with a Spanish needle, a goldometer, or just a plain dowsing rod.

## PERSONALS

R. E. Fishburn, of Tucson, Ariz [illegible] Kansas City

Frank Davis has returned to [illegible] from a trip into Sonora.

Robert Linton is in Lander County, Nev., on professional business

J. T. O'Hara, of Los Angeles, is confined in the St. Mary's Hospital in Tucson, Arizona

Hallett R. Robbins has been making examinations at Butte, Mont., for the past three weeks

P. D. Vonfield, interested in mining at Fairbanks, Alaska, was a recent visitor in San Francisco.

John T. Reid, after a stay of about 10 days in New York, left July 21 for home in Lovelock, Nevada

H. Mortimer Lamb, of Montreal, secretary of the Canadian Mining Institute, has been on a visit to England.

General Manager P. G. Beckett, of the Old Dominion Copper Mining & Smelting Co., is on the Pacific Coast.

Chas. M. McKean has assumed charge of the supply department of the Calumet & Arizona at Bisbee, Arizona.

M. K. Rodgers, mine operator of Guadalajara and Guanajuato, Mexico, is at the Park Ave. Hotel, New York.

Peter B. Scotland is now general superintendent of mines of the Arizona Copper Co., Ltd., with offices at Morenci, Arizona.

Dr. John Maxson Stillman, professor of chemistry, has been chosen vice-president of Johns Hopkins University at Baltimore.

J. M. Nibblett, Jr., is in charge of the mining operations of the East Texas Iron Ore Development Co. in Cass County, Texas.

Frank H. Probert, Los Angeles, Calif., is visiting the East on business matters, and will probably be there about six weeks

Dr Stewart W. Young, of Stanford University, has been visiting New York in connection with business of the Thiogen company.

Sir Richard McBride, premier and minister of mines for British Columbia, will shortly proceed to England on an official visit.

James Buchanan, superintendent of the Consolidated Mining & Smelting Co.'s smeltery, at Trail, B. C., is in Scotland on a visit.

Otto C. Burkhart, professor of mining at the Virginia Military Institute, Blacksburg, Va., has been in New York this week.

Edwin F. Gray, general manager of the Consolidated Coppermines Co., recently arrived at Ely, Nev., on his return from a trip to Alaska.

F. Bergen, formerly at the Morning mine, Mullan, Idaho, has been appointed superintendent for the Atlas Mining Co., White Horse, Alaska.

Charles G. Gates, of Minneapolis, Minn., son of the late John W. Gates, is on a visit of inspection to some of his mining properties in Alberta.

Charles W. Newton, general superintendent of the Butte & Ballaklava Copper Co. and the Butte & Zenith City Mining Co., Butte, Mont., is in the East on business.

D. A. Cavagnaro, formerly superintendent of the Channel Mining Co., at San Andreas, has been appointed superintendent of the Wisconsin mine at Forest, Sierra County, California.

Algernon Del Mar has resigned as superintendent of the Bishop Creek Milling Co., at Bishop, Calif., and is now open for professional work as erector of mill and mine structures.

H T Nelson, of Lebanon, Penn., has been appointed general manager of the Schuylkill Haven Rolling Mills Pottsville, Penn., which recently resumed after two years of idleness.

F. N. Flynn metallurgist for the Arizona Copper Co., has returned to Clifton after a three months' absence. When the new smelter is blown in he will be general superintendent of the plant

[illegible] Tretheway, a well known mine owner, of Cobalt, Ont., has been investigating the mining prospects of the newly opened [illegible] district about Hazelton, Skeena district, of British Columbia.

H. C. Ray, assistant professor of metallurgy of the School of Mines, University of Pittsburgh, Pittsburgh, Penn., is with the Butte & Superior Copper Co. in the experimental department for the summer.

E. B. Tinker, who has been in charge of the Keystone mine at Miami, Ariz., under the general direction of B. B. Gottsberger, has resigned that position in order to become manager of the Superior & Boston company.

Prof. Heinrich Ries, of Ithaca, N. Y., has resumed his investigations of the clays of western Canada, for the Canada Department of Mines, commencing this year's field work in the Boundary district of British Columbia.

Hon. Louis Coderre, secretary of state and minister of mines for Canada, has arranged to accompany next month one of the International Geological Congress excursion parties to British Columbia and the Canadian Yukon.

George W Heintz, of Salt Lake City, general manager of the United States Smelting, Refining & Mining Co. was a recent visitor in San Francisco. Mr. Heintz predicted much new development in California mines in the next two years.

D. A. Mitchell, for five years past with the Republic Iron & Steel Co., at Virginia, Minn., has been appointed assistant to F. A. Wildes, Jr., State Mine Inspector. He will have charge of the mines about Kinney and Mountain Iron.

General Manager B. Britton Gottsberger, of the Miami Copper company, has returned from a three months' absence and has resumed his duties at Miami, Arizona. President W. G. Rice, of the Superior & Boston, is at Globe, Arizona.

Frank J. Whitgrove has been appointed general superintendent of the Dekalb, Ill., works of the American Steel & Wire Co. He was transferred from the Lincoln works of the same company, where he is to be succeeded by Louis Booth.

N. C. Titus has resigned as consulting engineer of the Mabry properties at Republic, Wash. He has accepted a position as consulting engineer for a New York syndicate owning a gold property in Argentina, and will have his headquarters at Buenos Aires.

O. E. LeRoy, of the Geological Survey of Canada, Ottawa, is in West Kootenay, British Columbia, making preliminary arrangements for the visit to that district next month of a number of delegates to the International Geological Congress to be held in Toronto.

D. M. Carman, a former resident of San Francisco, has just returned to the States after a residence in the Philippines of 15 years. He is president of two mining companies in the islands of Luzon and Mindanao and is now in San Francisco to purchase new mining machinery.

Albert S. Bigelow, formerly president of the Osceola Consolidated Copper Mining Co., and active in several other Lake companies, is before the United States District Court, at Boston, in bankruptcy proceedings begun against him by the Columbia-Knickerbocker Trust Co., of New York.

George Flint, treasurer of the Radium Company, of America, Sellersville, Penn., sailed from New York for Europe, July 16, to confer, by engagement, with some noted scientists relating to the product of the company Mr. Flint's address is Care London City & Midland Bank, London, England.

B. B. Thayer left New York on July 17 for Butte, Mont., on his annual summer tour of inspection of the Anaconda operations. Mr. Thayer will remain in Montana until after the meeting of the American Institute of Mining Engineers, in the promotion of which he has been greatly interested.

J. P. Hutchins, of St Petersburg, was recently in Southern Russia looking at anthracite mines and also had a visit of three weeks in London. He expects soon to go to the Urals according to press despatches, has invented a new form of and thence to the Lena mines for the rest of the summer.

Francis Church Lincoln has resigned his position as professor of mining engineering at the University of Illinois in order to enter upon the duties of resident engineer of the Bolivian Development & Exploitation Co., with headquarters at La Paz, Bolivia. Professor Lincoln is now on his way to Bolivia

George S Rice, chief engineer of the U S Bureau of Mines, hoisting cage designed especially for use in mine-rescue work. One of these cages has already been installed on one of the Bureau's rescue cars and was used advantageously at Banner, Ala., in connection with a recent mine disaster there It is reported that other cars are to be equipped similarly

Samuel L Hoyt has been appointed assistant professor of metallurgy at the Minnesota School of Mines. Mr. Hoyt graduated from this school of the University of Minnesota in 1909, after which he pursued graduate work in metallography at Columbia, 1909-11, and later studied Continental methods at the Königliche Technische Hochschule, Charlottenburg, and at the University of Berlin.

Ira A. Williams, associate professor in charge of ceramic engineering in the Department of Mining Engineering of Iowa State College, has just been appointed to the chair of ceramics at the School of Mines of the Oregon Agricultural College. He is also to have charge of the ceramic investigations of the new Bureau of Mines and Geology for the state. In that capacity he is to make a survey of the clay and cement resources of the state, supplementing it with laboratory investigations.

John O'Keefe, who recently retired as superintendent of the American Steel & Wire Co.'s works at Farrell, Penn., was connected with the company and its predecessors for 40 years, and is eligible to the highest pension granted by the United States Steel Corporation. Mr. O'Keefe was placed in charge of the Washburn-Moen Co.'s wire mills at Worcester, Mass., in 1873. He was transferred to the Salem, Ohio, works of the American Steel & Wire Co. in 1902, took charge of the Cleveland mills in 1905, and went to Farrell in 1909. He has been succeeded as superintendent at Farrell by August Mann, late at the Anderson works.

## OBITUARY

Hugh S. White, superintendent of the Duncannon Iron & Steel Co., was accidentally killed at Duncannon, Penn., July 7, by falling from a railroad car.

Thomas G. Proctor, a prominent mining man of the Kootenay country, was killed in Victoria, B. C., July 10, by being accidentally struck by an automobile.

Peter A. Burch, of Los Angeles, Calif., known as a mine operator in Nevada, was overcome by the heat and died July 6, near Skidoo, Nev., while on his way from Los Angeles to Rhyolite in his automobile.

James McGregor, of Salt Lake City, a well known operator in Utah mines, is reported missing from Terre Haute, Ind., where he was on a visit, and it is believed that he had been drowned in the Wabash River.

Arthur B. Canfield, an owner and operator of oil wells in the Taft district, was killed in a collision of his automobile with an electric train at Pasadena, Calif., on July 3. The Pacific Electric Co. claims that the accident was directly due to an ordinance which prohibits cars from whistling at crossings within the limits of South Pasadena.

Ephriam Bayard, of Donora, Penn., died at Pittsburgh, July 20, aged 45 years. Born in Pittsburgh he began work in a steel mill at an early age, and had worked in Pittsburgh and Cleveland ever since, rising to responsible positions. For three years past he had been superintendent of the Donora Steel Co. He was active in philanthropic work, and took an especial interest in aiding boys.

Lewis James Hanchett died at Oakland, Calif., July 3. He was 81 years old. Mr. Hanchett left his birthplace in Michigan in 1851 and went to California during the gold excitement, traveling by way of Cape Horn. He was engaged in mining in California and Nevada and acquired a large fortune. In later life he raised blooded horses and engaged in farming. He built the first private car for shipment of race horses to the East.

## SOCIETIES

**Minnesota School of Mines**—Elting H. Comstock and Peter Christianson, of the faculty of this school, are at Globe, Ariz., for a few weeks, with members of the Junior class who will spend the remainder of the summer working in various mines in the Globe district.

**Oregon Agricultural College**—Mining students must now work two months, underground in a mine, or in the employ of a mining and smelting company, or in similar technical mining work before they can enter the senior year's work. This work has not been required heretofore.

**Iron Country M. C. M. Club**—This organization of former students of the Michigan College of Mines will hold its annual meeting Aug. 9 and 10 on the Marquette range. Delegations from the Gogebic, Menominee and Marquette ranges will attend. Trips will be made to the Negaunee Mine of the Cleveland-Cliffs Iron Co., the new hydro-electric plant of the same company near Marquette, and to the new steel and concrete ore dock of the Lake Superior & Ishpeming Railway.

**International Geological Congress**—On July 16 a fine bronze tablet to the memory of Sir William Edmond Logan, K. T., L.L.D., F. R. S., founder of the Geological Survey of Canada, was unveiled at Perce, Gaspé County, Quebec, where his first work was done. The tablet, which is suitably inscribed and bears an effective impression of the face of Sir William, was erected by the Twelfth International Geological Congress and affixed to a natural rock wall. The ceremony of unveiling was conducted by Dr. K. M. Clarke in the presence of a large party of members of the congress now touring Quebec, and the tablet was accepted on behalf of the municipality by Mayor Charles Lamb.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. Foreign patents are supplied at 40c. each.

AMALGAMATOR. William W. Guest, Alameda, Calif. (U. S. No. 1,067,023; July 8, 1913.)

CYANIDING—Agitating and Mixing Apparatus. Whitman Symmes, Virginia City, Nev. (U. S. No. 1,065,852; June 24, 1913.)

EXTRACTION of Precious Metals from Sands and Ores. William W. Guest, Alameda, Calif. (U. S. No. 1,067,022; July 8, 1913.)

PLACER-MINING MACHINE. Clinton A. Desmond and William T. Henley, Winnemucca, Nev. (U. S. No. 1,067,098; July 8, 1913.)

BLAST FURNACES—Device for Utilizing the Waste Heat of the Cowper Apparatus in Blast Furnaces. J. Pregardien, Coln-Lindenthal. Germany. (Brit. No. 1169 of 1913.)

ELECTRIC STEEL FURNACES—Thermal Treatment of Metal in Electrically Heated Furnaces. Paul Girod, Ugines, France. (U. S. No. 1,066,810; July 8, 1913.)

SMELTING—Method of Smelting Aluminiferous Iron Ores. Francis Mitchell McClenahan, Maryville, Tenn. (U. S. No. 1,066,833; July 8, 1913.)

LEAD AND ZINC—Process for the Separation of Complex Ores. William Morley Martin, Redruth, England. (U. S. No. 1,066,828; July 8, 1913).

ZINC—Process of Producing Zinc from Blue Powder. Warren F. Bleecker, Canonsburg, Penn. (U. S. No. 1,066,787; July 8, 1913.)

ZINC SULPHATE—Production of Zinc Sulphate. Anson G. Betts, Troy, N. Y. (U. S. No. 1,066,245; July 1, 1913.)

BLASTING TUBE. George H. Crosby and Charles H. Jones, Duluth, Minn. (U. S. No. 1,065,664; June 24, 1913.

ELEVATOR. George Henry Hulett, Cleveland, Ohio, assignor to The Wellman-Seaver-Morgan Co., Cleveland, Ohio. (U. S. No. 1,066,113; July 1, 1913.)

MINE-CAR BUMPER. George S. Greene, St. Clairsville, Ohio. (U. S. No. 1,066,603; July 8, 1913.)

CRUSHER. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. U. S. No. 1,066,218; July 1, 1913.)

ORE SEPARATOR—George Chandler Kidder, Salt Lake City, Utah. (U. S. No. 1,066,918; July 8, 1913.)

PRECIPITATION OF ORE VALUES from the Effluent waters of Ore-Crushing and Concentrating Plants, Treatment for the. Andrew Gordon French, Nelson, British Columbia. (U. S. No. 1,065,678; June 24, 1913.)

## INDUSTRIAL NEWS

The Yuba Construction Co., of San Francisco and Marysville, Calif., completed or contracted for a number of important dredges during the last year as follows: Two 15-cu.ft. steel-hull gold dredges (Natoma No. 8 and Natoma No. 10) and one 9-cu.ft. steel-hull dredge (Natoma No. 7) for Natomas Consolidated of California; a 9-cu.ft. steel-hull dredge for Oroville Dredging, Ltd., for use on its Pato mine in Colombia, S. A.; a 9-cu.ft. wooden-hull dredge for the Powder River Gold Dredging Co., at Sumpter, Ore.; a 6-cu.ft. wooden-hull gold dredge for the Pabst Brewing Co. interests (now building in Idaho); a 5-cu.ft. wooden-hull gold dredge for Ingersoll & MacDonald (now building on the Malaguit River in the Philippines). The company has also built during the last year several suction dredges among which were a 20-in. electrically operated steel-hull suction dredge for the West Sacramento Land Co., to operate on the Sacramento River; also a 20-in. steam-operated steel-hull suction dredge, to be used by Natomas Consolidated in building levees along the Sacramento River.

# EDITORIAL CORRESPONDENCE

## SAN FRANCISCO—July 19

**The Hall Sulphur-Recovery Plant** for experimental purposes at the Balaklala smeltery at [illegible], Shasta County, will be installed immediately. F. W. [illegible] is the new manager of the First National Copper Co., which will undertake the experiment with a view of ultimately reopening the Balaklala mine and resuming operations at the smelting plant. H. F. Wierum is in charge of the construction and installation of the plant, but he is here solely to make the experiments upon which will probably depend the starting of the plant on a commercial basis, and not to reopen the works. There are four McDougall roasters at the Balaklala plant. Two of these will be rigged up by Mr. Wierum for these experiments. One of them will be provided with oil burners, the other will be rigged for burning a fixed oil gas as fuel. The exact question of what kind of fuel can be used most effectively and economically has not been decided. It is known that fixed gas is by all odds the most desirable, but the employment of oil burners and the use of oil fuel will, it is thought, aso produce the conditions for distilling the sulphur and avoiding $SO_2$ in the final gas except as traces. The oil burner will be of a type which atomizes the oil with compressed air instead of steam and which has a very sensitive adjustment for the atomization of air combustion, all of which cannot be furnished by the atomizing air. The selection of an oil burner has not been definitely decided. Just at present Mr. Wierum's stay in San Francisco is for the primary object of deciding upon the selection of a gas producer. He has in mind one new type of gas producer, manufactured in Philadelphia, which he will probably install in the form of one unit big enough to operate one McDougall furnace. But in order to have no chance of failure in the gas supply he will also try to close negotiations for a producer that is made in San Francisco, or on this coast, or one that he can have manufactured if he can be supplied with the plans. When I talked with Mr. Wierum on July 15 he was not prepared to name the make of the producer. However, it is the purpose to employ two gas producers, one that will produce a high B.t.u., say 1500 B.t.u., and the other low or about 150 B.t.u. It is desirable to try the behavior of the two gases. The next three months will be employed in the testing of the two McDougall furnaces equipped with the oil and gas fuel appliances. There will be a few changes in the piping and cooling and in the flue connections. A Feld washing machine, made by the Bartlett-Hayward Co., at Baltimore, will be employed to wash the elemental sulphur and collect it in the shape of emulsion. Mr. Wierum has aso tried the Cottrell process on a small scale. He states that apparently this process precipitates the sulphur perfectly, but that there will be naturally many questions of detail as to how to recover it after it is precipitated. The McDougall furnaces are 18-ft. six-hearth plants, which have sufficient capacity for making thorough and competent tests of the Hall desulphurizing process.

## DENVER—July 19

**Shipments of Uranium and Vanadium Ores from Green River** are being made to the East. Several cars have been shipped, and more ore is being hauled. It is understood that most of this will be treated in the United States, instead of being sent to Europe.

**The Park County Mill Project** is being advanced. A. E. Moynahan, President of the Custom Mills Co., was in Denver lately in connection with the enterprise, the intention being to commence operations with a 100-ton plant. The company is capitalized at $500,000 and has wisely set aside $5000 for determining the character of the different ores which will come to the mill for treatment. The plant will probably be a combination of amalgamation, concentration and cyaniding, but this will not be determined until a thorough metallurgical test of the ores has been made.

**His Highness, Prince de Croy of Belgium,** W. J. Van Maa[illegible], proprietor of the Belgian Gazette, a financial paper of Brussels, and Camille [illegible], head of the General Coal Co., of Brussels, left Denver July [illegible], for Steamboat Springs, whence they will make an examination of the Yampa coal field in Routt County, and of the survey line of the Colorado & Northern Ry. to the anthracite fields, the building of which is part of the enterprise they have in mind; this road has its southern terminus near Hayden on the Denver & Salt Lake, formerly known as the Moffat Road. The line is also projected northward from the Pilot Knob anthracite field, to a junction with the Saratoga & Encampment Ry., a feeder of the Union Pacific Ry., and thence onward to Casper, Wyoming, opening a market for the fine engine coal of the Yampa field.

**An Interesting Project at Eagle** is the draining of the lake at the headquarters of Lake Creek with the object of placer mining the 80 ft. of wash deposit in the lake bottom. A sample of the wash is said to run as high as $13 to $20 per cu.yd. In order to drain to the bottom of the deposit it will be necessary to drive a 900-ft. tunnel. Work on this project is being done by Edward J. O'Flaherty, for the Electra Gold Mining Co., of Denver.

**The Geology of the Lady Belle Mine Consists of a** sandstone stratum varying from 40 to 50 ft. with a blue lime above and schist below, the dip being 34°. The richest ore is found on the hanging wall in the sandstone, but most of the sandstone runs from 5 to 15 oz. silver. There are spots of azurite in the sandstone where the best ore is found. The total shipment is 20 cars with an average gross settlement of $3100 per car; the royalties are 40%. A new strike of copper oxide on the Dakota claim has been made about a mile east of the Lady Belle on Horse Mountain.

## BUTTE—July 19

**An Increase of Tuolumne Capital Stock** will be voted upon at the special meeting of the company on Aug. 18; the increase will be from 800,000 shares of $1 par, to 1,500,000 shares of $1 par, for the purpose of combining with the Butte Main Range Mining Co. Some opposition will be brought out but it is doubtful whether it will be strong enough to defeat the merger plans. If it is voted, it will mean that the Tuolumne mine will be used to provide a development fund for the Main Range with an indefinite or permanent suspension of dividends.

**F. H. Wood, Vice-President of the New Mines Sapphire Syndicate,** of London, England, accompanied by Sydney Finnegan, secretary, and F. H. Lathbury, a mining engineer in the employ of the company, recently made a trip of inspection to the company's sapphire mines at Yogo, Mont. Before leaving for his home in London Mr. Wood announced that the company is about to put $40,000 into improvements for the purpose of increasing the output of the mines. The Yogo sapphires are noted for their brilliancy and size and the demand for them is increasing both in this and foreign countries. The company's sapphire bed extends over a length of four miles and contains a great supply of the gems.

**Electric Hauling Over the Butte Anaconda and Pacific** from the Butte mines to the Washoe plant will be commenced about Oct. 1. The portion of the road from the yards at Anaconda to the smelting works, known as the high line, is now completely electrified, and the ore cars brought from Butte under steam power are conveyed over the high line by electric locomotives. It has been demonstrated already that the electrically-operated locomotives are able to pull nearly twice the load of the steam type up the grade to the plant, and at a faster rate of speed, making a saving in cost of approximately 35%. It is probable that the passenger service will be carried on under electricity within a short time, although no definite data for its inauguration has been given out as yet.

**The Butte Central Mine and Mill Are Closed** and it is probable that the bondholders will be allowed to foreclose and bid in the property, after paying off the local claims, amounting to about $20,000. Later there will probably be a reorganization. There is local confidence in the Ophir mine, but through the recommendation of some engineers and the superintendent, Samuel McConnell, the company built a mill and expected to make development expenses by mining the low-grade ore in the mine. Mr. McConnell wants to take upon himself all the blame for the mistake, but that is small comfort to stockholders, especially when they remember that Mr. McConnell quoted frequently from alleged reports of engineers and assayers. The Ophir is but 500 ft. deep, and no mine in Butte has been an important producer at so comparatively shallow a depth.

**Butte Again Cuts Wages,** in accordance with the agreement between the mining companies and the union. The June payroll was made up at $3.50 and the miners accepted their pay envelope at that rate. Butte miners drew the high figure of the schedule but one month in the year, that being January, when they got $4 per day. In one subsequent month they were paid the $3.75 rate when under the schedule the companies could have reduced to $3.50. The $3.75 rate prevailed during three months. The reduction in the pay rate for June meant a loss of over $125,000 to the men and to Butte trade circles. The provision in the contract with the miners' union is to the effect that when the general average price of copper is below 15c. per lb. for the month the wages shall be $3.50 per day, and when above 15c. and up to 17c. per lb. the rate is $3.75, while above 17c. the rate is $4 per day.

### SALT LAKE CITY—July 19

**A Metallurgical Research Station in Salt Lake City** will be established by the U. S. Bureau of Mines in September of this year. The station will be supported in part by state funds, and in part by a recent Federal appropriation. It will be operated in connection with the School of Mines of the University of Utah, and attention will be given to methods of treating low-grade ores. Recently the state made an appropriation of $7500 for this kind of investigation, and as Utah is the first state to have made such an appropriation, it will have the first station to be established by the Federal authorities.

**The Chief Consolidated Mine at Tintic** has lately come to the front, and bids fair to take its place among the important producers of the state. The company owns a large and favorably situated area, much of which is still to be developed. In 1912, 31,000 tons of ore were shipped, net earnings from which were $323,000; early in the present year a dividend of $87,600 was paid, and recently a second of like amount has been declared. An oreshoot has been developed from the 1000- to the 1400-ft. level, and probably extends beyond these levels, above and below. The ore has been followed for 650 ft. in length and in some places is 60 to 70 ft. across. Another shoot, thought to be equally promising, opened on the 1400, has been followed 350 ft. below the level. Connections at depth with the Gemini, recently completed, have facilitated operation, furnishing a needed outlet and improving ventilation.

### FLAT RIVER, MO.—July 19

**Attention Is Again Directed to Madison County, Missouri,** where the Federal and National Lead companies have secured properties. With two such strong companies operating, confidence will be restored in the district and it is surmised that a great deal of optioning and diamond-drilling will be done this season. The National Lead Co. has secured the famous old Mine La Motte property containing about 37,000 acres and lying about three miles north of Fredericktown. It is planning a great deal of development work. The Federal Lead Co. has been operating the old Catherine Lead Co.'s mines. Lately it has optioned a tract near Fredericktown that is supposed to contain copper. The shaft has been unwatered and a diamond drill will be installed. A report is in circulation that M. J. O'Brien, who controls the North American property, will start drilling on the Schulte land to verify the drilling that was done some years ago and showed good ore. S. Clarke has organized a local company to option and prospect copper lands. Drilling will be started about Aug. 1, south of Fredericktown.

### NEGAUNEE—July 21

**The Finlay Method of Appraisal** of Michigan mines was upheld by Judge Cooper at Ironwood in the recent suit between the Newport Mining Co. and the city of Ironwood. The Newport Co., owned by Ferdinand Schlessinger of Milwaukee, was taxed $98,996 in 1911 on an assessment of $8,535,000. The previous assessment on practically the same showing had been $1,471,061. The Newport company protested that other property was not assessed at such a relatively high rate and that the Finlay method of appraisal was wrong in theory. This suit has been watched with interest by other mining companies and was in the nature of a test case; if the mining company had won, suits would have been started by other operators.

**Important Ore Discoveries,** southwest of Crystal Falls in the Mastodon section recently made by the Longyear company, Oliver Iron Mining Co. and Cleveland-Cliffs Iron Co., will cause considerable new construction of railroad. The Chicago & Northwestern Ry., one of the two ore carrying roads serving the Crystal Falls district, is planning new track and yards for a branch leaving the main line at Mastodon Station. This branch will probably serve all the mines southwest of Crystal Falls, some of which now ship over the present line which follows a more roundabout route. The Chicago, Milwaukee & St. Paul Ry. may also extend a new branch line to the Mastodon field.

### DULUTH—July 21

**The Income of the State of Minnesota** from the mines it owns in fee will be greater this year than at any time heretofore. For the last month and more these properties have been shipping at the rate of 100,000 tons a week. The biggest producer is the Grant mine at Buhl, Mesabi range, operated by Jones & Laughlin. This big Pittsburgh concern is also conducting important exploratory work in the vicinity of Grand Rapids, at the extreme western end of the Mesabi, where it has an extensive acreage under option. Leading officials of the company recently inspected operations and also paid a visit to the Steel Corporation's big concentrator at Coleraine. It is surmised that the Jones & Laughlin interests will take over the Grand Rapids lands, in which event the erection of a washing plant will follow. Much of the ore is sandy in its nature, similar to that mined in the vicinity of Coleraine.

### HOUGHTON—July 21

**The Edison Experiment on Quincy Stamp Sands** which is to be undertaken during the present summer is attracting a good deal of local attention, particularly for the reason that a few years ago the Edison people secured several carloads of Calumet & Hecla stamp sands and made experiments with their process of extraction by electricity. No reports ever were secured on these experiments on Calumet conglomerate tailings, and it was the general impression here that the results were not satisfactory.

**The Consideration Which the Calumet & Hecla Co. Shows for Employees** is shown in the notices sent to the men in their pay envelopes this month. Under the terms of the workmen's compensation and employer's liability act in this state, compensation is paid only for injuries which are of such a nature as to cause disability for at least two weeks. Minor injuries receive no compensation at all. The company now announces that in addition to the provisions as required by law, the Calumet & Hecla, the Ahmeek, the Osceola and all other subsidiary companies will pay compensation at the sixth day following the injury. This compensation will come from the Employees Aid fund.

### SPOKANE—July 19

**Valuable Mineral Lands in the Colville Reservation** are being inspected by a party of engineers under Joseph T. Pardee, of the U. S. Geological Survey. The lands, which will aggregate 188 square miles, lie from 75 to 100 miles northwest of Spokane. Government examinations began a year ago and probably will be completed this summer, according to Mr. Pardee, who says that as a result of the 1912 field work that portion of the reservation east of Nespelem, which contains most of the mineral deposits of this area, has been classified as to the mineral or nonmineral character of the lands. This classification has been transmitted to the Commissioner of Indian affairs, to whom interested parties may apply for details. The lands determined to be mineral in character are for the most part grouped around five localities: Covada, Upper Nine Mile Creek, Keller, Nespelem and Park City, with a few scattering areas elsewhere. None of the lands classified as mineral will be allotted to Indians, but the classification will not operate against the title to any lands that may have been granted or reserved by the government for schools, power sites or other purposes. Although some of the lands classified as mineral have been proved by underground work to contain valuable orebodies, most of them have not been developed and their mineral classification is based upon evidence offered by the surface and by the geology of the region in general.

### TORONTO—July 22

**The Dispute Involving Claim No. 940 in the Gillies Limit,** which was staked by several people at the time of the opening of this territory, has finally been settled. The application of B. Neilly, manager of the Penn-Canadian Mines, Cobalt, who hired a special engine to get him into Haileybury first, has been declared valid. This claim was desired by a good many people on account of some rather promising surface showings, and five different men staked it. Neilly was the first to arrive at the recording office, however, and his application has been sustained.

**Serious Bush Fires near Porcupine** and in other parts of northern Ontario have occurred recently, and in some instances, small settlements have been completely destroyed. A great deal of damage has been done to timber and pulp wood, thousands of acres of which have been burned off and a serious setback was given to many of the settlers in this district. The different mining camps in Cobalt, Porcupine, Kirkland Lake, Larder Lake and Gowganda were seriously threatened, but fortunately the rains came in time to prevent any large conflagration. While the danger is not yet quite over, the different camps are in a much better position than they were last year and no fears were entertained of any great disaster.

**The Burnside Property at Kirkland Lake** has drawn attention to the district with an exceedingly rich surface discovery and a small rush has resulted. This property adjoins the Foster-Tough and operations were commenced on the extension of the No. 5 Foster vein. Results of development not having been so satisfactory as was expected, surface prospecting was started, with the result that another vein, running parallel and about 100 ft. south, was uncovered. This has now been stripped for over 50 ft. and shows exceedingly rich ore, a considerable proportion of the valuable content being in the form of sylvanite. At one place, there was 20 in. of ore which gave an assay of $10,000 to the ton, but it is believed that the average width is about 9 in. and the average value about $500.

## CHIHUAHUA—July 14

**The Mining Industry Throughout Northern Mexico is Completely Paralyzed** as a result of the continued revolutionary disturbances. With the blowing out of the furnaces at the Chihuahua plant of the American Smelting & Refining Co., on July 7, every smelting plant in the northern states is shut down. Those at Mapimi, Torreon, Asarco, Aguascalientes, San Luis Petosi, Monterey and Matehuala have been out of commission for periods of from 30 to 90 days. The early resumption of operations at any of them seems unlikely. Details of actual conditions in southern Chihuahua, as well as throughout the states of Durango, Sinaloa, Coahuila, Zacatecas and Aguascalientes are lacking, owing to the fact that railroad communication south of Chihuahua has been cut off since early April, but sufficient information is at hand through reports of automobile parties of mining men and of others passing through this city to say that few mines are operating, only those which have milling plants on the ground and were fortunate enough to have supplies on hand. So far as can be ascertained, foreigners have not been maltreated to any great extent nor have foreign-owned or foreign-operated mines suffered property damage. In a few instances foreign as well as native companies have been requested to contribute to the cause of the rebels, sometimes with money, but more often with provisions. Owing to the rebel occupation of the Santa Eulalia camp several weeks ago, and to the discontinuation of train service over the two narrow-gage railroad lines, all of the mines there are closed. Since the discontinuation of service on the National line to El Paso, June 3, the city has been completely isolated, the Northwestern line via Madera having been out of commission for some time previous. The city is held by the government forces, while the region around is infested with rebels. All the foreign women and not a few of the men from near-by camps, are in the city, on account of the desired protection of about 4000 Federal soldiers. Foodstuffs, while not plentiful or varied, are sufficient for about 60 days and sell at advanced prices. Occasional news from outside points is brought in by automobile. There has been some exchange of shots between Federals and rebels just outside of the city limits, but it is not believed that an attack will be made. Several days ago rebels visiting the American Smelting & Refining plant, about six miles out of the city, were fired on by the Federal outposts, stationed on the surrounding hills, at least a score of shells dropped, fortunately without injury to person or property within the smeltery grounds.

**The Closing Down of the Smelting Plant and the Santa Eulalia Mines** has thrown approximately 5000 men out of employment, and considering that the majority are without resources and that an embargo has been placed on provisions leaving the city, these idle men constitute a menace, which may help the rebel cause, both by their taking up arms in order to secure food and by the creating of greater discontent toward the established government. It should be stated, however, that most of these miners have taken a neutral or pro-Federal stand and show a disposition to work as long as possible, a most encouraging sign as evidencing their weariness of the disturbed conditions which have existed for the last three years. Still another encouraging feature in this state as well as in other states, is the organization in the larger cities, and even in the smaller towns and haciendas, of citizen-volunteer protective guards.

**The Rio Tinto Copper Co., at Terrazas,** about 25 miles north of Chihuahua, has continued operations with interruptions, in spite of occasional visitation by rebel bands, and has sufficient fuel and supplies on hand for at least 60 days. In the western part of the state, Yoquivo, Batopilas, Tres Hermanos, Concheño and Barranca del Cobre companies are operating in a small way, but have been unable to market bullion for over 45 days. Owing to the closing of the Mexico-Northwestern Ry. and to the prohibition by the military authorities of sending out supplies, operations must soon cease. At Cusihuiriachic several companies are carrying on operations just sufficient for the maintenance of organization. At Parral, work is practically at a standstill on account of the impossibility of getting in supplies. Several of the larger concerns have, however, managed to keep milling plants in operation by hauling supplies in wagons from Chihuahua.

## GUADALAJARA—July 15

**Control of the Mirador Mine** in the Mascota district has been purchased by Ralph H. Ramsdell, manager of the Casados mine, who has also leased the reduction plant erected in that district several years ago by the Lawson Development Co. For some time this plant has been treating a limited amount of Mirador ore. The output of the mine and mill will be increased.

**Plans of the Cinco Minas Co.** for the erection of a 250-ton reduction plant in the Hostotipaquillo district are not being interfered with by disturbed conditions in Mexico. Some supplies for the plant have entered Mexico through Tampico and Veracruz, and other shipments are being routed across the Tehuantepec Isthmus to the Pacific port of Manzanillo. It is still expected to have the plant ready for operation before the end of the year. Judge J. W. Gerard, of New York, is president of the Cinco Minas Co.

**The El Favor Company has Built a High Wall** around its reduction plant and store, due to the presence of bandits in the Hostotipaquillo district, and has made arrangements to defend the properties in case of attack. Bandits visited the El Favor camp several weeks ago, but were satisfied with a contribution of 100 pesos, and made no attempt to molest anyone. Operations at the El Favor and Mololoa mines have continued uninterruptedly. High-grade ore from the El Favor mine is being shipped steadily to Aguascalientes, and much Mololoa ore is being milled at El Favor.

**The Mexican Searchers, Ltd., of London,** has surrendered its bond on the Pinavete mines in the Jora district of Tepic, and is withdrawing from the field. General conditions in Mexico are responsible. The deal for the mines, which involved several hundred thousand pesos, was arranged in 1911, and the English concern has been at work since that time, the new development amounting to about 1000 meters. The mines are owned by the Maduro Mining Co., of Chicago, of which H. M. McIntosh is the principal stockholder. The principal property is the San José de Ventanas, one of the famous antiguas of western Mexico.

**Thirty Bandits Attacked the Compañía Minera de Los Reyes,** a Mexico City concern, in the San Sebastian district of Jalisco a short time ago. Luis Terry, a Frenchman, manager for the company, and five Mexican employees fortified themselves in the reduction plant and held off the bandits, killing the leader and several of his men. When the bandits withdrew they went to the near-by camp of the Navidad Reduction & Mines Co., an American company, and looted the store there. Only limited work has been in progress for some time, and the value of the store stock did not exceed 600 pesos. The properties of the Navidad company are under option to California and Arizona interests, but because of disturbed conditions in Mexico no examination has yet been made.

**The Camp of the Mezquital Mining Co.,** a Philadelphia company, in the Mezquital del Oro district of Zacatecas, was recently attacked by rebels, and later looted. The three foreigners at the camp attempted to hold off the rebels, but the latter were in such number that it was impossible to do so. None of the foreigners was harmed, but all were robbed of clothing and other possessions. A few days ago Dr. J. H. Spence and M. Minehan, local mining men, and T. F. M. Fitzgerald and F. W. Holler, respectively mine superintendent and mining engineer for the Tonopah-Belmont Development Co., of Tonopah, Nev., were held up and robbed by rebels while on the way to Guadalajara from the Bolaños district of Jalisco. The rebels took their arms and ammunition, and 130 pesos in bills and silver.

# THE MINING NEWS

## ALASKA

A STRIKE ON SOME TRIBUTARIES OF THE SUSHANNA RIVER has been made near the head of the White River. The diggings are reported to be rich in value, and a number of men are now on their way there.

RAINBOW—Twenty tons of concentrate from the 500 tons of ore milled during the winter at the Chena mill have been shipped to Tacoma.

FISHER LEASE (Fairbanks)—Brunelle & Co., who are working a large crew on the Niggerhead claim on lower Dome, are said to be hoisting rich dirt.

AMERICAN EAGLE (Fairbanks)—A test shipment of 10 tons of ore from the McCarty lease on the American Eagle claim was recently made to the Fursteneau mill. The ore milled at the rate of $20 a ton.

MT. ANDREW—A recent examination of this property was made by representatives of the Granby Consolidated Mining & Smelting Co., with a view to purchase. The mine is located on Prince of Wales Island, and has been a good producer.

HOFFMAN BENCH FRACTION (Fairbanks)—Pay has been discovered by James Fallon and associates at this claim on Eva Creek; it is said to average about 85c. to the wheelbarrow. From the fact that the shaft drained several water-filled shafts farther up Eva Creek, it is thought to be on the continuation of the rich Eva paystreak.

HOT SPRINGS DISTRICT—It is thought that the output for 1912 will be exceeded by that of the present season. Many plants, large and small, are working. Howell & Cleveland are in good ground near the mouth of Miller Gulch. Bock, who did much prospecting by Keystone drill during the winter in the flats of Sullivan Creek, discovered a considerable area of pay dirt, which he is now engaged in mining.

TOTATLANIKA DISTRICT—It is planned to work the J. P. Sherman ground in this district by scraping and hydraulic methods. The ground is shallow, the depth to bedrock on the benches being only 6 ft. A ditch will be built to furnish water on the benches. The machinery and other supplies have been placed on the ground and the preliminary work is well under way.

MIZPAH (Fairbanks)—Thirty-five tons of ore taken out in prospecting the claim two years ago will be sacked for shipment to the Fursteneau mill at the head of Fairbanks Creek. Six tons milled at the time of prospecting returned $90 to the ton; the present shipment is expected to mill about $60. If the run proves satisfactory, a boiler and hoist will be installed and stoping commenced. The shaft is down 120 ft. and several hundred feet of tunnels have been driven.

FAIRBANKS DISTRICT—From the regularity with which clean-ups are arriving at the banks, it is freely predicted that the placer output of the camp will exceed the output for 1912. In spite of continued dry weather, only two creeks, upper Dome and upper Cleary, have reported any shortage of water. Here, however, operations are seriously hampered by the inability of the operators to obtain sufficient water for continuous sluicing. There is a slight shortage of labor, but this is not unusual in June and it is not expected to become serious.

CHATHAM MINING CO. (Fairbanks)—The interest of Joseph Henderson in 18 claims lying at the head of Chatham Creek, and embraced in the holdings of the Chatham Mining Co., has been purchased by Si Scrafford and Luther C. Hess. Wm. T. Burns, Hess and Scrafford are now the sole owners of the property. Much development work has been accomplished and a large amount of ore has been extracted. The four-stamp mill has been in continuous operation since September, 1912. Work will be continued under the direction of Mr. Nicholson, formerly connected with the Cliff mine, in the Valdez district.

CIRCLE DISTRICT—Hydraulic operations in the Circle district are suffering from a water famine. Barnette & Harrington on Mastodon, Berry & Lamb on Mammoth, and Berry on Eagle, are all forced to work only intermittently. Clark, on upper Mastodon, will soon have his hydraulic plant erected and ready for work. The Elmer dredge, on No. 10 Mastodon, is expected to start digging before July 1. There is little summer work among the smaller operators, as they find that drift mining in the comparatively shallow ground of the Circle district can be done to better advantage in winter when frost obviates the need of timber.

SPALDING (Fairbanks)—The latest clean-up, from 25 tons of ore taken from the 100-ft. level, gave $1577, equivalent to $63 a ton. This is the lowest grade of any ore that has been crushed for more than a year, and is said to have come from an unusually weak spot on the 100-ft. The mill is idle at present while the ore bins, holding about two weeks' run, are being filled. A shipment of lumber and other supplies has been made to the mine for the purpose of rebuilding the little mill of three 250-lb. stamps, whcih was destroyed by fire during the winter. Plenty of water is obtainable from the mine for the operation of this mill, and it will accordingly be placed near the collar of the shaft. It will be used to crush the high-grade ore, while the ore of lower grade will be hauled to the larger mill, which is located on Dome Creek, 2000 ft. from the mine.

RHOADS & HALL (Fairbanks)—Quartz mining throughout the Fairbanks district has received new impetus because of recent developments in this, the leading lode mine of the camp. The vein was lost last fall through a fault occurring between the 70-ft. and the 140-ft. levels of the winze. Crosscuts were driven into both hanging and foot, and about June 20, the foot-wall crosscut encountered the vein 80 ft. from the winze. Development work is being rushed on this portion of the vein, which seems to be in a solid formation, entirely free from the numerous slips and faults that have made mining so difficult and expensive in other parts of the mine. The depth from the surface is about 300 ft., making it 100 ft. below the permanent water level. The ore is as rich as any that has been found in the mine; the vein is said to be slightly larger than in the upper levels, averaging about 18 in. in width. A new messhouse and new quarters for the men are under construction. As soon as these are completed the crew will be increased and work of sinking a new shaft will start. The shaft will be vertical and will be sunk at such an elevation that the ore can be trammed directly to the mill. L. B. Rhoads is manager.

## ARIZONA

### Cochise County

COMMONWEALTH EXTENSION (Pearce)—About 25 men are at work on the property, where development work is confined to the 360-ft. level. The company plans to erect a mill and cyanide plant in the near future.

MASCOT (Wilcox)—The Mascot Copper Co. has begun to haul its copper ore by auto trucks to the new bins, recently completed at Wilcox, the shipping point. The ore is delivered to the bins by chutes from a trestle. Pierce-Arrow trucks are used.

COPPER QUEEN (Bisbee)—A gas pocket was encountered in the Holbrook mine recently and several miners together with Roos Moon, the night foreman, and Emmett Finnity, the assistant superintendent of the Holbrook, were overcome by the gas which rapidly filled the drift.

### Gila County

MIAMI COPPER (Miami)—Work of installing the electric hoist at the Captain (No. 1) shaft is almost completed and the retimbering and widening of the shaft from the 220-ft. depth to the tramming level (420 ft.) is well under way. The Red Springs shaft also has been retimbered. At the mill the new crushing and screening equipment is being installed, and the grab bucket is rapidly transferring the stock pile near shaft No. 4 to the mill. The bucket with a force of two men to each of the two 8-hr. shifts is dumping more than 500 tons of ore into the bins daily. Later it will be used to clean up the last of the large stock pile that has almost been exhausted by dropping it into the mine through the ore chute that was formerly the No. 2 shaft.

### Pima County

VULCAN (Tucson)—The Vulcan group of four patented claims in the vicinity of the San Xavier mine, has been bonded to Los Angeles people, who will continue to extract ore from the old glory hole.

OLIVE (Tucson)—Arrangements have been made to secure water from the San Xavier mine for operating the new concentrator. This, coupled with the opening up of new orebodies, has made possible the resumption of work in the camp.

### Pinal County

MAMMOTH-COLLINS (Schulz)—Work has been commenced at the old Mammoth property, which recently changed hands. Engineer McBride ordered from El Paso recently a large pumping plant, compressor and drills which will be operated by electricity. A power line from the Ray Consolidated power plant at Hayden, is to be built at once. A new mill will probably be built at the mine.

CALUMET & ARIZONA (Superior)—The shaft is still making a fair amount of water, although not nearly so much as three weeks ago. White shaft men have been substituted for the Mexicans formerly employed and piston drills have replaced the lighter drills since the water was encountered. The shaft is now 500 ft. deep and during the past two weeks it has been cut at the rate of 25 ft. per week. Connection between the shaft and main tunnel has been established at a depth of 180 ft., the connecting drift being about 100 ft. in length. The transmission line is now working smoothly, running the two compressors evenly. The current from Winkleman, is stepped down from 4500 volts to 420, 240 and 110 for various uses of the plant.

### Yavapai County

CORONADO (Congress)—A new mill has been purchased by the Wakota Development Co. to be installed at once.

ROUGH RIDER (Zonia)—The new hoist is on the ground and as soon as it is in working order the property will begin to ship.

Y-P (Senator)—The mill began to operate on full time on July 1. The 800-ft. tram line connecting the mine and plant is nearly finished.

COMMERCIAL (Prescott)—Exceptionally high-grade ore has been encountered in the north drift from the winze from [illegible] Hill. Daily shipments have been increased to 50 tons.

ARKANSAS-ARIZONA (Jerome)—Good ore is being taken from the south drift of the 1400-ft. crosscut which lacks 25 ft. of being under the shaft. When the point is reached a station will be cut and sinking will be resumed after a raise has been put through to connect with the shaft.

SUNDANCE (Senator)—After a recent examination by W. E. Muse, representing the Farwell estate of Chicago, and Mr. Gaffney, its engineer, it has been decided to reopen the property. The mine will be unwatered first and cleaned out to permit of more elaborate exploration. The property is equipped with a 10-stamp mill, some mining machinery and several substantial buildings. It adjoins the Senator mine.

### Yuma County

ARIZONA SOUTHWESTERN (Copperville)—The annual meeting was held in Kingman last week. The old board of directors were reëlected for the ensuing year.

NEW JERSEY (Chloride)—Large bodies of ore have been opened recently. Manager Mingle is in Los Angeles arranging for the necessary new hoisting and pumping equipment.

KINGMAN COPPER (Mineral Park)—The drilling outfit is on the ground at Mineral Park and drilling under the direction of a competent crew will be begun at once.

SWANSEA CONSOLIDATED (Bouse)—That work on a large scale will be resumed at the Swansea property is absolutely assured. A contract has been let for the continuation of No. 6 shaft for 1000 ft. Mr. George Mitchell, formerly president of the old company, has taken over the Bouse-Swansea R.R. and will supervise the operations. The regeneration of the Swansea Consolidated is due to M. Schutte, a banker from Holland, who visited that property recently.

TUMCO (Yuma)—The latest reports from the Tumco, better known as the Hedges mine, are that the property is now operating steadily. Of the old equipment 50 stamps have been dismantled, a new tube mill of 150 tons daily capacity has been installed, and the mill recently put in operation. Considerable money has been spent on the new pipe line and pumping plant. About 125 men are employed about the property and work is being carried on in all levels of the mine.

## CALIFORNIA

### Amador County

BUNKER HILL (Amador City)—The deepening of the shafts has progressed in the past two weeks at the rate of 4 ft. per day. It is expected to complete the sinking of the contemplated 400 ft. within 100 days. E. Hampton is superintendent.

SOUTH EUREKA (Sutter Creek)—It is reported that no dividends will be paid for the month of May owing to the large outlay for supplies, timbers and other materials and the preparation for placing in commission the Oneida mill. The South Eureka and the Oneida are both being put in excellent condition for extensive extraction.

### Calaveras County

WATERMAN (Angels)—A new three-compartment shaft has been started and good progress is being made.

REINER (Altaville)—The two skips that were lodged in the shaft by being caught in the clutches have been taken out with the assistance of a diver.

### Humboldt County

HORSE MOUNTAIN COPPER CO. (Eureka)—Copper concentrate is being hauled by wagon to Arcata on the Oregon & Eureka R.R. for shipment to the Tacoma smeltery. Arrangements are being made to employ auto trucks. Forty-five men are employed at the mine and mill. David Wilson is manager.

### Inyo County

TUNGSTEN ORE of high grade is reported to have been discovered within a few miles of Jackass Springs and about 30 miles from Keeler, at the lower end of the Ubaheba Range. The discovery was made by Harris and Graham. Graham died while on the prospecting trip.

INYO CERRO GORDO (San José)—This is a new corporation organized to operate the Cerro Gordo mines, and to succeed the Four Metals Co. The directors of the Inyo Cerro Gordo Mining & Power Co. are F. J. Hambly, President; Alexander Peers, Vice-President; A. L. Dornberger, Secretary-Treasurer; John E. Richards and Fred C. Ross, directors.

BLUE BELL (Darwin)—Cash Clark, of the Argus mine, has taken a purchase agreement on the Blue Bell, situated in Snow Cañon. Under the management of J. C. Cress, one of the owners, the mine is reported to have paid for development and to have some high-grade ore in place, chiefly gold but containing some silver. The shaft is down 200 ft.; the tunnel is 175 ft long and cuts the orebody 1000 ft below the surface. The mine is equipped with a five-stamp mill, Wilfley concentrator and cyanide plant. About 250 tons of tailing left from early-day working will be cyanided. The ore recently developed carries only a small percentage of sulphides and the tailing will not pay for cyaniding. A new 30-stamp mill is contemplated.

### Kern County

MOLYBDENITE is reported to have been discovered 2½ miles northeast of Randsburg. Eighteen claims have been located by J. Y. Anderson, E. E. Teagle, Manuel Rodgers and F. M. Myrick. The lode on which the first discovery was made by Anderson, is said to be 30 ft. wide, to contain 1½% molybdenum, and to have been traced for more than two miles. It occurs on a contact of lime and schist.

### Madera County

DAULTON—The installation of a 10-stamp mill is contemplated. The ore yields both gold and copper. The Daulton brothers are owners.

### Mariposa County

HUNTERS VALLEY—It is reported that J. S. Covert has located quicksilver claims in the valley about 45 miles east of Modesto. It is said that the samples will average 3% in quicksilver. At the Daly mine 15 men are employed and teams are hauling ore to the Ruth Pierce mill. Mr. Sugarman of San Francisco, is manager. The old Blackemore mine is also being developed under Mr. Sugarman's management. The mill of the School mine is working on good ore. A shipment of ore from the George Dulcich property has been sent to the Selby reduction works.

### Modoc County

HESS (Alturas)—The hoist has been installed and the skip track is down below the 100-ft. level. The engine that drives the mill has been shipped and as soon as it is installed the stamps will again drop. A recent clean-up is reported to have shown a good average value of ore.

LEIGHTON GOLD MINING CO (Highgrade)—This is a new organization which has purchased the Prudential, Eureka, Eureka Extension and Anniversary claims, which are said to be an extension of the Lucky Dutchman lease on the Yellow Jacket mine. T. E. Sturdevant, of Boulder, Colo., is president. E. C. Betts and S. E. Tisher, of Denver, are directors. The capital stock is $500,000, and it is reported that one-half this amount has been paid in.

### Nevada County

GOLDEN CENTER (Grass Valley)—The unwatering of the shaft to a depth of 150 ft. disclosed the fact that the first level had not caved. The 4x6-in. timbers used for car tracks in the mine nearly 50 years ago were found in fairly good preservation and in place.

LE DUC (Grass Valley)—The new buildings to take the place of those destroyed by fire have been constructed and the machinery, most of it new, has been erected in the mill, which is again in operation. The engine, blowers and other machinery for the underground work have been reinstalled and the long tunnel is being advanced.

### Placer County

RALSTON—Diamond drilling is in progress to determine the location of the gravel channel.

BLACK CANON (Westville)—The reopening of this old mine was begun May 15. A new road will be built to connect with the Westville-Bald Mountain road. Electric power will be installed and a pole line built from Alta, a distance of 14 miles. The old steam plant will be employed to drive a sawmill for timber and lumber. The mine is equipped with a 20-stamp mill in good repair, which will be driven by two 25-hp. motors. The old shaft, 246 ft. deep, will be rebuilt, and a crosscut to the shaft at the mill level will be run for tramming the ore. A compressor has been ordered. A site has been cleared for the shaft and compressor houses. E. B. Quigley, manager, formerly superintendent of the Barton mine, is interested with Eastern men, and has taken a bond and lease.

### Plumas County

NELSON POINT, on the middle fork of the Feather River, has been prospected and reported to be good dredging ground; it is stated that Lawrence Gardella, a dredge operator at Oroville, contemplates installing a dredge.

ONION VALLEY—The roads are opened and a number of miners are going into the district. The activity includes the Pilot Peak range, the Blue Nose country and Nelson, Poormans, Hopkins, Dixon, Winters and Washington Creeks. It is said that this will be the best summer in Onion Valley for 10 years. The general geological formation is similar to that of Cripple Creek, Colo. About two years ago high-grade arsenical ores were found in the Oversight mine near Minerva Bar. The outfitting points for the district are Gibsonville and Johnsville. It is not expected that there will be a rush of miners but the country is well prospected.

### Shasta County

BALAKLALA (Redding)—The old brick stack has been razed by dynamite. The structure was 275 ft. high and cost $34,700 to build. After the plant was forced to close, the stack became unsafe and in view of a contemplated resumption of operations it was found advisable to tear it down. The work was done by 96 shots disposed over ¾ of the circumference and fired simultaneously by electricity.

### Siskiyou County

OSGOOD (Yreka)—This property and adjoining claims have been bonded to Oregon and Ohio men. Frank Rose, of Talen, Ore., is manager. The company has also bought the Nigger Boy mine on Ash Creek.

### Tuolumne County

BLACK OAK (Soulsbyville)—A suit involving the purchase of this gold property was continued to July 17, to be argued before the Superior Court in Stockton. At the time for the purchase Charles A. Knox, of Berkeley, who held the option, asked for an extension of time. Thomas A. Fisher demanded compound interest at a high rate. The deal was about to fall through when the interest was reduced to 7% per annum. On Apr. 6, 1913, Mr. Knox made his payment with the interest as agreed upon. Fisher refused to accept the payment upon the terms. The difference in interest amounts to $84,000.

### Yuba County

RED RAVEN (Dobbins)—The Elk Gold Mining & Milling Co. has been declared by the Supreme Court to be entitled to this property, in recent litigation with the Mother Lode Mining Co. Development of the mine by shaft to a depth of 35 ft. and by tunnel has proved the property to be a valuable prospect. The shaft will be deepened to 100 ft. before drifting is done. The present owner is now installing a gasoline hoist and pumps and an electric-lighting plant. The mine will be operated wholly by electricity within a short time. The company is a close corporation. Otto C. Wullweber, J. Schultz and B. A. Kip, of Sheboygan, Wis., are the principal owners. George A. Bruce, of Marysville, is manager.

## COLORADO

### Clear Creek County

TWO KINGS—The new compressor plant is in operation at this property in Hukill Gulch. The bottom of the shaft is in a 14-in. vein of pay ore. The shaft will be sunk 100 ft. below the tunnel level on the Centennial vein and drifts will be advanced on the vein. A shipment of $40 ore has been made.

SPORTING TIMES (Georgetown)—After a period of idleness extending over two years, the property is to be reopened and operated. The underground workings will be overhauled, caves will be removed and tunnels retimbered where necessary. The company plans to drift on the vein intersected by the east crosscut driven from the Moore Adit and to undertake other development.

BLUE RIDGE (Lawson)—Active development is under way. A raise is being made on the vein from the upper level and drifting is in progress east and west from the bottom of the winze. A 4-ft. vein of concentrating ore is being developed, containing an 8-in. streak of smelting ore reported to assay $70 in gold, silver and lead. The low-grade ore is treated in the company's mill, and both the smelting ore and concentrate are shipped to the Chamberlain-Dillingham Ore Co. at Idaho Springs.

### Dolores County

RICO-WELLINGTON (Rico)—The last monthly statement shows receipts of $14,200 for zinc concentrate, $12,800 for lead concentrate, $6335 for crude copper ore, and $3000 for crude lead ore shipped. There is also about $12,000 in ore in transit. During the month of May a $12,000 overdraft was taken care of and the debt to the Knight syndicate cut down from $99,500 to $75,400. This is the entire indebtedness of the company. The net smelter returns amount to approximately $30,000 a month. The mill is handling 50 tons of ore daily and turning out 18 cars of lead concentrate, 24 cars of zinc and 20 cars of crude copper and lead ore per month.

### Teller County

PORTLAND (Independence)—It is now stated that 200 tons capacity will be added to the Portland mill, which will bring the total to 700 tons.

EL PASO (Cripple Creek)—In about a month work will be commenced at the Deep Drainage Tunnel level, which is 1328 ft. below the surface. This will give a large amount of stoping ground on orebodies already developed in levels above. The shaft which was raised from the tunnel is now being timbered.

AMERICAN EAGLE—Some ore valued at nearly $1 per pound, was mined on this property, of the Stratton Estate by Baker & Matheson, lessees, and 14 sacks were shipped by rail to the Portland Mill, Colorado Springs. En route, however, 8 sacks valued at $1000, were stolen from the sealed car. It is said that arrests will soon be made.

MORGAN & MILLER LEASE SUIT—This suit in which Judge John Sheafer entered a decree against the Ajax Gold Mining Co. compelling specific performance of a verbal lease as well as granting an injunction preventing the company from mining any of the ore opened by the leasers has been amicably settled out of court.

EL ORO—An important discovery is reported, an oreshoot 4 ft. in width having been opened and already driven on for 20 ft. The coarse ore is said to run about 2 oz. gold to the ton, while the screenings will go much higher. It was cut on the 350-ft. level of the main shaft and is believed to be the extension of the main Eclipse oreshoot which produced many thousand dollars worth of ore some years ago. Four carloads will be shipped at once.

ANCHORIA-LELAND (Cripple Creek)—Gold Hill is now to be developed at depth, that is to say, below the 1000-ft. point, where a barren zone has been proved to exist. It is believed rich ore will be reached, as has been done in other mines in the district where the same conditions exist. The plan now decided on is to sink the 1000-ft. shaft of the Anchoria-Leland to the 1300-ft. point, and from there to develop the Moon-Anchor, Conundrum and other mines of the Gold Hill section. C. W. Howbert is at the head of the enterprise.

### San Juan Region

TURNER GROUP—These 17 carnotite claims, in the Long Park district, near Nucla, in southwestern Colorado, are sold to O. B. Willmarth for the Colorado Carnotite Co. The group is now being placed in productive form.

COLORADO MINING CORPORATION—At Russell Siding, Huerfano County, uranium and vanadium deposits are being developed. The ore is exposed on the surface for 4500 ft., is 1 to 7 ft. in width, and yields from 2.63 to 2.65% vanadium oxide. Ores of similar character have been located near La Veta.

RAWLEY (Bonanza)—About a year ago the 6000-ft. drainage tunnel was completed, the mine being shut down in 1912 to allow of the unwatering of the workings, which it was estimated would take about a year. This is now accomplished, and a force of about 40 men will be put to work and production will be resumed. It is one of the biggest low-grade mines in the state and carries gold silver and copper in paying quantities. The mine is owned by the Rawley Mining Co., of New York. W. C. Russell is manager.

## IDAHO

### Coeur d'Alene

LUCKY FOUR (Murray)—This company has been organized under the laws of Oregon with $50,000 capital, 1,000,000 shares, to operate a group of claims in the Summit district.

GUELPH (Burke)—Oscar H. Hershey, geologist for the Bunker Hill & Sullivan, has just completed an inspection of the Guelph and reports highly encouraging indications. The company will develop a vein pointed out by Mr. Hershey as well as the vein on which work has been conducted heretofore.

## MICHIGAN

### Copper

STRIKE—All the Michigan copper miners except those in the Hancock and Oneco have struck, July 23, as we go to press.

LA SALLE (Calumet)—The stock pile has been about cleaned up and rock shipments henceforth will come direct from the underground openings. About 200 tons are being shipped to the mill daily, which will be increased as fast as the necessary additional labor can be secured.

FRANKLIN (Franklin Mine)—This company is driving a crosscut from the 32nd level, to cut the conglomerate lode, formerly mined at this property to a depth of about 2300 ft. The opening is made to ascertain the conditions of the formation at the additional depth of 900 ft. The formation parallels the Pewabic lode at a distance of about 450 feet.

MASS (Mass)—The operating force at this property is being increased as fast as possible, but the labor conditions throughout the district are in a very unsettled state and the smaller outlying mines are particularly handicapped in securing underground labor. Both B and C shafts are operating one shift, but as soon as the additional labor can be secured, two shifts will be resumed. Shipments of about 400 tons are being made to the company's mill daily.

HANCOCK (Harcock)—Rock shipments of 50-car lots are made about every two weeks to the Lake Milling, Smelting & Refining Co.'s plant. The rock is the product of development work. Operations are handicapped by the scarcity of underground labor throughout the district. Developments continue satisfactory and the work in the lower levels is showing the formation to have many characteristics in common with the Pewabic lode as opened in the lower workings of the Quincy.

### Iron

A SCORE OF DWELLING HOUSES WILL BE MOVED from between the Maas and Negaunee mines by the Cleveland-Cliffs company preparatory to caving the ground.

CORRIGAN, McKINNEY & CO.—The company is removing the mine machinery from its Crystal Falls mine where operations were recently abandoned.

JUDSON (Crystal Falls)—At this new mine of the Longyear interests in the Mastodon section, supplies and machinery are being received preparatory to starting development work. Dwellings are being erected for the company officials and employees.

IRON RIVER ORE CO. (Iron River)—A meeting of directors of this local company was recently held and an assessment of 1c. per share was levied. The company's mine west of Iron River is at present filled with water, and it is planned to pump it out.

BALKAN (Crystal Falls)—At this property of Pickands, Mather & Co. in the Mastodon section, operations have been started preparatory to changing the course of Mastodon Creek to a channel farther from the new mine. A small exploratory shaft is being sunk, but nothing has yet been done on the stripping.

PURCELL (Iron River)—The Purcell mine, operated by the McGreevey Steel Co., made its first shipment of ore a few days ago and it is the expectation of the management that regular shipments will be made until the close of navigation in the fall. The property was opened up in a hurry, as the task of putting down the shaft was not commenced until the middle of last December. It is 235 ft. deep and drifting was started at a depth of 220 feet.

CLEVELAND-CLIFFS IRON CO. (Iron River)—It is now a known fact that this company has located a body of ore on the lands on the north range, where drilling has been in progress for some time past. Just when the property will be opened up has not been announced. John Bush, formerly superintendent of the Ashland mine on the Gogebic range, is looking after the company's interests in that field.

PICKANDS, MATHER & CO. (Crystal Falls)—A contract has been let for stripping the territory recently leased from the Nevada Land Co., where it is known that a large body of ore exists. The overburden is not deep in some places, while in one spot it extends to a depth of 100 ft. and the task of getting ready to take out the ore will be a large one. The work will be in charge of William Perkins, of Norway.

ATHENS (Negaunee)—The work of shaft sinking at this property was commenced a few days ago and the work will be rushed with all possible speed, as the job is a large one and it will require some time to complete it. This property was drilled several years ago and the ore was reached at a depth below 2000 ft., the drills still being in ore when the holes caved at 2280 ft. The shaft will be lined with concrete and the entire equipment will be of the most modern and substantial design. The shaft will be sunk 2000 ft., making it one of the deepest on the Marquette range. Contracts have been let to J. S. Wahlman, of Ishpeming, for the erection of engine-house, shop building, and combination office and warehouse; only the engine-house will be built this year. The recent assessment of $565,000 on this property indicates a large orebody.

OLIVER IRON MINING CO.—This company has suspended drilling operations on the Michigan Land & Iron Co.'s lands in the Witch Lake district but no announcement has been made as to the results. The exploratory work covered a large area. Two of the drills operated in the Fence River country, two near Trout Lake and one near Witch Lake. A great many holes were drilled, some of which were put down to considerable depth. The fact that the company drilled in the region for over two years would lead to the belief that the work was not entirely barren of results.

## MINNESOTA

ALLEN (Virginia)—This, the only new producer in the Virginia district for this season, is an underground property. It will not make heavy shipments this year.

CUYUNA IRON & MANGANESE CO. (Crosby)—This company is drilling its twentieth hole on Section 10, 46-29, and is in iron and manganese. Ore has been encountered in each of the 20 holes drilled.

ROGERS, BROWN ORE CO. (Crosby)—Up to Friday, July 18, the three shafts of this company (Armour No. 1, Armour No. 2 and Kennedy) have sent to stock 240,000 tons. This is the heaviest tonnage from one producer that has yet been obtained on the Cuyuna range.

CUYUNA-DULUTH IRON CO. (Ironton) has announced Aug. 3 as the date on which the first shipment will be made. This is a stock company with shares widely scattered. The Duluth shareholders in the company have arranged to run an excursion to Ironton on the shipping date in honor of the event.

WHITESIDE (Buhl)—The drying plant which the Shenango Furnace company is building will be the largest and best of the kind in the Lake Superior region. It will be equipped to eliminate the combined moisture as well as the ordinary moisture. The former requires something like 600°, whereas 212° serves for the latter.

HULL-RUST (Hibbing)—Mining operations are being pushed with a vigor at this Steel Corporation property, as is the case with other large open-pit properties in the district. The shipments from the mine are averaging better than 700 cars a day. There are thirteen steam shovels in operation in the one pit and two forces are worked. The Hull-Rust, the largest iron mine in the world, will undoubtedly establish a new record for production this season.

PITTSBURGH STEEL ORE CO. (Riverton)—The company has added another giant, with a 4-in. nozzle and 100 lb. head. The hydraulicking operation being a unique one in the iron country, is watched with interest. It is doubtful whether there is another property on the whole Cuyuna range where conditions are such as to permit the hydraulicking the surface from the orebody. The land is on the shore of the Mississippi River, and the surface is only 45 ft. deep, which is shallow for the Cuyuna; the dumping ground is low and of sufficient slope to carry the sand and water mixture a considerable distance by gravity. Developments of the process will be followed with interest.

CUYUNA RANGE MINING TIMBER—The forthcoming report of the Minnesota State Forester will show that the Cuyuna Range mines used approximately $70,000 worth of mining timber in 1912. This figure includes 3500 cords of lagging (jack pine, tamarack, cedar and spruce) at $5.50 per cord, 1,050,000 lin.ft. of mining timber (jack pine, tamarack, spruce, white pine, norway pine, birch, ash and maple) at 4½c. per lin.ft., and about 10,000 short ties (tamarack and spruce) at 10c. each. The timber situation on the Range is becoming serious. The surface is largely cut-over pine land, denuded 20 or 30 years ago, while the second growth consists largely of jack pine, which to most mine operators is undesirable.

SPRUCE (Eveleth)—Five men were imprisoned in this mine for 31 hr. last week, when a cloudburst caused a number of the levels to become partly filled with water. There were 250 men in the mine when the water started to come in but most of them were employed on the upper levels and had plenty of time to seek safety. Five were unable to reach the shaft so they sought refuge in one of the drifts and banked rock in front of them to keep out the rushing water, but it reached a level of 5 ft. and the men stood up to their necks in it until rescued. A drift was blasted through from the timber shaft by the rescuers and all of the men were taken out alive, although they stated that they could not have endured the hardship many hours longer. The mine is the property of the Steel Corporation. The damage to the property is estimated at $100,000.

MAHONING (Hibbing)—This famous mine was for years the world's greatest openpit producer of iron ore, but now in that particular ranks second to its neighbor, the Hull-Rust. This year it is doing nearly double the work it has usually carried on during the summer season. Both the Steel Corporation and so called independent interests are associated in the control and operation of the property. While the season's output of the Mahoning will be about normal, at approximately 1,500,000 tons, much more stripping than usual is being accomplished. Three steam shovels are engaged in removing overburden during the daytime, and two are employed in that work at night. Usually of late years only one shovel has been assigned to operations of this character.

## MONTANA

### Broadwater County

OHIO-KEATING (Radersburg)—A good body of ore was cut a short time ago by a crosscut on the 500-ft. level at this property in the Radersburg mining district. The shoot has been drifted on for a length of 70 ft., the ore averaging over $25 in gold. Shipments of ore are being made daily by wagon.

DOBLER (Clasoil)—Preparations are being made to resume operations soon. Some time ago shaft sinking was started, but in the swampy ground, a large amount of water was encountered, so that work was suspended. A large pumping plant is being installed, and as soon as this is completed, sinking will begin again.

### Butte District

MOUNTAIN VIEW—A six-drill compressor is being installed on the property 40 miles south of Libby. The main tunnel is in 1400 ft. and will be continued until it crosscuts the four ore veins on the claims.

TUOLUMNE—A special meeting of the stockholders of the Tuolumne Copper Co. will be held in Butte, Aug. 18, to vote on a measure to increase the capital stock from 800,000 shares to 1,500,000 shares, the purpose of the increase being to acquire new properties. It has been announced that the next regular dividend will not be declared at the usual time. On the 2200-ft. level the East drift is now in 6 ft. of ore averaging 6% copper and 12 oz. of silver per ton. A considerable tonnage of ore has been blocked out by this drift.

BUTTE AND SUPERIOR—The results for the last ten days of June again showed an improvement over anything previously recorded, if reports can be credited. During this period the company treated daily an average of 588 tons, with a recovery of 92.69%, and with concentrates averaging 49.09%. For the entire month the company produced 6,713,-881 lb., with an average recovery of 90.25%, and with concentrates averaging 49.10%. Considering that it was only three months ago that the recovery was less than 80%, and that the concentrates were running less than 46%, this performance is most gratifying in every way.

### Deer Lodge County

SOUTHERN CROSS (Cable)—About 25 carloads of ore are being shipped weekly from this mine of the Anaconda company in the Georgetown district. A shoot of ore, 20 ft. in width, was recently opened by a crosscut on the 475-ft. level. A tunnel is being driven from a point near the railroad to connect with the shaft at the 75-ft. level in order to facilitate the handling of ore and to afford an inlet for timber and supplies, thus doing away with an uphill haul to the collar of the shaft.

### Granite County

ROYAL BASIN (Princeton)—The final payment of $25,000 was made July 1 on the property operated by the Royal Basin Mining & Milling Co. A tunnel is being driven which will, when completed, tap the vein at a depth of 800 ft. On No. 2 level a crosscut driven in new territory west of the old workings, recently opened a good body of copper ore.

PURITAN (Phillipsburg)—James A. Murray, of Butte, owner of this mine, has begun work preliminary to operating the property, which has been idle for many years. The mine is rich in native silver, much of the ore running between 200 and 300 oz. It was closed when the slump in the price of silver came. The shaft is being retimbered to water level, after which the water will be pumped out and development work begun.

### Jefferson County

RUBY (Basin)—Recently one of the richest strikes of gold ore made in Montana in years was made at this property in the Helena district about 20 miles northeast of Butte. Lessees operating the mine drove a crosscut from the tunnel, striking the ore at less than 100 ft., the shoot being only a few inches wide, but running into the thousands of dollars to the ton in gold.

## NEVADA

### Comstock Lode

K & R. PROPERTY (Ludwig)—This property, situated 1½ miles northeast of the Nevada-Douglas mine, is now a regular shipper. A 12- to 15-ft. vein, with a high-grade streak of cuprite, was recently cut in the lower tunnel.

YERINGTON MOUNTAIN (Yerington)—This property, situated several miles east of Yerington, made its initial shipment to the Thompson smelting works recently. Development has been in progress for a year, and a large tonnage of ore is now on the dump and blocked out in the mine. A spur was recently built from the Southern Pacific to the mine.

### Elko County

Alpha (Jarbidge)—A new mill has been ordered from Allis-Chalmers. Roads are being built to the millsite. A new boarding house will be erected and operated. The mine is operated by the Elko Mining Co. organized by Honore Palmer. John A. Jess is in charge of operations.

### Esmeralda County

INDIAN QUEEN (Benton, Calif.)—Joseph L. Bley principal owner of the Tip Top mine is reported to have taken a purchase option on the Indian Queen. This mine is said to have a large production to its credit. In recent years it has not been operated regularly.

### Humboldt County

SNOWSTORM GROUP (Rochester)—A 4-ft. vein has been discovered which assays $22 per ton.

RYE PATCH (Rochester)—The dumps have been leased and a cyanide plant to treat them will be erected. It is estimated that there are 50,000 tons of ore assaying 5 to 20 oz. silver.

NORTH OF ROCHESTER, about four miles, and south of the Rye Patch mine more silver locations have been made. This ground was originally located four years ago, before the Rochester boom.

DREAM (Rochester)—A discovery of good-grade silver ore on this property, situated in Fisher Cañon, 1½ miles southeast of Rochester, has recently been made. The ore resembles the better grade from Nenzel Hill.

ELKO PRINCE (Gold Circle)—The report of the sale of this property to New York capitalists has been confirmed. The first payment, of $100,000, has been made. The new company plans to erect a mill of such capacity and type as to make the custom milling of the low-grade ores of the district, as well as the better grade of ores of the Elko Prince, possible. It is reported that the company will erect a power plant on a fork of the Little Humboldt.

### Lyon County

GILBERT MINE (Silver City)—This property is now being worked by lessees.

NEVADA-WASHINGTON (Yerington)—Sinking has been resumed and a good grade of ore is being taken out.

BLUE JAY (Yerington)—A gasoline hoist has been installed. The retimbering of the shaft is progressing steadily. The 200-ft. and 400-ft. levels will be driven to cut the oreshoot opened on the 100-ft. level.

YERINGTON MOUNTAIN (Yerington)—The shaft which is being sunk to connect No. 3 tunnel with No. 4 tunnel is now down 600 ft. Regular shipments are now being made, the ore coming entirely from development.

EMPIRE-NEVADA (Yerington)—A crosscut at water-level is now being driven from the shaft toward the orebodies exposed on the surface. Lessees are now making shipments of ore in addition to the regular shipments by the company.

### Mineral County

TIP TOP (Sunland)—The material is on the ground for the construction of a 40-ton mill. The mine is situated on White Mountain summit and has been well developed. Thorndyke, McMill and Bley are the owners.

LUCKY BOY (Hawthorne)—A vein varying from three to seven ft. in width and carrying ruby silver and gray copper was cut in the tunnel. The discovery was made at a point 2300 ft. from the portal and at a depth of 175 ft. from the surface.

CONSOLIDATED MINING CO. (Aurora)—The drainage tunnel is now in 1500 ft., and will be driven 3200 ft. farther to connect with the Durand shaft. The tunnel is being driven on contract. The crosscut to the Humboldt shaft is in 1700 ft. A distance of 200 ft. more must be driven to cut the vein, which has been developed to a depth of 420 ft.

CINNABAR STRIKE—Samples from the cinnabar strike east of Mina have assayed as high as 7% mercury. A second discovery has been made two miles east of the original location, and sinking is now in progress. These two locations, which include about 500 acres, are now being surveyed.

### White Pine

BUTTE & ELY—The Heilbronner Co. in opposing the Coppermines merger points out that the Butte-Ely stockholders, who made the exchange, are paying $3.12½ in cash and quick assets for stock offered at $3 on the eastern exchanges, without taking any note of the value of the property itself.

## NORTH CAROLINA

### Mecklenburg County

NORTH CAROLINA PARTRIDGE SMELTING CO.—This company, of Charlotte, has completed its Partridge hot-blast smelting plant and is receiving ore.

### Montgomery County

A SUPPOSED DISCOVERY OF TIN has been made near Mount Gilead.

NEW WORK HAS BEEN STARTED on properties southwest of the Iola mine.

TALC PROPERTIES—Work is active at the three mines on Deep River.

COGGINS MINE—This property in the northern part of the county has been sold and it is reported that work has been commenced.

REYNOLDS MINE—This has been leased, with option of purchase, to D. C. Stainback. A small high-grade vein was discovered at this place three years ago and the property was taken over by M. L. Jones, who developed the Iola mine. Jones sunk a shaft on the high-grade vein and did a little other prospecting. Afterward a vein 6 or 7 ft. in width, but of low grade, was uncovered. Mr. Stainback will explore both veins.

UWARRA (Candor)—Sinking has commenced in the main shaft at 300 ft. A station will be cut at the 400 level and the shaft continued indefinitely. For some time there has been a boundary dispute between the Iola and Uwarra mines, the latter contending that underground works of the Iola had entered its ground. The parties have agreed upon a survey to be made by their respective engineers, with the aid of a disinterested outsider.

### Randolph County

ASHBORO COPPER MINE (Ashboro)—The property is again in operation, developing and shipping some ore.

### Union County

COLLOSSUS MINE (Waxhaw)—A cyanide plant is being constructed by the Mecklenburg Iron Works, of Charlotte, for this property, otherwise known as the Howie mine.

## SOUTH DAKOTA

GOLDEN REWARD (Deadwood)—The leasing system is proving successful here after having been followed for about a year. There are at the present time 44 leasers at work at various points, and a large proportion of the mill supply is produced by them. Some of the leases are yielding smelting grades of ore as well, and the work is responsible for a prosperity in the Bald Mountain district almost equal to the boom days of the camp.

CUMBERLAND—Differences among the stockholders have been adjusted and the following directors elected: F. C. Crocker, president; Jackson Crocker, vice-president; J. W. Fowler, Jr., secretary-treasurer; Alex Madill and F. L. Livingston. The warring interests have had a long siege in the courts, but now that peace again reigns it is proposed to resume work. The property has in the past been a heavy producer, and is equipped with hoist, compressor and a small stamp mill.

HOMESTAKE (Lead)—Twenty stamps have been added to the equipment, making a total of 1020 stamps now dropping. Production is up to the normal, and for the first half of the present year from January to June inclusive, $936,000 has been paid in dividends. The present monthly dividend, since the increase in capitalization, is $163,254. In common with many securities on the New York exchange, Homestake has settled to a point where it is an attractive investment, and local people are buying it when they can get it around $100 per share.

ELLIPTIC—A crew of men under the management of F. S. Stratton has unwatered the 700-ft. shaft and installed a diamond drill in the bottom. Former drilling is stated to have exposed at a depth of 600 ft. below the shaft bottom, a body of remarkably rich free-gold ore. Mr. Stratton and associates are seeking confirmation of these results, and should they be able to secure anything similar, will continue the shaft and develop thoroughly. A great deal of interest attaches to this work, as it is in a section outside of the recognized productive district, and a success will mean the stimulation of prospecting over a wide territory.

TITANIC—Cleaning out the old shaft, enlarging it to two compartments and timbering with substantial square sets, is rapidly going forward. The old shaft is a little over 100 ft. deep, and is repaired and enlarged nearly to the bottom. In addition to sinking to the 300-ft. point, the company will crosscut from each 100-ft. level. The work is being done on the Carbonate claim of the Iron Hill company, about 200 ft. west of and 50 ft. lower than the mouth of the Iron Hill shaft. From the latter shaft during former operations a large quantity of ore was extracted. The work now being carried forward by the Titanic company is destined to explore a virgin territory along the main ore-making fault of the camp. A commodious shaft house has been erected and arrangements made for the installation of a power hoist as soon as it shall be needed.

## CANADA

### British Columbia

SURF INLET GOLD MINES, LTD.—W. S. Edwards, one of the largest shareholders in the Dome mine and Dome Extension at Porcupine, Ont., has bonded for $850,000 the claims of this company on Princess Royal Island, 400 miles north of Vancouver. His engineer, J. Parsons, is making an examination of the property. The group comprises nine claims. It was bonded from the owner, E. A. Cleveland, three years ago by A. B. Clabon and Fred M. Wells, and by them vested in the present company. Several tunnels have been driven on quartz veins, and a raise in ore extends at one point, 260 ft. to the surface. The valuable mineral is gold, the ore being amenable to treatment by milling and cyaniding. The development work to date exceeds 2000 ft. The ore in sight is estimated at 125,000 tons valued at approximately $1,000,000.

### Ontario—Sudbury District

WHISTLE—The Canadian Nickel Co. is preparing this mine for production. The main orebody is above an adit level and is proved by drilling.

SHEPARD—This old mine, lying between the Kirkwood and the Blezard, has been unwatered by the Crown Reserve Co., of Cobalt and is now being examined. It has not been operated since the early '90s, at which time it shipped to New Jersey several cars of ore running 5% to 6% nickel.

MORGAN TOWNSHIP—A Sudbury syndicate is developing an outcrop in the township of Morgan on the North range east of the Levack properties. This outcrop was located by Thomas A. Edison's expedition about 1900 and was later relinquished. Henry Ranger is in charge of the work.

KIRKWOOD—The Mond Nickel Co. is said to have taken a contract to operate this property owned by William McVittie of Sudbury on a royalty basis. The mine lies about a mile east of the Garson mine, operated by the Mond company and is partly developed and drilled. The ore is in the foot wall and is good grade. A new shaft house and equipment are being installed.

MURRAY—At this mine, owned by the Canadian Nickel Co., successor to the Dominion Nickel-Copper Co., a shaft is being sunk near the old smelting plant site to open up the orebody recently developed by drilling. The company has cleared a new site for a plant near the mine, having abandoned the one selected last year, but no work or contracts for its erection have yet been concluded.

WORTHINGTON—The Mond Nickel Co., which once had an option on this property, but relinquished it after drilling, has purchased the mine from the McIntire estate of Montreal and will begin operations at once, at the same time carrying on explorations by drilling. The same owners had the Blezard mine and the Mond company is reported to have taken a contract to operate this on a royalty basis.

MOUNT NICKEL—The Nickel Alloys Co. of New York, which drilled this property in 1911, has suspended work until matters in litigation with the former owner, B. Howard Coffin, of Boston, are settled. Recently two attempts to renew drilling have been made by parties claiming control from the Coffin interests, but in each case they have been stopped by court order. The mine is reported to have drilled several hundred thousand tons of ore.

## MEXICO

### Chihuahua

BATOPILAS (Batopilas)—We are informed by the New York office of the Batopilas Mining Co. that its property is in continuous operation and that the June bullion product will soon be shipped via the West Coast Route, as it is reported that the road is about to reopen for traffic.

### Sonora

WEST COAST SMELTING & REFINING CO.—The company is planning to construct an automobile road from its property 51 miles northwest of Cabo to the Gulf of California. As soon as conditions improve, the new smelting plant recently designed by Ricketts & Banks will be built.

TIGRE (Yzabel)—Operations for June produced $133,049 of which $52,438 was profit. The stamps crushed 5619 tons and the cyanide plant treated 5275 tons of current tailing and 1971 tons of dump tailing. During the first half of 1913, $117,750 worth of bonds were bought in and canceled, leaving outstanding bonds of $99,050.

## ASIA

### Chosen

ORIENTAL CONSOLIDATED—During May the 240 stamps ran 26.2 days, crushed 26,107 tons, producing $152,954, and giving a profit of $59,567. The East Candlestick 10-stamp mill was hung up for a month because of labor shortage.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—July 23

The metal markets have been rather inclined to quiet and steadiness. There is so far no apparent inclination toward the revival of trade, except in copper.

## Copper, Tin, Lead and Zinc

**Copper**—What was foreshadowed in our last report transpired immediately afterward. The price for electrolytic having been cut to the point where European buyers were interested, it developed that their interest was large and heavy transactions were effected on July 17 and 18 in which all of the agencies participated. The bulk of the business was done at 14c., delivered in Europe, or about 13.80c., New York. Most of the sales were for August-September shipment, but some contracts for October shipment were consummated. The producers having comparatively few orders on their books at first met the demand freely, but when it persisted they raised their prices, beginning on July 19. American consumers at first remained apathetic, but by July 21 they began to display some interest. Some million-pound transactions were consummated among them, but their buying has not yet become large or general, although it has been increasingly evident that they are short of supplies. On the other hand, the producers are maintaining their willingness to trade and have not marked up prices quite so rapidly as the daily newspapers have indicated. At the close large interests were still willing to do business at 14⅜c., delivered, usual terms.

A considerable volume of business in Lake copper was done around 14.40c., New York. On some special brands 14.50c. was realized. The Lake producers have such a large accumulation of copper, far out of proportion to the electrolytic stock, that the miners' strike ought not to interfere with deliveries.

In the aggregate the business of the last week ran to many tens of millions of pounds, being the largest of any week for several months.

Electrolytic copper closes strong at 14.15@14.25c., while Lake is quoted at 14.25@14.50c. We quote casting copper nominally at 13.70@13.75c. as an average for the week.

The market for standard copper in London has been strong and active, and has advanced steadily with larger transactions than for some time past. On July 17 the market for spot was £63 5s. and for three months £63 8s. 9d.; on July 18, £63 13s. 9d. and £63 16s. 3d., respectively, and on July 23 it was over £1 higher, closing at £64 15s. for spot and £64 17s. 6d. for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 15¾c. per lb., for carload lots at mill.

Exports of copper from New York for the week were 7335 long tons. Our special correspondent gives the exports from Baltimore at 2322 tons for the week.

**Visible Stocks of Copper in Europe** on July 15 are reported as follows: Great Britain, 18,670; France, 3730; Rotterdam, 4300; Hamburg, 1830; Bremen, 1810; total, 30,340 long tons, or 67,961,600 lb., being 1760 tons less than the June 30 report. In addition to the stocks above 2080 tons are reported afloat from Chile and 4850 from Australia, making up a total of 37,270 tons.

**Tin**—The excitement which had prevailed in the London market has subsided. The tone has become strong and prices have advanced from day to day in an orderly manner. Transactions were comparatively small. Sellers in this market were rather reluctant to enter into large commitments, and were almost daily asking a slight premium over importation price. Fair purchases for future delivery by consumers were reported. The market closes at a slight recession from the top at £188 15s. for spot and the same for three months, and about 41½c. per lb. for August tin in New York.

**Lead**—An active business was done in the early part of the week at rather better prices, St. Louis basis. We quote New York at 4.32½@4.35c., and St. Louis at 4.20@4.22½ cents.

The market for Spanish lead continues strong and has advanced to £20 10s.; English lead 10s. higher.

**Spelter**—The market is a shade firmer and St. Louis is quoted 5.05@5.15c.; New York, 5.20@5.30 cents.

The market abroad is also firmer, good ordinaries being quoted £20 15s.; specials, £21 10s. per ton.

The base price of zinc sheets was advanced ¼c. on July 23, and is now $7.25 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

**Imports and Exports in Great Britain** of metals other than iron and steel, are reported for the five months ended May 31, as follows, in long tons, except quicksilver, which is in pounds:

| | Imports 1912 | Imports 1913 | Exports 1912 | Exports 1913 |
|---|---|---|---|---|
| Copper | 50,389 | 58,905 | 22,859 | 30,681 |
| Tin | 18,879 | 19,277 | 23,321 | 18,022 |
| Lead | 91,221 | 91,417 | 21,937 | 26,817 |
| Zinc | 57,053 | 59,873 | 3,733 | 3,973 |
| Quicksilver, lb. | 2,384,648 | 2,162,062 | 939,645 | 1,115,181 |
| Minor metals | 2,956 | 3,560 | 11,484 | 13,921 |
| Ores, etc.: | | | | |
| Tin ore | 13,019 | 13,951 | ..... | ..... |
| Pyrites | 388,043 | 368,837 | ..... | ..... |

### DAILY PRICES OF METALS

### NEW YORK

| July | Sterling Exchange | Silver | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 17 | 4.8640 | 58⅝ | 14¼<br>@14½ | 13.75<br>@13.85 | 39¾ | 4.32½<br>@4.35 | 4.20<br>@4.22½ | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 18 | 4.8650 | 59⅛ | 14¼<br>@14½ | 13.75<br>@13.85 | 39⅞ | 4.32½<br>@4.35 | 4.20<br>@4.22½ | 5.20<br>@5.30 | 5.05<br>@5.15 |
| 19 | 4.8665 | 59⅛ | 14¼<br>@14½ | 13.85<br>@13.95 | 39⅞ | 4.32½<br>@4.35 | 4.20<br>@4.22½ | 5.20<br>@5.30 | 5.05<br>@5.15 |
| 21 | 4.8665 | 58¾ | 14¼<br>@14½ | 14.00<br>@14.10 | 40⅜ | 4.32½<br>@4.35 | 4.20<br>@4.22½ | 5.20<br>@5.30 | 5.05<br>@5.15 |
| 22 | 4.8665 | 58¾ | 14¼<br>@14½ | 14.05<br>@14.15 | 41⅛ | 4.32½<br>@4.35 | 4.20<br>@4.22½ | 5.20<br>@5.30 | 5.05<br>@5.15 |
| 23 | 4.8675 | 58⅝ | 14¼<br>@14½ | 14.15<br>@14.25 | 41½ | 4.32½<br>@4.35 | 4.20<br>@4.22½ | 5.20<br>@5.30 | 5.05<br>@5.15 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

### LONDON

| July | Silver | Copper | | | Tin | | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| | | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | | |
| 17 | 27 1/16 | 63¼ | 63 7/16 | 68 | 181¼ | 182¼ | 20 | 20¼ |
| 18 | 27⅛ | 63 11/16 | 63 13/16 | 68½ | 182 | 182½ | 20 | 20⅜ |
| 19 | 27⅛ | ... | ... | | | | ... | . |
| 21 | 27 1/16 | 63 15/16 | 64 1/16 | 69 | 183¾ | 184¼ | 20¼ | 20½ |
| 22 | 27 1/16 | 64 3/16 | 64 5/16 | 69½ | 187½ | 187½ | 20⅜ | 20½ |
| 23 | 27⅛ | 64¾ | 64⅞ | 69½ | 188¾ | 188¾ | 20½ | 20¾ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅜c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—The market has improved and sales have been on a larger scale than for several weeks. Quotations are 23¼@23¾c. per lb. for No. 1 ingots, New York. Foreign aluminum brings about 19½c. in bond.

**Antimony**—The market has been quiet, with small sales only. The prices are a little off, 8.40@8.50c. per lb. being quoted for Cookson's; 8@8.10c. for Hallett's; 7.45@7.55c. for Hungarian, Chinese and other outside brands.

**Quicksilver**—The market has been rather quiet, but generally steady, and there is no change in prices. The New York quotation is $40 per flask of 75 lb., with 60c. per lb. asked for small orders. San Francisco, $39.50 for domestic and $37 for export orders. London, £7 10s. per flask, with £7 2s. 6d. asked from second hands.

## Gold, Silver and Platinum

**Gold**—There was no change on the open market in London, prices remaining at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was some demand for Paris but most of the supplies went to the Bank of England.

Exports of gold from New York week ended July 19 were $2,131,732, chiefly to Paris. Imports were $316,539, from Australia, Mexico and Central America.

**Iridium**—There has been no improvement in supplies and dealers are still quoting about $85 per oz., New York.

**Platinum**—The market is rather quiet but remains very steady. Dealers continue to ask $45@46 per oz. for refined platinum, and $49@52 for hard metal.

**Silver**—The market has continued quiet and steady, advancing to 27¼d. and dropping back to 27$\frac{1}{16}$d. on Chinese selling and cessation of buying by the Indian Bazaars.

Exports of silver from London to the East, Jan. 1 to July 10, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £3,677,200 | £4,044,000 | I. £366,800 |
| China | 933,500 | 417,000 | D. 516,500 |
| Total | £4,610,700 | £4,461,000 | D. £149,700 |

Exports of silver from New York week ended July 19 were $1,650,207, to London and Paris chiefly. Imports were $184,267, from Mexico and South America.

**Gold and Silver** movement in the United States six months ended June 30:

| | Gold | | Silver | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Exports | $33,396,836 | $63,734,616 | $33,669,222 | $33,321,781 |
| Imports | 25,264,342 | 27,910,595 | 25,264,240 | 18,132,804 |
| Excess, exp. | $8,132,494 | $35,824,021 | $8,394,982 | $15,188,977 |

Exports of merchandise for the six months this year were valued at $1,166,160,120; imports at, $879,199,831; excess of exports, $286,960,289. Adding excess of exports of gold and silver gives $337,973,287 as the total export balance.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—July 19

The high price of zinc blende is $48, the base per ton of 60% zinc, ranging from $43@45. Calamine sold at $21@23 per ton of 40% zinc. The market was weaker, with offerings here and there 50c. per ton lower. The average of all grades is $42.50 per ton. Lead is unchanged at $52.50 per ton of 80% metal, with the average of all grades $52.24 per ton.

SHIPMENTS WEEK ENDED JULY 19

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week | 9,230,890 | 1,010,520 | 1,361,200 | $245,655 |
| Totals 29 weeks | 312,894,090 | 22,214,540 | 51,914,500 | $8,672,292 |

Blende value, the week, $196,936; 29 weeks, $7,021,974.

Calamine value, the week, $12,450; 29 weeks, $286,737.

Lead value, the week, $36,269; 29 weeks, $1,363,581.

### PLATTEVILLE, WIS.—July 19

The base price paid this week for 60% zinc ore was $44 per ton. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED JULY 19

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,254,240 | 187,610 | 995,020 |
| Year to date | 80,468,870 | 3,999,390 | 34,450,460 |

Shipped during week to separating plants, 2,207,460 lb. zinc ore.

# IRON TRADE REVIEW

### NEW YORK—July 23

No serious weakness in finished steel prices has developed, even though some few of the mills are nearing the point where they will not be able to operate full with business now on books. Sentiment for the more distant future has distinctly improved in the past week and predictions are frequent that 1914 will prove one of the best years the iron and steel trade has ever had. This opinion is strongly held by some of the largest producers, who predict that the next buying movement will be the greatest seen for years. It is probable, however, that even if the market proves strong eventually there will be some price readjustments in the near future. Thus wire products have been weak for two or three months, and for 30 days past it has been possible to buy from some mills at $2 under the nominal prices. Sheets have been declining for some time, and the leading interest is now adjusting current shipments on its contracts to the prices made by independents for several weeks, but it is not revising any contracts. No irregularities in plates have been reported, but some shading in the next few weeks would not be surprising. Tubular goods and merchant bars are easily the strongest in the list, with mills very well filled.

The most notable new business in the past week has been in structural steel, in which some good contracts have been placed. Some shipbuilding contracts have been let, which will require a large tonnage of plates and shapes.

Pig iron is quiet and some buyers seem to think that the bottom has not yet been reached. Sales have been chiefly of small lots.

**Exports and Imports of Iron and Steel** and of manufactures thereof in the United States, five months ended May 31, are valued by the Department of Commerce and Labor, as below:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Exports | $115,427,964 | $130,270,191 | I. $14,842,227 |
| Imports | 11,028,718 | 14,493,787 | I. 3,465,069 |
| Excess, exports | $104,399,246 | $115,776,404 | I. $11,377,158 |

Actual tonnages of iron and steel exports, so far as given in the reports, were 1,249,834 in 1912, and 1,251,091 in 1913; increase 1257 tons only. Tonnage of imports was 75,526 in 1912, and 128,207 in 1913; increase 52,681 tons.

### PITTSBURGH—July 22

The steel mills continue to run at practically full capacity, and output is large for the season, the weather having been unusually favorable for July. Absolutely necessary repairs have been crowded into the shortest space of time possible. The wire mills, however, are running light, and only about half the independent sheet mills are running, the others being down for repairs. The unfinished steel supply does not seem to be increased in consequence.

The Connellsville coke market is quiescent. The operators have not sold below $2.50, the figure they set long ago, but the full July tonnage has not been taken. The next question is what will be done on August tonnage. The operators have had to restrict output, and furnaces doubt whether they will be resigned to continue this restriction, but there is no guarantee that if the price were reduced more coke would be sold.

**Pig Iron**—The pig-iron market has not firmed up. It is losing nickels per ton when formerly it was losing quarters, but the trend up to the moment continues downward. Basic has weakened from the $14.50 level, sales being made at $14.35, if not at $14.25, while 2500 tons bessemer sold at $15.75, Valley, the $16 quotation having been largely nominal for several weeks. We now quote: Bessemer, $15.75; basic, $14.35; malleable, $14; No. 2 foundry, $13.75; forge, $13.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh, except that foundry iron can be done at $14.50, Pittsburgh.

**Ferromanganese**—The market has been quiet since the open reduction of $2.50, reported last week, and the new figure is occasionally shaded on small prompt lots. We quote the regular market on prompt and forward at $58.50, Baltimore.

**Steel**—The market has been quiet, but there is no loosening up in the supply and prices are as well held as ever on billets and sheet bars, though rods are off 50c. The Youngstown Sheet & Tube Co. is now operating several of the six new openhearth furnaces it has been building, and the Midland plant of the Pittsburgh Crucible Steel Co., also six furnaces, is now starting. The Edgar Thomson extension of 14 furnaces will begin operations in a moderate way in a few weeks. We quote billets at $26.50, sheet bars at $27.50 and rods at $28.50, maker's mill, Pittsburgh or Youngstown.

## IRON ORE

The railroads concerned have complied with the order of the Interstate Commerce Commission, that rates on ore from the Lake Erie ports to the Pittsburgh and Wheeling districts must be equalized. The new rate is 88c. to furnaces in both districts. This a reduction of 8c. to Pittsburgh, but an increase of 28c. in the Wheeling rate. Several of the companies intend to put in another complaint that the new rates are exorbitant.

**British Iron Ore** imports six months ended June 30 were 2,916,538 long tons in 1912 and 4,022,629 tons in 1913; increase, 1,106,091 tons.

## SAULT STE. MARIE CANAL

The total freight passing through the Sault Ste Marie Canals in June was 12,173,613 short tons, the heaviest tonnage ever reported in one month. For the season to July 1 the total tonnage reported was

| | 1912 | 1913 | Changes |
|---|---|---|---|
| East-bound | 15,329,385 | 18,286,122 | I. 2,956,737 |
| West-bound | 4,521,385 | 7,109,241 | I. 2,587,856 |
| Total | 19,850,770 | 25,395,363 | I. 5,544,593 |

The number of vessel passages reported was 7180, showing an average cargo of 3523 tons. The mineral freights included in the totals were, in short tons except salt, which is in barrels:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 3,940,305 | 6,496,119 | I. 2,555,814 |
| Iron ore | 12,928,232 | 15,270,994 | I. 2,342,762 |
| Pig and manuf. iron | 197,811 | 145,195 | D. 52,616 |
| Copper | 30,689 | 33,532 | I. 2,843 |
| Building stone | 2,282 | 273 | D. 2,009 |
| Salt, bbl | 295,687 | 265,279 | D. 30,408 |

Iron ore this year was 60.1% and coal 25.6% of the total tonnage reported.

## COKE

The Connellsville "Courier" reports coke production in the Connellsville region for the half-year ended June 30 at 10,657,038 short tons. Shipments for the half-year were 10,623,160 tons, showing practically no stocks left on hand.

**Exports and Imports of Fuel in the United States**, five months ended May 31 are reported as follows, in long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Anthracite | 829,278 | 1,647,208 | 30 | 13 |
| Bituminous | 4,998,276 | 5,138,387 | 621,610 | 633,853 |
| Coke | 344,905 | 409,538 | 33,019 | 27,912 |
| Bunker coal | 3,255,375 | 3,008,654 | | |
| Totals | 9,427,834 | 10,203,787 | 654,629 | 661,765 |

Increase in exports 775,953 tons, or 8.2%; increase in imports, 7136 tons, or 1.1%. The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The heaviest exports are to Canada, while that country also furnishes a large share of the imports. The imports are mainly on the Pacific Coast.

# CHEMICALS

## NEW YORK—July 23

The general market is dull, but fairly steady in most lines.

**Imports and Exports of Chemicals** and raw materials in the United States, five months ended May 31, were as follows:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Arsenic, lb | 2,012,920 | 3,930,875 | | |
| Copper sulphate, lb.. | | | 5,079,140 | 3,202,092 |
| Bleach, lb | 29,738,094 | 32,331,605 | 400 | 1,820 |
| Potash salts, lb | 263,255,770 | 253,652,949 | 1,538,842 | 5,221,278 |
| Soda salts, lb | 4,874,359 | [illegible] | 200,692 | 152,887 |
| Acetate of lime, lb....... | ........... | ...... | 30,127,147 | 31,650,710 |
| Nitrate of soda, tons | 197,478 | 312,085 | 4,226 | 2,666 |
| Sulph. of ammonia, tons | 21,697 | 23,604 | 60 | |
| Phosphate, tons | | | 470,417 | 484,941 |
| Sulphur, tons | 7,413 | 2,623 | 15,019 | 33,735 |
| Pyrites, tons | 380,281 | 431,481 | | |
| Magnesite, tons | 31,293 | 68,593 | 356 | 510 |
| Chrome ore, tons | 23,349 | 23,409 | | |

Exports include re-exports of foreign material. Some phosphate rock is imported, but is not given separately in the trade returns.

**Arsenic**—The market is still dull. There is little buying, but supplies are lighter, and quotations at \$3.12½@3.37½ per 100 lb. are fairly firm.

**Copper Sulphate**—Sales have been good. Prices are steady at \$5.25 per 100 lb. for carload lots, and \$5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is still quiet, with only moderate sales. Quotations are a shade off, at 2.35c. per lb. for both spot and future. Efforts are being made by the Chilean producers to restrict production and thus secure higher prices.

## PETROLEUM

Exports of mineral oils from the United States in June were 181,289,671 gal. For the six months ended June 30 the total exports were 862,273,280 gal. in 1912, and 931,673,465 in 1913; an increase of 69,400,185 gal., or 8%, this year.

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## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | Feb | March | April | May | June |
|---|---|---|---|---|---|
| Alaska shipments | 660,250 | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 |
| Anaconda | 21,250,000 | 22,900,000 | 23,800,000 | 25,600,000 | |
| Arizona, Ltd | 3,000,000 | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 |
| Copper Queen | 6,810,706 | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 |
| Calumet & Ariz | 4,050,000 | 4,250,000 | 4,500,000 | 4,300,000 | |
| Chino........ | 3,898,998 | 4,464,723 | 3,925,409 | 3,883,611 | 3,787,157 |
| Detroit | 1,689,277 | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,691 |
| East Butte | 1,325,000 | 1,400,000 | 1,400,000 | 1,268,595 | |
| Mammoth........ | 1,661,150 | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 600,000 | 625,000 | |
| Mason Valley | 1,348,070 | 1,608,492 | 1,264,304 | 1,186,560 | |
| Miami | | | | 1,943,900 | 2,612,000 |
| Nevada Con.. | 4,798,537 | 5,555,320 | 5,650,000 | 5,933,275 | 6,344,863 |
| Ohio. | 380,849 | 591,651 | 690,001 | 650,071 | |
| Old Dominion | 2,381,000 | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 |
| Ray | 3,610,000 | 4,287,000 | 4,379,128 | 4,384,400 | |
| Shannon | 1,152,000 | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 |
| South. Utah. | *nil* | 62,224 | 132,267 | 200,000 | |
| Tennessee | 1,600,151 | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 |
| United Verde*. | 2,750,000 | 3,000,000 | 3,000,000 | 3,000,000 | |
| Utah Copper Co | 7,585,303 | 8,248,880 | 9,539,847 | 10,003,227 | 11,637,949 |
| Lake Superior*.. | 19,000,000 | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 |
| Non-rep. mines*.. | 5,399,849 | 6,203,606 | 6,000,000 | 6,300,000 | |
| Total prod...... | 94,951,140 | 102,619,054 | 104,224,079 | 109,824,500 | |
| Imports, bars, etc. | 21,372,292 | 24,215,480 | 25,578,297 | 22,205,942 | |
| Total blister.... | 116,323,432 | 126,834,534 | 129,802,376 | 132,030,442 | |
| Imp. ore & matte.. | 9,459,432 | 11,911,041 | 7,177,363 | 10,528,562 | |
| Total Amer. | 125,782,864 | 138,745,575 | 136,989,739 | 142,559,004 | |
| Miami† .... | 2,817,200 | 3,102,200 | 2,312,900 | | |
| Shattuck-Arizona | 1,136,480 | 1,234,450 | 1,158,326 | 1,026,170 | 1,059,625 |
| Brit. Col. Cos: | | | | | |
| British Col. Cop... | 688,312 | 844,735 | 794,000 | | |
| Granby .. | 1,740,000 | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,535,680 | 2,204,720 | 2,811,200 | 2,424,800 | 1,984,640 |
| Cananea.......... | 4,880,000 | 4,772,000 | 3,581,690 | 2,272,000 | 2,908,000 |
| Moctezuma....... | 2,730,914 | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,178,000 | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 |
| Cape Cop., S. Af. | 712,320 | 732,480 | 586,880 | 387,520 | 414,400 |
| Kyshtim, Russia | 1,352,960 | 1,478,400 | 2,544,640 | 1,490,000 | |
| Spassky, Russia | 1,003,520 | 974,400 | 974,400 | 721,280 | |
| Exports from | | | | | |
| Chile .. | 5,824,000 | 7,840,000 | 7,616,000 | 3,584,000 | 5,824,000 |
| Australia . | 5,512,000 | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 |
| Arrivals—Europe‡. | 8,509,760 | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

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## STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U. S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VI, '12. | 122,315,240 | 66,146,229 | 61,449,650 | 49,615,643 | 117,801,600 | 167,417,244 |
| VII.... | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII... | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII.. | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,804,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,452,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | | | | 52,904,606 | 71,904,000 | 124,808,606 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Mining Companies—United States

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt |
| Acacia, g. | Colo | 1,438,989 | $ 1 | $ 129,618 | Jan. '11 | $0 01 |
| Adams, s.l.c. | Colo | 80,000 | 10 | 778,000 | Dec. '09 | 0.04 |
| Ahmeek, c. | Mich. | 50,000 | 25 | 1,700,000 | Apr. '13 | 7.00 |
| Alaska Mexican, g. | Alas. | 180,000 | 5 | 3,187,381 | May '13 | 0 30 |
| Alaska Treadwell, g. | Alas. | 200,000 | 25 | 13,185,000 | May '13 | 1 00 |
| Alaska United, g | Alas. | 180,200 | 5 | 1,397,050 | May '13 | 0 60 |
| Am. Zinc, Lead & Sm | U. S. | 165,360 | 25 | 985,820 | Apr. '13 | 0 50 |
| Anaconda, c. | Mont. | 4,332,500 | 25 | 74,919,375 | Apr. '13 | 0.75 |
| Argonaut, g. | Cal. | 200,000 | 5 | 1,200,000 | June '10 | 0 05 |
| Arizona Copper, pf. | Ariz. | 1,426,120 | 1.20 | 1,831,011 | May '13 | |
| Arizona Copper, com. | Ariz. | 1,519,896 | 1.20 | 15,429,473 | Feb. '13 | 0 48 |
| Bagdad-Chase, g., pf. | Cal. | 84,819 | 5 | 202,394 | Jan. '09 | 0.10 |
| Baltic, c. | Mich. | 100,000 | 25 | 7,750,000 | Dec. '12 | 7 00 |
| Bingham N. H., c. | Utah. | 228,690 | 5 | 294,219 | July 12 | 0.10 |
| Bonanza Dev., g. | Colo | 300,000 | 1 | 1,425,000 | Oct. '11 | 0.20 |
| Bunker Hill Con., g. | Cal | 200,000 | 1 | 751,000 | July '13 | 0 05 |
| Bunker Hill & Sul., l.s. | Ida | 327,000 | 10 | 14,369,550 | July '13 | 0.20 |
| Butte-Alex Scott, c. | Mont. | 74,000 | 10 | 111,000 | June '13 | 0 50 |
| Butte & Ballaklava, c. | Mont. | 250,000 | 10 | 125,000 | Aug. '10 | 0 50 |
| Caledonia, l.s.c. | Ida. | 1,300,000 | 1 | 52,000 | June '10 | 0.01 |
| Calumet & Arizona, c. | Ariz. | 596,353 | 10 | 17,714,441 | June '13 | 1.25 |
| Calumet & Hecla, c. | Mich. | 100,000 | 25 | 122,050,000 | June '13 | 10 00 |
| Camp Bird, g.s. | Colo. | 1,100,051 | 5 | 9,383,512 | Jan. '13 | 0.24 |
| Centen'l-Eur., l.s.g.c. | Utah. | 100,000 | 5 | 3,750,000 | Apr. '13 | 1.50 |
| Center Creek, l.z. | Mo. | 100,000 | 10 | 420,000 | Jan. '13 | 0.05 |
| Champion, c. | Mich. | 100,000 | 25 | 8,000,000 | June '13 | 1 00 |
| Cliff, g. | Utah. | 300,000 | 1 | 120,000 | Jan '13 | 0.10 |
| Cliff, g. | Alas. | 100,000 | 1 | 180,000 | Nov. '12 | 0 05 |
| Colo. Gold Dredging. | Colo. | 100,000 | 10 | 250,000 | July '13 | 0 25 |
| Colorado, l.s.g. | Utah. | 1,000,000 | 0.20 | 2,570,000 | Dec. '12 | 0.03 |
| Columbus Con., g.s. | Utah. | 285,540 | 5 | 226,832 | Oct. '07 | 0.20 |
| Commercial Gold. | Ore. | 1,750,000 | 1 | 43,750 | Dec. '10 | 0.00½ |
| Con. Mercur., g. | Utah. | 1,000,000 | 1 | 3,415,313 | July '12 | 0.03 |
| Continental, z. l. | Mo | 722,000 | 25 | 286,000 | Jan. '13 | 0.50 |
| Copper Range Con., c. | Mich. | 393,445 | 100 | 13,492,906 | Apr. '13 | 0.75 |
| Daly Judge, s.l. | Utah | 300,000 | 1 | 585,000 | June '13 | 0.15 |
| Daly West, s.l. | Utah. | 180,000 | 20 | 6,606,000 | Jan. '13 | 0.15 |
| Doctor Jackpot, g. | Colo | 3,000,000 | 0.10 | 45,000 | Mar. '11 | 0 00½ |
| Doe Run, l. | Mo | 65,782 | 100 | 3,237,869 | Dec. '12 | 1.50 |
| Elkton Con., g. | Colo. | 2,500,000 | 1 | 3,029,460 | May '13 | 0.02 |
| El Paso, g. | Colo. | 490,000 | 5 | 1,658,545 | Mar. '13 | 0.12½ |
| Ernestine, g s. | N.M | 300,000 | 5 | 400,000 | Dec. '12 | 0 00½ |
| Fed. M. & S., com. | Idaho. | 60,000 | 100 | 2,708,750 | Jan. '09 | 1.50 |
| Fed. M. & S., pf. | Idaho. | 120,000 | 100 | 9,028,060 | June '13 | 1.50 |
| Florence, g. | Nev. | 1,050,000 | 1 | 840,000 | Apr. '11 | 0.10 |
| Frances-Mohawk, g. | Nev. | 912,000 | 1 | 546,000 | Jan. '08 | 0 05 |
| Free Coinage, g. | Colo. | 10,000 | 100 | 180,000 | Dec. '09 | 1.00 |
| Fremont Con., g. | Calif. | 200,000 | 2 50 | 194,000 | June '13 | 0.02 |
| Frontier, z. | Wis. | 1,250 | 100 | 161,272 | June '13 | 2.00 |
| Gemini-Key'ne, l.g.s. | Utah. | 5,000 | 100 | 2,110,000 | May '13 | 10.00 |
| Gold Chain, g. | Utah | 1,000,000 | 1 | 130,000 | May '13 | 0.03 |
| Gold Coin of Victor. | Colo | 1,000,000 | 1 | 1,350,000 | Feb. '09 | 0 02 |
| Gold Dollar Con. | Colo. | 2,500,000 | 0.10 | 100,000 | Dec. '12 | 0.00½ |
| Gold King Con., g. | Colo | 5,750,370 | 1 | 1,407,319 | Dec '11 | 0.03 |
| Golden Cycle, g. | Colo. | 1,500,000 | 5 | 2,441,000 | June '13 | 0.02 |
| Golden Star, g. | Ariz. | 400,000 | 5 | 140,000 | Mar '10 | 0 05 |
| Goldfield Con., g. | Nev. | 3,558,367 | 10 | 24,906,811 | Apr. '13 | 0.30 |
| Grand Central, g. | Utah. | 500,000 | 1 | 1,520,750 | Apr '13 | 0 05 |
| Granite, g. | Colo. | 1,650,000 | 1 | 269,500 | Nov. '12 | 0.01 |
| Hazel, g | Cal | 900,000 | 1 | 873,000 | Nov '12 | 0.01 |
| Hecla, l.s. | Idaho. | 1,000,000 | 0.25 | 2,850,000 | June '13 | 0.02 |
| Hercules, l.s | Idaho. | 1,000,000 | 1 | 3,650,000 | July '11 | 0.06 |
| Homestake, g. | S. D. | 218,400 | 100 | 33,204,537 | July '13 | 0.65 |
| Horn Silver, l.s.z | Utah. | 400,000 | 25 | 5,662,000 | Sept '07 | 0.05 |
| Iowa, g.s.l. | Colo. | 1,666,667 | 1 | 200,166 | June '11 | 0.00½ |
| Iowa-Tiger Leasing g.s. | Colo. | 12,655 | 1 | 13,921 | Jan '12 | 0.10 |
| Iron Blossom, s.l.g. | Utah. | 1,000,000 | 0.10 | 1,570,000 | Apr '13 | 0.10 |
| Iron Silver, s.l.g. | Colo. | 500,000 | 20 | 4,700,000 | Apr. '13 | 0 10 |
| Jamison, g. | Cal | 390,000 | 10 | 378,300 | Jan '11 | 0.02 |
| Jerry Johnson, g. | Colo. | 2,500,000 | 0.10 | 150,000 | Aug '11 | 0 01 |
| Kendall, g. | Mont. | 500,000 | 5 | 1,475,000 | Nov. '12 | 0.02 |
| Kennedy, g. | Cal. | 100,000 | 100 | 1,831,001 | Apr '10 | 0 03 |
| King of Arizona, g. | Ariz. | 200,000 | 1 | 396,000 | Aug. '09 | 0 12 |
| Klar Piquette, z.l. | Wis. | 20,000 | 1 | 162,500 | Dec. '12 | 0.50 |
| Knob Hill, g. | Wash. | 1,000,000 | 1 | 45,000 | May '12 | 0 00½ |
| Liberty Bell, g. | Colo. | 130,551 | 5 | 522,093 | Oct. '10 | 1 00 |
| Little Bell, l.s. | Utah. | 300,000 | 1 | 75,000 | Mar '11 | 0.05 |
| Little Florence, g. | Nev. | 1,000,000 | 1 | 430,000 | Jan. '08 | 0.03 |
| Mammoth, g.s.c. | Utah. | 400,000 | 25 | 2,280,000 | Oct. '12 | 0.15 |
| Mary McKinney, g. | Colo. | 1,309,252 | 1 | 1,025,188 | Apr. '13 | 0.02 |
| May Day, g.s.l. | Utah. | 800,000 | 0.25 | 148,000 | Feb. '13 | 0.03 |
| Mexican, g.s. | Nev. | 201,600 | 2.50 | 20,160 | Aug. '11 | 0.10 |
| Miami, c. | Ariz. | 664,993 | 5 | 1,844,516 | May '13 | 0.50 |
| Modoc, g.s. | Colo. | 500,000 | 1 | 275,000 | Dec. '11 | 0 01 |
| Mohawk M. Co. | Mich. | 100,000 | 25 | 2,975,000 | Feb. '13 | 3.00 |
| Monarch-Mad'a, g.s.l. | Colo. | 1,000,000 | 1 | 40,000 | May '11 | 0.01 |
| Montana-Tonop., s.g. | Nev. | 921,865 | 1 | 530,000 | Dec. '12 | 0.10 |
| Mountain, c. | Cal. | 250,000 | 25 | 4,216,250 | May '08 | 0.44 |
| National, g. | Nev. | 750,000 | 1 | 570,000 | May '11 | 0.10 |
| Nevada Con., c. | Nev. | 1,999,394 | 5 | 12,237,986 | June '13 | 0.37½ |
| New Century, z.l. | Mo | 330,000 | 1 | 237,600 | Oct. '09 | 0 01 |
| New Idria, q. | Cal | 100,000 | 5 | 1,710,000 | June '13 | 0 10 |
| North Butte, c. | Mont. | 410,000 | 15 | 10,865,000 | Apr. '13 | 0.50 |
| North Star, g. | Cal. | 250,000 | 10 | 3,886,989 | June '13 | 0.20 |
| Old Domin'n, M. & Sm. | Ariz. | 162,000 | 25 | 2,956,000 | Apr. '13 | 1.25 |
| Ophir, s. g. | Nev. | 201,600 | 3 | 2,068,360 | Jan. '12 | 0.10 |
| Opohongo, g.s.l. | Utah. | 898,978 | 0.25 | 80,907 | Jan. '13 | 0.02 |
| Oroville Dredging. | Cal. | 700,000 | 5 | 1,383,036 | Dec. '09 | 0.12½ |
| Osceola, c. | Mich. | 96,150 | 25 | 11,458,550 | Apr. '13 | 3.00 |
| Parrot, c. | Mont. | 229,850 | 10 | 7,221,273 | May '13 | 0.15 |
| Pearl Con., g. | Wash. | 1,909,711 | 0.05 | 181,422 | Dec. '10 | 0.02 |
| Pharmacist, g. | Colo. | 1,500,000 | 1 | 87,500 | Feb. '10 | 0.00½ |
| Pioneer, g. | Alas. | 5,000,000 | 1 | 4,041,526 | Oct. '11 | 0.03 |
| Pittsburgh-Idaho, l. | Ida. | 803,000 | 1 | 216,810 | Oct. '12 | 0.04 |
| Pittsburgh Silver Peak, g. | Nev. | 2,790,000 | 1 | 613,800 | June '13 | 0.02 |
| Portland, g. | Colo. | 3,000,000 | 1 | 9,277,080 | Apr. '13 | 0.02 |
| Quilp | Wash. | 1,500,000 | 1 | 67,500 | Feb. '13 | 0.01 |
| Quincy, c. | Mich. | 110,000 | 25 | 20,732,500 | June '13 | 1.25 |
| Republic, g. | Wash. | 1,000,000 | 1 | 85,000 | Dec. '10 | 0.01½ |
| Rochester, l.z. | Mo. | 4,900 | 100 | 188,396 | Dec. '10 | 0.50 |
| Round Mountain, g. | Nev. | 866,426 | 1 | 328,404 | Sept. '10 | 0.04 |
| Seven Troughs Coal. g. | Nev. | 1,500,000 | 1 | 37,500 | July '12 | 0.02½ |

## Mining Companies—United States —(*Continued*)

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt |
| St. Joseph, l. | Mo. | 1,000,000 | $10 | $ 8,860,357 | June '13 | $0 15 |
| Shannon, c. | Ariz. | 300,000 | 10 | 750,000 | Jan. '13 | 0.50 |
| Shattuck-Arizona, c. | Ariz. | 350,000 | 10 | 1,225,000 | Jan. '13 | 0 50 |
| Silver King Coal. l.s. | Utah. | 1,250,000 | 5 | 2,159,885 | Apr. '13 | 0.15 |
| Sioux Con., s.l.g. | Utah. | 745,389 | 1 | 872,697 | July '11 | 0.04 |
| Skidoo, g. | Cal | 1,000,000 | 5 | 275,000 | May '12 | 0.02½ |
| Smuggler, l.s.z. | Colo. | 1,000,000 | 1 | 2,235,000 | Nov. '06 | 0 03 |
| Snowstorm, c g. | Ida. | 1,500,000 | 1 | 1,147,118 | Apr. '13 | 0 01½ |
| South Eureka, g. | Calif. | 299,981 | 1 | 366,881 | Apr. '12 | 0 07 |
| Standard Con., g.s. | Cal. | 178,394 | 10 | 5,229,809 | Jan. '12 | 0.10 |
| Stratton's Ind., g. | Colo. | 1,000,000 | 0.60 | 486,000 | May '13 | 0.06 |
| Success, z. | Ida. | 1,500,000 | 1 | 925,000 | May '13 | 0.02 |
| Superior & Pitts., c. | Ariz | 1,499,793 | 10 | 4,799,340 | June '13 | 0 38 |
| Tamarack, c. | Mich. | 60,000 | 25 | 9,420,000 | July '07 | 4 00 |
| Tennessee, c. | Tenn. | 200,000 | 25 | 3,556,520 | June '13 | 0.75 |
| Tomboy, g. s. | Colo. | 300,000 | 4.85 | 3,069,090 | June '13 | 0 48 |
| Tom Reed, g. | Ariz. | 909,555 | 1 | 1,318,940 | June '13 | 0.06 |
| Tonopah Belm't, s.g. | Nev. | 1,500,000 | 1 | 4,343,003 | Apr. '13 | 0.25 |
| Tonopah Ext., g.s. | Nev. | 943,433 | 1 | 353,785 | Jan. '13 | 0.02½ |
| Tonopah of Nev., s.g. | Nev. | 1,000,000 | 1 | 10,450,000 | Apr. '13 | 0.40 |
| Tri-Mountain, c. | Mich. | 100,000 | 25 | 1,250,000 | Dec. '12 | 3.00 |
| Tuolumne, c. | Mont. | 800,000 | 1 | 520,000 | May '13 | 0.10 |
| Uncle Sam, g. s. l. | Utah. | 500,000 | 1 | 495,000 | Sept. '11 | 0 05 |
| United Cop. Min., c | Wash. | 1,000,000 | 1 | 110,000 | June '13 | 0.01 |
| United (Crip. Ck.) g. | Colo. | 4,000,100 | 1 | 440,435 | Jan. '10 | 0.04 |
| United Globe, c. | Ariz. | 23,000 | 10 | 1,184,500 | Apr. '13 | 7.50 |
| United Verde, c. | Ariz. | 300,000 | 10 | 33,347,000 | June '13 | 0.75 |
| Utah, s.l. | Utah. | 100,000 | 10 | 325,000 | Dec. '10 | 0 02 |
| Utah, c. | Utah. | 1,562,599 | 10 | 18,616,484 | June '13 | 0.75 |
| Utah Con., c. | Utah. | 300,000 | 5 | 7,650,000 | Apr. '13 | 0.50 |
| Valley View, g. | Colo | 1,000,000 | 1 | 240,000 | Dec. '10 | 0.04 |
| Victoria, g s l. | Utah. | 250,000 | 1 | 207,500 | Mar. '10 | 0.04 |
| Vindicator Con., g | Colo | 1,500,000 | 1 | 2,677,000 | Apr '13 | 0 03 |
| Wasp No. 2, g | S. D. | 500,000 | 1 | 416,965 | May '13 | 0.02 |
| Wellington Mines, g. | Colo. | 10,000,000 | 1 | 210,000 | Jan. '13 | 0 001 |
| Wolverine, c. | Mich. | 60,000 | 25 | 7,940,000 | Apr. '13 | 5 00 |
| Work, g. | Colo. | 1,500,000 | 1 | 172,500 | July '08 | 0 00½ |
| Yak, s.l. | Colo. | 1,000,000 | 1 | 1,417,685 | Oct. '10 | 0.04 |
| Yankee Con., g.s. | Utah. | 1,000,000 | 1 | 167,500 | Jan. '13 | 0.01 |
| Yellow Aster, g. | Cal. | 100,000 | 10 | 1,156,789 | July '13 | 0.05 |
| Yellow Pine, l.z.s | Nev. | 950,000 | 1 | 275,508 | July '13 | 0.02 |
| Yukon Gold, g. | Alas. | 3,500,000 | 5. | 4,987,500 | June '13 | 0.07½ |

## Coal, Iron, Industrial and Holding Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Amalgamated, c. | Mont. | 1,538,879 | $100 | $76,659,791 | May '13 | $1.50 |
| Am. Sm. & Ref., com. | U. S. | 500,000 | 100 | 24,333,333 | June '13 | 1.00 |
| Am. Sm. & Ref., pf. | U. S. | 500,000 | 100 | 44,606,333 | June '13 | 1.75 |
| Am. Smelters, pf. A | U. S. | 170,000 | 100 | 7,620,000 | Apr. '13 | 1.50 |
| Am. Smelters, pf. B. | U. S. | 300,000 | 100 | 11,607,000 | Apr. '13 | 1.25 |
| Cambria Steel | Penn. | 900,000 | 50 | 17,335,000 | May '13 | 0.62½ |
| Greene Cananea | U. S. | 2,471,314 | 25 | 2,475,282 | Mar. '13 | 0.25 |
| Guggenheim, Expl | U. S. | 831,732 | 25 | 15,729,650 | Apr. '13 | 0.62½ |
| Inter'l Nickel, com. | U. S. | 115,826 | 100 | 9,141,183 | June '13 | 3.00 |
| Inter'l Nickel, pfd | U. S. | 89,126 | 100 | 4,006,814 | May '13 | 1 50 |
| Inter'l Sm & Ref | U. S. | 100,000 | 100 | 3,100,000 | May '13 | 2 00 |
| Lehigh Coal & Nav | Penn. | 482,956 | 50 | 22,535,092 | Nov. '12 | 1 00 |
| National Lead, com. | N. Y. | 206,554 | 100 | 7,385,393 | June '13 | 0 75 |
| National Lead, pf. | N. Y. | 243,676 | 100 | 26,708,074 | Apr. '13 | 1 75 |
| Old Dominion, c. | Ariz. | 293,245 | 25 | 3,946,918 | Apr. '13 | 1.25 |
| Phelps, Dodge & Co | U. S. | 450,000 | 100 | 26,084,304 | June '13 | 4 50 |
| U. S. Steel Corp., com. | U. S. | 5,083,025 | 100 | 188,050,070 | June '13 | 1 25 |
| U. S. Steel Corp., pf. | U. S. | 3,602,811 | 100 | 332,463,820 | May '13 | 1 75 |
| U. S. S., R. & M., com | U.S.-Mex. | 486,320 | 50 | 5,045,525 | Apr. '13 | 0.75 |
| U. S. Sm., R. & M., pf. | U.S.-Mex. | 351,105 | 50 | 12,114,165 | Apr. '13 | 0.87½ |

## Canadian, Mexican and Central American Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Ajuchitlan, g.s. | Mex. | 50,000 | $ 5 | $ 200,000 | Oct. '12 | $0.25 |
| Amparo, g.s. | Mex. | 2,000,000 | 1 | 1,086,884 | May '13 | 0.04 |
| B. C. Copper | B. C. | 591,709 | 5 | 615,398 | Jan. '13 | 0.15 |
| Beaver Con., s. | Ont. | 1,996,490 | 1 | 409,879 | Dec '12 | 0.03 |
| Buffalo, s. | Ont. | 1,000,000 | 1 | 1,877,000 | May '13 | 0 03 |
| Cobalt Townsite, s. | Ont. | 1,000,000 | 1 | 330,000 | May '13 | 0.03 |
| Coniagas, s | Ont. | 800,000 | 5 | 4,640,000 | May '13 | 0 45 |
| Con. M. & S. Co. of Can. | B. C. | 58,052 | 100 | 1,014,061 | Oct. '12 | 4.00 |
| Crown Reserve, s. | Ont. | 1,768,814 | 1 | 5,129,562 | June '13 | 0.05 |
| Crow's Nest Pass C. Co. | B. C. | 248,506 | 25 | 2,182,864 | Mar. '11 | 0 25 |
| Dominion Coal, com. | N. S. | 150,000 | 100 | 5,550,000 | Jan. '13 | 1 06 |
| Dominion Coal, pf. | N. S. | 50,000 | 100 | 4,915,000 | Aug. '12 | 3 50 |
| Dos Estrellas, g.s | Mex. | 300,000 | 0 50 | 14,130,000 | June '13 | 1 25 |
| El Oro, g.s. | Mex. | 1,147,500 | 4.85 | 8,668,418 | Dec. '12 | 0.24 |
| Esperanza, s.g. | Mex. | 455,000 | 4 85 | 11,664,608 | Jan. '13 | 0 36 |
| Granby, s.l.c | B. C. | 148,496 | 100 | 4,642,573 | June '13 | 1 50 |
| Greene Con., c. | Mex. | 1,000,000 | 10 | 8,044,400 | Feb. '13 | 0.45 |
| Guanajuato D., pf., s. | Mex. | 16,000 | 1000 | 274,356 | Jan. '11 | 3 00 |
| Hedley Gold. | B. C. | 120,000 | 10 | 984,000 | June '13 | 0 50 |
| Hollinger, g. | Ont. | 600,000 | 5 | 790,000 | June '13 | 0 15 |
| Kerr Lake s. | Ont. | 600,000 | 5. | 4,620,000 | June '13 | 0 25 |
| La Rose Con., s. | Ont. | 1,498,407 | 5 | 3,888,491 | Apr. '13 | 0.25 |
| Le Roi No. 2, g | B. C. | 120,000 | 24 30 | 1,471,580 | Jan. '13 | 0.36 |
| Lucky Tiger Com., g. | Mex. | 715,337 | 10 | 1,825,564 | June '13 | 0 05 |
| McK.-Dar. Sav. s | Ont. | 2,247,692 | 1 | 3,438,396 | Apr. '13 | 0.10 |
| Mines Co. of Am. (new). | Mex. | 1,700,000 | 10 | *1,102,500 | Apr. '13 | 0.12½ |
| N. Y. & Hond. Ros. | C. A. | 150,000 | 10 | 3,152,500 | June '13 | 0.20 |
| Nipissing, s. | Ont. | 1,200,000 | 5 | 9,990,000 | Apr. '13 | 0.37½ |
| Peñoles, s.l.g. | Mex. | 80,000 | 25 | 6,360,688 | June '13 | 1.25 |
| Peregrina M. & M., pf. | Mex. | 10,000 | 100 | 328,656 | Sept. '10 | 3.50 |
| Pinguico, pf., s. | Mex. | 20,000 | 100 | 600,000 | Oct. '11 | 3.00 |
| Right of Way Mns†s. | Ont. | 1,685,500 | 1 | 202,260 | Dec. '11 | 0.02 |
| Rio Plata, s. | Mex. | 373,437 | 5 | 345,714 | Feb. '13 | 0.05 |
| San Rafael, g.s. | Mex. | 2,400 | 25 | 1,439,780 | Oct. '12 | 0.90 |
| San Toy, g.s. | Mex. | 6,000,000 | 1 | 480,000 | May '13 | 0.10 |
| Sopresa, g.s. | Mex. | 19,200 | 20 | 1,517,438 | Jan. '11 | 34.00 |
| Stand'd Silver-Lead. | B. C. | 2,000,000 | 1 | 725,000 | May '13 | 0.02½ |
| Timiskaming, s | Ont. | 2,500,000 | 1 | 1,534,155 | Apr. '13 | 0.06 |
| Tem. & Hud. Bay, s. | Ont. | 7,761 | 1 | 1,800,552 | June '13 | 3.00 |
| Trethewey, s. | Ont. | 1,000,000 | 1 | 961,998 | Jan. '13 | 0 10 |
| Wettlaufer-Lorrain, s. | Ont. | 1,416,590 | 1 | 566,636 | Jan. '13 | 0.05 |

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Andes, Nev. | July 27 | Aug. 19 | $0.02 |
| Arlington, Ida. | July 3 | Aug. 4 | 0.002 |
| Atlas Wonder, Nev. | July 14 | Aug. 6 | 0.01 |
| Belcher, Calif. | July 21 | Aug. 11 | 0.10 |
| Blue Bull, Nev. | July 14 | Aug. 18 | 0.02 |
| Blue Star, Ida. | July 10 | Aug. [illegible] | [illegible] |
| Challenge Con., Calif. | July [illegible] | [illegible] | 0.05 |
| Clary Gold, Calif. |  | [illegible] 1 | 0.05 |
| Con. Virginia, Nev. | July [illegible] | [illegible] 20 | 0.10 |
| Eagle Mountain, Ida. | July [illegible] | Aug. 16 | 0.0005 |
| Emerald, Utah (1st install.) |  | Aug. 9 | 0.005 |
| Empire, Ida. | July 12 | Aug. 12 | 0.002 |
| Galena King, Utah | July 21 | Aug. 11 | 0.02 |
| Gould & Curry | July 14 | Aug. 5 | 0.03 |
| Iron Mask, Ida. | July 11 | Aug. 11 | 0.002 |
| Iron River, Mich. |  |  | 0.01 |
| North Bunker Hill, Ida. | July 15 | Aug. 16 | 0.002 |
| O.K., Utah | July 26 | Aug. 12 | 0.005 |
| Overman, Calif. | July 24 | Aug. 13 | 0.05 |
| Rescue Eula, Nev. | July 6 | Aug. 11 | 0.01 |
| Savage, Nev. | July 14 | Aug. 5 | 0.05 |
| Snowshoe, Ida. | July 2 | Aug. 2 | 0.005 |
| Tintic & Central, Utah |  | Aug. 9 | 0.005 |
| Tintic Delmar, Utah | July 16 | Aug. 16 | 0.0015 |
| Umatilla, Nev. | July 14 | Aug. 18 | 0.01 |
| Union Chief, Utah | July 10 | July 31 | 0.01 |
| Utah-United, Utah | July 19 | Aug. 11 | 0.01 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | ...... | 24.286 | 27.919 | ...... |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | NEW YORK |  |  |  | London, Standard |  |
|---|---|---|---|---|---|---|
| | Electrolytic |  | Lake |  |  |  |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | ..... | 17.353 | ..... | 76.636 | ..... |
| August | 17.498 | ..... | 17.644 | ..... | 78.670 | ..... |
| September | 17.508 | ..... | 17.698 | ..... | 78.762 | ..... |
| October | 17.314 | ..... | 17.661 | ..... | 76.389 | ..... |
| November | 17.326 | ..... | 17.617 | ..... | 76.890 | ..... |
| December | 17.376 | ..... | 17.600 | ..... | 75.516 | ..... |
| Year | 16.341 | ..... | 16.560 | ..... | 72.942 | ..... |

New York, cents per pound, London, pounds sterling per long ton of standard copper

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 |  | 202.446 |  |
| August | 45.857 |  | 208.351 |  |
| September | 49.135 |  | 223.762 |  |
| October | 50.077 |  | 228.353 |  |
| November | 49.891 |  | 227.619 |  |
| December | 49.815 |  | 226.875 |  |
| Av. year | 46.096 |  | 209.322 |  |

New York cents per pound London in pounds sterling per long ton

### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | ...... | 4.603 | ...... | 18.544 | ...... |
| August | 4.569 | ...... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | ...... | 4.924 | ...... | 22.292 | ...... |
| October | 5.071 | ...... | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | ...... | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | ...... | 6.966 | ...... | 26.174 | ...... |
| August | 7.028 | ...... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ...... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | .... | 14.38 | ..... | 14.38 | ...... |
| August | 15.43 | ..... | 14.90 | ..... | 14.85 | ...... |
| September | 16.86 | ..... | 16.03 | ..... | 15.63 | ...... |
| October | 17.90 | ..... | 17.18 | ..... | 17.22 | ..... |
| November | 18.07 | ..... | 17.09 | ..... | 18.00 | ..... |
| December | 18.15 | ..... | 17.45 | ..... | 18.73 | ..... |
| Year | $16.01 | ..... | $14.93 | ..... | $15.28 | ..... |

## STOCK QUOTATIONS

**COLO. SPRINGS** July 22

| Name of Comp. | Bid |
|---|---|
| Acacia | .02½ |
| Cripple Cr'k Con. | .01 |
| C. K. & N. | .10 |
| Doctor Jack Pot | .05½ |
| Elkton Con. | .52½ |
| El Paso | 3.20 |
| Findlay | .02 |
| Gold Dollar | .07 |
| Gold Sovereign | .02½ |
| Isabella | .10 |
| Jack Pot | .04 |
| Jennie Sample | .05 |
| Lexington | .01 |
| Moon Anchor | .07 |
| Old Gold | .01 |
| Mary McKinney | .51 |
| Pharmacist | .01 |
| Portland | .94 |
| Vindicator | .89 |
| Work | ‡.004 |

**SALT LAKE** July 22

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .06 |
| Black Jack | .08 |
| Cedar Talisman | .00½ |
| Colorado Mining | .13 |
| Columbus Con. | .00½ |
| Crown Point | .01¾ |
| Daly-Judge | 6.30 |
| Grand Central | .50 |
| Iron Blossom | 1.32½ |
| Little Bell | ‡.10 |
| Lower Mammoth | .01½ |
| Mason Valley | 4.00 |
| May Day | .07 |
| Nevada Hills | .85 |
| New York | ‡.00½ |
| Prince Con. | .31 |
| Silver King Coal'n | 3.10 |
| Sioux Con. | .02¼ |
| Uncle Sam | .02½ |
| Yankee | .08 |

**TORONTO** July 21

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .07 | Foley O'Brien | .12 |
| Coniagas | 7.05 | Hollinger | 16.50 |
| T. & Hudson Bay | ‡58.00 | Imperial | .01 |
| Timiskaming | .34 | Jupiter | .14 |
| Wettlaufer-Lor. | .11 | Pearl Lake | .28 |
| Apex | ‡.01 | Porcu. Gold | .10 |
| Crown Chartered | ‡.00½ | Preston E. D. | .02 |
| Doble | .25 | Rea | .10 |
| Dome | 15.00 | Swastika | .04 |
| Dome Exten | .07 | West Dome | .15 |

**SAN FRANCISCO** July 22

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS |  | MISC. NEV. & CAL. |  |
| Alta | .05 | Belmont | 6.25 |
| Belcher | .24 | Jim Butler | .71 |
| Best & Belcher | .06 | MacNamara | .15 |
| Caledonia | 1.40 | Midway | .44 |
| Challenge Con. | .03 | Mont.-Tonopah | 1.12½ |
| Chollar | .01 | North Star | .98 |
| Confidence | ‡.21 | West End Con. | 1.32½ |
| Con. Virginia | .12 | Atlanta | .16 |
| Crown Point | .24 | Booth | .02 |
| Gould & Curry | .04 | C.O.D. Con. | .03 |
| Hale & Norcross | .07 | Comb. Frac. | .03 |
| Mexican | .94 | Jumbo Extension | .15 |
| Occidental | .70 | Pitts.-Silver Peak | .45 |
| Ophir | .16 | Round Mountain | .60 |
| Overman | .50 | Silver Pick | .04 |
| Potosi | .01 | Tramp Con. | ‡.01 |
| Savage | .11 | Argonaut | ‡1.60 |
| Sierra Nevada | .10 | Bunker Hill | 2.00 |
| Union Con. | .11 | Central Eureka | .10 |
| Yellow Jacket | .21 | So. Eureka | ‡2.00 |

**N. Y. EXCH.** July 22

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 68½ |
| Am. Agri. Chem. | 48 |
| Am.Sm.&Ref.,com | 63 |
| Am. Sm. & Ref., pf. | 99 |
| Am. Sm. Sec., pf. B | 80¾ |
| Anaconda | 34⅞ |
| Batopilas Min. | 1⅝ |
| BethlehemSteelpf | 71¼ |
| Chino | 35¾ |
| Federal M. & S., pf. | 34 |
| GreatNor.,ore.,ctf. | 33¾ |
| Guggen. Exp. | 43 |
| Homestake | 100½ |
| Inspiration Con. | 14⅞ |
| Miami Copper | 22⅝ |
| Nat'nalLead,com. | 48 |
| National Lead, pf. | 105½ |
| Nev. Consol. | 16 |
| Phelps Dodge | 190 |
| Pittsburg Coal, pf. | 82½ |
| Quicksilver, pf. | 4½ |
| Ray Con. | 17¾ |
| Republic I&S, com. | 24 |
| Republic I & S, pf. | 86¾ |
| Slossshefli'd, com. | 26 |
| Sloss Sheffield, pf. | 85 |
| Tennessee Copper | 30 |
| Utah Copper | 44¾ |
| U. S. Steel, com | 57 |
| U. S. Steel, pf. | 107 |
| Va.Car.Chem., pf. | 96 |

**N. Y. CURB** July 22

| Name of Comp. | Clg. |
|---|---|
| Barnes King | 1.45 |
| Beaver Con. | .30 |
| Big Four | .42 |
| Braden Copper | 7 |
| B. C. Copper | 2¼ |
| Buffalo Mines | 2 5/16 |
| Can. G. & S. | .25 |
| Con. Ariz. Sm. | 5/16 |
| Davis-Daly | 2 |
| Diam'field-Daisy | .02 |
| Ely Con. | .08¾ |
| Florence | .34 |
| Giroux | 1⅜ |
| Gold Hill Con. | ‡¼ |
| Goldfield Con. | 1 11/16 |
| Greene Cananea | 7 |
| Greenwater | .06 |
| Internat. S. & R. | ‡109 |
| Kerr Lake | 3 7/16 |
| Keystone | ‡2 |
| La Rose | 2¼ |
| McKinley-Dar-Sa. | 1¼ |
| Min. Co. of A. new | 2⅜ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 8⅜ |
| Ohio Copper | 3/16 |
| Pacific Sm. & M. | ⅛ |
| Puebla S. & R. | 2⅛ |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N.J. | 361 |
| Stewart | 1⅞ |
| Tonopah | 4 3/16 |
| Tonopah Ex. | 2⅜ |
| Tonopah Merger | .87 |
| Tri-Bullion | ⅛ |
| Tularosa | ⅜ |
| Union Mines | ⅛ |
| United Cop., pfd. | 3 |
| Yukon Gold | 2½ |

**LONDON** July 12

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 15s 1½d |
| El Oro | 0 14 0 |
| Esperanza | 0 18 9 |
| Mexico Mines | 5 5 0 |
| Oroville | 0 5 0 |
| Santa Gert'dis | 1 0 0 |
| Stratton's | 0 1 7½ |
| Tomboy | 1 5 0 |

**BOSTON EXCH.** July 22

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1⅜ |
| Ahmeek | 267 |
| Alaska Gold M. | 18 |
| Algomah | 1¼ |
| Allouez | 34 |
| Am. Zinc | 20 |
| Ariz. Com., ctfs. | 2⅝ |
| Bonanza | 32 |
| Boston & Corbin | 90 |
| Butte & Balak | 1¼ |
| Calumet & Ariz. | 62½ |
| Calumet & Hecla | 427 |
| Centennial | 12 |
| Cliff | 1½ |
| Copper Range | 39¼ |
| Daly West | ‡2½ |
| East Butte | 11½ |
| Franklin | 5 |
| Granby | 59½ |
| Hancock | 17⅛ |
| Hedley Gold | 30 |
| Helvetia | 40 |
| Indiana | 5⅛ |
| Island Cr'k, com. | 47 |
| Island Cr'k, pfd. | 81 |
| Isle Royale | 20 |
| Keweenaw | 1¾ |
| Lake | 7 |
| La Salle | 4¼ |
| Mass | 3 |
| Michigan | 1 |
| Mohawk | 46 |
| New Arcadian | 2 |
| New Idria Quick. | ‡3⅞ |
| North Butte | 26⅜ |
| North Lake | 1¾ |
| Ojibway | 65 |
| Old Dominion | 45 |
| Osceola | 78⅛ |
| Quincy | 60 |
| Shannon | 7¼ |
| Shattuck-Ariz. | 25¾ |
| Superior | 26⅛ |
| Superior & Bost. | 2¼ |
| Tamarack | 29⅛ |
| Trinity | 4⅛ |
| Tuolumne | 95 |
| U. S. Smelting | 36⅜ |
| U. S. Smelt'g. pf | 46⅝ |
| Utah Apex | 1⅝ |
| Utah Con. | 9 |
| Victoria | 93 |
| Winona | 1⅜ |
| Wolverine | 47 |
| Wyandot | 75 |

**BOSTON CURB** July 22

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 3 |
| Boston Ely | 50 |
| Boswyocolo | ‡01 |
| Butte Central | 11 |
| Cactus | 03 |
| Calaveras | 2⅜ |
| Chief Cons. | 1¼ |
| Corbin | 91 |
| Cortez | 15 |
| Crown Reserve | 3 1/16 |
| Eagle & Blue Bell | 1 |
| First Nat. Cop. | 2¼ |
| Houghton Copper | 3 |
| Majestic | 36 |
| Mexican Metals | 48 |
| Moneta Porc. | ‡07 |
| Nevada-Douglas | 1¼ |
| New Baltic | 75 |
| Oneco | 90 |
| Raven Copper | 15 |
| Rhode Island Coal | 02 |
| Smokey Dev. | ‡75 |
| S. W. Miami | ‡1½ |
| South Lake | 4 |
| Trethewey | 33 |
| United Verde Ext. | .60 |

‡Last quotation.

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# Clear Creek and Gilpin County Notes

By Stephen L. Goodale[*]

*SYNOPSIS—Some placer mining still conducted. District quiet but technically interesting. Large breast water-wheels, vertical belts for stamps, short runs in custom mills, large belt slime-concentrator, geared drive for cam shafts, etc., exemplify departures from current practice. Lack of coöperation among owners of small properties retards development. Many mills foolishly erected and abandoned. One example of a successful small-scale mill. Urgent need of better treatment processes. Sigafoos tunneling machine is being developed.*

⁂

A granite monument stands in Chicago Gulch near Idaho Springs to mark the place where gold was first found in Colorado in 1858. Placer mining is no longer carried on in Chicago Gulch, but a few workers are still at it in other gulches in this region, and in spite of the fact that most of the gravel has been washed over at least several times, they are usually able to recover enough to pay wages, although there is no longer any hope of striking a bonanza.

Fig. 1. Quartz Hill, Central City

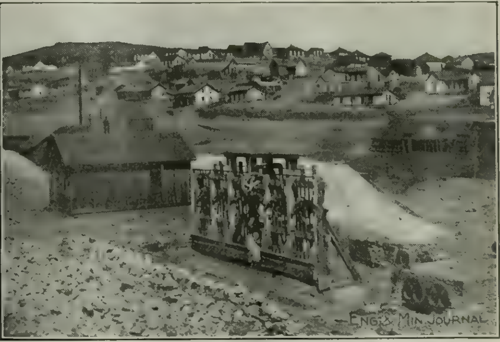

Fig. 2. Abandoned Plants at Nevadaville

### Trommel and Carpet Gold Washer

Fig. 3 shows a typical outfit in Nevada Gulch. The washer is made of a piece of old trommel screen set over the upper end of a line of sluice boxes, the latter being lined with old carpet. The gravel is worked around on the screen so that the fine dirt is carried through and over the carpet by a small stream of water. This carpet is occasionally washed off into a tub, and the concentrates thus obtained are carefully cleaned by hand panning and the gold separated. It is surprising that, although the dirt has already been washed several times, some coarse gold is still recovered; most of it, however, is extremely fine. It is considered a good day's work to recover $3 in gold, and concentrates worth perhaps $1.50 more.

### Districts Quiet but Technically Interesting

These districts appear remarkably quiet; there is none of the excitement of a new camp, and not much money is coming in for investment in new undertakings. There is, however, a good, steady production from a number of mines, and some legitimate prospecting going on. There is much of interest here to the student of mining, not only in the milling operations of such companies as the Argo, and in the Malm dry-chlorination process, but also in the regular mining operations and even in the old mills. It is intended in this article merely to describe briefly a few of the things of general interest peculiar to the region.

### Water Power Installations Varied and Interesting

The utilization of water power is illustrated in several stages, ranging from the old breast wheel with its power directly applied through gearing, to the modern Pelton or to the high-efficiency turbine driving a dynamo for long-distance power transmission. The Hidden Treasure mill was driven in part by the largest breast wheel ever put in commission. This mill is now being dismantled, having had several years of idleness following a noisily successful career, and the water-power drive is now practically its only feature of engineering interest. The mill was a good example of typical Gilpin County stamp-mill practice with slow speed, high drop, hand-fed stamps, amalgamation on short plates, concentration by bumpers, large losses and low recovery.

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[*] Professor of metallurgy, University of Pittsburgh.

### Large Breast Wheel of Unique Design

The waterwheel is 50 ft. 6 in. in diameter, the contractor having been allowed to add, at his own expense, 6 in. to the specified size of 50 ft., after the contract had been let, in order to have the credit of building the largest wheel in existence, a record not likely to be broken. The buckets are of about 2.36 cu. ft. capacity each, being nearly 21 in. deep, about 3¼ in. wide and 5 ft. long across the face of the wheel. There are 20 built-up spokes, each consisting of two 6x10-in. timbers at the outside of the wheel with two ¾-in. tie-rods across their ends for stiffening. The inner end of each stick is held rigidly in the 6-ft. diameter center plates by three 1-in. bolts, and the outer ends are mortised to the rim of the wheel. Power was transmitted from the wheel through either one of two toothed bands encircling the rim, one on each side of the buckets. This gear is of 4-in. pitch, and the teeth are 6 in. wide by 2⅜ in. high, the plates being bolted to the rim; lugs mortised into the wood at 16-in. centers serve to take the thrust. The wheel rests on a 6-in. shaft, reinforced by having several rails bound on between the hub plates. This shaft has merely to carry the weight of the structure and not transmit any turning moment, inasmuch as the power is taken off where it is applied, at the rim of the wheel. While the housing is now in bad condition, the wheel itself looks as if it could be started up at short notice.

### Short Runs and Frequent Clean-ups in Custom Mills

The old local custom of running each lot of ore separately for the account of the mine operator, is still followed at the operating mills; the milling companies do not usually purchase the ore, but simply turn over to the mine owner or lessee the gold and concentrate actually recovered, and receive payment for its treatment according to a more or less regular schedule. This practice involves frequent careful cleaning of the plates and concentrate boxes, and the retorting of small lots of amalgam at a time, as most of the mines shipping to these mills operate on a rather small scale. As to the concentrate, the samplers are willing to purchase small individual lots, which are kept separate at the mill until settled for and are then bulked for shipment to the smelters.

The Polar Star mill, a short distance down Clear Creek below the Hidden Treasure, is running intermittently on custom ore, a 25-stamp section of the mill being driven by a waterwheel similar to the one described but smaller. On this wheel, however, the gear is about half way between the rim and hub instead of at the rim. A geared drive for stamps seems to have been quite usual hereabouts, and is shown in Fig. 2, an old mill at Nevadaville.

The superintendent of the Polar Star, at the time of my visit was retorting a lot of amalgam which he estimated to contain 17 to 20 oz. of bullion worth about $18 per oz. This he was doing in an ordinary heating stove, which for small lots he considered easier than his regular retorting furnace. The outlet pipe for condensing mercury from his small retort was cooled only by water poured over it by hand at frequent intervals, the water being held against the pipe to a certain extent by a rough tin trough underneath.

### An 80-Stamp Mill with Vertical-Belt Drive

At the 80-stamp mill of the 50 G. M. Co. is an unusual arrangement of belt drive. The mill engine is on the lower or concentrator-floor level at one end of the mill as usual, but the line shaft is placed exactly over the batteries, being hung from the roof trusses. The stamps are driven by a series of vertical belts from pulleys on this line shaft. This arrangement gives rather more free space than usual about the lower part of the batteries, but it is questionable if this advantage is sufficient to outweigh the expense of long belts, the disadvantage of vertical belts, etc. The pulley centers on the main drive must be 35 to 40 ft. apart.

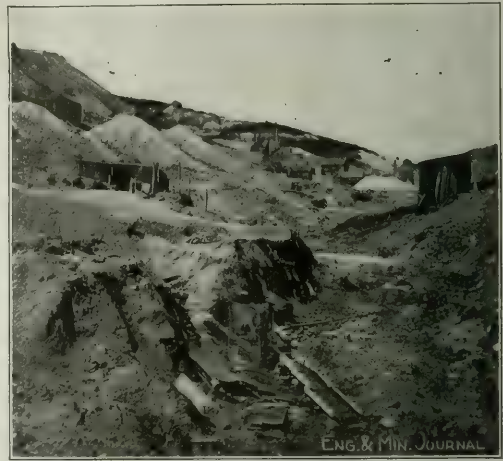

Fig. 3. Placer Mining in Nevada Gulch

Many owners of small properties about Central City seem to be waiting for this company to pump out its mine and drain their workings, since it is one of the deepest mines in the district and drains many others when operating. There seems to have been no coöperation on the part of the smaller operators in bearing the expense of this pumping. A large body of ore is said to exist on the 1400 level of this mine, but it would cost about $60,000 to pump out and more than that to cover indebtedness on the mine before operations could be begun. This combination of circumstances has kept the property idle a long time, so that the workings and timbering are probably in poor condition.

### Dog-in-the-Manger Policy

Almost all mining camps, both new and old, present similar instances of people hanging on in the hope that some one else will turn in and work. What a deadening sort of life it is! The people concerned are not always at fault or possessed with laziness—although they are pretty sure to acquire the latter quality—but are frequently the victims of chance. Many of the Colorado camps reported as dead are apparently so because of these people who hang around waiting for the other fellow to get busy and start something, being neither willing themselves to work nor to accept for their property a reasonable sum from some one who could work it. It is hard to tell on what such people live, for they toil not, nor is their spinning of more substantial stuff than dreams.

### A Profitable Small-Scale Mill

A pleasing contrast to the conditions outlined is found in the little W. S. Smith & Son mill, a good illustration of a small business run on a conservative basis, without much advertising or display, but making a commercial success nevertheless, possibly because the owner is the manager and is managing energetically. It would seem as if there were opportunity for a large number of similar small operations in many places in Colorado for people with limited capital but with a large stock of energy. This mill is housed in a plain, low, sheet-iron-covered building, on the road between Central City and Blackhawk. The equipment consists of a Denver crusher and a Denver No. 2 quartz mill, driven by a 25-hp. slide-valve engine. An amalgamating plate of fair length is used and the tailings run over a Wilfley table. Mr. Smith speaks highly of his equipment, saying that he can secure excellent amalgamation from the pulp produced by this mill, partly because there is little sliming and the pulp comes out as a product of nearly uniform size, and also partly because he watches everything carefully, believing that it is not much use to handle material unless one saves the valuable contents therein. This little mill is run on surface stuff, old dumps, etc., and, as a business, reminds one somewhat of the gulch mining, to which it is big brother; although on a larger scale and requiring more capital, it is not more than many a man could easily handle.

### Better Treatment Processes Necessary

The mine owners in this region, as in others, have to contend with too low a price for their product, receiving usually far less than that which should be obtainable considering the valuable metals contained. In this respect, the miners are in about the same fix as the farmers who think that they are robbed by the railroads and commission men; for not only are the miners also largely at the mercy of the railroad, but much of what the railroad leaves is taken by the reduction company working their ores.

This district is much in need of a system of metallurgical treatment that will recover nearly all of the desirable metal of the ores, and will do it at a reasonable cost. The ores of the region present difficult treatment problems, because of their great variety in general, and because the character of an ore frequently changes in the veins within a short distance. A proper treatment should recover both clean and rusty gold, heavy, hard, tough sulphides, and also brittle, valuable minerals that slime and float; it should recover and get paid for not only lead and copper, but zinc also when present.

This may explain, partly at least, why so many companies in this district have erected mills, but it can scarcely explain why so many of these mills should have been dedicated to the memory of the two follies: building a mill without ore and building a mill according to personal prejudices. Within a short distance of Idaho Springs there are at least 17 mills, of which half perhaps may be operated intermittently, while probably not more than three or four are in anything like continuous operation. Still another is being built. These mills in their equipment vary greatly from straight concentrators, like the Jackson, to a modern cyanide plant, like the Argo. Almost every one of these mills has some feature of peculiar interest; in the Jackson, for instance, there is a great belt slime-concentrating table, the belt being about 5 ft. wide and 15 ft. long on top, and working on the principle of the buddle; it was designed and erected there, and while probably the only one of its kind in existence, does excellent work. The older mills are recovering probably not over 75% of the ore content, some of them less, while the newest mill is able to get in the neighborhood of 90%.

### Work on Metallurgical Problems Is in Progress

It is a pleasure to see that this problem of ore treatment is being undertaken by men who have the technical training and practical experience necessary to secure results. The Malm dry-chlorination plant in process of building seems to be halted temporarily, with the mill erected and the machinery partly installed. This process promises much for not only this district but for others as well, if the company is able to maintain operations through the trying-out stage. Other work also is in progress, notably cyanidation, which was tried out at the Hudson, and is being continued at the Argo mill. Many mill men are at work improving amalgamation and putting concentration processes on a more satisfactory basis.

### The Sigafoos Tunneling Machine

On the mining side the Sigafoos tunneling machine may be mentioned. This is being tried out at Georgetown with an 8-in. machine. Experiments are being made with different forms of stamp head, and with other adjustments varied to get the machine on a commercial basis. The machine can be made to bore a hole with its present equipment, and is so doing, but probably not yet in a commercial way.

⁂

## The Kennedy District, Nevada

The Kennedy mining district, about 55 miles south of Winnemucca, Nev., after experiencing two periods of relative prosperity with corresponding depressions, is now practically owned by the Gold Note Mining & Milling Co., which controls about 75% of the mineralized territory, according to Paul Klopstock ("Bull. A. I. M. E.," July, 1913). The district is about 6½ miles long, north and south, and 1½ miles wide, comprised chiefly of eruptive rock and gneiss. Quartz porphyries, grano-diorite, diabase and rhyolite with the gneiss make up the bulk of the country. Near the town of Kennedy several rhyolitic dikes have been intruded, ranging from 6 to 20 ft. in thickness and often mineralized to form ore. Near the Gold Note mine, quartz porphyries and grano-diorite have been intruded by rhyolite, and along the planes of intrusion a number of veins have been formed. The veins can be traced for from ½ to 1½ miles on their northwest strike; they range in dip from 30° to 65° to the south, and in width from 1½ to 5 ft. They were formed after the rhyolitic intrusions or at the same time, and pass indiscriminately through the various country rocks; they show slickensided walls and clay selvages. Apparently, the rhyolite in its upward movement met resistance and spread out, causing fractures which probably unite at a depth of 850 ft. below the surface. The gangue is silica, rhyolite and calcite. Faulting occurs, but is not serious. The oxidized zone varies from 50 to 125 ft. in depth on the dip and is underlain by a zone of secondary sulphide, varying from 50 to 75 ft. in depth, below which the primary sulphides are found. Iron sulphide only is present in quantity, lead, zinc and copper being uncommon. Apparently, there is a close connection between the fault planes and the mineral content of the secondary sulphide zone.

⁂

# Metal Tariff in the Senate

Washington Correspondence

The Senate Finance Committee on Friday, July 18, filed with the Senate through Chairman Simmons, a report dealing with the principal features of the tariff bill as altered by the Finance Committee. This report devotes considerable attention to the changes in the metal schedule made by the Committee. In part the Committee says:

> The principal alterations made consist of placing pig iron, iron kentledge, spiegeleisen, iron and steel scrap, ferromanganese, iron in blooms, loops and slabs, steel ingots, blanks, and billets, cast-iron pipes, and antimony ore on the free list, and in materially reducing the rates upon many of the heavy products of iron and steel as a result of transferring the foregoing basic materials to the free list.
>
> All of the enumerated products thus transferred to the free list, with the exception of ferromanganese, are produced in large quantities here at a cost which does not exceed that in other countries. They are all articles of prime importance in the industries generally, and, owing to their heavy and bulky nature, the relatively high cost of transportation in itself constitutes an impediment to excessive importations. In addition to this, the industry is largely controlled by a few great corporations.
>
> Judged by all available tests, the American iron and steel industry is fully able to sustain itself without Government aid. It has unrivaled supplies of raw material well situated with reference to one another. It has the use of abundant capital and the best of business organization, as shown by the large profits earned and the large reinvestments made in the industry. It is able to export in competition with foreign countries, as is freely admitted by its chief officials and as is shown by the figures of the Government. Were the domestic demand not so extensive as it has been, exports might be increased, and the testimony of the officers of the United States Steel Corporation shows that the prices abroad are about as satisfactory as they are at home. The industry has all the advantage of low costs when estimated from a rigid accounting standpoint. For all these reasons it may be regarded as well fitted from every point of view in which to establish rates of duty upon a strictly revenue-producing basis.
>
> The House bill places iron ore upon the free list mainly because it was found that the domestic supply of iron ore was largely controlled by the United States Steel Corporation and for the purpose of aiding the independent iron and steel manufacturers in their competition with this monopoly.
>
> For similar reasons the Committee on Finance thought that ferromanganese should also be placed upon the free list. The United States Steel Corporation largely controls the domestic ore out of which ferromanganese, which is a necessary material in the manufacture of steel, is produced. This corporation is the only producer of ferromanganese in this country, but produces it only for its own use and consumption. It was thought under these conditions just that the independent competitors of this monopoly should be permitted to import this high-priced alloy free of duty, and that with iron ore and ferromanganese on the free list domestic competition would be strengthened and the price of the finished products of iron and steel would be eventually lowered.
>
> The changes otherwise recommended by the Finance Committee in Schedule C are practically all in the direction of reductions from the House rate. Having placed pig iron and allied products upon the free list, your committee felt justified in reducing the House rates upon many of the products of these raw and semi-raw materials, such as beams, girders, joints, car trucks, anchors, tinplate, etc. For this reason, as well as because the House rates were thought not sufficiently low to be competitive, further reductions were made in some of the more highly organized products of this industry.
>
> The committee amendment as to automobiles provides for reclassification of that paragraph and reduces the rates on low-priced automobiles 33% and 56%, respectively, from the House rate, according to the value of the automobile. The duty is likewise reduced on motor cycles, rail wheels and tires, and a number of other products used heavily in the industries.
>
> The duty on aluminum is changed from an ad valorem to a specific and the House rate reduced about 1c. per lb. It was thought by your committee that the circumstances justified a further reduction than that made by the House, and that owing to the great variation in the price of this product and the close alliance between the domestic and the foreign manufacturers, justified the substitution of a specific for an ad valorem rate.
>
> Of the few cases where the Senate committee has raised the rates on the items carried in the steel schedule, those of lead ores, zinc ores, and zinc may be mentioned. In the House bill the rate upon lead ore is fixed at 0.5c. per pound, which is a reduction of 66⅔% from the rate of the Payne-Aldrich bill.
>
> The reductions made in the House bill on lead ore, zinc ore, and zinc appealed to the Finance Committee as too radical and below the point of competition. In the interest of the industry, a continuation of which is absolutely essential for the welfare of the mining interests, the Senate committee raised the duty to 0.75c. per pound on lead ores, which was also the rate of the Wilson law.
>
> Zinc in ores were first made dutiable under the present law, the rate being 0.25c. per lb. on ores carrying zinc in excess of 10% and less than 20%, 0.50c. per lb. in excess of 20% and less than 25%, and 1c. per lb. on all ores in excess of 25%. Duties paid on importations of zinc-bearing ores for 1910 show an equivalent ad valorem rate of 55.64 per cent. and for 1912 of 44.64 per cent.
>
> The House fixed a compound duty of 10% ad valorem upon zinc ore and zinc in bars. The rates appear to be somewhat lower than those upon lead ore or lead in bars. The metals are frequently found in association with each other and are extracted by similar processes. The committee has therefore reported the duty on zinc in ores at 12½% ad valorem and upon zinc in bars at 15% ad valorem, which, though lower than the rate on lead, compares more favorably with it and will increase the revenue derived from importations.
>
> Antimony ores, which were placed on the free list by the Committee on Finance, are produced in this country only to a very limited extent. A duty on this article is exclusively for revenue purposes, but considering the extended consumption of antimony for manufacturing purposes in many lines of industrial activities the revenue from imports of antimony ore are dispensed with.
>
> The rate for the so called basket paragraph of this schedule, imports under which are very heavy, is under the present law 45% ad valorem; in the House bill it is reduced to 25%, and in the bill as amended by the Senate committee a further reduction to 20% is made, or below one-half of the present rate.
>
> To sum up, the changes made by the Committee on Finance in Schedule C may be classified under two general heads—those relating to iron and steel and those relating to other metals.
>
> (a) In general, the committee was of the opinion that the rates fixed by the House on iron and steel were too high. The evidence produced in recent investigations of the steel industry has conclusively shown that that branch of manufacture is making large returns and is amply able to hold its own in the world market, as well as against foreigners in domestic trade. Iron and steel products are essentially necessaries, and a reduction of rates on them to the lowest possible point is in line with the principles laid down by the party in past years. Not only, therefore, has the committee thought best to carry the heavier products to the free list, but it has made a general cut upon all of the more immediate derivatives of these products.
>
> (b) On the other metals, lead, zinc, etc., it has been thought that the rates established by the House were too low, and consequently moderate advances are made.

# Two Arizona Cyanide Mills

By Herbert A. Megraw

*SYNOPSIS—Discussion of the Tom Reed mill, at Oatman and the Vulture mill at Wickenburg, Ariz., which are situated so that living and working conditions are difficult. Both are all-slime mills. The Tom Reed treats continuously through Pachuca tanks while at the Vulture there are no agitation tanks at all. The most important feature is the absence of a filtration plant at the Vulture and the probable scrapping of the one at the Tom Reed mill.*

⁂

The property of the Tom Reed Gold Mines Co. is situated in the western part of the State of Arizona, not far from the California line. The village of Oatman, which consists principally of the officers and employees of the Tom Reed Co., is not reached by the railroad, but communication is established at Kingman, about 20 miles distant. With Kingman, transportation is by means of automobile stage for passengers; machinery and supplies are brought in on wagons and occasionally pack animals.

The situation is in a rocky, desert country, comparatively isolated, the nearest activity being at the Gold Road mine of the U. S. Smelting, Refining & Mining Co., about 1½ miles distant. Aside from this large mine, there is nothing within a much greater distance. Water is scarce and its use has to be governed by great economy. The name of the company is taken from the name of one of the claims which comprise the property.

Tom Reed Mill, Oatman, Ariz., Showing Filter Plant Discharge

General View of Tom Reed Mill

### Ore is Gold in Quartz

Gold is the principal valuable metal in the ore, and it occurs generally free in quartz and, to a smaller extent in calcite. The ore is not particularly hard, but requires fairly fine grinding to free the gold and expose it to the action of cyanide solutions.

From $15 to $25 per ton is the general variation in the value of the ore treated in the mill and the average for several months at a time has been near the higher figure. While there is a small amount of silver occurring with the gold, it is not significant and no effort to save it would be worth while. At present the mill treats about 150 tons daily of dry ore, crushing with stamps and regrinding with tube mills. The total-sliming system of cyanidation is followed, crushing in cyanide solution containing 2 lb. KCN per ton. At the point where it is ready for the agitation treatment, the solids in the pulp will average about 70% through a 200-mesh screen and remaining on 100 mesh the quantity is about 1 to 2%, the whole making a product not particularly difficult to agitate.

### Treatment Depends on Character of Material

While pulp of this class may be difficult to agitate in those cases when it is largely heavy, granular and devoid of colloid constituent, the governing factor is usually, or ought to be, the fineness necessary to liberate the economically maximum amount of gold. The question of fine grinding has prompted vigorous partizanship for or against it by those metallurgists who believe strongly in extremes of fine grinding or no regrinding at all. Some maintain that extremely fine grinding is wasteful and costly, and that if the grinding is not carried to extremes, agitation of the entire pulp is unnecessary and extravagant. Certainly there are several factors which must be given consideration. Primarily, of course, the cost of fine grinding must be weighed against the additional income furnished by it, and, to be truly profitable, this increased income must be sufficient to cover the cost of regrinding, interest and depreciation on the grinding plant, and leave a profit in addition. Even this comparison alone, however, is not sufficient to justify a proper decision. Part of the material reduced to the so called state of slime is likely to be granular, though fine, and its agitation will cost more than if a true slime, or colloid matter, were being handled. This extra cost of agitation is not to be ignored in an exhaustive search for definite facts.

Contrary to what seems to be the general belief a large proportion of this fine granular material might be successfully leached provided only that it were well cleaned, that is, entirely free of colloid material. If, and when, this gran-

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Note—This is the eighteenth, and last, of a series of articles by Mr. Megraw on American cyanide practice. Previous articles appeared Nov. 2, Nov. 23, Dec. 14, Dec. 21, Dec. 28, 1912; Jan. 4, Feb. 8, Feb. 15, Feb. 22, Mar. 1, Mar. 8, Mar. 29, Apr. 5, Apr. 26, May 17, June 14 and July 5, 1913. A new series of articles dealing with comparative details of cyanide practice, as distinguished from this descriptive and discussive series, will begin with an article on "Calculation of Extraction in Cyanidation," will appear on Sept. 6, 1913.

ular material is sufficiently fine to liberate the contained metal and expose it to the action of cyanide solutions, it is more than likely that leaching will provide for recovery of an amount equal to that which could be obtained by agitation, at much less cost. Leaching will take longer to accomplish the same result, but the cost will be less and extraction will be as good in many cases. Also, the installation of a leaching plant costs less than that for agitation, and maintenance expenses and interest are therefore lower. In calculating the cost of leaching plants, however, it should not be forgotten that the separation, meaning a definite and clearly marked separation, of fine, granular material from a slime pulp is not a simple operation and is likely to cost an appreciable sum per ton treated. The most natural deduction is that every problem should receive separate study and be solved according to its requirements. At the Tom Reed plant, the grinding is carried to a fine point where the product is comparatively easy to agitate and gives better extraction; hence the total-sliming treatment.

### STAMP-CRUSHING PRACTICED

At the Tom Reed mine the ore is hoisted and passed over a grizzly and through a No. 2 Austin gyratory crusher. Thus prepared, the ore is delivered to a long 16-in. conveyor belt which delivers it to the mill bin. From the bin, Challenge feeders supply a battery of 20 stamps of 1250 lb. each, dropping 105 times per minute through 6 in. The material is crushed to pass a 12-mesh screen. Crushing is done in cyanide solution containing 2 lb. KCN per ton and alkalinity equal to about 2 lb. CaO per ton of solution is carried.

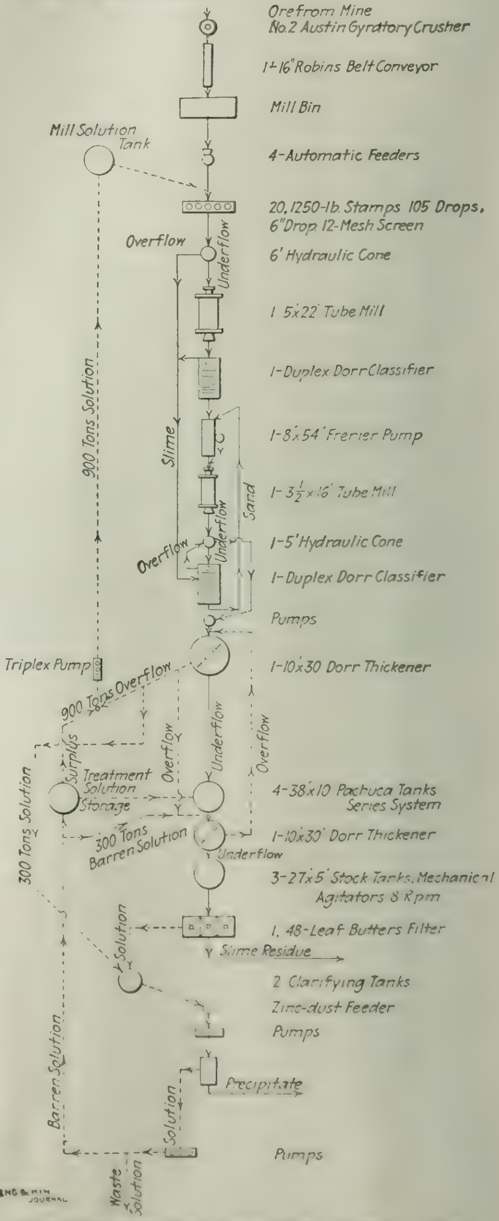
From the stamps the pulp is received in a 6-ft. hydraulic cone, the slime overflowing to a circuit which will be described, and the sand going directly into the first tube mill.

### CLOSED TUBE-MILL AND CLASSIFIER CIRCUIT

Sand, or underflow, from the 6-ft. cone is fed into the first tube mill which is 5x22 ft., and equipped with El Oro lining. From this mill the entire pulp is delivered into a Dorr duplex classifier, from which the slime overflow joins the overflow from the 6-ft. cone first mentioned and the sand is delivered to an 8x54-in. Frenier pump, and thence to the second tube mill. This mill is a small one, 3½x16 ft., and is also fitted with the El Oro lining, which has given good results at this mill. The pebble consumption in these mills is 4 lb. per ton of ore crushed. This small tube mill delivers its product into another hydraulic cone, this one 5 ft. in diameter, whose overflow comprises the stream of total slime going to the agitation system. Its underflow is fed into a second duplex Dorr classifier, the overflow from which returns to the cone and overflows from there into the treatment circuit, while the sand product is taken to the Frenier pump which elevates it, for further grinding, into the small tube mill. It will be noted that the rather complicated flow of pulp through the grinding and separating machines is merely an exceptionally careful system of separating sand and slime so that the pulp for agitation may be uniformly and finely reground.

### AGITATION IN PACHUCA TANKS

A 10x20-ft. Dorr thickener receives the slime pulp now prepared for agitation, thickens it to a consistency of about 1 : 1 and delivers the thickened product to a battery of four 38x10-ft. Pachuca tanks which are operated in series. During agitation treatment the solution is maintained at 3 lb. KCN per ton and 2 lb. CaO per ton. Due to the character of the ore, the chemical consumption of cyanide is so small that it may be disregarded. The total cyanide loss is ¾ lb. per ton of ore milled and is almost entirely mechanical. The lime consumption is about ½ lb. per ton of ore treated.



FLOW SHEET OF TOM REED MILL, OATMAN, ARIZ.

### Vacuum Filtration May Be Discarded

Pulp from the agitation tanks is received in another 10x30-ft. Dorr thickener which delivers thickened pulp into a series of stock tanks which are equipped with mechanical agitators, in which the pulp is kept thoroughly mixed until ready for filtration. The overflow is returned to dilute the inflow into the first thickener, the solutions being disposed of, as shown in the accompanying flow sheet. A 48-leaf filter of the stationary vacuum type, or Butters system, is used for filtration, and, although it has proved satisfactory, it will probably be replaced by continuous decantation in the near future, experience and experiments having shown that system to be more economical and quite as efficient. Tailing from the filtering tanks is discharged by gravity into a dam, where the material is skimmed at intervals, as has already been described.[1].

Solutions from the filtration plant are precipitated and returned to a treatment-solution storage tank, from which the solution for treatment is drawn. Any surplus at this point may be returned to the mill-solution tank at the head of the mill, thus maintaining a solution balance without difficulty.

Zinc shavings have been used for a long time for precipitating the gold from cyanide solutions at the Tom Reed mill, but recently the system was changed and the Merrill zinc-dust apparatus installed. The system gives entirely satisfactory results, 420 tons of solution being precipitated in a plant designed to handle only 300 tons. With zinc shavings, the consumption of zinc amounted to 0.25 lb. per ton of ore treated, while with zinc dust only 0.15 lb. is necessary.

The mill crushes an average of 150 tons per day, requires 134 hp. for its operation, and employs 16 men for its regular control. Pebble consumption in the tube mills amounts to 4 lb. per ton of ore crushed. While itemized cost data is not obtainable, the aggregate is $2.50 per ton milled, including the depreciation account. Average extraction is 95% of the gold in the ore.

### The Vulture Mill in the Desert

The property of the Vulture Mines Co. is situated about 14 miles southwest of Wickenburg, in central Arizona. The country is practically desert, and water is scarce. There is no available wood for fuel, and, as coal is extremely expensive laid down at the mine, distillate and oil are used entirely to furnish motive power. Power for the mill is furnished by two 150-hp. Nash engines, which are entirely satisfactory.

The valuable metal is gold, which occurs in white quartz, together with pyrite and small quantities of galena and chalcopyrite, sometimes banded and sometimes occurring in masses with the pyrite. The present orebody is one which was discovered in 1911, the vein having been faulted and the ore entirely lost. The mine is an old one, having been discovered by H. Wickenburg in 1863. Surrounding country rock is dioritic schist, no igneous intrusions having any influence on the ore deposition. The average milling ore contains gold to the value of approximately $20 per ton. Mine ore is trammed a short distance from the working shaft to the crusher bins, from which it is fed to a gyratory crusher. The crushed ore, which passes a 2-in. ring, drops to a conveyor belt, and is elevated to another ore bin. From this the ore is hoisted over a trestle 700 ft. long to the mill bins by means of a friction hoist on the mill line shaft.

### Regrinding in Wheeler Pans

The stamp installation consists of twenty 1600-lb. stamps, dropping 98 times per minute through 6½ in., and crushing through a 40-mesh round-aperture screen. Chuck blocks are used, and the ore is subjected to amalgamation inside the mortars.

A Dorr duplex classifier follows the stamps, and separates the pulp into sand and slime. Solution is used throughout the mill, including the stamp-crushing department. The slime portion of the ore is elevated to three Deister slime concentrators, the tailing from which is taken to a series of thickeners. The classified sand is reground in two 5-ft. Wheeler pans, which make 42 r.p.m., and each is capable of grinding 35 tons per day, 85% of which passes a 100-mesh screen. The consumption of iron amounts to about one pound per ton of ore treated.

Vulture Mill, Wickenburg, Ariz., Showing Inclined Tramway for Ore Delivery

From the two grinding pans, the ground pulp passes to four Wilfley concentrators, the high-grade sulphide being here removed, and the tailing from the tables is again reground in a third Wheeler pan, identical with the other two. The product of this third pan is sent directly into the first of a series of continuous thickening tanks, together with the slime from the Deister concentrators. In this series of thickeners, there is continuous decantation and thickening of pulp, followed by a thinning by means of weaker solutions. Water for final washing enters the last thickener and progresses to the first in a direction contrary to that of the moving pulp. The accompanying flow-sheet diagram shows the movement of the pulp and solutions in the thickener series, as well as in the rest of the mill. No filter is in use and the final thickener is required to discharge the pulp at the maximum possible thickness.

It will be noted that there are no tanks for agitation of the pulp, the operation being practically grinding, concentrating, washing and discharging. The operators, however, believe that better results could be obtained by using one or two agitation tanks ahead of the thickener series, and such tanks will probably be installed in the near future.

Zinc dust is used as a precipitant, a feeder of the belt type being installed. A precipitate press of the Merrill triangular type having sixteen 36-in. frames, is used to collect the precipitate, which is not acid treated, but is melted directly in an oil-fired tilting furnace and the bullion shipped. Slags formed in the melting are periodically smelted in a small blast furnace, the lead bullion cupelled and the product added to the regular output of the mill.

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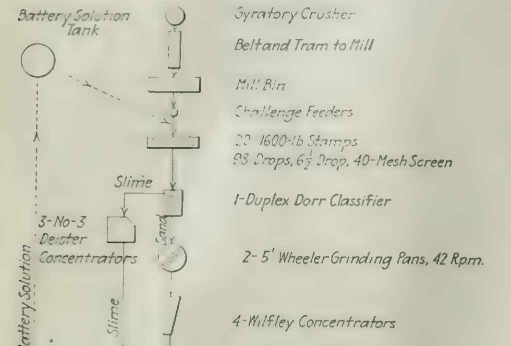
[1] "Eng. and Min. Journ.," Mar. 22, 1913.

### CONTINUOUS DECANTATION SUCCESSFUL

It is of particular interest to note that in the two modern and efficient plants described here, experiment has shown that expensive filtration plants may be considered superfluous. At the Tom Reed mill, where a filtration plant was originally installed, it will be superseded by continuous decantation, resulting in a material economy, while at the Vulture, no filter has been installed, the series of four thickeners satisfactorily doing the work. In practice the thickeners deliver a product which is acceptable from the point of view of contained moisture. The first of the series at the Vulture mill delivers a product containing 31% moisture; the second, 13%; the third, 12%; and the fourth and final one, 35% moisture. If necessary, the thickener can deliver a product containing as little as 25% moisture on a slime which settles rapidly. It is not too much to say that on the same material, the vacuum filter cannot do a great deal better than the thickener, considering all points at their real value. In the statements that are made here in this connection, reference is made solely to the treatment of gold ores of milling grade. Silver ores, requiring solution of greater cyanide strength, may be treated by a variation of the system which will be mentioned in a later article.



FLOW SHEET OF VULTURE MILL, WICKENBURG, ARIZ.

### VULTURE SLIME NOT PARTICULARLY FINE

Extremely fine grinding is not required on the Vulture ore to secure the economically maximum extraction. Classification stated in the accompanying table shows the condition of the pulp undergoing treatment.

CLASSIFICATION OF SLIME PULP

| | |
|---|---|
| + 80 mesh | 12.0% |
| + 100 mesh | 2.5% |
| + 150 mesh | 23.5% |
| + 200 mesh | 16.5% |
| — 200 mesh | 45.5% |

Solution is used throughout the mill, usually maintained at about 2.1 lb. KCN per ton of solution. Lime is added at the mortars in sufficient quantity to maintain an alkaline condition.

About 1 lb. of KCN is consumed in treatment, 2 lb. of lime and 0.4 lb. zinc, in the form of zinc dust. Costs, while not at present available for publication, are reasonable in view of the adverse conditions already mentioned. These Arizona plants are particularly instructive as examples of first-class operation under difficulties.

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## Attempt to Stimulate Bromine Consumption

A prize of £500 is offered by the German Bromine Convention to the discoverer of a process or compound leading to a new an increased consumption of bromine (*Chem. and Drug.*, May 17, 1913). For many years past the production of the existing German bromine factories has far exceeded the consumption, so that a fresh field of use is urgently required.

The following are some of the conditions attached to this competition: The new discovery must represent a technical innovation, and must not adversely affect existing uses of bromine. The process must be applied in practice at the latest one year after the awarding of the prize. The process must, in the opinion of the jury, lead to a considerable increase in the European consumption of bromine at a suitable price. Competitors must send in their processes at the latest by Jan. 1, 1914, to the Deutsche Bromkonvention G. m. b. H., Leopoldshall-Stassfurt.

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## Machine Drilling Contest

The Fourth of July drilling contest, at Cripple Creek, seems to have been dominated by the machine drilling this year. Reports of the contest are highly interesting. The winning machine was a 16-V Waugh, which drilled 20 ft. 6$\frac{11}{16}$ in. in 15 min. All machines used 1$\frac{1}{2}$-in. air connections and drilled from the end of a $\frac{3}{4}$-in. hose, 50 ft. long. The steel was all of cruciform section with a high-center bit and not a single piece in the entire test broke, battered or chipped. Of other machines in the contest, an Ingersoll-Rand drilled 13 ft. 5$\frac{3}{16}$ in., and a McFarlane, 6 ft. $\frac{6}{16}$ in. in 10 min., when the connection broke so that the full 15 min. was not employed.

# Experiments with an Oil-Burning Shaft Furnace

By Albert L. Waters*

*SYNOPSIS—A record of experiments on an oil-burning shaft furnace. The experiments were promising, but had to be abandoned for lack of capital. Further investigation is indicated.*

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In the fall of 1909, I was employed by the distinguished mechanical and metallurgical engineer, John W. Nesmith, founder and for many years president of the Colorado Iron Works Co., of Denver, who had patented and was experimenting with an oil-burning blast furnace in the yards of his works at Denver and wanted a metallurgist to assist him. An ordinary blast furnace, 42 in. in diameter, had been fitted with the oil-burning attachment. For over a year previous to 1909, Mr. Nesmith, for demonstration purposes, had started this furnace frequently in the mornings and operated it smoothly until the end of the working day. He felt that it was a demonstrated success which would be taken up soon by the big operators at such points in the West where crude-oil fuel would prove cheaper than coke. He believed that he had made a great contribution to metallurgical science and that it was the crowning act of a long and successful life which had given so many mechanical improvements in the early smelting practice of the West. It was pointed out to Mr. Nesmith that a single day's operation did not mean complete mastery of the problem and preparations were being made for a two weeks' continuous run when this remarkable pioneer was suddenly called over the divide.

Oil-Burning Smelting Plant Converted into a Coke Furnace

### Construction of the Original Oil-Burning Shaft Furnace

It then fell to my lot to carry on the work and the furnace was prepared for the campaign. One side of the furnace had been removed from the crucible upward for 6 ft. and new short jackets made to fill the space from the feed floor to the top of the combustion chamber, which was a cylindrical drum of boiler iron 6 ft. in diameter and 18 ft. long. This was lined with firebrick with a space at the top between the iron and the brick 18 in. deep where the blast entered, passed over the back of the firebrick arch and entered with the oil at the end of the chamber. Two simple, long-flame burners burned the oil. Ore was charged by shovel with care that the finest part of the charge fell where the oil flame entered the shaft. The inventor had found that the oil must be entirely burned before striking the charge in the shaft of the furnace. This intense flame under pressure melted the charge and the molten products flowed into the combustion chamber, from which they were tapped out into a small forehearth or settler.

Experiments proved that too short a distance between burner and charge resulted in lamp black being condensed on the surface of the viscid, partly fused face of ore in the shaft; the lamp black became incorporated in the mass where it could not be touched by the oxygen and so was unburnable and infusible. Balls of this refractory mixture sooner or later froze up the furnace wherever oil burning in shaft furnaces has been tried in the West so far as I know. The long combustion chamber got away from this trouble and for the first eight to 10 hr. after blowing in the furnace it ran hot and freely, the slags were clean and the entire experiment highly encouraging. In about 14 hr. serious trouble started invariably. At first reasons were supposed to have been found for it, bad feeding, irregular blast, and the like, but after four trials it was discovered that the thick crusts found in the throat of the furnace where the ore and flame met were largely magnetite, probably caused by the superoxidizing hot blast. To avoid this condition 2% of coke was added to act as a reducing agent and no further trouble was experienced. Five per cent. of coke was tried to see if it would increase the speed. The furnace would speed up usually for about three hours and then drop back to its normal capacity of 30 to 40 tons per day of 24 hours.

### Charge Composition

The charge was made up of low-grade sulphide copper ore carrying some magnetite and blende from the Yak Tunnel at Leadville. Some carbonate copper ores were purchased near Salida and the silica flux used was a low-grade gold ore from Gilpin County which carried 18% alumina. With the magnetite, blende and alumina, the charge was not what might be called an easy one. During these operations there was smelted 715,572 lb. of charge, which required 6738 gal. of crude oil or 18.8

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*Mining engineer, Tucson, Ariz.

gal. per ton of charge smelted. If we deduct 25 gal. per hr. for the 20 hr. consumed in the various blowings-in, we would have a consumption of 17 gal. per ton of charge smelted. The best run for 24 hr. was 80 tons of charge with a consumption of 11.8 gal. of oil per ton of charge. The slags were held at between 36 and 38% silica, and the lime between 8 and 12%. The balance was mainly iron with alumina and zinc. The copper in the slag ran from 0.2 to 0.4% and the matte averaged about 42% copper. Toward the end of the tests considerable trouble was experienced because of the burning out of the firebrick lining of the combustion chamber.

About a year before these tests were made a company of New York men had contracted for a complete smelting plant to use this system in Arizona. As I was the only person who then was familiar with the advantages and disadvantages of the crude-oil furnace, it naturally fell to my lot to direct the erection and operation of this new and larger plant in Arizona. T. A. Dickson, a chemist and metallurgist well and favorably known at Salt Lake and Goldfield, who had been my assistant in Denver, became associated with the undertaking at this time and much of the data which follows is taken from his reports as superintendent of the plant.

### Operations on a Large Scale

The furnace was an ordinary water-jacketed copper-matting furnace, 36x108 in. at the tuyeres, with a heavy bosh. A brick-lined steel combustion chamber was attached to one side. It was about 18 ft. long by 10 ft. wide by 4 ft. 6 in. high. The inner brick-arch radius was 16 ft. The end of the chamber away from the furnace had four specially designed long-flame crude-oil burners, three peep holes and two compressed-air flue-dust injectors for throwing flue-dust and concentrates into the combustion chamber. All blast was brought in over the top between the brick arch and the steel shell and passed into the combustion chamber around the burners. The floor and sides were carefully lined with best quality Harbison-Walker magnesite brick. The arch was silica brick. Chrome brick were placed between the acid and basic brick. The brickwork was thoroughly seasoned and slow fired before use.

Three classes of ore were combined to make up the greater part of the charge, whose analyses ran about as follows:

| | Cu<br>% | Fe<br>% | CaO<br>% | $SiO_2$<br>% | S<br>% |
|---|---|---|---|---|---|
| A.. | 5 | 44 | 2 | 27 | 7 |
| B.. | 4 | 20 | 22 | 36 | 0 |
| C.. | 2 | 26 | 14 | 24 | 20 |

These ores contained considerable fines, but their physical condition was classed by Mr. Dickson as fair. The ore *A* contained much magnetite and gave the usual trouble in the furnace through a tendency to form mushy crusts in the combustion chamber and in the forehearth.

### The Usual Infantile Troubles Begin

The plant was blown in early in 1912. The furnace started smelting with remarkable smoothness and speed, but considerable trouble developed in the power house and then with the burners, for which the system could be blamed in no way. The furnace was shut down four hours, but in 22 min. after putting on the blast it was running so fast that the blast had to be repeatedly cut to enable the men to get the slag away fast enough. Then burner trouble shut the furnace down for five days and a solid mass of slag and matte 18 in. thick froze in the combustion chamber, which was used as a crucible. When firing was resumed it took only six hours to melt out this mass in the combustion chamber and to have the furnace running at a good rate. The next day the silica brick around the trap spout in the combustion chamber burned out, causing a bad runaway and draining the furnace. This performance was repeated each day for two more days, when the trap spout was abandoned and intermittent tapping resorted to. Next some trouble was experienced through the shutting off of the air passages through the charge at the throat of the furnace where the combustion chamber and shaft joined. These crusts were largely magnetite coming from the ore *A*, and I believe that a great deal was formed by the superheated blast. Coke was tried as a reducing agent, as had been done successfully at Denver, to do away with these crusts, but the throat was so much larger that the coke simply rolled through into the chamber without doing any good.

During the later runs no attempt was made to use a trap spout, as it was impossible to maintain the brick breasts with magnesite, chrome, silica, or Golden firebrick. From midnight of May 11 until noon of May 15 the furnace was in continuous operation. It was then found necessary to shut down owing to excessive cutting away of the sides and bottom linings of the combustion chamber. During this last run a Cyclone burner, made in Los Angeles, was tested and gave very much better satisfaction than those which were sent with the furnace. The following table will give an idea of what was accomplished by these experiments, which were carried further and on a larger scale than was ever done before so far as I know.

DATA ON OIL SMELTING IN THE BLAST FURNACE

| Date | Hours | Tons smelted | Oil used, gal. | Oil per ton, gal | No. of Burners |
|---|---|---|---|---|---|
| April 24 | 24 | 85.0 | 1743 | 20.5 | 4 |
| May 3 | 24 | 64.5 | 1180 | 18.2 | 2 |
| May 4 | 24 | 70.2 | 1235 | 17.6 | 2 |
| May 5 | 24 | 51.3 | 1455 | 28.3 | 4 |
| May 11 | 8 | 14.5 | 500 | 34.4 | 4 |
| May 12 | 24 | 60.2 | 2185 | 36.3 | 4 |
| May 13 | 24 | 60.4 | 1820 | 30.1 | 4 |
| May 14 | 24 | 72.0 | 19[illegible]0 | 26.9 | 4 |

The oil was California crude, asphalt base, 18 deg. The time of the entire experiment was 264 hours; longest continued run, 86 hours; total tons smelted, 651.037; average tons per day, 59.1; average oil consumption, including heating up and blowing in, 29.4 gal. per ton of charge. Taking the seven full days' run, the average was 66.2 tons per day, consuming 24.8 gal. per ton of charge.

It would appear that too many burners were being used and this may account for the destruction of the linings. Typical slags run were as follows:

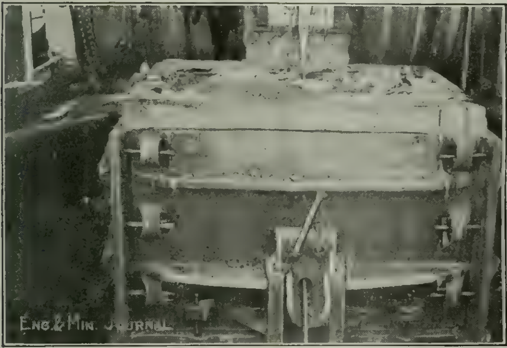
| FeO<br>% | CaO<br>% | $SiO_2$<br>% |
|---|---|---|
| 43.5 | 10.7 | 36.0 |
| 43.3 | 12.0 | 35.4 |
| 32.5 | 17.6 | 39.6 |
| 36.9 | 17.7 | 37.4 |

The copper contents ran from a trace to 0.2% when the trap spout was used and rose to 0.9 with intermittent tapping, which was caused, probably, by the rush of slag through the small settler and by the high copper content of the matte, which ran from 45% to 71% copper. The slag losses seemed to have been purely mechanical.

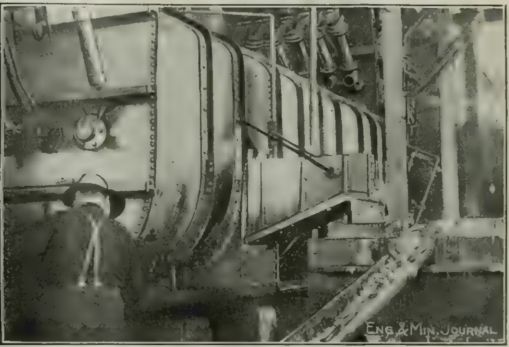
The company was not sufficiently strong to carry on these experiments and I converted the furnace into a coke burner by closing up the combustion-chamber side with firebrick protected by water pipes and leaving a 4-in. slot across the entire side of the furnace for a tuyere until proper water jackets could be provided for the combustion-chamber side. The furnace ran without any difficulty for over 30 days in this way and smelted as high as 215 tons of charge per day of 24 hours.

### Conclusions

There is no doubt in my mind that copper ores can be smelted in a shaft furnace with oil fuel alone. With ores low in sulphur, some coke or other solid reducing agent may have to be used to protect the sulphur and to avoid magnetite crusts. Where an important consideration is the elimination of sulphur and its use as fuel, then the superheated, powerfully oxidizing blast of the hydrocarbon furnace will prove of particular value. The oil used should be about 15 gal. per ton of charge smelted. Where 15 gal. of crude petroleum costs the same or less than 240 lb. of fair coke, its use is worth while investigating, and where 20 gal. of crude oil cost the same or less than 240 lb. of fair coke, its use is strongly indicated. There is no doubt but what two combustion chambers should be used instead of one, and there is a question if there should not be one chamber for each lower jacket of the furnace. In that case the furnace would be operated with an inside crucible and ordinary end or side trap spout, and it is believed that the formation of crusts and the destruction of refractory lining would be entirely eliminated.



Settler and Slag Tap



Oil-Fired Shaft Furnace

It is no proposition for a small new company to consider. It should be carefully worked out by some strong company, having other furnaces in operation and room for a small experimental furnace, say 36 in. by 36 in., in some convenient space where it can be given power, blast and slag-handling facilities. The strong company which is first to secure and perfect this system will make a great step forward and, in California or Arizona, or wherever a cheap oil supply can be had, will reduce its smelting costs by 60c. to $1 per ton of charge smelted in shaft furnaces.

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**A Pump Man at the Leonard Mine, in Butte, Fell 550 Ft.** to his death in a shaft on July 11. He appeared to have been fixing drained-boards in the man-cage compartment and was hit by the cage from below. His badly mangled body was found in the sump. The Leonard has been extremely unfortunate this year in the number of its accidents.

# Nickel Developments at Sudbury

Special Correspondence

The recently organized Canadian Nickel Co., successor to the Dominion Nickel-Copper Co., is rumored to be negotiating a deal by which the Mond Nickel Co. will become interested in a large way in the new company, or by which the Mond company will purchase the large holdings of Canadian Nickel. The basis of the rumor is the fact that engineers for the Mond company have recently been given full access to the drilling data of the Murray mine and also the apparent halting of the plans of the new company to erect smelting and refining works. Officially, nothing can be learned as to the reported deal.

It is understood that one of the reasons for the reported deal is the difficulty which has been experienced abroad in financing a deal of this magnitude and kind. The new company has already paid several million dollars to Messrs. J. R. Booth, M. J. O'Brien and associates for the control of the property and a large preliminary expenditure in exploration and general plans has been made since the sale was consummated during the last months of 1912. The drilling expenditure on the Murray mine alone has amounted to upward of $20,000 monthly. A large staff has been engaged in planning and detailing the extensive smelting plant projected. Work on sinking a working shaft at the Murray mine is under way. The new company announced that it would use the Hybinette refining process and that it would refine in Ontario. The work has been carried on under the direction of J. E. McAllister, of Montreal, formerly of British Columbia, with J. A. Holmes in local charge. W. C. H. Wilson, formerly of Greenwood, British Columbia, has acted as general auditor and business manager.

Practically all of the exploration recently has been on the Murray orebody and its extension onto the ground of the Elsie mine, purchased from the Lake Superior Corporation. It is reported that a large tonnage has been proved at the Murray. Unofficial estimates run from 5,000,000 to 8,000,000 tons. This is said to average 3 to 3½% combined nickel and copper and much of it better. The company also owns proved or partly proved nickel properties elsewhere in the district, including the groups at Nickel Lake, Joe Lake and the Whistle on the North range and the Victor mine on Blue Lake, properties in Falconbridge township and other South range properties in the vicinity of the Murray mine. In all, the holdings cover [illegible] acres and are second to and nearly equal to those of the International Nickel Co. The proved tonnage, it is claimed, is equal to that of the International.

The Mond Nickel Co. has just blown in its new plant, at Conniston, and is in need of new and large ore reserves to satisfy the 1000-ton smelting capacity. It has recently renewed exploration activity, and has secured by purchase or option, the Levack properties, the Kirkwood, Worthington and Blezard mines. The present chief supply of this company is from the Garson mine, but some ore is still coming from the Victoria. It is preparing to operate the Kirkwood and is drilling the Worthington and the Levack No. 1. The work of sinking the deep shaft on the tract near the old Froud mine purchased three years ago, is being delayed by water, but it is expected that this property will soon be ready to produce ore for the Conniston plant.

Twenty-seven diamond drills are now engaged in exploration work in the Sudbury district, distributed as follows: Canadian Copper Co., two on Creighton mine and four at Froud (No. 3); Mond Nickel Co., nine in Levack township on the Tough-Stobie options, one at the recently purchased Worthington mine and one on the Little Stobie in Blezard township; Canadian Nickel Co., nine on the Murray mine, McKim township; the Rae syndicate, one on Lot 11, 6th Concession, McKim.

The Canadian Copper Co. and the Canadian Nickel Co. are engaged in developing orebodies already proved. The Mond Nickel Co. works in Levack township is now chiefly confined to the No. 1 Levack outcrop in Lot 10, 2d Concession. Work on the Big Levack outcrop, Lot 2, 4th Concession, was started, but was discontinued for a time. The Big Levack has been drilled several times, once before by the Mond company and recently by the Miller syndicate. The adjoining Strathcona property was drilled by the Canadian Copper Co. last year, and relinquished.

Drilling results on the Murray mine are attracting attention. This property was purchased from the H. H. Vivian estate, of Swansea, Wales, in April, 1912, by the Dominion Nickel Copper Co. for $125,000, after it had been idle and offered at this price or less for more than 10 years. It has a strong outcrop and at one time furnished the chief supply for a smelting plant at the mine, operated by the Vivians. It was drilled by several interests, more recently the Mond Nickel Co., and in each case relinquished. The Dominion company, on acquiring control, inaugurated an extensive drilling program and almost immediately found an extension of the ore from the old mine which has been followed up and found to be enormous.

The fortunate discovery of this large orebody enabled the Dominion company, controlled by Messrs. J. R. Booth, of Ottawa, and M. J. O'Brien, of Montreal, to sell out advantageously to a syndicate organized through Dr. F. S. Pearson, of New York and Montreal. The new company is continuing its exploration operations to define the orebody and to increase the reserves as a basis for an extensive financing plan. It is reported that in June over a million tons of new ore was developed by drilling on the Murray. The orebody flattens from the contact and is practically continuous up to 1800 ft. from the contact, where it is about 1000 ft. below the surface. Drilling in Lot 11, 6th Concession, of McKim township, is under control of Charles McRea, of Sudbury, and is based on the expectation of finding extensions of the Murray mineralization in that direction. The Guggenheim interests of New York last year drilled Lot 10, adjoining, and found little ore on the contact. After the Guggenheim engineers had relinquished the option on this property, the owners were not satisfied and put down a drill hole 600 ft. into the basal granite, but found no ore. The monthly expenditure for diamond drilling in the district now is more than $50,000. Most of the work is done on contract on a basis of $3 to $3.50 per ft. The rock is not hard to cut and good cores are obtainable generally. In some cases there is a sand and gravel overburden upward of 100 ft.

It is likely that much more drilling will be undertaken in the district in the future to test out the numerous undeveloped outcrops, or "burns," as they are called locally, which are found at frequent intervals along the 120 or more miles of contact now definitely defined and mapped. The experience at the Murray has given an impulse and basis for more courageous exploration in the district than has as yet been undertaken.

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## Granby Development at Hidden Creek

The Hidden Creek mine of the Granby Consolidated Mining, Smelting & Power Co., in the Portland Canal district, B. C., is now sufficiently developed to ship the estimated smelting-plant requirement of 2000 tons per day. It is estimated that there is approximately 8,000,000 tons of ore in sight. The difference in elevation between the highest exposure of ore on the property and the lowest, in a series of tunnels, is 865 ft., and between the upper exposure of ore and the deepest diamond-drill hole, sunk to a point 300 ft. below sea level, there is a vertical depth of nearly 1500 ft. This will convey some idea of the area of ground that has proven to be ore-bearing. The last cores showing mineral taken from the deepest drill holes gave assays of 6 and 11% copper. Mining costs will be reduced to a minimum. All the ore will fall by gravity through raises connecting the various tunnel levels. The lowest tunnel, which will be the main outlet, will be widened from the portal a distance of 400 ft. in order to permit the laying of double tracks therein. Ore trains will back into this opening and the cars will be automatically loaded. Between the tunnels there will also be storage pockets with a total holding capacity of 15,000 tons. Between the lowest tunnel and the next tunnel above, a large excavation has been made for the installation of a crushing plant through which all the ore will pass in its descent from the various workings. The crusher capacity will be 200 tons per hr. Below the crusher are five 400-ton ore pockets. About 1¼ miles of railway tracks, extending from the mine to the smelting plant and ore-docks, have already been built. Near the works is located the electric-power plant, directly connected with the blowers. The power plant, beside furnishing power for operating the mine and works, will also light the new town that is now rapidly being built up.

## Ontario Metal Production

Returns made to the Bureau of Mines show that the metal output of Ontario for the first quarter of 1913 was as shown in the accompanying table. The principal gold producers are the Hollinger and Dome, but the McEnany and MacIntyre also contributed, as well as the Cordova in Hastings County, and the Canadian Exploration Co. at Long Lake. The Foster-Tough mine at the new camp of Kirkland Lake is turning out some rich ore. The quantity of ore milled in all was 69,905 tons, the average yield of gold being thus a little under ¾ oz. per ton.

ONTARIO METAL PRODUCTION FOR FIRST QUARTER 1913

| Product | Unit | Quantity |
|---|---|---|
| Gold | Oz. | 50,637 |
| Silver | Oz. | 7,264,559 |
| Copper | Tons | 3,075 |
| Nickel | Tons | 6,311 |
| Iron ore | Tons | 15,389 |
| Pig iron | Tons | 181,042 |
| Cobalt and nickel oxides | Lb. | 280,096 |

The production of silver was nearly equal to that for the corresponding period of last year, being only some 74,485 oz. less. The mines of Cobalt proper furnished 7,253,595 oz.; South Lorrain, 198,381 oz.; Gowganda, 54,350 oz., and from gold bullion, 10,964 oz. Shipments amounted to 7053 tons ore; 2130 tons concentrates, and 1,926,160 oz. of bullion. Silver refineries in Ontario recovered 2,754,292 ounces.

A New California Dredge, Natoma No. 7

The Sudbury mines yielded 1589 tons more of nickel and 538 tons more of copper than during the first three months of 1912. The producing companies are the Canadian Copper Co. and the Mond Nickel Co., but a third company which acquired the holdings of the Dominion Nickel-Copper Co. is actively preparing for production.

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## World's Emery Supply

The world's supply of emery comes from Greek islands and from Asia Minor, near Smyrna. Importations into the United States, which average $250,000 annually, have been hampered within the past year because of disturbed conditions in the Balkans. In this connection the following dispatch from Athens (*Daily Consular and Trade Reports,* June 30, 1913) will be of interest:

> It is thought that the bill passed by the Greek Chamber regulating the emery trade of Naxos, one of the Greek islands supplying a large proportion of the world's requirements of soft-polishing emery, will result in the speedy settlement of the strike for higher wages of the workers engaged in obtaining the mineral. The minimum selling price of Naxos emery is fixed by the bill at 65 francs ($12.54) per metric ton (2204.6 pounds), while first-grade emery must not be sold below 110 francs ($21.23) per metric ton. The grading of the mineral will be under the control of three Government officials stationed on the island, and all sales have to be checked by a special agent stationed on the neighboring island of Syra, where the product has to be shipped after sorting. The agent will give a certificate with each lot sold, which will contain particulars regarding the quantity, quality, selling price, and steamer by which reshipment will be made. Heavy penalties will be enforced in cases where false information on these points is given.

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## Gold Dredging in California

### Special Correspondence

Natoma Dredge No. 7, built by Paul E. Morse, was started to work at 4:30 p.m., May 12, and has run continuously ever since except for the usual stops for oiling, etc. No. 7 is a new steel dredge built to replace old Natoma No. 7, which went out of commission about a year ago. Actual work was begun on Jan. 2, 1913, and the 4 mos. 10d. elapsed time makes a record of dredge construction for boats of this size. No. 10, a larger boat, was built also by Mr. Morse, in 5 mos. 21 d., which was considered quick work.

No. 7 is 134 ft. 8 in. long, 46 ft. 3 in. wide and 9 ft. 6 in. depth of hull, and has buckets of 9 cu.ft. capacity, the ladder carrying 98 buckets. She is considered the finest dredge yet built, special attention being given to ease of getting to all parts of the boat through carefully planned walkways, platforms, and stairways, all of steel, as well as safeguards from danger to employees.

Work has been started on the shops and camp at the site of Yuba No. 14 at Hammonton. No. 14 also will be built of steel and will be the largest gold dredge yet built, being somewhat larger than Yuba No. 13, which was built two years ago at Hammonton.

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## Decomposition of Lead Sulphate by Ferric Oxide

When lead sulphate is heated in a current of air, decomposition is insignificant below 900° C, says O. Proske, in *Metall und Erz.* Above this temperature active decomposition sets in, and at 1100° C. the whole of the sulphur trioxide is driven off. The presence of ferric oxide causes a greater decomposition at a given temperature, but not to the same extent that silica does, and ferric oxide which has been heated to 1200° C. is more effective than ordinary red oxide. Ferrous oxide when mixed with lead sulphate is oxidized only by the air at temperatures below 800° C., but at higher temperatures is oxidized partly by oxygen derived from lead sulphate.

# Applied Geology, Michigan Iron Ranges

By P. B. McDonald*

*SYNOPSIS—Outcrops not extensive on Michigan iron ranges. Much prospecting is therefore done with the diamond drill, especially in soil-covered regions. Excellent results obtained and valuable finds made. Drilling should be directed by a competent geologist in order to avoid expensive mistakes. Illustrated examples of successful and unsuccessful diamond drilling.*

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The early method of exploration for iron ore in the Lake Superior district was to find a good-looking outcrop of ore formation and sink a test shaft, extensions being traced by pits and trenches. In some of the older districts lines of test pits can be followed across the formation through woods and fields for half a mile or more. On account of the difficulty of sinking test shafts through the thick overburden in swamps these generally favorable areas for concentration could be prospected only along their margins.

The customary plan today is to diamond-drill for concentrated deposits of ore at depth, since all the surface showings have long been taken up. Swamps can be drilled almost as conveniently as higher ground, either by laying corduroy roads for transporting machinery and coal, or by doing the work in winter when access is easy. It is not uncommon to drill under a lake by setting up the drill on the ice; this was done on Lake Michigamme by the Oliver Iron Mining Company.

### Diamond Drilling Should Be Directed by Competent Geologists

In some cases, as in the Negaunee basin, courageous operators have drilled over 1500 ft. in jasper and lean ore before finding merchantable deposits. Diamond drilling costs, on the average, $3 per foot. On account of the presence of several barren formations, such as iron-stained slates, oxidized dikes, etc., which resemble quite closely the leaner phases of the ore formation, there is need of an experienced man to direct the starting and stopping of drill-holes, in order to avoid useless drilling. Moreover the best orebodies are found in folds and intersections, requiring that close geological relationships be worked out. Several of the mining companies which are expanding, maintain geological departments for the supervision of diamond drilling and general exploration work, and usually these departments have proved profitable.

### Variations in Geology of Different Ranges

The general geology of the iron ores on all three ranges of Michigan is the same; the detailed geology is quite different. In general, the iron lies in what is called "ore formation," a series of sedimentary beds of both fragmental and chemically deposited material; ore formation includes iron ores, lean ores, iron carbonate and silicates, jasper, chert, and various mixtures of iron and silica, with slaty phases common. Typical ore formation is banded, with alternate layers of iron oxide, silica or carbonate; leaching of the ore formation by underground waters has concentrated the iron into merchantable ores. In the Iron River and Crystal Falls districts the ore formation is commonly less than 300 ft. thick and occurs irregularly distributed at several different horizons in discontinuous lenses through black and gray slates.

On the Marquette range the ore formation is thicker, being often over 1000 ft., and occupies a much wider and more definite area on the surface. In all districts its original thickness, as just given, is often increased several times by folding or faulting of the strata. Associated closely with the ore formation on all ranges are slates, "greenstone" or diorite dikes, quartzite and usually dolomite. The slates and quartzite are commonly bedded parallel with the ore formation, being sedimentary rocks, but the dikes, being igneous intrusions, cut at any angle across the ore formation and are of variable shape. Ore is usually found in large troughs, more or less complex, where the ore formation is folded or intersects a dike. The actual occurrences, as proved by mining and diamond drilling, are so different and irregular that several definite cases will be described.

### Examples of Successful Drilling

Fig. 1, from the Marquette range, shows a diamond-drill hole 600 ft. deep which has cut 150 ft. of ore. Two outcrops showed on the surface; one was a hill composed of a coarse, green, diorite dike, the other was a low mound showing Goodrich quartzite, which usually overlies ore formation on the Marquette range; at the base of the quartzite was a small showing of hard ore formation and contact conglomerate, dipping away from the dike. It was inferred from this that a diamond-drill hole across the formation and cutting the dike at depth would be likely to find a concentration on the dike, and this belief was borne out by results. Another favorable place to explore for ore in the section shown in Fig. 1 would be just under the Goodrich quartzite, where the hard ores of the Marquette district are usually found; however, most of these hard-ore horizons were explored and mined in early days.

Fig. 2, also from the Marquette range, shows a diamond-drill hole 400 ft. deep cutting 200 ft. of ore. The only outcrop is a ridge of pinkish Ajibik quartzite, a rock known to underlie the Siamo slate which usually forms the foot wall of the ore formation. After some trouble, the dip of the quartzite was determined; it being not readily discernible, as the quartzite was rounded and cross-cracked by weathering. The diamond-drill hole was started far enough back from the quartzite to allow for a good thickness of Siamo slate, and the hole was pointed to cut the formation approximately at right angles.

In many localities where the iron formation and footwall slates are covered by thick overburden, their general trend can be traced by outcrops and ridges of parallel-bedded quartzite which, being harder than the other rocks, shows more frequently in outcrops or in "hogbacks."

In Fig. 3, from the Marquette range, are shown two diamond-drill holes. The first was drilled at an angle across the dip of the formation for general results, and encountered an 80-ft. dike with merchantable ore lying along the further side. Such a dike makes a favorable place for concentration, as water leaching down the dip of the ore formation is halted at the dike, which in this case was found to be several thousand feet long. A vertical hole was then drilled alongside the dike, after trying two or three churn-drill holes through the soil to locate the dike on the surface. The vertical hole found ore for 750 ft. in depth, which, with an average width of 30 ft., made 1,500,000 tons for 1000 ft. in length, a fair-sized deposit.

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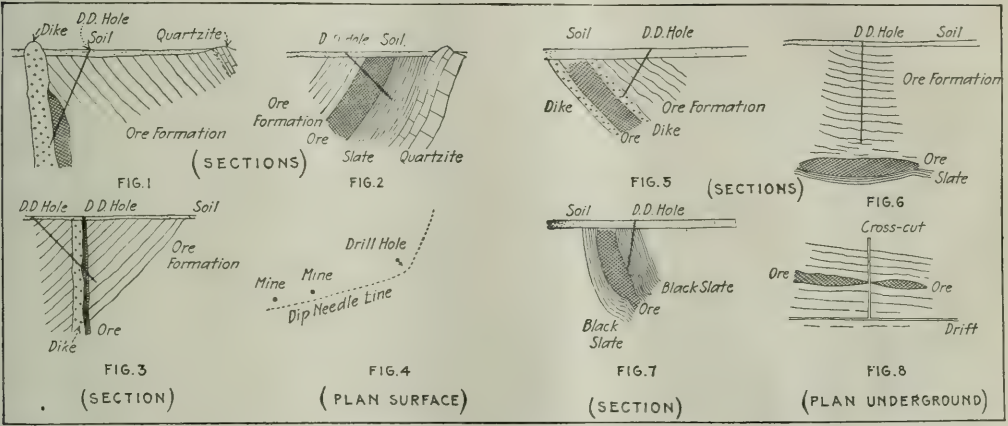
*Mining engineer, Gouverneur, N. Y.

Fig. 4 is from the Amasa district, and is a plan of surface operations, illustrating the value of dip-needle work in a drift-covered country. Two mines were known to have fair-sized orebodies, but extensions of the ore had been difficult to trace because there were no outcrops and the surface soil was 100 ft. thick, making exploration expensive. There was found to be a line of maximum magnetic attraction which passed about 300 ft. from the mines. This line may have been due to magnetite in the slate foot wall, in the ore, or in the hanging wall. The dip-needle line served to indicate the general direction of the formations, and showed a bend in the strata about a mile from the mines. Such a bend or angle is a favorable place to look for ore, as a pocket is there likely to exist in the foot-wall slates. A diamond-drill hole was therefore located at the bend in the formation, as indicated by the line of maximum attraction of the dip needle, and was placed about the same distance back from the line as the shafts.



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Examples of Successful and Unsuccessful Diamond Drilling

### Examples of Unnecessary Failure

In Fig. 5, from the Crystal Falls district, is illustrated a drift-covered country with a diamond-drill hole which was stopped in a fine-grained, gray dike because the core from the dike was not examined closely and was mistaken for the foot-wall slate. Later, another company, better advised, drilled through the dike and found 100 ft. of ore concentrated between two dikes intruded nearly parallel to the ore formation. The second company had the benefit of the services of an experienced geologist, who examined under a miscrocope the core samples from the dike and determined that they were not slate. Frequently it is difficult to distinguish in a drill core between gray slate and fine-grained dike material.

A vertical drill-hole is shown in Fig. 6, from the Marquette range. It was sunk 800 ft. in the Negaunee basin and then abandoned when 100 ft. more would have reached a good-sized orebody concentrated in a fold of the foot-wall slates. The hole was abandoned because it had been expensive, costing $4000, and because a slaty phase of the ore formation was cut at 800 ft., which looked similar to foot-wall material, but in reality was not. The deep, soft orebodies of the Negaunee basin, accounted by J. R. Finlay to be the greatest ore reserve in Michigan, lay unknown for years under a flat, drift-covered surface, until George Maas and others set up diamond drills in the fields around the city of Negaunee and drilled deeper than previous underground work had gone.

Fig. 7, from the Iron River district, shows the effort of a company which drilled one short hole in black slate, found no ore, and threw up its option. Later another company, more courageous, penetrated the slate and found ore. The geological occurrence in the Iron River field is somewhat different from that in the older, better known Michigan districts, because the ore occurs in irregular, discontinuous lenses in the Michigamme slate. This was for a long time confusing to mining men, because they were accustomed to see slate only in the foot wall. Many of the early companies in the Iron River field were too easily discouraged and abandoned explorations that later operators developed into large mines.

Fig. 8 is from the Menominee range. It is the plan of a mine level where a crosscut was driven 200 ft. into the wall for the purpose of finding any possible lense of ore parallel to the main deposit. Nothing was encountered at first, and the crosscut was stopped; later a more careful examination of the sides of the crosscut disclosed a thin seam of ore. Upon following this up, the orebody shown in the sketch was developed. One of the peculiarities of the Old Menominee range around Iron Mountain is the fact that occasional parallel lenses of ore are found back in the walls of the main ore zone; this fact has accounted for the continued life of some of the older mines that were supposed to be worked out years ago.

### Applied Geology, Audacity and Pure Luck Have Led to Discoveries

As in all mining regions, discoveries of valuable orebodies have been made as much by luck and accident as by well-advised exploration. The big Mastodon "find" recently made by the Longyear interests in the Crystal Falls district was a triumph of skilful applied geology, but the discovery of the equally large Maas mine orebody at Negaunee a few years ago by George Maas was more in the line of luck. The story goes that Maas was in possession of an old sketch map of the Marquette district which had been made by a German who visited there at one time; printed on the map in German over the present location of the Maas mine was the remark that "here is a good place to look for iron ore."

Mining men laughed at the idea of there being ore under the flat fields where Maas began drilling, but in a short time a huge orebody of 10,000,000 tons was proved up. Other explorations by Maas at the Negaunee mine and in the extensive territory west of the American mine were considered daring ventures, but either through luck or from some other quality the results were successful and large orebodies were found.

Some of the recent discoveries of ore in the Iron River field were cases of pure accident. Many of the original settlers were Scandinavian farmers who threshed out a living on 40 or 80 acres of land. When iron ore began to be discovered in the district every farmer for miles around maintained that his land had ore on it, and several of them hung around the mining offices until some company agreed to put a hole down just for a chance.

To everyone's surprise, three or four of these chance holes struck ore, and the known ore horizons were considerably increased. Somewhat different were the explorations of W. H. Selden, of Stambaugh, who has turned over several well started ore discoveries to mining companies. Mr. Selden had lived in the mining district for some time and had been a close observer of developments; he carefully calculated the trend of the ore zones and sunk exploratory shafts, eventually proving the extension of ore west and north of the Hiawatha mine.

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## Strontium in California and Arizona

Celestite, strontium sulphate, is the mineral from which the various strontium compounds used in the arts are made. Strontium iodide, bromide, acetate, lactate and other salts are used in medicine and in the chemical laboratory, according to the U. S. Geological Survey (Bull. 540-T). Strontium hydrate is coming into use in the recovery of sugar from beet molasses. Strontium nitrate is the compound usually used to produce "red fire" in fireworks.

The celestite deposits in California occur along the northeast margin of the Avawatz Mountains in San Bernardino County, and are found in a belt 9 miles long and 1½ miles wide. The thickness of the bed is variable but may be as much as 75 to 80 ft. It is not pure but is mixed with gypsum, quartz, clay and iron and manganese oxides and possibly other substances.

Arizona celestite deposits are south of Gila Bend, Maricopa County. They occur as beds over- or underlaid in some places by sandstone beds and in others by igneous flows. In the northwestern part of the deposit the bed with which the celestite is associated is 40 to 50 ft. thick. The upper 8 or 10 ft. is the purest part of the deposit as known at present.

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## Tonopah Extension Mining Co.

The report of the Tonopah Extension Mining Co., for the year ended Mar. 31, 1912, shows that there was no increase in the acreage of mining property owned by the company during the year. The total area at the present time amounts to 256.7 acres. During the year there were mined 54,618 tons of ore, all of which was treated at the mill. The total silver and gold content of this ore was 957,674 oz. of silver and 9758.5 oz. gold, or an average of 17.534 oz. silver and 0.179 oz. gold per ton, showing an increase of 0.86 oz. in silver and 0.002 oz. in gold per ton over last year. The average price received for silver was $0.61448 per oz., making the average of the ore mined and milled, $14.46 per ton.

The total profits earned during the year amounted to $236,293, after writing off $17,242 for depreciation upon machinery and building, and expending $41,205 for sinking a new shaft, the cost of which was charged to mining expense. Out of this profit, the sum of $94,339 was paid in dividends to stockholders, the fixed asset accounts were increased by $1980 and the balance, amounting to $139,972, remains in the treasury of the company, or in its current assets, principally in the form of interest-bearing securities.

In the mine there were 4296 ft. of drifting performed, 2198 ft. of raises and 3738 ft. of crosscuts, in addition to 940 ft. of shaft sinking, making a total of 11,172 ft. of development during the year. The new shaft was sunk to a depth of 952 ft. and three levels established from it. On the first, or so called 750-ft. level, there is a drift running east which will be connected with the 660-ft. level from the old shaft by means of a raise.

The mining cost, including all development work, was $5.331 per ton. Milling costs were $3.29 per ton, and the metal losses in milling, $0.964 per ton, while marketing bullion amounted to $0.233 per ton, a total expense and loss in tailing of $9.818 per ton, which subtracted from the gross value per ton of the ore milled, $14.469, leaves a profit per ton of $4.651. Extraction was 93.33% of the silver contained in the ore. The mill operated 97.41% of the available time during the year. Average fineness of the bullion produced was 945.104 in silver and 9.760 in gold. An accurate estimate of ore in reserve is not considered possible, but, basing expectations on present ore exposure and the past record of production, it is believed to be safe to assume that 150,000 tons of ore will be produced from the present area under development.

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## Record Coke Production in Pennsylvania

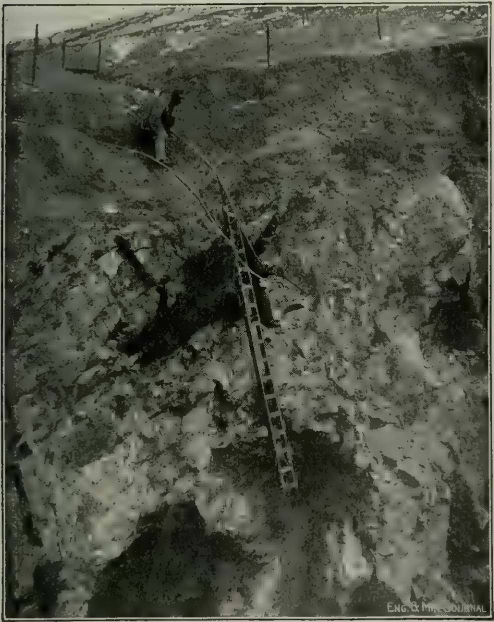
Pennsylvania, the greatest coke-producing state, manufactured 27,372,018 short tons in 1912. This production is a record for the state and is more than was produced by all other states combined, according to the U. S. Geological Survey.

# DETAILS OF PRACTICAL MINING

## Drilling in Mid Air

By C. M. Hansen*

At the Bullwhacker Copper Co.'s properties in Butte, Mont., a great deal of glory-hole mining has to be done which would be extremely difficult, perhaps impossible, with a piston drill. Much of the drilling is done in positions almost inaccessible, without even opportunity for a foothold. However, by means of a Jackhamer drill, the miner is able to make good progress with comparatively little difficulty. Even an ordinary plugger drill would be extremely troublesome for this work on account of the difficulty of rotating in cramped quarters.



Drilling in Bullwhacker Open Pit

In many cases the operator works sitting on a wooden seat in a rope sling let down over the side of the cliff, and the accompanying illustration shows the method of drilling a particularly difficult hole where a ladder had to be pressed into service. Here the operator has one foot on the ladder and is braced against it. There was just sufficient footing for the left foot on a projection of the rock.

One can get an idea of the dangerous nature of work of this sort when it is considered that it is 75 ft. from the operator's position to the bottom of the cut, where the broken ore is mucked into the cars and hoisted on an incline to the surface. Ore running about 4% copper is mined, the vein matter averaging about 125 ft. in width at the place where the photograph was taken.

Great speed is made in drilling the oxidized granite, about 1 ft. per min. Three-foot starters are used, followed with the 6-ft. steels, the holes being drilled to take $1\frac{1}{4}$-in. powder. During April enough ground was broken with one drill to ship about 1600 tons.

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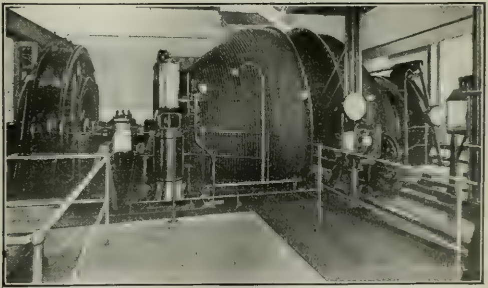
## Efficiencies of Two Rand Electric Hoists

By J. N. Bulkley*

The efficiency of electric hoists in actual practice is always a matter of interest. That of the Hecla hoist in the Cœur d'Alene was recently calculated at 41%[1]. This figure seems low, since here on the Rand better results are being obtained. Two examples may be cited of electric hoists with which no equalizer is used.

The hoist of the Cinderella Deep shaft has cylindro-conical drums, with diameters increasing from 10 to 20 ft. It handles a net rock-load of 10,000 lb. in a 6500-lb. skip from a maximum depth of 4170 ft., with a $1\frac{3}{8}$-in. rope weighing 3 lb. per ft. The hoist motor was rated at 1180 hp., and 55 r.p.m. The design was for a maximum rope speed of 3516 ft. per min., and the time to be occupied by a trip was calculated at 110 sec. with 20 sec. for loading. For reasons unconnected with the hoist, only 66% of the designed speed was attained.



Cinderella Consolidated Five-Ton Hoist

The hoist had to handle part of the shift and material. It was in service during October, 1912, for 744 hr., so that the motor-generator was always running. During this time the power consumption was 131,130 kw.-hr., as registered by meter. As indicated by the graphic recording watt-hour meter, 115 hr. was consumed in hand-ing men and material and the approximate energy consumption for this service as found by various tests was 5350 kw.-hr. The number of man-trips was 840 with 30 men on the two-deck cage and the number of material trips was 170.

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*Butte, Mont.

*Consulting electrical engineer, General Mining & Finance Corporation, Ltd. Johannesburg, South Africa.

[1] "Eng. & Min. Journ.," Mar 29, 1913, p. 658. "Electric vs. Compressed-Air Hoists," by K. A. Pauly.

The rock tonnage hoisted was 21,890, the number of trips was 1431, so that the net load per skip was 9880 lb. Of the whole number of skip loads, 4278 came from the maximum depth of 4170 ft., five from a depth of 3690 ft. and 148 from a depth of 3070 ft. This work production calculated to foot-pounds and converted to kilowatt-hours gives 68,260 kw.-hr. of useful work done in the shaft. The work per trip was therefore 15.4 kw.-hr.

USEFUL WORK OF MEYER & CHARLTON INCLINED SHAFT HOIST

| Vertical Depth in Feet | No. of Skips | Tonnage | Useful Work Done in hp. hr. |
|---|---|---|---|
| 340 | 50 | 225 | 66 2 |
| 560 | 88 | 396 | 24 |
| 630 | 11 | 50 | 31 |
| 704 | 120 | 540 | 384 |
| 900 | 57 | 256 | 233 |
| 1100 | 42 | 189 | 210 |
| 1175 | 648 | 2,918 | 3,465 |
| 1270 | 541 | 2,435 | 3,130 |
| 1437 | 521 | 2,346 | 3,405 |
| 1535 | 1333 | 6,002 | 9,300 |
| 1437 | 8 | 36 | 52 |
| 1437 | 89 | 400 | 581 |
| Total | 3508 | 15,793 | 21,081 2 |

Deducting the time consumed in man and material service the time occupied in rock hoisting was 629 hr., and in the same way the power consumption was 125,780 kw.-hr. The average duration of a trip as indicated by tachograph was 165 sec. Hence the whole number of rock trips occupied 203 hr. of actual running time, and for 426 hr. the motor-generator ran light. The energy consumption while running light was 49 kw.-hr. per hr., including excitation of hoist motor. Hence the wasted energy was 20,874 kw.-hr. Deducting this loss, the actual energy consumption in rock hoisting was 104,906 kilowatt-hours.

The number of rock trips made per hour was 1431 divided by 629, or 7.05; the hoist was designed for 25.7 trips per hour; hence the load factor was only 27.5%. The efficiency, including losses when the motor-generator was running light, was 68,260 kw.-hr. output, divided by 125,780 kw.-hr. input, or 54.2%. With a 100% load factor, which would eliminate the motor-generator losses while running light, the efficiency would be 68,260 kw.-hr., divided by 104,906, or 65%. Since the copper losses of the hoist motor and generator are the principal losses, it is safe to say that the overall efficiency of the plant would be still further increased if the duration of a trip were reduced to the calculated figure of 110 seconds.

The incline shaft of the Meyer & Charlton Gold Mining Co., Ltd., has a dip of 42° 28′ for 746 ft. from the collar, of 33° 47′ for the next 360 ft., of 34° 50′ for the next 38[illegible] ft., of 32° 13′ for the next 171 ft. and of 27° 10′ to the boundary. The hoist is of the Ward-Leonard type, has drums, 3 ft. 8 in. by 10 ft., hoists an average net rock load of 9000 lb., though designed for 10,000 lb., in a 7000-lb. skip with a 1⅛-in. rope weighing 2.55 lb. per ft. The maximum rope speed is 2000 ft. per min. The man cages run at 1000 ft. per min. and carry 30 men. The hoist motor is rated at 452 hp. and 64 r.p.m. During August, 1912, the total energy consumption was 33,900 kw.-hr. During this period, 1020 man trips were made and 108 material trips and 15,793 tons were hoisted, while 900 short trips were made in the changing levels. The average hoisting depth was about 1320 ft. The distribution of the tonnage by levels is shown in the table.

Calculated on the basis of the total energy input for all service and the useful work done, the efficiency is obtained by multiplying 21,081 by 0.746, and dividing by 33,900. It comes out 46.5%. The efficiency of the hoist, while engaged in handling rock only, would, of course, be much higher.

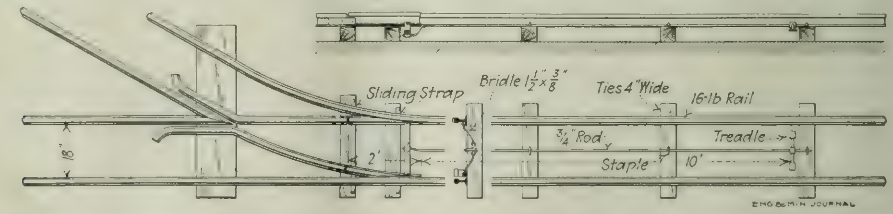
[Though not specifically stated, the Cinderella hoist was apparently also of the Ward-Leonard type. The Hecla hoist had a flywheel equalizer.—**Editor.**]

⁂

# Treadle-Operated Switch

By A. H. Bromly*

The accompanying drawing shows a switch which can be operated by the trammer as he passes with his car and before the car reaches the switch itself. As shown, it is applied to a track with 18-in. gage, the switch points being 24 in. long. The fish plates fastening the points to the fixed rails have only one bolt through the points and are left loose on the point end to permit the necessary play. The bridle connecting the two points is bolted to the flanges and bent downward as seen in the cross-section. A small strap is riveted to the bottom of this so as to form a bearing for the end of a ¾-in. round rod. This rod lies between the rails for about 10 ft. and is held to the ties by staples so as to make a series of bearings. The end which operates in the bridle of the switch points is bent down so as to form a crank end. The other end is rigidly connected to a two-winged treadle lying between the rails, as shown. The trammer steps on the proper wing of this treadle as he approaches the switch and the latter is thrown as desired. The car will take the same side of the switch as the side of the treadle on which the trammer steps. The points should be provided with iron straps to slide upon.



Semiautomatic Switch for Mine Track

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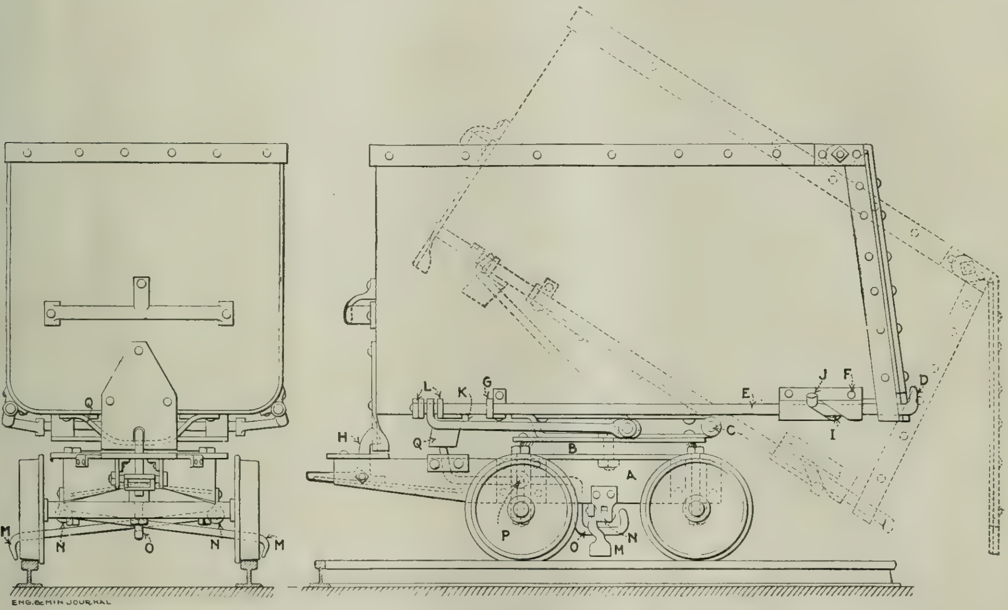
*Mining engineer, Apartado 232, Mexico, D. F. Mexico.

## Automatic Car-Door Lock and Rail Grip

Mechanisms recently devised by George E. Truax (U. S. pat. 1,055,575) for turntable-dump ore cars, are designed to lock and release the car door automatically by the dumping of the car and to grip the rails in the same automatic manner, in order to prevent the car from overturning.

As seen by the illustrations, the car consists of the usual bed *A*, with a turntable device *B*, a dumping hinge *C*, and a rear foot latch *H*. The door is held against the front of the car by the hooks *D*, as shown in Fig. 1, on the ends of the rods *E*. These rods, one on each side, can slide back and forth and also rotate in the bearings *FG*, fastened to the car body. The bearings *F* carry spiral slots *I* in which move the studs *J*, fastened to the rods *E*. Evidently if the rods are thrust forward, they must rotate through the action of these studs.



Automatic Lock for Car Door and to Grip Rails

Pivoted at about the center of the turntable are the pitmen *K*. These at their upper ends are turned in and form loose collars around *E*, acting between the fixed collars *L*. Since the car body is pivoted forward of the pitmen pivots, when the latch *H* is released and the car lifted, the pitmen tend to force rods *E* forward and thus rotate them; by this rotation, the hooks *D* are released from the door of the car and the door allowed to swing open, as shown dotted. The locking of the door by the hooks proceeds in the same automatic manner with the lowering of the car.

The car is also made to grip the tracks by means of the hooks *M*. These hooks are on the ends of rods hinged to opposite sides of the car bed, as seen at *N*. Their position is controlled by the bent lever *O*. This lever is pivoted at *P* and its upper end is depressed by the bracket *Q*, when the car is not dumping. The lower end of *O* at such times, lifts the gripping hooks *M* so that they are clear of the rails. When the car is lifted to dump, the hooks *M* are allowed to drop and fall under the heads of the rails, thus holding the car bed against any force tending to lift it from the track.

⁂

## Products of Explosion

A series of experiments was undertaken by the U. S. Bureau of Mines to determine the amount and nature of the products of blasting explosions and to devise means for the abatement of the poisonous gases formed (*Bull.* 48). The Bichel pressure gage was used for collecting the products. The gases considered poisonous are $CO$ and $H_2S$. As will be seen by inspecting the table, the gelatin dynamite generated the least of these, but is, nevertheless, far from satisfactory. The formulas for gelatin dynamites seem to provide sufficient oxygen in the sodium nitrate to oxidize completely the combustible materials and are thus said to be well balanced. The sulphur used, however, forms hydrogen sulphide and it also appears that the paraffin-coated paper wrappers have not been given sufficient consideration as combustible material. A formula was devised which decreased slightly the combustible material and increased the sodium nitrate so as to accomplish complete oxidation of the paper and also of the hydrogen sulphide. Gelatin dynamite made on this formula was tested in the same way and evolved no $CO$ or $H_2S$ whatever, as shown in the table.

Further tests, using large quantities under actual mining conditions were conducted, one in a limestone mine at West Winfield, Penn., and one in a zinc mine at Franklin Furnace, N. J. Results of this latter test are also shown in the table, giving the percentages of gases found in typical cases in the air near the blast immediately after its occurrence. No CO or $H_2S$ were found after the explosion of the special gelatin, although an odor of $H_2S$ was noted, and it is possible that some was formed and then decomposed before analysis. It should be noted that complete detonation was obtained in every case. It is concluded that gelatin dynamites should be made with an excess of oxygen, in order to eliminate poisonous gases, but if chemical or physical changes take place in an explosive before use, proper conditions do not exist for such elimination, and if the explosive is so old as materially to have lost its sensitiveness or is frozen or is set off with too weak a detonator, the amount of poisonous gas evolved is increased.

It is well recognized that an explosive burned slowly evolves a large quantity of poisonous gases and justifies its eloquent name of "stinker." A test was made with the pressure gage on some 40% ordinary gelatin dynamite so burned, and results were obtained as shown in the table. In addition to the high amount of CO evolved, there was 11.9% of nitrogen oxides.

In order to neutralize or prevent the formation of poisonous gases, there have been proposed several compounds for use in conjunction with blasting explosives. These consist largely of oxygen-carrying salts, alkaline carbonates, camphor gum, etc. Such compounds often mislead a miner by means of the pleasant aromatic odor they generate, while in reality they probably do not overcome the poisons at all. Tests were made to determine the effect of one of these compounds, which analyzed as follows: Moisture, 4.01%; camphor gum, 9.33%; $NaHCO_3$, 14.62%; NaCl, 9.3%; $(NH_4)_2CO_3$, 42.88%; $CaCO_3$, 19.86%. In the tests, various amounts were mixed with a charge of 40% straight nitroglycerin dynamite. In the first of the two tests listed in the table, 7.2 grams of the compound were added, together with the 12.4 gram wrapper cut into bits. In the second, the procedure was the same except that 23.8 grams of the compound were added. The logical conclusions are that there is no neutralizing effect got by using these compounds, and that the wrapper adds to the percentage of CO formed so that the net result is to increase rather than overcome the poisonous elements in the products of explosion.

In practically all of these tests, the detonator used was a No. 6 electric, except in the case of the black powder.

RESULTS OF ANALYSES OF PRODUCTS OF COMBUSTION OF VARIOUS BLASTING COMPOUNDS

| | | Weight of Charge, Grams | Weight of Products of Combustion, Grams | | | Gaseous Products, Percentage by Volume | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Gaseous | Solid | Liquid | $CO_2$ | CO | $O_2$ | $H_2$ | $CH_4$ | $N_2$ | $H_2S$ | $NO_2$ | NO |
| Laboratory Tests | Straight nitroglycerin dynamite, 30% | 200 | 96.8 | 102.1 | 12.9 | 22.9 | 28.4 | 0.0 | 20.6 | 0.7 | 27.4 | | | . |
| | Straight nitroglycerin dynamite, 40% | 200 | 107.4 | 87.1 | 12.4 | 27.3 | 26.9 | 0.0 | 18.0 | 0.4 | 27.4 | | | .. |
| | Straight nitroglycerin dynamite, 50% | 200 | 124.8 | 70.3 | 14.7 | 24.4 | 31.2 | 0.0 | 20.7 | 0.7 | 23.0 | | | |
| | Straight nitroglycerin dynamite, 60% | 200 | 143.5 | 49.6 | 11.9 | 22.2 | 34.6 | 0.0 | 23.2 | 0.8 | 19.2 | | | |
| | Low-freezing dynamite, 60% | 200 | 161.5 | 43.5 | 3.9 | 8.9 | 47.4 | 0.0 | 31.0 | 0.6 | 12.1 | | | . |
| | Ammonia dynamite, 40% | 200 | 95.7 | 85.9 | 26.1 | 41.4 | 3.8 | 0.0 | 3.1 | 0.8 | 45.5 | 5.4 | | . |
| | Gelatin dynamite, 40% | 200 | 96.3 | 96.3 | 11.7 | 50.8 | 3.0 | 0.0 | 1.8 | 0.8 | 39.5 | 4.1 | | |
| | Granulated nitroglycerin powder, 5% | 200 | 115.5 | 93.6 | 8.3 | 51.3 | 2.7 | 0.0 | 0.9 | 0.7 | 28.7 | 15.7 | | |
| | Black blasting powder, FFF | 300 | 154.4 | 126.9 | 4.1 | 49.7 | 10.8 | 0.0 | 1.8 | 0.6 | 28.4 | 8.7 | | |
| | Special gelatin dynamite, 40% | 200 | 85.5 | 102.3 | 13.2 | 51.0 | 0.0 | 0.9 | 0.0 | 0.7 | 47.4 | 0.0 | | |
| | Gelatin dynamite, 40%, burned. | 51.5 | | | | 19.4 | 13.7 | 0.0 | 0.4 | 1.4 | 53.2 | | 0.6 | 11.3 |
| | Straight nitroglycerin dynamite and neutralizing compound | 219.6 | 111.1 | | | 25.6 | 28.2 | 0.0 | 18.9 | 0.5 | 26.8 | | | |
| | | 236.2 | 124.0 | | | 20.7 | 31.5 | 0. | 25.0 | 0.7 | 22.1 | | | |
| | | | | | | Percentage of Gases in Mine Atmosphere | | | | | | | | |
| Mine Tests | Special gelatin dynamite, 40% | 14,500 | Sample taken two minutes after firing blast, four feet from face, five feet from bottom | | | 1.25 | 0.00 | 20.[illegible] | 0.0 | 0.0 | 78.5 | 0.0 | | |
| | Ammonia dynamite, 40% | 11,600 | | | | 0.65 | 0.05 | 20.[illegible] | 0.0 | 0.0 | 78.8 | 0.0 | | |
| | Straight nitroglycerin dynamite, 40% | 11,300 | | | | 1.76 | 0.11 | 20.2 | 0.4 | 0.0 | 77.9 | 0.0 | | |

# Mucking in a Flat Vein

The consolidation of seven properties to form the Crown Mines, Ltd., on the Rand, was followed by a centralization of operations and the installation of a comprehensive scheme of development and working. The difficulty of handling the ore in the stopes, says R. C. Warriner (*Journ.* South African Inst. of Eng., April, 1913) was met by developing a system of small, 55° chutes in the country rock, the general scheme of which is evident from the accompanying cross-section. The vein is thus split up into sublevel sections, tributary to the chutes, so that the maximum distance that the ore has to be shoveled in the stope is about 100 ft. The tramming to the chutes is done in 20-cu.ft. cars, which are dumped in tipples, the low height and rigidity of such cars being a great advantage. The tipples are end-dumping except where the chute comes directly into the stope, when the side-dumping type is used.

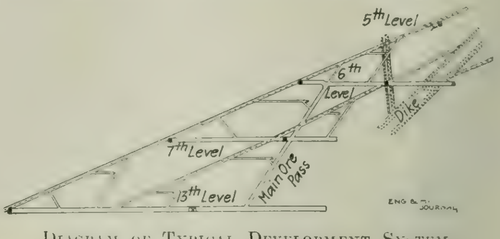


DIAGRAM OF TYPICAL DEVELOPMENT SYSTEM, CROWN MINES

To a foreign observer, the system would seem to entail a tremendous expense in dead work (even the advantage of prospecting not being present), as compared with gravity planes, small hoists or shaking chutes. It is stated, however, that in the scheme of advance development on a large scale, blocks were laid out of such dimensions on the strike as to reduce the cost to a negligible figure, the cost of the chutes and the accompanying crosscuts working out at from 2c. to 3c. per ton developed, and no maintenance charges being necessary.

The fact that the ore must be shoveled down the stope an average of 50 ft. is a great disadvantage from the American standpoint, and would probably prove a prohibitive expense in view of our high-priced labor. With a supply of sturdy, amenable, cheap native labor to draw on, however, conditions might easily be reversed. The use of self-acting gravity planes seems never to have received sufficient attention in South Africa.

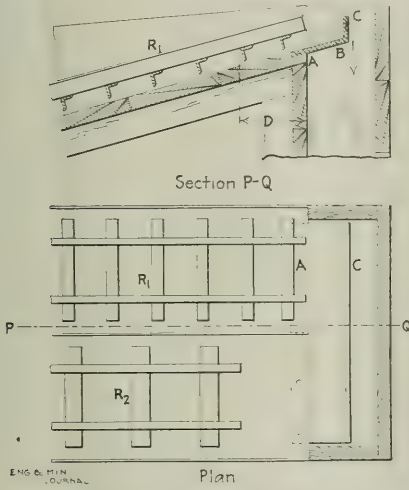
# DETAILS OF METALLURGICAL PRACTICE

## Regulating Moisture in Sand Discharged by Dorr Classifier

M. G. F. Söhnlein*

If thin pulp is fed to a Dorr classifier, the sand discharged often contains an objectionable amount of moisture. This can be remedied by a simple arrangement shown in the accompanying sketch, in which the rake *R* is at the end of its upward stroke.

A 1/8-in. iron plate, which has the same width as the classifier, is bent into the shape *A B C* and bolted to the bottom at the discharge end. The sand is piled up in *A B C* and loses much water, before it is discharged over the lip *B C*. Every time the rakes bring some wet sand up to *A*, an equal amount of dryer sand leaves the classifier at *C*. I have made *A B* = 5 in. and *B C* = 2 in., but these measurements have to be varied according to the quantity of sand and the desired degree of moisture. By using this appliance the amount of water in sands could be reduced from 60% to only 12%. I conceived the idea by watching a classifier work when a bank of frozen pulp had been formed at the discharge end, which had almost the same effect as the lip.



Moisture Regulator on Dorr Classifier

[The Dorr classifier, when required, is equipped with a device for accomplishing the same result. At the end of the rake travel, for any convenient distance *D*, in the drawing, a filter bottom is inserted, which may be connected with vacuum or not, as required. The rake-travel bed may be made longer to allow for this installation if necessary.—Editor.]

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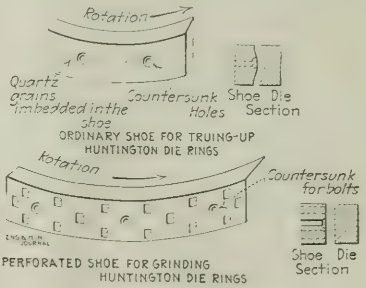
*Cia. Minera de Oruro, Machacamarca, Bolivia.

## Huntington Mills and Their Operation

By Claude T. Rice

The great trouble with Huntington mills is their high cost of upkeep, and the large amount of watching they usually require to keep them in good condition. The cost of upkeep and repairs on Huntington mills is directly dependent upon the condition in which they are maintained. If mullers are allowed to become rough and flat, as the die rings are uneven, then pounding is sure to result, and the mill racks itself to death. Most of these troubles appear to be due to the fact that the mills are either over or underfed. Of course, the latter is the more desirable condition viewed from the standpoint of cost of upkeep, but no millman willingly lets that condition prevail on account of the decreased capacity, and its effect upon the total cost of milling.

The cause of the over and under feeding can be traced directly to the prevalent practice of feeding a thin pulp to the mills instead of a dewatered product and adding the required amounts of water below the mills. Most Huntington mills are treating an oversize product, coming from rolls, that has first been sent to jigs or coarse tables to remove as much of the free mineral as possible before it is ground finer. As a result the consistency of the pulp varies as well as the amount and so it is impossible to keep a regular load on the Huntingtons without giving them an undue amount of attention. But if the product from the concentrators is dewatered, as it would be, were it being sent to rolls, and if this dewatered product is stored in front of the Huntington mills in a bin fitted with automatic feeders, say of the plunger type, all trouble from over or under feeding is done away with, as a regular and constant feed can thus be maintained. This is the practice at the Silver King mill, at Park City, Utah, where it is probable that Huntingtons are run at less cost of upkeep than at any other mill in the country.


Rotation
Quartz grains imbedded in the shoe
Countersunk Holes
Shoe Die
Section
ORDINARY SHOE FOR TRUING-UP HUNTINGTON DIE RINGS
Rotation
Countersunk for bolts
ENG & MIN JOURNAL
PERFORATED SHOE FOR GRINDING HUNTINGTON DIE RINGS
Shoe Die
Section

Huntington Mill Shoes

Even if the Huntington mills are fed regularly, the dies and mullers will wear unevenly, but fortunately the mullers get flat mainly on account of the die rings wearing unevenly. Consequently the problem is to keep the die rings true. Shoes are sent out with Huntington mills as they come from the factory, but they are seldom used to true up the die ring, as they greatly decrease the capacity of the mill. These shoes are cast-iron segments of a circle having the inner diameter of the die ring, bolted to a yoke similar to the one that carries the muller. This shoe, as it goes around in the mill, tends to wear down the high places in the die ring. Unfortunately it grinds slowly, and if there is much quartz in the pulp, the die wears unevenly from top to bottom, quartz accumulates in the places where the shoe is countersunk to receive the bolts, and wears the die faster than the metal of the shoe. The shoe itself, therefore, requires frequent truing up, or new irregularities will appear while the older ones are being removed. The capacity is thus decreased in the mill, as the muller does not come entirely in contact with the die throughout the whole of its face.

This drawback in the ordinary shoe has been overcome by J. W. Thompson, superintendent at the Silver King mill, by having soft cast-iron shoes made with holes scattered regularly over the surface for the quartz grains to accumulate in. The quartz grains then train back from the holes and become imbedded in the soft cast-iron of the face, so that soon the whole surface is made up of a number of sharp quartz grains imbedded in the cast iron.

As the grains are evenly scattered, both laterally and vertically, over the surface of the shoe, the wear on the ring is even, and owing to the fact that the quartz grains cut faster than does the ordinary cast-iron shoe, the shoe does not have to be in the mill as long a period as the old-style ones. In order to concentrate the wear as much as possible on the high places in the die ring, the shoe is made longer than in the case of the ordinary shoe, and on that account, too, the wear is faster than if an ordinary shoe were used. Such shoes are kept ready on a yoke, and as soon as any tendency toward chattering is noticed in the mill a muller is taken off and a shoe and yoke put on in its place. As the die rings are kept smooth, there is no reason for the mullers to pound and they wear evenly. As the mullers do not pound, bolts do not work loose, and breakages from that cause do not result. Therefore, the mills in the main need merely inspection, and no large repair crew is required to keep them in operation.

Experience has shown that the perforated shoe wears approximately twice as fast as the old form, when once the shoe has become embedded with quartz particles. The wear is mainly on the quartz, which renews itself from time to time.

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## The Basic-Lined Copper Converter

Writing in the June "Bulletin of the American Institute of Mining Engineers," E. P. Mathewson outlines the history of the adoption and development of the basic-lined converter, as applied to copper bessemerizing. He states that practically all the bessemerizing of copper matte in the United States today is done in basic-lined converters. The main points to be observed for successful operations are: Not to exceed a temperature of 2100° F.; not to have tuyeres smaller than $1\frac{1}{4}$ in., $1\frac{1}{2}$ in. being the preferred size; to drive in punch rods the full size of the tuyere opening immediately after pouring copper; to maintain in the converter as large a mass of matte and slag as possible, in order to prevent sudden changes in temperature and overheating of the lining; and to employ a slag containing preferably about 25% of silica.

A test made with a view to finding out whether the cutting action of converter slag on a magnesia brick lining bore any relation to the silica content of the slag was made, 13 slags being selected from daily samples sent to the laboratory and analyzed for silica and magnesia. The result showed no relation whatever between silica and magnesia content.

The basic-lined process shows the following advantages: Decreased cost of lining; ability to use large units with resulting economies in labor, power and repairs; neatness and cleanliness of plant with consequent abolishment of danger to the health of the lining crew, arising from dust.

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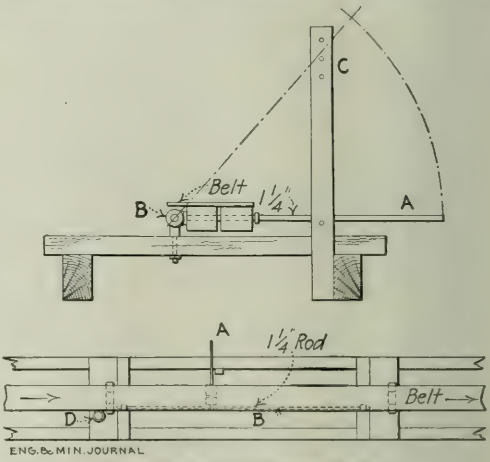
## Side Tip for Conveyor Belt

The accompanying sketch shows a simple and effective side tip for a 14-in. conveyor belt, devised by W. J. Nichol, Lord Nelson Co., St. Arnaud, Victoria (*Min. and Eng. Rev.*, May, 1913). As at present arranged the ore from a rock-breaker is delivered by the belt at three points, two of the points being fitted up for side delivery, as in the sketches, and the other point is over the end pulley.



SIDE TIP FOR CONVEYOR BELTS

When the side tip is in operation the lever *A* is raised and held at an angle by a pin at *C*; when the lever is in its lowest position the ore on the belt is carried past the tip. With this arrangement the wear and tear and strain on the belt is much less than with the usual mechanical distributor, and it is inexpensive to install, as the apparatus is merely a rearrangement of one set of three troughing pulleys, two of them being used as carriers on the lever *A*, and the third one as a guide pulley running on a vertical spindle, as shown at *D*.

⁂

**Simple Contact Electric Connections Will Have Less Resistance** if a little oil is introduced in them. This finds application in the electrode connections in electrolytic copper refining.

# THE COST OF DOING THINGS

## Effect of Centralization on Costs

An interesting analysis of the effect on costs of various changes in mining operations is given by R. C. Warriner in an article describing the Crown Mines, Ltd., "Journ. South African Inst. of Eng.," April, 1913). The company was formed to include some seven adjacent properties on the Rand and radical changes in operations were made, extending from the underground workings to the mill. It was expected that these would result in material savings. Apparently a slight increase in costs per ton took place. Two months, June, 1909, and January, 1913, are examined, as representing the two different systems. The respective tonnages were 137,753 and 190,000, the costs per ton were $3.79 and $4.12. One explanation of the increased cost for the new system is that there had not elapsed sufficient time to get it working well or to feel the effect of improvements, nor was the tonnage yet up to a maximum.

In certain items, an absolute reduction of costs had been effected. Thus a consolidation of the surface workshops brought about a saving of 3.46c. per ton. Pumping costs were reduced from about $20,500 for the month to about $12,100, making a difference of 9.06c. per ton, considering the increased tonnage. In surface work, 7632 more tons were sorted and 37,874 transported, and an absolute reduction of $3700 effected. These surface savings per ton were 2.94c. on sorting and crushing, 2.90c. on transportation, 8.38c. on milling, 13.24c. on cyaniding. The total amount of these various savings was $0.40 per ton.

The following factors operated to increase the costs:

(1) There was a relative increase in development footage. The footage was increased from 2678 to 3798, and while based on equivalent tonnage, this would have represented an increase of 104 ft. only, the increased cost at $14.60 per ft. was 0.8c. per ton.

(2) There was an increase in sorting percentage from 9.846% to 12.874%; if this increase in discard had not been made, the corresponding increase in the tonnage milled would have made a saving of 13.8c. per ton.

(3) Native wages, recruiting fees and compound expenses increased, due to competition in recruiting between the various groups. This wage increase amounted to 6c. per shift worked and the other items to 7.5c. per shift worked. On the 190,000 tons, this amounted to 17.4c. per ton.

(4) The introduction of sand filling accounted for an increase of 3.2c. (5) Additional water service underground for spraying against dust, added 3.2c. (6) Miners' phthisis insurance made an increase of 1.4c. (7) Main-reef foot-wall mining was largely discontinued so that for the square units of reef broken, a smaller tonnage resulted. In other words, what amounted to a narrower vein, was mined. The increase in cost from this was considerable and while difficult to estimate, probably did not fall far short of 40c. per ton.

(8) The effects of the introduction of the eight-hour day are similarly difficult to calculate. It is put in at a 12c. increase.

The total of these items amounts to about $0.93 per ton. If the unavoidable changes in conditions, which caused the increases, had not occurred, the total saving by the new system would have been $1.13, which would have been accounted for, in addition to the items enumerated, by decrease in shaft maintenance and other economies difficult to analyze.

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## Dome Mines

Abstracts from the second annual report of the Dome Mines Co., South Porcupine, Ont., Canada, for period Nov. 30, 1911, to Mar. 31, 1913, are given herewith. The gross proceeds from the ore treated amounted to $1,043,995. The working profit was $509,956, after deducting the following expenditures: $157,666 for mining, $214,788 for milling, $131,097 for general works expense, $5839 for selling and $24,649 for office and general expenses. A net profit of $371,228 is shown after writing off $138,728, consisting of $61,087 for development, $53,516 for general charges and $24,125 for fire loss. The company ended the period with $217,128 current assets and $272,267 current liabilities. Deferred charges carried on the books are: buildings and equipment, $1,008,963, and general development, $342,403. The net addition to the development account was $148,391, after deducting amount written off.

The Dome property consists of 240 acres situated in the southern part of Tisdale township. The orebody is a dome of quartz and outcrops on the surface for about 800 ft. and the width varies from 200 to 250 ft. In July, 1911, the company's half-erected mill was destroyed by the fire that burned most of the plants of the district. A mill of 10,000 tons monthly capacity has since been erected and milling operations were commenced on Mar. 23, 1912. During the period covered by the report 128,015 tons were mined, 25,179 tons of this were waste and 102,836 tons were ore. Openpits produced 93,581 tons of this ore and 9255 tons came from development work. Of the waste rock dumped 6266 tons came from sinking No. 2 shaft and the balance almost entirely from development. The development work performed consisted of 155 ft. of shaft sinking at No. 2, 866 ft. of raising, 1835 ft. of drifting, 2059 ft. of crosscutting, and 657 ft. of incline, total 5572 ft. The mill as erected comprises forty 1250-lb. stamps, four duplex Dorr classifiers, four 5x22-ft. tube mills, four Pachuca tanks, 8x40 ft., three 90x4-in. frames Merrill slime-filter presses, two 52-in. Merrill zinc-dust precipitation presses.

The mill has treated 101,812 tons of ore yielding $10.25 per ton or $1,043,994.93, of which 53.7% was recovered by amalgamation and 46.3% by cyanidation. The percentage of extraction is reported to be 95.63%. The refinery and assay office comprises a briquetting machine for gold slimes, small water-jacketed blast furnace, cupel furnace, retort for amalgam, and Monarch fusing furnace.

The assay office is equipped to handle about 150 determinations a day. The sampling department is fully equipped with crushers and grinders. Power has been changed from steam to electric, which is delivered from Wawaitin Falls, 13 miles distant, and costs are expected to be lowered as steam power has been excessive. The ore reserves above the 45-ft. level are estimated to contain 315,528 tons of ore running $7.53 per ton. In addition to this there are 250,000 tons developed below the 45-ft. level to the 100-ft. level, which on present knowledge cannot be valued. On the 100-ft. level there is 46,750 sq.ft. of ore not taken into account until further work is done. No credit is taken of ore reserves for much larger bodies of ore indicated by bore holes and development at the 260-ft. level from vertical shaft No. 2. The operating costs, exclusive of development, were as shown in the accompanying table:

OPERATING COSTS ONLY, DOME MINES

| | Mining | Crushing | Milling | General | Total |
|---|---|---|---|---|---|
| | | Per Ton Milled | | | |
| Labor | $0.54 | $0.06 | $0.25 | | $0.85 |
| Supplies | 0.17 | 0.01 | 0.33 | .... | 0.51 |
| Steam | 0.09 | 0.01 | 0.01 | | 0.11 |
| Power | 0.19 | 0.06 | 0.69 | | 0.94 |
| Water | | | 0.15 | | 0.15 |
| Laboratory, samples | 0.05 | | 0.05 | | 0.10 |
| Repairs | 0.16 | 0.10 | 0.32 | | 0.58 |
| Department work, expenses | 0.11 | | 0.31 | | 0.42 |
| Camp, hospitals, etc. | | | | 0.18 | 0.18 |
| Insurance and taxes | | | | 0.09 | 0.09 |
| Superintendence and general | | | | 1.02 | 1.02 |
| Total | $1.31 | $0.24 | $2.11 | $1.29 | $4.95 |

The rock drills principally used for development are the Ingersoll-Rand No. 43 piston and the Rand Butterfly stoper drill for raises. In the pits the Rand BC No. 26 Butterfly hand hammer drill is used almost entirely, although a Rand No. 43 is used for drilling through overburden to rock for starting a new bench on the rim of the pit. No records were kept of efficiencies up to Dec. 31, 1912, so the following figures are for the last three months of the period covered by the report. Shifts are of 9 hr. length.

DRILLING AT THE DOME MINES

| Linear development | Drifts and Crosscuts | Raises |
|---|---|---|
| Average machines, running foot | 5.6 | 5.2 |
| Footage drilled per machine shift | 35 | 16.5 |
| Footage advanced per machine shift.. | 1.68 | 0.62 |
| Stoping | | |
| | Rand No. 43 | Rand and Hammer |
| Average number of machines running | 1.5 | [illegible] |
| Holes drilled per machine shift | 3.4 | [illegible] |
| Footage drilled per machine shift | 30 | 38.7 |
| Tons broken per machine shift | 43.7 | |
| Tramming from boxes | | |
| Average tons trammed per shift | | 272.8 |
| Average number of trammers per shift | | 11.8 |
| Average tons per man per shift | | 22.7 |
| Tramming from development | | |
| Average tons trammed per shift | | 43 |
| Average number of trammers per shift | | 7.12 |
| Average tons per man per shift | | 6.1 |

⁂

## Buena Tierra Mining Co.

The report of the Buena Tierra Mining Co., Santa Eulalia, Chihuahua, Mex., for the year ended Dec. 31, 1912, states that 31,781 tons of ore were mined from which 1038 tons or 3.27% was sorted out on surface as waste. The shipments to the smelting plant, 30,085 tons, showed a net return of 8.65 oz. silver and 15.1% lead. Operating costs at the mine were: Mining, $1.33 per ton; development, $1.08; general expenses, 51c.; taxes, 11c.; sorting and transportation, 86c.; total, $3.92 per ton. Including expense chargeable to ore shipped from stock, the total cost of ore to smelting works was $4 per ton shipped.

The Santa Eulalia district is included in a large area of well marked bedded limestone, which lies nearly horizontal, with a dip of 10° S. In the greater part of the district it is covered over with flows of andesite and rhyolite. Certain strata show abundant fossils. These strata are, apparently, more favorable to ore deposition; and almost all of the known orebodies of the district occur within these horizons. The limestone beds are remarkably free from folds, but are much fractured, and somewhat faulted by numerous belts of fissures nearly vertical, which extend for long distances. The ore-bearing solutions availed themselves of the fissures in the limestone as circulating channels, and spread out horizontally in more favorable strata, especially where the ground was much fractured by cross-fissures. Ore is not found continuously along these fissures, but usually in large blocks or masses at the junctions of fissures.

⁂

## Approximate Costs of Concrete Construction

The costs given in this table, from Taylor and Thompson's "Concrete Costs," are the approximate costs of completed structures, based chiefly on published cost data. The total costs, including excavation, forms, steel, and miscellaneous work, are divided by the number of cubic yards, so that the costs as given are in terms of a cubic yard.

It is evident from the wide range in costs that the values can be used only for rough approximations. The costs include an allowance for superintendence, overhead charges and general expense, but do not include any allowance of home-office expenses and profit. Such a table as this, is useful when it is desirable to make rough preliminary estimates for the sake of deciding between different types of construction or in the case of contemplated work whose prosecution may depend on the expense involved.

RANGE AND AVERAGE OF COMPLETED CONCRETE STRUCTURES

| | Cost per Cubic Yard | |
|---|---|---|
| | Range | Average |
| Mass foundations | $4.00 to $9.00 | $7.00 |
| Mass concrete as in a dam | 6.00 to 9.00 | 7.50 |
| Bridge piers and abutments | 7.00 to 15.00 | 10.50 |
| Arches 30-ft. to 50-ft. span | 5.00 to 17.00 | 9.50 |
| Arches less than 30-ft. span, culverts | 5.00 to 12.00 | 9.50 |
| Girder bridges | 7.00 to 18.00 | 12.50 |
| Conduits, sewers, etc. | 5.00 to 16.00 | 9.50 |
| Tunnel lining | 6.00 to 12.00 | 15.00 |
| Core and gravity retaining walls | 6.00 to 8.00 | 7.00 |
| Reinforced retaining walls | 12.00 to 15.00 | 13.50 |
| Reservoirs | 6.00 to 23.00 | 10.50 |
| Tanks | 4.00 to 20.00 | 12.00 |
| Whole buildings | 8.00 to 26.00 | 14.00 |
| Walls in buildings | 12.00 to 25.00 | 17.50 |
| Encasing structural steel | 14.00 to 21.00 | 18.50 |
| Pipe | 11.00 to 15.00 | 12.50 |

**The Surface-Tramming Cost per Ton of Ore** from the James shaft to the Lake View mill in Western Australia is 4c. This includes loading and discharging. The labor cost is 1.8c.; repairs, 1.16c.; fuel, 0.74c., and supplies, 0.28c. The ore is loaded by "butterfly" chutes into 38-cu.ft. or 2.1-ton side-dumping cars, six at a time, and hauled by steam locomotive in trains of from 18 to 20 cars. The locomotives are of the six-wheel coupled type, weigh 9½ tons and are rated at 60 hp. The track gage is 24 in.; 20-lb. rails are laid on 4x7-in. by 4-ft. 6-in. ties, spaced about 2 ft. The length of the line is about one mile and a difference in elevation of 51 ft. against the load exists. The maximum grade is 2%. About 10 trips are made per 8-hr. day and 9615 tons handled per month. The train is operated by one engineer and one loader. The cost of tramway material and equipment was $21,700, and the labor cost of installing was $11,150.

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22,885—CONCRETES—Some Experiments with Mortars and Concretes Mixed with Asphaltic Oils. Logan Waller Page, William J. Boucher and A. R. Goldbeck. (Proc. A. S. C. E., May, 1913; 7 pp.) Discussion of paper by Arthur Taylor and Thomas Sanborn, previously indexed.

# CORRESPONDENCE AND DISCUSSION

## The Beatty-Guggenheim Case

In the JOURNAL of July 12, under the heading, "The Beatty-Guggenheim Case," is discussed the recent decision of Justice Gerard in the suit of Alfred Chester Beatty against the Guggenheim Exploration Co. and Oscar B. Perry.

I was Mr. Beatty's counsel in that case, and therefore am familiar with it. The JOURNAL article would give an erroneous impression—unfavorable to Mr. Beatty—to anyone not familiar with both sides of the controversy. Mr Beatty is in Europe. I, therefore, deem it my duty to take this matter up with you.

This suit was not brought by the Guggenheim company but by Beatty against the Guggenheim company and Perry, to recover money and Yukon Gold Co. stock and options. Justice Gerard decided against Beatty. Beatty has appealed, but the appeal cannot be heard until next winter.

A. N. C. Treadgold had some mining claims and options on a large number of claims in the Yukon, for the most part lying contiguous to one another, and together making a single situation. He offered them to the Guggenheim company. After a meeting between Treadgold, John Hays Hammond, the general manager and consulting engineer of that company, and Beatty, assistant manager and assistant consulting engineer, Hammond sent Perry, a hydraulic-mining engineer, and a corps of Perry's assistants, to the Yukon to make an examination.

Perry promptly wired Hammond a highly favorable report from the Yukon, adding that Treadgold had to have money immediately. This money was needed to protect maturing options, the loss of which would cause the disintegration of the situation. Hammond wired Beatty, then in the West, to go to the Yukon. Beatty wired from the Yukon to Hammond, strongly recommending taking over the properties. Attention was again called to Treadgold's urgent need for immediate money. There was a delay in answering this telegram. In the meanwhile, it was absolutely necessary for Treadgold to have $15,000. Perry was exceedingly anxious that it should be put up, but he had no ready money. After a conference between Perry and Beatty, Beatty put it up out of his own funds. This money held the situation together and contributed much toward the Guggenheims making the large amount they subsequently made out of this situation. After six days' delay a telegram was received by Beatty and Perry from Hammond. This was answered, and then in a day or two, another telegram, which is the telegram referred to in your article, came. Whether or not this telegram, at that time, ended the Guggenheim company's connection with the matter, is immaterial in any view of this case; but let us see what Daniel Guggenheim, the president and head of the Guggenheim company, said that telegram was intended to mean. He testified:

> (p. 653) When we sent that telegram I want to explain that Mr. Hammond and I agreed that it was advisable to send some telegram in order to turn the matter down at that time. But he said to me, "Mr. Guggenheim, even though we will turn it down now, those gentlemen will all come on to New York in the winter, when we will take the business up again and discuss it; the business will come to us."

Regardless of what this telegram was or was not intended to accomplish, at any rate it meant delay, but the situation could not wait. More money had to be put up. After a conference with Perry, Beatty again came to the rescue. Beatty agreed to advance $20,000 more which he subsequently did, in time to save the situation. If this money Beatty put up had been lost, the loss would have been his—not the company's.

In referring to a telegram to Beatty, sent previous to the one just referred to, you say: "On the strength of this he was authorized to expend $300,000 on *the purchase* of claims" and then later on, you say: "The court calls attention to the point that neither in this telegram nor any other put in evidence did the company withdraw its authorization to *spend $300,000 to protect the situation.*"

There was no authority to spend $300,000 or any other sum, loan or advance money "*to protect the situation.*" The only authority was to *purchase* claims up to $300,000 the title to which, this telegram said, must be taken in the name of the Guggenheim company, so that "our possession such claims will make strong our position in negotiations and is key to the situation." That was impossible. Treadgold had such control over the situation that it could not be done without his consent, and, of course, he would not consent to that. Beatty, answering this telegram, wired that it could not be done, but no suggestion came from New York about advancing or loaning Treadgold any money. The telegram just referred to reads:

> In the meantime to protect situation we authorize you to purchase claims up to $300,000. Claims must be taken in our name and we must not be committed to further investment Treadgold. We take it our possession such claims will make strong our position in negotiations and is key to the situation.

After the subsequent telegram which Mr. Guggenheim testified was sent "to turn the matter down at that time," was received, the question arose as to Beatty—in view of his having advanced his own money and agreeing to advance more money—becoming personally interested. Beatty told Perry that while he would advance the money needed immediately, he had no right to become personally interested in this situation without Daniel Guggenheim's and Hammond's consent—that he believed they would consent, but if they did not, Perry would have to return this money to him, but if they did consent, he would become personally interested with Perry. That was agreed to.

Beatty and Perry then inspected other properties in which the Guggenheim company was interested up in that country, at some distance from the Yukon, and then Beatty returned to New York. Perry returned to the Yukon, where Treadgold had remained. After Perry furnished Treadgold with Beatty's money and a small amount that some relatives of Perry's put up, Treadgold and Perry entered into negotiations with reference to the contract between themselves. Treadgold was unwilling to let anybody besides himself hold the title to any of the claims, and the contract finally entered into between him and Perry provided that if Treadgold sold certain of the claims within a fixed time, Perry should have his money back and a certain profit, but if he did not sell them, then Perry was to receive the title to those claims.

Two or three months later, Treadgold came to New York and reopened the negotiations with Hammond. About Dec. 5, 1905, a deal was finally consummated between Hammond and Treadgold by which the Guggenheim company took over the entire situation. The amount to be paid included the profit which Perry was to get under his contract with Treadgold, which amounted to about $45,000 cash and a small amount of stock. The Treadgold-Guggenheim transaction amounted to several million dollars.

Although Perry then had a contract with the Guggenheim company to which I will refer later on, Hammond, at the time he agreed to purchase the Treadgold properties, after consulting Daniel Guggenheim, made a new contract with Perry, then in New York, by which Perry, in consideration of releasing all claim against the Guggenheim company, and agreeing for two years to render any services he might be called upon to render in connection with these properties, was to receive 4% of the stock of the Yukon Gold Co. to be formed to take over the Treadgold situation, and an option on 4% of the stock at cost, and also 2% of the stock of the Northwest Hydraulic Co., another company to be formed to acquire properties in connection with the Treadgold properties, Perry, knowing that if Beatty had not put up his own funds, Perry on account of the contingent character of his existing contract, would not have gotten anything out of this situation, felt that Beatty was entitled to share in all he made. He agreed to give Beatty a part of his profit under the Perry-Treadgold contract, and of what he got under his contract with the Guggenheim company, but no part of his Northwest Hydraulic Co. stock.

Beatty testified that as soon as he returned to New York, he told Daniel Guggenheim and Hammond that he had put up his own money, and that it was agreed between him and Perry that if Guggenheim and Hammond did not object, Beatty should be interested with Perry in everything that came to him out of the transaction, and that they assented to it, except that it was later stipulated that Beatty should get none of Perry's Northwest Hydraulic stock.

Beatty and Hammond testified that Daniel Guggenheim and Hammond, realizing that the Guggenheim company owed Beatty a great deal on account of his having put up his own money to keep the situation together, which his contract with the company did not call on him to do, readily assented that Beatty should receive a share of everything Perry was to get out of this situation, except that Guggenheim did not want Perry to give Beatty any of his Northwest Hydraulic stock.

In 1904, Hammond made a contract with Perry to give him 5 to 7½% of any proposition that the Guggenheim company took over on his recommendation. In one finding the court finds that it was under this contract that Perry examined the Yukon properties in 1906. In another finding the court finds the contrary. Regardless of which of these two findings is correct, the fact is that the gross amount Perry got under his 1905 contract, including the part he was to give Beatty, was less than Hammond agreed in the 1904 contract to give him. Moreover, Justice Gerard specifically found that the amount given Perry under this contract, which included the part Beatty was to get, was reasonable and fair.

This all occurred in 1905. No Yukon stock was issued until 1908. All the cash, profits, stock and option which Perry was to get under any and all of the contracts, were actually delivered to him in 1908, but in April, 1908, Perry, acting under instructions of the Guggenheim company, refused to deliver Beatty the part thereof he had agreed Beatty should have. Then Beatty brought this suit against the Guggenheim company and Perry to compel Perry to perform his agreement.

Apart from all legal questions and technicalities, the question is, was Beatty "secretly" interested in Perry's profits and gains, or did Daniel Guggenheim and Hammond, the principal officers of the Guggenheim company, when they made the contracts with Perry and with Treadgold, in 1905, know that a part of what Perry was to receive under both contracts was to go to Beatty because he had put up his own money, thus making possible this deal which became so profitable to the Guggenheim company, and did they, with this knowledge, make these contracts, intending that Beatty should share therein. Or, in other words, did they at that time know that Beatty had a personal interest, and did they assent to his having such interest?

Justice Gerard found that although Hammond, who was Beatty's superior officer, knew about this, as a matter of law he did not have sufficient authority to make notice to him notice to the company. Justice Gerard found that Daniel Guggenheim did not know that Beatty was interested with Perry or in the properties.

Beatty offered the following letter from John H. Steele, then and now the general counsel for the Guggenheim company, but which the Judge in his final opinion decided he would not receive in evidence:

July 14, 1908.

A. Chester Beatty, Esq.,
Dear Mr. Beatty—

In compliance with your request and in order that, in case of anything happening to me or to Daniel Guggenheim, before he can make a reply to the questions on the memorandum you left with me this morning, you may have my recollection of our conversation with Daniel Guggenheim a few days ago, I desire to say that at that interview Daniel Guggenheim stated that, at the time the transaction for the Yukon properties was made with Perry, he knew that you were interested with Mr. Perry in the properties.

Faithfully yours,
JOHN N. STEELE.

John Hays Hammond, who was an entirely disinterested witness, testified:

(p. 161)

Q—Did you understand from what Mr. Beatty told you that he, Beatty was interested with Perry in the profits on this contract? A—Yes.

Q—And did you so inform Daniel Guggenheim? A—I told Daniel Guggenheim that Mr. Perry and Mr. Beatty were interested in the profits to be derived from whatever transaction took place out of the Yukon situation

(p. 166)

Q—Now at the time you fixed this compensation of Perry, did you know from Mr. Beatty that he was to share in that compensation? A—I did

Q—And did you tell Daniel Guggenheim so? A—I did

Q—And did Daniel Guggenheim object to it? A—He did not.

(p. 460)

Q—Did you have conversations with Daniel Guggenheim about that? A—Yes, I did, stating, "I cannot remember the words of the conversation. I can only remember the fact that I did have a conversation with Daniel Guggenheim that Mr. Beatty was interested with Mr. Perry and why I am so absolutely confident on that point is because of the fact that when we finally came to settle with Perry, Daniel Guggenheim stipulated that Mr. Beatty should have no interest in what was called the Northwest Hydraulic Co.; that was subsequently specified, but in the other things it was agreed that he should be interested."

Defendant Oscar B. Perry, now consulting engineer and a director of the Guggenheim Exploration Co., testified:

(p. 249) Mr. Beatty, in my presence, made some remark to Mr. Hammond about his being interested in what this compensation was to be and Mr. Hammond at one time made a remark which indicated that he knew Mr. Beatty was interested, by saying to me, in Mr. Beatty's presence, something to the effect of not letting Mr. Beatty get away with too much of this, or something of that sort.

(p. 87)

Q—Did not Mr. Hammond say to you in his office at or about the time the contract was signed, that Daniel Guggenheim wished you to retain this entire 2% participation in the Hydraulic Co., and not give any of that to Mr. Beatty? A—Yes, he did say something of that kind, or practically to that effect.

Thomas W. Lawson, testified that at the time he and the Guggenheim's were negotiating with reference to Lawson's marketing the Yukon stock, he had the following conversation with Daniel Guggenheim:

(p. 252) . . . . and I made one of the foundation conditions of my attempting the sale of the stock that I know in advance what other stock was outstanding other than that which I was to attempt to sell, that I might know what I would have to deal with in the formation of my selling plans, and in a subsequent carrying of them out. (p. 266, cross-examination.)

Q—Now, who made use of the expression that Mr. Perry and Mr. Beatty were in partnership? A—The expression of partnership?

Q—Yes. A—I am not sure that the word partnership was used. That drives me back again. Daniel Guggenheim in answer to my quite urgent questions trying to pin the Beatty interest down in some form that we could deal with it in the formation of my plans for selling the stock, said to me that we could not, he could not deal with it as so many shares of stock, or a definite interest, because Mr. Perry and Mr. Beatty had been in together from the start and had a partnership, or a joint interest or an undivided interest, I don't know just what term or what word it was.

Q—Daniel Guggenheim used that expression on that occasion, you say? A—Yes.

The Court, in an extremely long opinion, did not quote from Daniel Guggenheim's testimony. Let us see whether, if he told arbitrators not bound by the rules prevailing in courts, what he told on the witness stand, they would not believe that he knew and assented to Beatty's being interested with Perry. As already stated, the contracts between the Guggenheim company and Treadgold and Perry were made in December, 1905.

(pp. 634-5)

A—Mr. Hammond told me something in 1906. I think the end of the year, that Mr. Beatty had advanced some money in order to hold certain options in the Klondike. That is the substance of everything that was said in reference to that matter.

Q—Did he say to whom he had advanced it? A—He said he had advanced the money to Mr. Perry. . . . .

Q—Did he, Hammond, at any time speak to you upon the subject of Mr. Perry's compensations from the Guggenheim Exploration Co. for his services in connection with the Yukon business and in which the name of Mr. Beatty was used in any form? A—No, he did not. He told me he said to me at one time, that Mr. Beatty wants to get some of the stock or wishes to get some of the stock that was allotted to Mr. Perry, and whether I would have any objection to his getting any of that stock. I told Hammond that I did not object, but he should be very careful and see that Mr. Beatty did not take too much of Mr. Perry's stock, and told him that I did not think Mr. Beatty needed a guardian, but I thought perhaps Perry did.

(pp. 667-8)

Q—Now, when you got back here in 1908, you testified yesterday, the question was asked by Mr. Marshall, "My recollection of that matter is that it was in your hands and Mr. Beatty and I did not discuss it." In those days, at that time, you were investigating it and finding out what the situation was and familiarizing us with it. A—We didn't know anything about it.

Q—Up to that time you didn't know that Mr. Beatty had any stock or claimed to have any stock in the Yukon, did you? A—Well, you know he was to get some stock that Mr. Hammond said he could take from Mr. Perry. He had that stock.

(p. 668)

Q—When did you find out that he claimed the right to have a part of Mr. Perry's 4% and a part of Mr. Perry's profits on the Perry-Treadgold situation? A—Those are two questions.

Q—No, only one. A—I never knew what part of Mr. Perry's stock he was to get. I simply told Mr. Hammond that I had no objections to his getting some of Mr. Perry's stock, and I never knew at any time as to the stock, until after I got home from Europe, that was in 1908, that he had some stock that Mr. Perry was to give him that was in partnership with Mr. Perry.

Beatty's contract gave him the specific right to purchase stock in any company floated by the Guggenheim company. He required no authority of any kind to buy Yukon stock, nor was he required to give the Guggenheim company any notice about any purchase of Yukon stock, so that when Daniel Guggenheim consented to Beatty's "getting" part of Perry's stock, it did not mean buying it.

Daniel Guggenheim, referring to a conversation with Beatty, after Guggenheim's return from Europe in 1908, this controversy having arisen during his absence, testified:

(pp. 628-9) I then told him or we had some subsequent talk after that, that I would see to it that no injury would come to him in reference to the matter, that he would get everything he was entitled to, but that I was waiting for the result of the investigation. I said I was perfectly willing when the time came to arbitrate the matter, or refer it to anyone, or have any kind of a fair way to decide what he was entitled to. He said, "Mr. Guggenheim, I will leave it to you to be the arbitrator."

Can one conceive that an employee who had taken a *secret profit* would go to his employer and offer to make that employer the arbitrator?

As I understand it, Justice Gerard held, as a matter of law, that even if the officers of the company knew that Beatty was interested with Perry and assented to it, the company would not be bound unless those officers knew the exact amount of Perry's interest, that is, that it is not enough for an agent to say to his principal, "I have a personal interest in a transaction, are you willing to deal with me on that basis?" but that he must say, "I have a 9% or a 13% interest." If that is the law, it would seem to have been unnecessary to discuss the details as to the facts of this case, because Beatty testified unequivocally that he did not tell Hammond or Guggenheim the exact amount of his interest in Perry's profits and gains, but simply that he was to get a part thereof. They knew whether they regarded it of any importance whether he got a fifth or a quarter or a third of Perry's interest. We claim that such a holding to the law is contrary to the authorities in this country.

In the JOURNAL's article, referring to the profits made by Perry out of the contract with Treadgold, and a part of which Perry agreed that Beatty should have, you say: "Nor would the agreement with Perry have been questhan if it had been solely for his own benefit." Now that presents the remarkable feature of this case. If Beatty was disqualified from taking profits out of the Perry-Treadgold contract, so was Perry. They were both working for the Guggenheim company. The company paid Perry's expense in making the Yukon examinations. A distinction is sought to be made because Perry's compensation was contingent and Beatty's was fixed by a salary. There is nothing in that. A lawyer working for a client on a contingent-fee basis is as much bound by the rules governing attorney and client as if he were working for a fixed fee.

Daniel Guggenheim said he did not know until 1908 that Perry was getting any profit under the Treadgold contract, but when he did learn it he took no steps to have Perry return this profit to the company; on the other hand, Perry thereafter—after this suit was begun—was made consulting engineer of and a director in the Guggenheim Exploration Co. The question of the respective amounts that Perry and Beatty got for their services, could not have induced the distinction between Perry and Beatty, because Perry got more for three or four months' work in the Yukon and for a two-year contract, which did not obligate him to perform any services unless called for, than Beatty got for four years' services.

This controversy between Beatty and the company arose about Apr. 1, 1908. Justice Gerard in one of his findings says:

> In the summer of 1908, after the expiration of plaintiff's contract with defendant company, defendant company through Daniel Guggenheim, sought to get plaintiff to enter into a new contract for plaintiff's services, as chief engineer and general manager of said company, for a period of years. Plaintiff declined to enter into such contract.

The managing officers of the Guggenheim company knew that Beatty was interested with Perry and assented to it. That is the vital thing. The technical legal questions involved are of minor importance at this time.

HENRY WOLLMAN.

New York, July 29, 1913.

[Our article was simply a summary of Justice Gerard's decision, except for the last paragraph, seven lines, which comprised our only comment.—EDITOR.]

## The Michigan Strike

Whether the conditions now obtaining in the copper-mining district of Upper Michigan are the results of a walkout or a lockout are immaterial. The fact remains that the situation approaches that of a strike of the miners, a thing that has not happened in the affected district for a great many years, and that has never before been brought about there by that least-liked and most rapacious of all the great labor organizations of this country—the Western Federation of Miners. For it is this and this alone that is responsible for the present situation in the Michigan Copper Country.

Recent press dispatches state that 20 of the best known mines of the district are closed down; one mining captain is seriously injured as the result of an assault; that small battles have occurred between the sheriff and his deputies on one side and the strikers on the other; that the sheriff is virtually a prisoner and has called on the Governor of the state for troops. And the strike is scarcely three days old. This indeed is "going some," and there are indications, at least to those conversant with the history of the country and its mines, that the strike will not be short-lived one.

According to published reports, the miners have made but three demands: an 8-hr. day; abolition of the one-man drill; recognition of the union. Those familiar with the mines and the conditions of work and its supervision obtaining on surface and underground, know that while the present 10-hr. day is such in theory, it is a misnomer as far as the actual working hours of the miner is concerned.

He goes underground at 7 in the morning and his drill is rarely operating before 8. He takes an hour for lunch at noon and quits work at any time between 4 and 5 in the afternoon in order to get to the shaft for the man-car at five. The actual hours of work can be readily deduced. However, in spite of this, and many other conditions governing the policy of the 10-hr. day, it is believed the mining companies could, if occasion demanded it, concede the 8-hr. day with no loss in profit to themselves. The recognition of the union is a matter which is harder to believe will be so easily solved, involving as it does a policy at utter variance with one which has prevailed in the district since its earliest days, over 60 years ago. But the real stumbling block is undoubtedly going to be the demand for the abolition of the one-man drill, and there is plenty of reason for supposing that the battle will be drawn on this line.

Frequent reference has been made in these columns during the past two years to the progress that has been made in introducing this machine into this district. It was a long time getting there, and it took some time and not a little money to test fairly this innovation, for an innovation it surely was to this region. However, its use is now becoming quite general, and as frequently predicted in the JOURNAL, the possibilities it offers through reduced operating expense, means much to a district, where dividends and successful operation hang on the fractions of a cent in the cost per pound.

It is hard to believe that the mining companies will concede any right of the miners to dictate on this score, where personal safety of the workman is not involved. It is equally hard to believe that the better-thinking class of miners here, those whose fathers and in some cases whose grandfathers have preceded them, even in one mine, will insist on the abolition of this particular type of drill.

To them, it should and probably will mean an added opportunity to demonstrate their efficiency as miners, and they will undoubtedly soon see, if they do not already, that the general use of this drill means an added life for the district, in that it will help make available, ground hitherto not considered profitable. To the inefficient and the man who prefers to draw his pay without giving adequate return, it is an incentive to strike. Obviously, it is this sort that does frequently strike first, dragging unwilling victims with them.

It is to be hoped that the former class will take this opportunity to assert itself. If it does not, it is equally to be hoped that the operators, who know their ground better than all others, will fight it out on this line if "it takes all summer." There is ample reason for believing that they will do just this under the circumstances.

THOMAS THOMAS.

Houghton, Mich., July 27, 1913.

# EDITORIALS

## The Strike in Michigan

We are used to hearing of strikes, turbulences and riots in such mining districts as Butte, Cripple Creek and the Coeur d'Alene, but not in the heretofore calm and blissful purlieus of the Lake Superior copper region. That is a region of a settled population, of homes, of green grass and of woods. The conditions of living have been far more agreeable there than in the rough regions of the Rocky Mountains where the necessity of men sleeping in bunk houses and the absence of real home life have been some of the complaints put forward by labor agitators in justification of their claims for the extraordinarily high wages which have been demanded and received.

Back in the days of 25c. copper, in 1906-7, a lot of Lake Superior miners, tempted by the high wages, went to Butte. It was not long before they discovered that their net income, the surplus remaining after expenses were paid, was less in Butte than in Michigan, and there was a general return to the old home. Since then, the Lake Superior companies have voluntarily raised wages, this having been done in the early part of 1912, when the price for copper experienced a substantial recovery, and nothing has ever been intimated respecting a reduction, although the price for copper has suffered some material relapses.

Nor have any mining companies in the United States been so paternally solicitous as to the welfare of their employees. We know this from our own observations, which have repeatedly been the subject of articles in the JOURNAL. The state has, moreover, enacted thoroughgoing compensation legislation, which has been accepted by the companies in a spirit of coöperation. If any mining population in the United States, and we know almost all of the important mining districts by having been on the ground, ought to be contented, we consider that it is the mining population of Lake Superior.

What, then, are the grievances that have led to this strike, which has been brewing for a long while? One of them is alleged to be the introduction of the one-man drill. This is the same old objection of labor-unionism, first to the use of machinery at all, then to the use of improved machinery. What matters it to rehearse the familiar old arguments? What matters it if the workman profit along with employer, wherein Lake Superior experience has differed in no wise from experience elsewhere?

Of course, increase in wages is to be demanded. One of the strike leaders imported from the Rocky Mountains is quoted as saying that while it is true that the Lake Superior companies have made increases, their scale will stand several more before it attains the Montana level. The Lake Superior miners who went to Montana in 1906-7 and went back can throw some light upon this subject.

The nub of the Lake Superior strike is clearly the recognition of the Western Federation of Miners, which has obtained a foot-hold in this previously peaceable district and wants to strengthen it, of course, to its own benefit in dues, etc. The lawlessness by which this is to be promoted apparently starts with the young, unmarried Huns, Finns, Slavs, etc. We can hardly conceive of any of the old-time Cornishmen going in for that sort of thing. Be this as it may, we are now witnessing the strange spectacle of Calumet and Painesdale under the guard of infantry, cavalry and artillery.

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## The Situation in Mexico

During the last week it is clear that Mexican affairs have been rapidly approaching a crisis. So long as the Huerta government was unrecognized by the United States no money to speak of was forthcoming from Europe. The foreign loan that has been talked of so much turns out to be little more than options to European bankers. Such money as the Mexicans have been allowed to have takes care of scarcely more than maturing obligations. In these circumstances a strong effort to secure American recognition by suasion and by threats was made. Ambassador Wilson came home to urge this. Previous to his return he was held rather high in popular estimation, but his diplomatic reputation blew up with his blazing indiscretions upon arriving in New York. The President apparently intends to stand calmly by his policy of non-recognition and there are indications moreover of the exercise of a stronger hand in maintaining the rights of Americans who find themselves in danger in Mexico.

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## Lake Iron Ore Rates

The railroads serving the Old Range section of the Lake Superior iron region could not very well advance rates to the Lake ports from the mines this year in face of the quite recent decision of the Interstate Commerce Commission ordering the Minnesota roads to reduce their rates by 25%; but they sought to attain their end by indirection. The rate from mines to Lake ports was fixed at 40c. per ton, the same as for several seasons past but an additional 5c. per ton, called a "loading charge" was imposed. No such charge has heretofore been made and this practically amounted to an increase of 12½% in the freight rate. Moreover, this charge is increased by 0.25c. a day for storage, if ore remains on the shipping docks for over 10 days.

Naturally this addition was not approved by the shippers, and an appeal to the Interstate Commerce Commission was taken by the Newport Mining Co., Corrigan, McKinney & Co., and other shippers, the defendants being the Chicago & Northwestern, the Chicago, Milwaukee & St. Paul, the Duluth, South Shore & Atlantic, and the Lake Superior & Ishpeming roads. For some weeks past the Commission has been taking testimony in Chicago, chiefly on the side of the railroads, and some interesting facts have been submitted.

In 1890-93 the rate to the ports was 70c., but this was reduced by graded steps to 40c., which has been the established charge for several years, and to which no objection has been made. The selling price of ore this season is much higher than when the 40c. rate was established. In their plea the railroads set forth these facts, and also say that handling the business has required the building of costly ore docks and the installation of machinery which has been expensive to build and operate. For this they claim they are entitled to some recompense in the form of the loading charges.

There is some show of justice in this plea. It does not mention, however, that while many improvements have been needed, a very large and profitable business has been built up, from which there is a heavy return; to say nothing of the indirect profit resulting from the demand for stores for the mines and for the large population which has grown up around them. These points, however, will doubtless be brought out as the shippers' side of the case is presented.

The railroad rate from the mines to the Lake is a deduction from the value of the ore, since that is sold f.o.b. Lake Erie port and the seller pays all charges to that point. The provision of large terminal facilities, docks, etc., has always been held to be a necessity where a large business is to by secured and as an incident to that business. Without pronouncing on the reasonableness of the rate, it seems as if a flat advance would have been better than the indirect method adopted.

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## Respecting Arbitration

What is sauce for the goose is not sauce for the gander in disputes between organized labor and its employers. The conductors and trainmen of the Eastern railways voted to increase their wages, about 7% voting in the negative. Why even 7% should vote against having their pay raised is only partly comprehensible. The railways having refused to grant the increase that was voted, a general strike, together with all the horrors of interrupted food supply of the cities, etc., was threatened. This was averted by the action of the President in securing the passage by Congress of a new arbitration law agreeable to both parties. Then it appeared that the railway managers proposed to submit some things to arbitration as well as the men. The ideas of the railway managers were of the following nature:

> When a minimum day's wage is paid in any class of service it shall entitle the railroad to the full mileage or hours of service paid for.
>
> In no case shall double compensation be paid.
>
> That consideration be given to a reduction of existing rates of pay of yard brakemen and of passenger conductors and trainmen on long continuous runs, where there is an opportunity to make excessive mileage in a limited number of hours.
>
> Employees in two or more classes of service on continuous duty or under continuous pay shall be paid the rates applicable to the different services performed with a minimum equal to 10 hours at the lowest paid service.
>
> On passenger and freight trains, where under extra-crew laws additional men are required the rate of pay for all brakemen shall be 30% below rates established for brakemen on trains not affected by such laws.

To the neutral outsider such points seem reasonably defensible in a settlement of grievances, unless it be held that the employee is the only party who can have a grievance. The railway union is evidently obsessed by the latter conception, inasmuch as a general howl arose from it and a renewal of the threat to strike, arbitration go hang. From the union standpoint, arbitration is apparently of no use except as a medium of playing "heads I win, tails you lose."

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## The Lake Strike and the Copper Market

The strike at the Lake Superior mines has apparently had a good deal of effect upon sentiment in the copper market, especially abroad. The idleness of this group of mines, which produces about 18,000,000 lb. of copper per month, will naturally restrict production, but perhaps not to so great an extent as is expected.

After the mines were closed down, operations continued at the smelteries, and probably will continue so long as the stocks of "mineral" last. Presumably there is no great stock of mineral at the works in Michigan, but the Calumet & Hecla company always used to carry a large stock at its Buffalo works, and we have never heard that such policy had been altered. However, the strike at the mines will no doubt reduce production to some extent, depending upon its duration, and this ought to be reflected quickly in the refiners' statistics, inasmuch as the Lake producers are both smelters and refiners and their output suffers no loss of time in transit.

With respect to the immediate market supply of Lake copper, there ought not to be any special alarm, the Lake companies having been carrying for some time past an undue proportion of the accumulation. We fancy that on July 1, the time of the last report, they must have had at least 20,000,000 lb. on hand, against only about 29,000,000 lb. being carried by the electrolytic refiners. During the long period of absence of buyers in the copper market, the principal Lake producer was more indifferent than anybody else; nor did it participate in the slashing of prices at the end. As things have turned out its policy may prove beneficinal all around.

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## A Semi-Automatic Mine Switch

The switch described by A. H. Bromly as a Detail of Practical Mining in this issue, is one of the little kinks about a mine whose value is apparent to the miner, even if it has no direct connection with the cost sheet. There are many points of mining practice which cannot be expressed in dollars and cents. Many methods or appliances must be adopted or rejected on the basis of common sense rather than on any evidence obtained from examining costs. This is rather the fault of the cost sheet than the result of any quality inherent in the method or appliance. The best of cost-keeping systems is only an approximation; too much is distributed *pro rata*. Much as the harassed superintendent may complain of the detail required, the plain truth is that there is not enough detail. A perfect cost-keeping system should show in figures the inter-relations of all operations. The effect on costs of any new installation, small or large, of any change in operations, should be calculable in advance. It is not, and to be frank, probably it never will be. To return to our treadle switch: Such a device would cost a small amount to install, an amount which could be estimated rather closely. What the consequent reduction in tramming costs would be cannot be stated, but it would unquestionably more than pay interest, depreciation, and repairs on the installation.

## BY THE WAY

It is whispered that the Government would like to drop its suit against the Steel Corporation but does not know just how to let go. The Hon. A. O. Stanley has been quiet since the exposure of his experience with the Wolf of Wall Street, in which the legislator played the part of the poor old grandmother in Little Red Riding Hood.

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The experimental ore-dressing plant of the Department of Mines at Ottawa, Canada, erected according to the plans of Doctor Haanel, Director of Mines, is approaching completion. This will be the best equipped and best designed experimental works of this kind whereof we know. In the same plant there is an excellent fuel-testing installation, including gas producer, experimental boiler, engines, etc., which is already in use.

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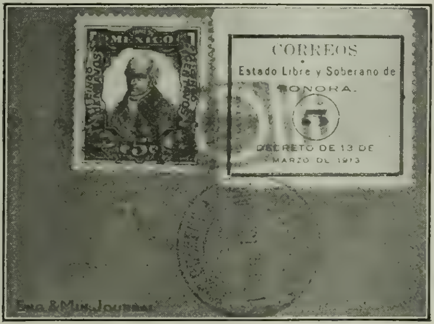
The accompanying halftone shows a portion of an envelope received by the JOURNAL from Sonora. Apparently the left-hand stamp must be used to comply with the International Postal Union Regulations, while the right-hand stamp carries it through Sonora.



STAMP OF THE STATE OF SONORA

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Elbert Hubbard thus expresses his views respecting scientific management as expounded by Louis D. Brandeis: He (Brandeis) "leaps into fame by appearing before the Interstate Commerce Committee and stating that the railroads of America are wasting a million dollars a day through extravagance, collecting this money from the dear people. He suggests that they can cut their coal bills in two by consuming their smoke—that they start goose-farms and sell the honks to automobiles—and reveals long lists of figures to prove his case."

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The prohibition of the export of crude platinum from Russia, agreed upon over a year ago, has never been enforced, since it is said that it will interfere with the provisions of some of the commercial treaties with other nations. The object of the proposed law was to secure the establishment of refineries in Russia and the export of the metal in fine instead of crude form. Now a new law has been brought forward to secure the same object. It provides for an export duty of 30% on crude metal, which is practically a prohibition. It is said that this law will probably be enacted, time for the construction of refining works being allowed before it goes into operation.

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Curious ideas often get into the heads of congressmen. For example, the other day, Senator Bristow discovered that the Democrats had placed a duty on raw amber of 10%. He suggested that amber was produced in New Jersey and Massachusetts. Senator Hughes, of New Jersey, said that if amber was produced in New Jersey, he had never known it. Senator Martine said that he was certain it had never been produced in New Jersey. Senator Oliver discovered that by putting the duty on crude amber the Democrats had added probably $35,000 in revenue, but by reducing it on the manufactures of amber they had lost about $78,000 annually. The paragraph went over.

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## Decision in the Flotation Litigation

According to a despatch received from Butte, Mont., on July 29, Judge Bourquin has handed down a decision in the suit of Minerals Separation, Ltd., against James M. Hyde, adverse to Hyde. According to the summary of the decision transmitted by wire, Judge Bourquin in reviewing the evidence sharply contrasted the Minerals Separation patents with the Froment patent, holding that they are radically different and that the doctrine of equivalents had no application. He decided, moreover, that the defense against the Minerals Separation patents on the grounds of lack of novelty and anticipation was not established and held that the Minerals Separation patents upon which suit was founded are valid in respect to all claims in issue, and that there was an infringement by the defendant, Hyde.

Consequently, a decree as demanded in the bill of complaint, otherwise than as to treble damages and for accounting before the masters, was ordered. This decision, of course, refers to the use of the flotation process by the Butte & Superior Copper Co. There has been no news as to whether the defendant would take an appeal to a higher court, but such action is probably to be expected.

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## Something New in Mexico

A staff correspondent of the *Evening Sun* reported from Mexico under date of July 29 that President Huerta and the Mexican people have shown a sudden change of spirit toward the United States.

> The cause is undoubtedly the peremptory message which President Wilson ordered communicated to the Mexican government touching redress for the shooting of Charles B. Dixon, U. S. immigration agent, at Juarez, and requiring the release of two American prisoners.
>
> Nelson O'Shaughnessy, American Charge d'Affaires, received from Washington a note couched in terms that are decidedly peremptory, demanding the court-martial and immediate punishment of the Federal soldiers who shot Immigration Agent Dixon; also the release forthwith of McDonald and Bissell, United States ctiizens, whom Pascual Orozco recently captured and condemned to death.
>
> O'Shaughnessy lost no time in calling on President Huerta and laying the American Government's demands before him. Huerta at once promised the immediate release of McDonald and Bissell, as well as the summary punishment of the shooters of Dixon.
>
> The results of O'Shaughnessy's visit were instantaneous No sooner had the American Charge d'Affaires left the National Palace than President Huerta summoned his Foreign Minister and directed him to take the necessary steps to comply with the demands of the United States.

# The Copper Country Strike

*SYNOPSIS—Western Federation of Miners directly responsible for strike, unionism being the real issue; all mines closed down to fight to a finish; militia called to hold rioting in check.*

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The first general strike in the history of the Lake Superior copper country was called by the Western Federation of Miners, Wednesday morning, July 23. On July 14, the local union officials asked for a conference with the various mining companies, naming July 21 as the limit of time in which a reply was to be made. This communication was not acknowledged and the strike was ordered. It was not precipitated without abundant warning. For a year past it had been persistently reported that the summer of 1913 would see a test of strength between Western Federation and the mine operators. While conditions as to wages and working and living conditions in the copper country have always been exceptional, rumors of an impending strike has long affected business conditions. Labor unrest has driven hundreds of good miners out of the district, as they did not choose to remain while a strike was impending. Business men have hesitated over purchases, and conditions have been such as almost to paralyze the development of the district along commercial lines. The strike was a bad thing for the copper country, long before it actually was declared. Therefore there was more relief than surprise at the final rupture; relief because the prospect of labor trouble had hung over the copper country like a pall and it is unquestionably to its benefit to have the situation cleared up by a final clash on the issues raised.

### UNIONISM THE REAL ISSUE

In many of its aspects the strike is unique. The strike began with an almost entire lack of preliminaries. The only formal representation to the mine operators was a recent presentation of a memorial against the one-man drill, for shorter hours and more pay. The mine operators ignored it. After a brief interval the strike was ordered and the men went out; the federation members in obedience to their leaders, and the many others because of intimidation or because the companies resolved to make no effort to operate for the time being. There was no exchange of views, no suggestion of arbitration. Both operators and federation were apparently willing to join in a finish fight on the questions involved.

The real and underlying issue is recognition of the union. The copper country has always been an open camp. Organization has been sporadic, and the companies have never treated with the unions. They employ union and non-union men indiscriminately. Union men have been under no ban, but it has been the consistent policy of the operators to treat with their men as groups of employees, not as members of unions. The Western Federation of Miners has long had envious eyes on the Michigan copper country. For many months its agents have been working a foothold there. It has been uphill work, but it has persisted until it has a representation of several thousand miners. The influence of the federation first made the strike possible and then precipitated it.

A contributory cause of the strike is that for the last year there has been a scarcity of labor for underground tramming, which resulted in a large number of outside men being brought into the district. This was the opportunity that the Federation had been waiting for; the chance had come for it to extend its membership and influence in the copper country by enrolling as many of the newcomers as possible.

Specifically the Federation demanded recognition of the union, an 8-hr. day, a $3 minimum wage, and the abolishment of or a change in the operation of the one-man drill. Officials of the Federation claim that they are backed by the national organization and the American Federation of Labor with authority and funds to prolong the strike for several months.

### ALL MINES CLOSE DOWN

With the exception of the Hancock and the Winona, all the mines in the district were closed down Wednesday. No attempt on the part of the management was made to continue operations. The English and Irish miners are apparently opposed to the strike. The Finns and Austrians are strongest in the union and practically every miner of these two nationalities has joined the strikers. A week before the strike, the Federation officials stated a membership of about 4000. The day the strike was called they claimed an increase of 9000. About 70% of the miners are opposed to the strike. The willingness of so many of the miners to go to work resulted in serious trouble at various places. The most serious trouble is centered at the Calumet & Hecla shafts. Several mass meetings and parades resulted in riots at Calumet. The strikers, armed with rocks, clubs and drills, marched to the various shafts and prevented all men from going underground, as well as stopping all surface working and closing the shafts. Thursday, every mine in the district was closed. The several hundred deputies were unable to handle the situation and Thursday, Governor Ferris was requested to send aid.

Recognizing the seriousness of the strike, the governor ordered the entire National Guard to leave at once for the copper country. The Calumet engineers were joined by the Houghton light infantry at the Calumet armory Thursday afternoon. Special trains Friday and Saturday brought in companies from the lower peninsula, and by Sunday, it was expected that two troops of cavalry, two companies of artillery and all the infantry of the entire National Guard, numbering 2400 to 2500 men, would be in camp around Calumet. Besides the troops, there were more than 2000 deputies on duty. The state troops will remain in the district until the trouble is over. With the complete closing down of all properties, things are quieted. Practically all the stamp mills are closed because only a day's run of rock is kept on hand at most of the mills. The smelting plants will probably continue running for a few days.

The Federation officials state that they are strongly opposed to any rioting, violence or damage to mining property. At several shafts they have permitted the pumps to continue running. All they ask for is a hearing by the mine management. The managers, however, will hold no conference until all rioting and disorder is stopped. The managers have made no attempt to open the mines and many of the Cornish miners, opposed to the strike, have left for the iron country.

## PERSONALS

Dr. L. D. Ricketts arrived in New York, July 30.

H. C. Enos has returned to Mexico City from Pachuca.

H. S. Coe recently left San Francisco on his way to Nicaragua.

Ludwig Vogelstein is returning to New York from Europe by S.S. "Imperator."

Paul R. Fanning, metallurgist to the Philippine Bureau of Mines, is visiting California.

W. R. Ingalls, editor of the "Journal," expects to go to Montana about Aug. 10 next.

T. R. Drummond, mining superintendent of the Inspiration Consolidated, has resigned.

J. R. Finlay will return to New York about July 30 from a trip several weeks in the West.

J. Parke Channing is in Houhton, Mich., this week, and is expected in New York next week.

R. H Vail, assistant editor of the "Journal," is visiting the copper smelting works of Arizona.

John M. Fox has opened an office at Tonopah, Nev., as operative, consulting and examining engineer.

B. A. Bosqui will leave San Francisco shortly to take charge of the new mill of the Commonwealth Mining Co., at Pearce, Arizona.

Samuel Sanford, formerly associate editor of the "Journal," and now in the Bureau of Mines at Washington, has been visiting New York.

C. W. Wright, manager of the mining interests of Lord Brassey in Sardinia, is visiting in this country, on vacation. He will return to Sardinia in September.

Jack E. Shaw, recently assistant superintendent of the Gaston Gold Mining Co., is now superintendent of the Birchville Mining Co., at Graniteville, California.

Benjamin E. Purser has become general superintendent of the mines of the Woodward Iron Co., Bessemer, Ala. I. V. Dalrymple has been appointed his assistant.

Walter J. Radford has accepted the position of engineer for the company operating the Lady Belle Lease at Eagle, Colorado, and will have his headquarters at Denver.

Thos. P. McNamara, until recently foreman of the Combination mine, Goldfield, Nev., passed through New York recently on his way to the Sudbury district in Ontario.

Fred. Searles, geologist for the Goldfield Consolidated Mines Co. spent a day in New York recently. He will attend the International Geological Congress at Toronto.

The engagement is announced of Miss Elizabeth McNear, of Oakland, Calif., to John Power Hutchins, of St. Petersburg, Russia. The wedding will take place in October in London.

Archibald Johnston, vice-president of the Bethlehem Steel Corporation, has gone to China on a business mission connected with important naval contracts that are to be placed by that company.

Bernard MacDonald, well known in mining circles of Mexico and the United States, is reported to have been captured by Federal troops under Orozco in Chihuahua, and imprisoned there under sentence of death. He has just been released.

H. C. Wilmot has resigned as superintendent of the Colorado Mining Co., Aroroy, Philippines, and has accepted the position of manager of the Syndicate, an adjoining property, which is at present building a 100-ton cyanide mill.

Percy E. Barbour, manager of the Uwarra mine, Candor, N. C., was in New York for a few days this week. Mr. Barbour recently suffered an injury to his knee, on account of which he is going to a hospital in Baltimore for treatment.

Harry W. Newton, general superintendent of the North Washington Power & Reduction Co., of Republic, Wash., has been in Spokane negotiating for the purchase of a 600-hp. Corliss engine, to be installed at the mill of the company in Republic.

Dr. S. Gregory, representing the Minerals Separation Co., Ltd., has been in this country for several weeks and will remain here for some time longer, the American business of th company having developed to such an extent as to require much attention.

E. B. Tinker has been appointed superintendent of the Superior & Boston mine at Globe, Arizona; he has been at the Miami for five years past, recently in charge of the New Keystone property. W. A. Sullivan has been appointed chief clerk and purchasing agent; he is from the Ahmeek mine in Michigan.

Joseph MacDonald, general manager of the Consolidated Mining & Milling company of Guanajuato, Mexico, has been on trial at Juneau, Alaska, charged with the murder in 1902 of N. C. Jones, a mission worker at the Treadwell mine. MacDonald was then manager of the Treadwell mine. The missionary demanded that he close the mine on Sunday. MacDonald's plea is self-defense.

Governor Strong, of Alaska, has appointed William Maloney, of Nome, territorial mine inspector, under the provisions of chapter 72 of the Alaska session laws. Under this law the territorial mine inspector has been assigned to the mining sections of the second and fourth judicial divisions, with headquarters at Nome. The office carries a salary of $2500 per year, with actual traveling expenses in the sum of $2500 a year. Mr. Maloney enters upon his duties Aug. 1. The appointment is for a period of two years. He is a well known mining man of Seward Peninsula, where he has been engaged in mining for the past 12 years. Besides being a practical miner, he possesses the necessary technical knowledge of mining prescribed by the law creating the office. The territorial mine inspector will be under the supervision and direction of the governor and the Federal mine inspector.

## OBITUARY

U. G. Wolf, of El Paso, Texas, is reported to have been killed by Mexican outlaws on July 16, at the Creston-Colorado mine in Sonora.

Gordon Montgomery, electrician at the Temiskaming mine Cobalt, Ont., was killed instantly, July 22, by the heavy voltage while laying a line from an electric pump at the mine.

Arthur M. Thomas, a miner well known in Butte, Mont., died July 16, at San Francisco, where he was on a visit. He was 37 years old and had been a resident of Butte the greater part of his life.

James Conmee, of Port Arthur, Ont., died at Prescott, Arizona, recently, aged 64 years after a long illness, having gone to Arizona for his health about six months ago. Mr. Conmee was a native of Sydenham, Ont., and served in the American civil war, after which he went into business in Port Arthur as a railway contractor and was largely interested in mining and the lumber trade. He was the first president of the Canadian Mining Institute in 1894, and became president of the Canadian Mines Development Co. in 1896. He took a prominent part in public life and for several terms represented his constituency in the Ontario Legislature and in the Canadian House of Commons, retiring two years ago.

## SOCIETIES

**University of Utah**—By the will of James McGregor, recently deceased, the School of Mines has been made the beneficiary for $50,000. Mr. McGregor, whose death occurred in Terre Haute, Ind., had large mining linterests in Utah.

**American Peat Society**—A joint annual meeting of the Canadian and American Peat societies will be held at Montreal, Canada, Aug. 18-20. Opportunity will be given members and their friends to visit the two largest peat fuel plants on the Continent. These are located at Farnham and Alfred.

**American Chemical Society**—The 48th annual meeting will be held at Rochester, N. Y., Sept. 9-14. All papers for the meeting must be in the Secretary's hands on or before Aug. 22, or in the hands of secretaries of divisions by Aug. 20, in order to be on the program; especially the secretary of the Organic Division requests that organic papers be sent direct to him. By vote of the Council no papers can be presented at the meeting that are not printed on the final program. The following are the addresses of the divisional and sectional secretaries: Industrial Division, S. H. Salisbury, Jr., Lehigh University, South Bethlehem, Penn.; Physical and Inorganic, R. C. Wells, U. S. Geological Survey, Washington, D. C.;

Fertilizer, J. E. Breckenridge, Carteret, N. J.; Agricultural and Food, G. F. Mason, care of Heinz Company, Pittsburgh, Penn.; Organic, Wm. J. Hale, University of Michigan, Ann Arbor, Mich.; Pharmaceutical, Frank R. Eldred, 3325 Kenwood Ave., Indianapolis, Ind.; Rubber, Dorris Whipple, care of The Safety Insulated Wire & Cable Company, Bayonne, N. J.; Biological, I. K. Phelps, Bureau of Mines, 40th and Butler Sts., Pittsburgh.

**International Exposition of Safety and Sanitation**—The first exhibition ever held in America will take place in New York City, Dec. 11-20, 1913, under the auspices of the American Museum of Safety. Safety and health in every branch of American industrial life, manufacturing, mining, transportation on land and sea, business, engineering, in all of their subdivisions will be represented at this exposition. It will be the first step toward making a representative exhibition of the progress of safety and preventive methods in America. There will be absolutely no limit to the scope of the exposition. It will embrace everything devoted to safety, health, sanitation, accident prevention, welfare and the advancement of the science of industry. By a special act of Congress exhibits from Europe and other foreign countries are to be admitted free of duty. European employers have cut their accident and death rate in half by a persistent campaign for safety. There are 21 museums of safety in Europe. All of these various museums will contribute to the American Exposition.

## INDUSTRIAL NEWS

The Chile Copper Co. is going to use Symons disc crushers in its mill at Chuquicamata, Chile.

After operating two Hardinge mills for 14 months, the Tomboy Gold Mines Co., at Telluride, Colo., is installing two additional mills of the same type.

The Ingersoll-Rand Co., 11 Broadway, N. Y., has received an order from the Inspiration Consolidated Co., of Miami, Ariz., for compressors and compressed-air locomotives.

It is reported that the Vulcan Iron Works, of Wilkes-Barre, Penn., has received the contract to build three rotary washers and a dryer for the West Coast Smelting & Refining Co., of Tecolete, Sonora, Mexico.

The General Electric Co., Schenectady, N. Y., has received an order from the Inspiration Consolidated Co., at Miami, Ariz., for a hoisting equipment. The hoists will have a capacity of 10,000 tons every 14 hours, lifting 630 feet. They will be automatic and of the flywheel type with Ward Leonard control.

The Keystone Driller Co., of Beaver Falls, Penn., has started the publication of "The Keystone Drill Magazine," which is concerned with problems of well drilling, pumping and mineral prospecting. The first issue is dated July, 1913, and contains articles on "Electric Cable Drills in a Cement Quarry," by F. L. Jorgensen, and "Steam Traction Cable Blast Hole Drills in Earth and Rock Excavation," by Albert D. Blakeslee.

## TRADE CATALOGS

C & C Electric & Manufacturing Co., Garwood, N. J. Bulletin 513 C. Electric Arc-Welding Apparatus. Ill., 28 pp., 10x7½ in.

This bulletin contains a complete description of its new multiple-unit arc-welding outfit, by means of which several operators can work from the same machine and use either graphite or metallic electrodes and perform all kinds of welding operations by means of the electric arc. Copies can be obtained by addressing the office in Garwood.

Ingersoll-Rand Co., New York. Ingersoll-Rand Products. Illus., 140 pp., 6x9 in.

This booklet is very complete, not only in illustrating the entire line of the company's production, but the dimension and the capacity tables shown with each type of machine are of great assistance to an intending purchaser in selecting machines of a specified type and size to meet certain requirements. It also tells of the many uses of compressed air in different fields, while about 20 pages are devoted exclusively to tables of horsepower required to compress air from atmospheric pressure to various gage pressures, efficiency tables of air compression at different altitudes, compressed-air transmission tables, drill capacity tables, indicator charts, etc. It is profusely illustrated with halftone and sectional views of the various machines and anyone at all interested in compressed air and its applications should not be without it. A request to the New York office will bring a copy.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

MINE-CAR BRAKE. Ora Mobberly, Corbin, Ky. (U. S. No. 1,067,050; July 8, 1913.)

ALUMINUM—Solder for Aluminum. Charles H. Frantz, New Orleans, La. (U. S. No. 1,067,016; July 8, 1913.)

FURNACE—Tilting Metallurgical Furnace. Willis W. Case, Jr., Denver, Colo. (U. S. No. 1,066,995; July 8, 1913.)

STEAM SHOVELS—Jack for Power-Operated Shovels. George T. Kleven, Winesap, Wash. (U. S. No. 1,067,038; July 8, 1913.)

SEPARATOR for Ores (Centrifugal). John R. E. Sievers and Russell P. Howard, Butte, Mont. (U. S. No. 1,067,766; July 15, 1913.)

REFINING—Process and Apparatus for Refining Metals by Heating. A. Helfenstein, Vienna, Austria. (Brit. No. 13,577 of 1912.)

AMALGAMATOR. Alfred L. Lawson, Chicago, Ill., assignor of one-half to George S. Welsh, Chicago, Ill. (U. S. No. 1,067,352; July 15, 1913.)

COPPER RECOVERY—Apparatus for Recovering Copper from Its Ores. Henry M. Wilcox, Chicago, Ill. (U. S. No. 1,066,968; July 8, 1913.)

DRILL—Rock Drill. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,066,901; July 8, 1913).

FURNACES—Improvements in and Relating to Furnaces for Metal Heating and Metallurgical Purposes. J. A. Hill, Sheffield, Eng. (Brit. No. 12,349 of 1912.)

LEAD AND ZINC—Treating Complex Ores or Their Concentrates. William Morley Martin, Redruth, England. (U. S. Nos. 1,066,829, and 1,066,830; July 8, 1913.)

MINE-CAR WHEEL. William Joseph McDonald, Huntington, W. Va., assignor to American Car & Foundry Co., St. Louis, Mo. (U. S. No. 1,066,638; July 8, 1913.)

SMELTING FURNACE. Charles A. Kuenzel, Buena Vista, Colo., assignor to The Kuenzel Gas Producer & Smelter Construction Co. (U. S. No. 1,067,481; July 15, 1913.)

MELTING FURNACE—Gas-Fired Melting Furnace. William G. Kranz, Sharon, Penn., assignor to National Malleable Castings Co., Cleveland, Ohio. (U. S. No. 1,067,040; July 8, 1913.)

LENORA MINING CO. (Corcoran)—This is a new corporation with a capitalization of $500,000. The incorporators are James H. Baley, G. N. Sherban, Lenora Sherban and J. F. Schattgen

LEACHING—Apparatus for Concentration of Ore Values. Charles S. Bradley, New York, N. Y., assignor to Bradley Copper Process Co., Jersey City, N. J. (U. S. No. 1,066,880; July 8, 1913.)

EXTRACTION—Process of Extracting Metals from Their Ores. Henry B. Slater, Riverside, Calif., assignor of one-half to Ransom B. Shelden, Riverside, Calif. (U. S. No. 1,066,855; July 8, 1913.)

ROCK-DRILLING MACHINE. Daniel Shaw Waugh, Denver, Colo., assignor, by mesne assignments, to The Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,067,388; July 15, 1913.)

CRUSHERS—Mantle for Crushing Heads of Gyratory Rock Crushers and the Like. David Gavine Hunter, Simmer, and Thomas George Murton, Jack, Transvaal. (U. S. No. 1,066,277; July 1, 1913.)

TIN—A Process or Processes for the Purification or Recovery of Tin from Alloys or Mixtures Containing Smaller Quantities of Other Metals. P. Bergsoe, Copenhagen, Denmark. (Brit. No. 21,223 of 1912.)

EXCAVATING APPARATUS. James E. Redmond, Crandall, Ga., assignor of one-fourth to Eldridge L. Bates, Crandall, Ga., and one-fourth to Judge J. Bates, Etowah, Tenn. (U. S. No. 1,066,655; July 8, 1913.)

FLOTATION PROCESS—Ore Concentration. Edward Hoit Nutter, Berkeley, Calif., and Henry Lavers, Broken Hill, N. S. W., Australia, assignors to Minerals Separation, Ltd., London, England. (Cl. 83—85.) (U. S. No. 1,067,485, July 15, 1913.)

CONCENTRATION—Improvements in and Relating to Concentrating Apparatus for Separating Metals, Ores and Other Substances in Wet Recovery Processes. W. E. Cox, Lelant, and H. McGill Morris, St. Buryan, Cornwall. (Brit. No. 5975 of 1912.)

NICKEL—Method of Electrolytically Recovering Nickel. Horace L. Wells, New Haven, Conn., and Tom Cobb King, East Orange, N. J.; said Wells assignor to said King; Mary H. King executrix of said King, deceased. (U. S. No. 1,067,698; July 15, 1913.)

SULPHUR AND PHOSPHORUS IN IRON—Process of Removing Sulphur and Phosphorus from Iron and Similar Metals. Albert E. Greene, Chicago, Ill., assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. (U. S. No. 1,065,605; June 24, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—July 22

**Advantage to Nevada and Sierra Counties** will result from widening the gage of the Narrow Gage Railroad. A meeting by the stockholders of the road was recently held to increase the bonded indebtedness from $162,000 to $662,000. Application for this increase has been granted by the state railroad commission. The road extends from Colfax on the Southern Pacific to Nevada City and is the only railroad in Nevada County. Without good wagon roads into other sections of the county the railroad has not been of the greatest advantage to the more remote mining districts. With the broadening of the railroad and the building of a new road from Nevada City to Alleghany, connecting North Columbia and Moores Flat, it is believed that the impetus given to the mining industry in northern Nevada and southern Sierra counties will ultimately result in extending the railroad north from Nevada City.

**Exploration of the Copper Belt Extension** on the west side of Sacramento River in Shasta County, by the Mammoth Copper Co., is reported to have confirmed the results of diamond drilling by the Shasta Copper Exploration Co. The Exploration Co. did about 6000 ft. of diamond drilling in 1911 in the Stowell or Webster group of 23 claims on Spring Creek southwest of the Balaklala, covering the principal territory between the Balaklala mine and the Iron Mountain mine. The situation of the claim made the property attractive to the Balaklala Copper Co., but when the Coram plant was permanently closed down the attention of the Mammoth Copper Co. was attracted to the prospects. The diamond drilling was done under the management of M. E. Dittmar of Redding one of the largest stockholders in the Exploration Co. The Mammoth Copper Co. has a purchase option or bond on the claims and it is not unlikely that a purchase may be consummated provided continued development proves as satisfactory as it has been in the 800-ft. tunnel.

### BUTTE—July 24

**Opposition to Merger** of the Tuolumne with the Butte Main Range company is likely to develop and some of the local shareholders of Tuolumne are threatening litigation. The Tuolumne and Main Range are owned and controlled by allied interests.

**An Increase in Copper Production** may be made now that the copper mines of Michigan are closed down because of the strike, and according to reports they are likely to remain closed possibly for several months if both sides remain as firm in their determination not to yield as at present expressed. Then the Anaconda company may largely increase its production to keep the supply up to the demand. The Anaconda, the North Butte and East Butte can easily increase their outputs say by from 8,000,000 to 10,000,000 lb. per month and this in a large measure will make up for the loss in supply by the Lake companies. The mines of these three companies have large ore reserves and all the properties are in better condition now than ever before in their history. The Great Falls reduction plant can treat much more ore than is now being treated, the same thing is true of the Washoe at Anaconda and the East Butte plant. If production, however, does not increase considerably during the remaining five months of the year the Anaconda company will have produced about 25,000,000 lb. more of copper in 1912 than in 1913. For the six months ended June 30, 1913, production was a little more than 17,000,000 lb. less than for the same period of last year. There is talk among the Butte union members of $1 or possibly $2 assessment per month per member for the support of the Michigan strikers.

**A Purchase by the St. Paul Ry.** of the line from Butte to Great Falls from the Great Northern is a subject discussed here by railroad men who profess to have the information that negotiations to that end have been going on. The chief revenue of the Hill road from Butte to Great Falls comes from the ore-hauling contract with the Anaconda Copper Mining Co., and it is pretty well understood that the Anaconda company will not renew the contract, which has yet two or three years to run. The Chicago, Milwaukee & St. Paul Ry., which, through interlocking directorates, is closely allied to the Anaconda and Amalgamated companies, has been counted on to do the Great Falls ore hauling when the Great Northern contract expires, but the method has not been surmised until recently. The road will be electrified when taken over by the St. Paul. J. J. Hill is also expected to bring a new line into Butte by the time the Great Falls branch is sold. The talk among railroad men is that the Mondak cutoff, now being built toward Lewiston will be connected with the Billings & Northern and a line from the latter extended to Helena and on to Butte by the way of Whitehall and south to connect with the Gilmore & Pittsburgh road, which now runs from Armstead on the Oregon Short Line to Salmon City, Idaho, presumably a link in a Hill road to San Francisco. Preliminary surveying has been started on the proposed Butte, Wisdom & Pacific Ry., the first line being run from Divide to Ralston a distance of 27 miles, and it is expected that construction work will be begun before the close of this year.

### SALT LAKE—July 26

**The Alta District,** including Little and Big Cottonwood, is one of the oldest mining camps in Utah, the first ore discovery having been made in 1864. Data regarding the production and history of the camp have recently been collected. Alta is in the Wasatch Mountains, about 18 miles west of Salt Lake City, and 15 miles from the nearest railroad station at Sandy. Most of the ore is hauled by way of Little Cottonwood Cañon, although shipments are also made through Big Cottonwood. Mining is made difficult by the high altitude and heavy snowfall, the camp being snowed in for the greater part of the year. The melting snow hampers operations. Most of the ore mined in the past has come from above the water level and in order to reach to greater depth in the future, tunneling will probably be resorted to. The deepest shaft in the district is that at the Prince of Wales mine, which is 900 ft. deep. The production in silver, lead, copper and gold has been estimated at approximately $27,000,000. The Flagstaff, with an estimated production of $8,000,000, and the Emma, with an estimated production of $5,000,000, were the two largest producers. The other principal mines in the order of production were: the Vallejo & North Star, Prince of Wales, Grizzly, Maxfield, Columbus Consolidated, McKee & Resolution, City Rocks, Albion, Toledo, Savage & Montezuma, Nabob, Oxford & Geneva, Peruvian, etc. Among the properties producing at present are the Michigan-Utah, which includes the old Grizzly, City Rocks, and other properties, the Alta Consolidated, Columbus Extension and South Hecla. Development is being done in various parts of the district, and shipments of ore accumulated during the winter are being sent out.

### DULUTH—July 21

**An Extension of the Mesabi Range of Minnesota,** to the east, not shown on the U. S. Geological Survey maps, is noted by Geo. A. St. Clair, a mine owner of Duluth. This magnetic extension stretches from Township 60, Range 13, St. Louis County, to South Lake, in Cook County, a distance of 80 miles, where it crosses into Canada. It varies up to a mile in width as measured on the surface, but the available ores are low in grade, averaging 30 to 40%; scattered diamond drilling has shown a depth of 100 to 700 ft. Mr. St. Clair estimates several billion tons of this low-grade ore available for opencut mining, and believes that a sintering or metallizing process will be devised that will make the extraction profitable.

**The Cuyuna Range Will Ship 2 500,000 Tons of Ore in 1914,** compared with 1,000,000 tons this year as estimated by George H. Crosby of Duluth. The Pennington mine, which is being stripped by the operating company, Tod-Stambaugh & Co., will ship 100,000 tons this year, its initial year as a shipper, and should ship 500,000 tons next year. The Pittsburgh Steel Ore Co.'s mine on the Cuyuna range will, it now appears, make a small shipment this year, and a heavy shipment next year. This is a stripping proposition also. The Cuyuna-Duluth Iron company, which is about to inaugurate shipments from its Ironton shaft, will sink another shaft, on its Federal property, and will produce from two shafts during the coming winter for 1914 shipments. The Cuyuna-Mille Lacs mine, a producer of manganese ore, and of iron ore which carries a high average of manganese, will, it is expected, be shipping at the rate of 1000 tons per day by the latter part of August. The ore production at present is about 500 tons per day. The [illegible] Iron & Steel company reports high-grade iron ore at a depth of 130 ft. on its No. 2 property at a distance of 300 ft. east of the regular drilling. It was on this property that high-grade iron ore was developed between 495 and 600 ft., a few weeks ago. Concentrators are to be established at the Thompson mine of the Inland Steel at Crosby, and at the Pittsburgh Steel Ore mine at Riverton. Ground will be broken for stripping the Thompson in a few days.

### MARQUETTE—July 26

**A Development Record** has been established by Pickands, Mather & Co. at the Bengal mine at Iron River, Menominee range. Development work started only last autumn, the property has entered the list of shippers. Since the mine eventually will be one of the heaviest producers in the district, it is expensively equipped. All the buildings are of brick and steel, modern in every respect. The steel headframe is one of the largest on the range. It is 105 ft. high and is provided with a No. 7½ ore crusher. Pickands, Mather & Co. are shipping large tonnages from the Baltic and Caspian mines at Iron River. The Zimmerman property of the Spring Valley Mining Co. also is making a good record in this particular. But little work is in progress in the Michigamme district, at the western end of the Menominee range, although it was expected that there would be 200 men employed by this time; not more than 25 men are at work. The mines in the field are the Ohio and Portland of the Rogers-Brown interests and the Imperial of the Cleveland-Cliffs Iron Co. Extensive improvements have been made in the last year and the mines are in condition to operate on a larger scale than heretofore; but it appears there is small demand for the limonite ore produced in the district.

### NEGAUNEE—July 24

**Mine-Tax Protests Continue** from mining companies, which believe that their properties are assessed too high. On the Marquette range the Jones & Laughlin agent has asked that the valuation of the famous old Lake Angeline mine be reduced from $150,000 to $100,000, stating that not over 100,000 tons of ore is left in the mine and that the cost of extraction is high. The Cleveland-Cliffs and Oliver companies recently made formal protests on valuations of their mines and will probably continue their objections later. At Ishpeming the Cleveland-Cliffs is assessed $2,925,000 on the Hard Ore and Lake mines, $2,316,000 on the Cliffs shafts, and $149,000 on the old Salisbury mine; the Oliver is assessed $3,645,000 on Sec. 16 mine and $894,000 on the old Lake Superior Hard Ore.

**Payment of Employees Twice a Month,** in accordance with the new state law, is being prepared for by the mining companies. The custom in the past has been to pay once a month, about the fifteenth or twentieth, for the previous month's labor. The new law also specifies that not more than 15 days shall elapse after a period of labor is completed before payment is made. The larger mining companies will probably pay between the tenth and the fifteenth and again between the twenty-fifth and thirtieth. This change in pay days will affect the letting of contracts in underground work, as these have been let by the month in the past except that contracts for drifting at a certain rate per foot and for stoping at a certain rate per car have been usually arranged by the mining captain.

### LEAD—July 26

**Taxation of Mining Properties** has been a matter claiming the attention of Black Hills operators, since a decision was arrived at to place the valuation at a figure more nearly the actual worth. In the past the rule in this section has been to make the valuation at a low figure, but a state tax commission, created by the last legislature, has ordered large increases. The assessed valuation of the Homestake, typical of Black Hills properties, has been increased three-fold, and many items not previously listed have been added. For instance bullion on hand on July 1 was listed at $125,000; other properties have been increased in like proportion, and in some instances nonproductive property has been valued at an almost exorbitant figure. It is promised that the tax levy will be reduced far below former figures so that the gross taxes paid will be about the same as formerly, but as is always the case when a radical change is made in a system of taxation and an earnest effort put forth to ascertain the true value of taxable property, much dissatisfaction is expressed.

### JOPLIN—July 26

**Suit against Thomas Coyne,** of Webb City, has been filed in the Joplin Federal court by the Consolidated Mines Selection Co., of London, which seeks to recover $133,000 from its vendor from whom it purchased the Mary C. mine at Thoms Station in 1912 for the highest sale price paid for a single mine in the district. The petition to the court alleges misrepresentation of the property and asserts that the value of the property really did not exceed $10,000. Amos D. Hatton, of Webb City, and E. St. George Noble, of Joplin, were also named in the petition as being parties in the alleged conspiracy to "sell the mine under fraudulent representations." According to the court petition the company paid $135,000 for the lease and mill. The Mary C. mine was at one time the greatest producer in the district and some record outputs were made. The sale was made to the corporation after several weeks of exhaustive examination by engineers in the employ of the buyers. The petition to the court alleges that the mine's ore was made to appear richer than it really was and that cracks on the surface indicating caving ground were filled with tailings to deceive the agents of the company. The suit will be tried at the January term of court.

**The Passing of Sheet Ground Mining** is the most prominent feature of change in the mining industry of Webb City, the month of July seeing the closing down of five of the largest and heretofore steadiest producers in the north Webb City camp. Their closing down is permanent as in most instances the ground is entirely cut out or all the ground that is worth working is gone. The previous month had noted the closing down of several properties in that field, and July shows a cut in the shipments of ores from that camp. From a record of 4,000,000 lb. per week and even as high as 6,000,000 lb. some weeks the decline has brought the weekly tonnage down to 3,000,000 lb. with the certainty of a further decline before the year ends. From first place as a producer of ore, Webb City may have to yield to Joplin within another year or two. Already several weeks have shown the Joplin output greater than that of Webb City, a condition that has not prevailed for a number of years previously. Two of the mining companies that have been mining in that field have changed their activities to other parts of the district and one of them, the Underwriters Land Co., has already developed a property in the Joplin camp that is rapidly taking the place of its former mines, the Golden Glow and the Yellow Dog mines at Webb City, in the tonnage of ore shipped each week. The new property is known as the Priscilla mine and is in what is termed the West Joplin sheet ground area. Besides this mine the company has drilled a large area and is now sinking two other shafts with the expectation of operating two more mills by the end of the year. It will be seen from this that the production lost at Webb City is being made up at Joplin. The Danglade companies are changing their operations to the Thoms Station camp and will augment their output from new mines in that field before the end of the year.

### SPOKANE—July 22

**The Erection of a Smelting Plant in the New Hazelton District, B. C.,** the feasibility of which is being investigated by engineering representatives of English capitalists, according to a statement attributed to F. C. McKinnon, will be advantageous to Spokane operators engaged in the development there of lead-silver and copper properties. Paying $11.50 per ton for the transportation and treatment of their ore, the Spokane operators anticipate a cut of 50% on these charges with a plant at hand. The English corporation has invested a large sum in the development of the Hudson Bay mine, on Hudson Bay Mountain, 30 miles south of New Hazelton. Favorably impressed with it's earnestness, the Grand Trunk Pacific has sent engineers into the field to survey a route to the property.

### CORDOVA, ALASKA—July 9

**The Bering River Coal Test** is being discussed by the people of southwestern Alaska because of the apparent failure of the government's expedition to bring out the 800 tons mined last year for experimental purposes. It seems that the "Maryland" which is now at the mouth of the Bering River will wait there for many months before the coal can be brought down. Dr. Downing, who is in charge of the expedition to bring the coal from Stillwater to open navigation, is still at the mouth of the Bering River with his $30,000 fleet of specially built lighters. He contemplates dredging a channel as the lighters draw more water than the depth of the river. Experienced mining men in this district say that if the Navy wanted the coal to make a steam test it could have been delivered and now waiting for the warship for less than half what the lighters cost. The opinion here is that Dr. Downing stands as much chance of getting the coal down the river this summer as a transportation man would have of taking the appendix from an army mule without the assistance of a veterinary. So far the 800 tons have cost the government $100,000 and the coal is still at the mines.

# THE MINING NEWS

## ALASKA

GOLD FROM NOME AND ST. MICHAELS was received at Seattle July 17, having been brought in on the S.S. "Senator," the shipment being worth about $700,000, and making the receipts at the Assay Office since July 1 more than $1,000,000, a gain over the same period of last year.

SHORTAGE OF WATER ON SEWARD PENINSULA is so serious that the output of gold for the year may be appreciably affected. In addition to this the frost last winter penetrated so deeply into the ground that it is thawing slowly, delaying the progress of the dredges; this condition prevails in all parts of the peninsula.

A STRIKE ON THE SUSHANNA was recently made and is causing much excitement, as it promises to develop into the most important discovery since the Klondike. It is reported that gravel containing from 75c. to $5 per pan is being washed and that two men using crude appliances washed out $2500 worth of gold in one day. Bedrock is found from 4 to 5 ft. below surface. Pay has also been found on Bonanza, Eldorado and other tributaries of the Sushanna River. Many prospectors are going to the district where laborers are now receiving $12 per day.

CONSTRUCTION OF TRAILS AND ROADS is desired by nearly every district in Alaska. Colonel Richardson, president of the Alaska road commission, states that requests for such trails and roads have been made to such an extent that an expenditure of $2,000,000 would have to be made to satisfy all the demands. These requests have been considered by the board consisting of Colonel Richardson, Lieutenant Edgerton and Lieutenant Weeks, and they have found them meritorious, but are unable to comply with the requests because of the lack of funds. Lieutenant Edgerton states that with an appropriation of $2,000,000 all the roads requested could be built and kept up for a period of three years. The work would cover only those roads that are justified by the development work done in the different camps.

ALASKA TREADWELL (Douglas)—In June 74,900 tons of ore yielded bullion and concentrate worth $208,407 or $2.81 per ton, $109,375 being the estimated net profit.

ALASKA MEXICAN (Douglas)—In June 18,207 tons of ore yielded $51,254 worth of bullion and concentrate, or at the rate of $2.84 per ton, $25,350 being the estimated net profit.

RAINBOW (Fairbanks)—The Straub mill, erected last winter, having proved unsatisfactory, it is planned to install a Joshua Hendy five-stamp battery. Negotiations are pending for the purchase of a battery from the Chena Milling, Smelting & Refining Co. This mill was built at Chena in 1910 to do custom work, but, owing to the high cost of transporting ore from the mines to the mill, it has been idle most of the time.

RUSH & BROWN (Kasaan)—Work on the winze to the third level has been delayed and has now been stopped at a depth of 56 ft., because of the nonarrival of a new boiler. Drifting and stoping is being continued on the second level from which 900 tons of ore have been broken from a new oreshoot and shipped to Tacoma.

## ARIZONA

### Cochise County

LEADVILLE (Courtland)—All the deals on this property that have been made by Fuller & Neer have been called off and the general manager, W. W. Holmes, is attending to all matters pertaining to the mine.

### Gila County

MIAMI COPPER (Miami)—Excellent progress is being made in the work of reopening the northwest orebody affected by the April cave-in. The Captain shaft is rapidly being put in shape and the tramming level is being carried into that territory for extraction of Captain ore.

INSPIRATION CONSOLIDATED (Miami)—At the millsite considerable preliminary work is in progress, but the work of putting in concrete will not begin for a few weeks. Cement is arriving at the rate of one carload per day, and iron for reinforcement is being delivered at the concentrator site.

INSPIRATION EXTENSION (Miami)—The shaft has been started, the contract for the first 100 ft. having been awarded. The new development company's equipment consists of a 25-hp. gasoline hoist and accessories. A small compressor to run light drills will be installed in the near future. The shaft lies a short distance northwest of the main east and west shafts of the Inspiration Consolidated. The shaft has been started in schist of the same character as that found in Consolidated ground.

### Mohave County

GOLD ROAD (Gold Road)—A recent weekly shipment of bullion from this property was valued at $20,000.

KEYSTONE (Mineral Park)—This property has been unwatered, and it is expected that sinking to the 500-ft. level will soon be started.

GOLCONDA (Golconda)—The timbering and enlarging of the shaft on this property has just been completed from the 400- to the 200-ft. level, and is progressing rapidly from the 200-ft. level to the surface. There is a large amount of ore on all the levels opened and also in the Prosperity tunnel. Within six weeks this property will probably resume shipments of its zinc ore to the Oklahoma smelters.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—The annual stockholders' meeting of this company was recently held. At the same time the mill was started for a preliminary trial of the machinery. Due to defects in the concrete work, it was found that the foundations of the concentrating tables and crushers would have to be replaced. This work is progressing rapidly. The steel headframe is at Yucca awaiting shipment to the mine, and an electric hoist and large compressor are being installed at the main shaft.

NEVADA-ARIZONA MINES CO. (Hackberry)—This company is endeavoring to bring its property in the Music Mountains to the producing stage at the earliest possible date. Due to the long drought this year, there is a shortage of water for milling, but it is expected that a sufficient supply for all purposes can be developed. A large block of ore is in sight on the Lucknow and Roosevelt claims. The stope in the Roosevelt tunnel shows 3 ft. of good milling ore. Samples of this ore will be shipped to Denver and Los Angeles for mill tests, and a cyanide test will be made by R. C. Jacobson, of Kingman. The mill is nearly completed.

### Pinal County

CALUMET & ARIZONA (Superior)—The shaft is now more than 500 ft. deep, and is making about 6000 gal. of water per 24 hr. A pump station is being cut at the 500-ft. level and a pump will be installed. The main working tunnel is about 1000 ft. long, and stringers of carbonate and sulphide ore have been passed through. A 15-drill compressor may be installed in the near future. Thomas Ryan, diamond-drill contractor, who has been drilling the Magma property for several months, may drill 1500 ft. on the property.

MAGMA COPPER CO. (Superior)—Because of the large amount of water and comparatively small amount of power available, work has been held back during the last few months, but such work as has been done has been satisfactory, and there is now an excellent showing of ore in both the 650- and 800-ft. levels east. When the power line from Roosevelt via Miami is completed the Magma will have ample power and development work will proceed more rapidly, and within the next few months construction of a concentrator will begin. It is said that the company will begin purchasing mill equipment within 60 days. Considerable equipment has already been ordered to be delivered at the mine to be installed in time to begin operation when the transmission line is completed. Three transformers for the substation to reduce from 45,000 to 2200 volts, three transformers to reduce the voltage from 2200 to 440 for the mine pumps, three vertical Aldrich pumps to be driven by 75-hp. motors, a 225-hp. motor to drive the compressors, and considerable auxiliary machinery, has been ordered. The Magma is shipping the usual amount of high-grade copper ore to Florence by team, thence by rail to the El Paso smelters. About 500 ft. of diamond drilling remains to be done by contract. Ore has been encountered in all of the holes drilled.

## CALIFORNIA

### San Francisco

"BORAX SMITH" may be declared an involuntary bankrupt, four creditors with claims amounting to $155,000 having filed a petition in the federal court at San Francisco. The petition declared that prior to May 5, when a committee was appointed to act as trustees in managing F. M. Smith's affairs, he conveyed without money consideration properties valued at $1,000,000 to the Mercantile Trust Co., to B. F. Edwards, and to his wife, at a time when he was insolvent. These transfers, the complaint alleged, constituted acts in bankruptcy.

### Amador County

CENTRAL EUREKA (Sutter Creek)—An assessment of 2½c. per share on the capital stock has been levied.

LITTLE ILLINOIS—Good ore disclosed in the west vein has induced the company to arrange for the installation of a new 10-stamp mill.

GRILLO (Volcano)—Twenty men are employed at this gravel mine, and are taking out an average of $300 per day. The channel is a recent discovery. The mine is being worked by Grillo Brothers, but it is bonded to San Francisco men at the purchase price of $8000. One-half the amount was paid on July 1. The formation is a capped river channel and is close to the town of Volcano.

### Calaveras County

DOLLING (Angels)—The mine is being unwatered and preparations made for resumption of mining and milling. This mine for a time kept a 40-stamp mill in operation. The mill was closed down last year and development of new orebodies undertaken. Good ore was found in a winze sunk from the 400-ft. level and another good vein was also found in a drift from the same level. Some difficulty other than lack of ore development caused the mine to close down during which time it has made a large amount of water.

### Modoc County

HESS (Adin)—The new 10-stamp mill is completed and the stamps will begin dropping immediately. A large tonnage of $5 ore has been blocked out.

### Nevada County

ZEIBRIGHT (Towle)—A new drift will be driven about 350 ft. above the present tunnel workings. The mill will be partly rebuilt this summer.

ARCTIC (Washington)—A new concrete power house is being built and a 600-kw. turbine will be installed. A 5-ton motor truck is used to transport material from Emigrant Gap, 20 miles distant.

GASTON (Gaston)—The timbers that are to be used in building the new mill are now being sawed at the sawmill. The new mill will be 1500 ft. lower than the present mill, and 10 stamps of the old 40-stamp mill equipment will be used in the new mill.

OUSTOMAH (Nevada City)—New electric equipment and a new compresor have been installed. Four stopes are being worked, the ore containing heavy sulphides. The mill was started July 6. The shaft is 1050 ft. deep and will be sunk to 1500 ft. to get under the oreshoots. An 8-in. piston pump on the 600-ft. level and a 9-in. bucket pump on the 900 are used for drainage.

### Plumas County

IN THE NELSON DISTRICT, placer mining has been temporarily suspended at some of the mines owing to a shortage of water.

### Tuolumne County

BLACK OAK (Soulsbyville)—The trial of the suit to determine the rate of interest to be paid by Charles T. Knox, who purchased and developed the mine, was begun in the Superior Court at Stockton, July 17.

## COLORADO

### Clear Creek County

TERRIBLE—A force of 25 men is employed in cleaning out, repairing and retimbering the lower levels of this mine, preparatory to the resumption of active operations.

MORNING STAR (Ames)—Recent development by this company has been encouraging. The Sunlight vein is being developed by a drift driven with air drills. The compressor plant is operated by water power. The Morning Star and Sunshine lodes have been leased for a period of two years. The lessees will commence operations on these veins in the near future.

### Conejos County

FROM THE PLATORO DISTRICT a shipment of a 10-ton lot of rich ore from the Miser tunnel has been sent to the Pueblo smelting plant. The Miser mine is the property of the Guadaloupe Consolidated Mining Co.

### Gilpin County

SECURITY PLACER (Black Hawk)—A steam shovel capable of digging 1000 cu.yd. per day is to be installed on these properties on which John Cantlon and C. K. Berryman have a three-years lease.

### Lake County

MACHINERY AT THE ARKANSAS VALLEY WORKS is now largely operated electrically and the Colorado Power Co. is building a new line from the substation in California gulch to the plant.

THE EXTENSION OF THE GOLD BELT, it is reported from Leadville, is being proved up as far as Red Mountain, 6 miles south of the Mt. Champion group, by prospectors who are working in great numbers over the low divide between Lackawanna Gulch and Hayden Gulch and Echo Cañon, where new discoveries have recently been made. The Fidelity mine on Bull Hill is said to be proving one of the richest mines in the district.

STARS CONSOLIDATED MINING CO. (Leadville)—The Morning and Evening Star groups operating under the foregoing company name are paying monthly dividends, the output being nearly 4000 tons per month, chiefly carbonate of zinc carrying silver.

### San Juan Region

FRISCO TUNNEL CO. (Animas Forks)—An important strike of rich, silver-bearing, gray copper ore has been made in the Red Cloud vein in the Bagley tunnel 900 ft. below the outcrop.

### Summit County

WELLINGTON (Breckenridge)—In the half yearly financial statement which accompanied the July dividend of $50,000, the directors state that the wet mill will remain shut down till the price of zinc ore warrants its further operation. The No. 2 mill or magnetic separator is treating the "middlings" made by the wet mill prior to the closing down, and three carloads of concentrates were recently shipped. From Dec. 1, 1912 to May 1, 1913 the company sold $164,868 worth of ore.

### Teller County

CRIPPLE CREEK DIVIDENDS in July include $60,000 declared by the Portland, $30,000 by the Golden Cycle, $45,000 by the Vindicator and $26,800 by the Mary McKinney. The Elkton will pay its usual quarterly dividend of $50,000 in August.

FREE COINAGE (Altman)—The new mill of 50 tons daily capacity is being built and will be ready for operation in about 30 days.

MIDGET-BONANZA (Cripple Creek)—The Beckof Leasing Co. of St. Louis, of which J. Dopke is president and William Allen superintendent, has taken the Midget shaft under lease and will develop the property extensively, and lease to local men. The mine is on Gold Hill.

AJAX (Victor)—The mill known as the Colburn mill, is now running satisfactorily and treating about 250 tons per day, part being from the dump and the rest mill dirt from the mine where the company is working two machines in ore. The lessees will now produce about four carloads per day and the July output will show an increase over June.

## IDAHO

### Cœur d'Alene District

GREEN HILL-CLEVELAND VS. HEADLIGHT—The Green Hill-Cleveland Co. is seeking an injunction to prevent the Headlight company from doing further work on the plaintiffs' ground; the right to survey the Headlight workings is also asked.

NATIONAL (Mullan)—Tests are being made on the ore in order that a flowsheet for a 500-ton concentrator may be drawn. As soon as this work is completed building the mill will be started. A tramway one mile in length is being planned to carry the ore from the mine to the mill.

FRISCO (Gem)—The mine after several months of work, has been unwatered and is now about in condition for resumption of mining. Although the mine has been idle since 1908, the timbers were found to be in good condition. As soon as the drifts are cleaned development work will be started.

HYPOTHEEK (Kingston)—Development work is now confined to the 700-ft. level, where good ore is being encountered. The 40-ton mill is working at capacity and is producing 6 tons of lead concentrates daily. It is now planned to electrify the hoist and build a large reservoir for mill water.

BLACK BEAR (Black Bear)—The ore in the raise from the No. 3 tunnel is found to be of better grade as the work progresses and the vein is found to widen. The raise now shows 2½ ft. of solid lead-zinc ore. In the raise from the No. 2 tunnel there is 6 ft. of stoping ore. A total of more than 5000 ft. of work has been done on the property of which 2500 ft. is a crosscut and 1200 ft. a drift on the vein. The face of the drift is 2000 ft. below the surface; ore has been encountered 1200 ft. higher up. A winze is being sunk to meet the raise from the lower tunnel. The vein is 25 ft. wide where it has been crosscut, and it carries some exceptionally rich zinc ore.

REX MINING CO. (Wallace)—Spokane stockholders in this company, which owns the Rex mine, formerly called the Sixteen to One, on Nine-Mile Creek, have submitted a proposition to the other shareholders to subscribe a fund of $30,000, as a loan to the company to finance continuation of development of the property, which has been closed since the leasing company suspended operations about six months ago. The notice of the proposal states that many of the stockholders favor a continuation of development where the lessees quit and elsewhere in the mine. There is no ore in sight and little money in the treasury, and it has been suggested that the stockholders voluntarily contribute enough to sink the main shaft as much deeper as the directors deem advisable, and to do considerable crosscutting. It is estimated that this work will require about $30,000. Accompanying the announcement is a call for the annual meeting, which was appointed to be held at Augusta, Maine, Aug. 1, where plans were to be formulated to develop the mine further or to dismantle it.

## MICHIGAN

### Iron

ERIE ORE CO. (Randville)—The Erie Ore Co., which succeeded to the holdings of the Groveland Mining Co., in the Randville district, is employing about 30 men in test-pitting, trenching and surface exploratory work. Some ore has been located close to the surface but it is of low grade and it would not pay to mine it unless it could be taken out with steam shovels. The Breitung company has some lands adjoining that they explored several years ago; the ore located was low in grade but may be used at a later date.

## MINNESOTA

### Cuyuna Range

NEW DOCKS AT DULUTH and new grain elevators to cost $2,000,000 will, it is reported, be built by the Canadian Northern Ry. One of the docks will be designed to ship iron ore. Sooner or later the Canadian Northern will be handling some iron ore, for the main line to Duluth crosses the Mesabi range, and it is expected that the company will extend its branch from Port Arthur across the Vermilion to a connection with the main line. This road will be completed between Montreal and Vancouver within 12 months, and after that is accomplished the company will give more attention to feeders.

JONES & LAUGHLIN (Crosby)—This company has leased an iron property near the Pennington mine, which is now being stripped, and it is expected that the newly acquired mine will also be stripped.

### Mesabi Range

KELLOGG (Virginia)—This mine controlled by the Tesora Mining Co., of which Capt. M. L. Fay, of Duluth is president, has delivered a lease of the property to Pickands, Mather & Co. The lease runs for 14 years, and the minimum royalty is $350,000 per year. The royalty is $1 per ton, and the ore is a fine grade of Bessemer, of good structure and uniform. The lease formerly was held by the New York State Steel Co., but that company abandoned it last April.

## MISSOURI

### Joplin District

YELLOW DOG (Webb City)—This once famous mill is being dismantled to be erected by the Comanche Mining Co. on a 20-acre lease of the Center Creek Mining Co.

AGENT (Carthage)—C. C. Playter & Co., of Joplin, has made its initial output from this mine, after many weeks spent at draining the property. It formerly was known as the Cornell and is on the Sampson land.

ELENITA MINING CO. (Galena)—Deeper mining is to be done by this company, which plans to sink its shaft to a depth of 165 ft. There is said to be some good ore in the upper workings, which will be mined while sinking continues.

LOCKPORT (Galena)—A record production of zinc ore with a horse-hoisting outfit was made in a recent week by Murphy & Bramble, who sold more than $3000 worth of ore. The ore now averages about 10% and carries some lead.

GRAY (Joplin)—Construction work on a 200-ton mill has been begun by A. F. Dexter & Co., which has a 16-ft. face of zinc ore in two drifts at a depth of 160 ft. Several drill holes were put down and ore is said to have been found in each.

MORGAN & CO. (Joplin)—Silicate that is bringing top market prices is being mined by this company at 44 ft. Large chunks of the ore, encrusted with galena and blende, have been taken out. The land is owned by E. G. Doane & Son, of Joplin.

YOUNG & SERGEANT (Galena)—This company is conducting a drilling campaign, with expectations of finding zinc at a depth of about 100 ft. One of the holes is near the Scarlet Kid mine, the largest operating plant on the ground, known as the Foster tract.

GRASSELLI CHEMICAL CO. (Stotts City)—It is reported that two drills are being used in prospecting a large acreage in this old camp. The advent of this company in the Stotts City camp has caused the entrance of four other drills and the prospecting will cover a large acreage of virgin territory.

ARCO (Joplin)—This company has just started its new mill on a 23-acre lease of the Connor land, in the western part of the district, after a shutdown to permit drilling for water. A hole was put down in the shaft and water was encountered. According to D. M. Sayers, manager, an extensive orebody is available.

CHAPMAN & DODGE (Webb City)—The Wyatt mines, on the Dixon land, at Thomas Station, were recently purchased, but according to the contracts of sale the purchasers will wait a stipulated time before taking charge. Good lead ore is being hoisted, but the new owners will mine in the lower levels. The Captain E. mine is on the same tract and is producing both zinc and lead.

SCHIFFERDECKER LAND (Joplin)—The well known 400-acre tract east of Joplin, owned by Charles Schifferdecker, has been leased by W. G. Stevens and the tenth drill hole is now being sunk. The results of the drilling insure the early sinking of two shafts for the development of zinc ore while in nearly every hole put down shallow lead ore was found. The shallow deposits will be subleased to small operators which will probably result in a large lead-ore production by early autumn.

BIG IRISHMAN (Thoms Station)—Weekly turn-ins now are being made at this mine, a new plant having been placed in operation only a short time ago. It is owned by H. C. Moses, Victor Grieb, Frank Logan, Caro Stewart and Frank Williams, of Carthage, and two Kansas City men. A tramway is to be erected from the east shaft to the mill, in order that the ore may be sent direct to the concentrating plant. The mineral extends from the 126-ft. level to the 155-ft. level. The roof of the present drift is at the 126-ft. level, and a high mill recovery is made on ore from the main shafts. Ten days' operation of the plant produced two carloads of blende and 20,000 lb. of galena.

## MONTANA

### Butte District

GENEVIEVE (Butte)—The Butte & Great Falls Mining Co. which is operating this claim at the head of Dixie Gulch, three miles north of Butte, has sunk a shaft to the 200-ft. level and is now cutting a sump preparatory to crosscutting at this depth. It is believed that the Genevieve vein, which outcrops on the surface, will be reached 40 ft. from the shaft. A steam hoist capable of sinking to a depth of 500 ft. has been installed, and a two-drill air-compressor is being used.

COLORADO (Butte)—The Davis-Daly company operating this property in the southern part of the Butte district, sustained a loss of $88,939 during the year ended June 1. Up to the last few months, however, the company has shipped practically no ore, but has been under a heavy expense in doing development work. Good ore was struck a few months ago and regular shipments have been made since then, the amount having been gradually increased until at present an average of more than 200 tons of ore is being mined and shipped daily.

EAST BUTTE (Butte)—A production of about 2,225,000 lb. of copper per month is being maintained in spite of the improvements being made to the smelting plant. These improvements will be completed in about another month and then the company will be in a position to increase the production if necessary by at least 500,000 lb. per month. The development work is being done on an extensive scale and the ore reserves are considerably larger now than at any time in the history of the property.

NORTH BUTTE (Butte)—In sinking the Granite Mountain shaft the 2500-ft. point has been passed and at the present rate of progress it is estimated that a depth of 2800 ft. will be reached by the middle of October. Then a sump will be sunk and connection made with the 2800-ft. level of the Speculator shaft. It has not yet been determined when the Speculator shaft will be closed for retimbering and all the ore hoisted through the Granite Mountain shaft, but it is believed that the Speculator shaft will be operated as long as it remains in a perfectly safe condition.

LEXINGTON (Butte)—It has been reported that John D. Ryan and Eastern men are preparing to reopen this mine, the work to begin probably in August. The mine was formerly owned by the La France Copper Co. but was sold to Eastern men several months ago at sheriff's sale. The work of obtaining title to certain of the claims and fractions has been completed and the new owners are now free to proceed. The mine was worked originally for silver, but the lower levels contain large shoots of zinc ore, and with the improved appliances now in use for the recovery of zinc, the mine should again become a producer.

### Missoula County

IRON MOUNTAIN (Missoula)—It is reported that a fine body of ore has been opened and it is said that before another month the company will not only be making operating expenses but will also be putting some money into the treasury. Since the installation of the electric plant the company has been able to reduce operating expenses.

## NEVADA

### Comstock Lode

CALEDONIA (Virginia City)—The new 75-hp. Fairbanks-Morse hoisting motor has been installed at the New York shaft, which is now being repaired, preparatory to opening the old workings to gain a working course through to the Caledonia mine adjoining.

MONTE CRISTO (Virginia City)—Milling of ore has been resumed at this property under lease to the Mexican company, and shipments are being made to the Mexican mill and to the mill at the Monte Cristo mine. It is planned to maintain a daily shipment of 125 tons.

SUTRO TUNNEL (Virginia City)—Work will soon be started on the drainway in the south lateral tunnel from the Ward shaft connection to the Crown Point drift, to be used when the pumps are installed in the joint incline in the Sturges group of mines in Gold Hill. It is planned to start pumping early in the autumn in that section to unwater the Crown Point, Belcher and Yellow Jacket mines to the 1800-ft. level.

WEST COMSTOCK MINING & LEASING CO. (Virginia City)—Los Angeles men interested in this company, operating on the Golden Gate claims at Jumbo, five miles from Virginia City, paid a visit to that camp recently. From a shaft on the Golden Gate claim, an east crosscut on the 200-ft. level, has encountered a vein, 25 ft. wide. Driving north and south on the vein has shown milling-grade ore, and 500 tons has been mined. Work has been stopped at the Syene shaft of the company, and all work will be concentrated on the Golden Gate oreshoot. It is reported that a mill will be built if further development work justifies it. Pumps have been placed in the Golden Gate shaft to care for a flow of water that appeared upon cutting the vein.

### Humboldt County

A GOLD STRIKE has been made in Sacramento cañon, near Rochester. The oreshoot is flat, wide, and assays $7.50 over the entire width.

NEVADA SHORT LINE R.R. (Rochester)—A 6-cylinder, 60-hp. gasoline motor has been ordered for this road. Dump cars and flat cars have already been delivered.

EASTERN STAR (Gold Circle)—The shaft, which is sunk in the hanging wall, is now down 270 ft. It is equipped with a cornish pump of 500 ft. capacity. Drifting north and south on both the second and third levels is in progress. The oreshoot is 6 to 8 ft. wide and the ore is of good milling grade. On the second level narrow quartz stringers show free gold, silver and argentite. A shipment of ore will be made in order to determine the best treatment process, the directors having decided to erect a mill this summer. The mine is now making enough water to supply 20 stamps. A 10-stamp unit will be erected first, with a tube mill for regrinding, and a cyanide plant.

### Lyon County

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended July 17, 1913, were as follows: From Mason Valley Mines Co., 1930 tons; from Nevada-Douglas, 1132 tons; from other mines, 1299 tons; total, 4361, or a daily average of 623 tons. During the same week six cars of matte were shipped.

NEVADA-DOUGLAS COPPER CO. (Ludwig)—This company will trade its 5000 shares in the Nevada Copper Belt R.R. to shareholders of the Nevada-Douglas Copper Co., at the rate of one share of railroad stock for 10 shares of the mining stock. The railroad bonds, which the company held, have been sold at par. The reason given for this exchange is that laws already existing and which may be enacted make this exchange desirable, also to place the company above any criticism, either public or private, for holding stock in a railroad.

### Mineral County

AURORA (Hudson)—Work on the 40-stamp mill is being hastened as much as possible by the Hughes Construction Co. Auto tracks and teams are hauling the supplies from Hudson, the nearest railroad point.

### Nye County

JUMPING JACK (Manhattan)—A recent mill test has proved the ore to be of commercial grade if treated on a large scale. A large tonnage of ore is available.

MANHATTAN-DEXTER (Manhattan)—A No. 8 Cameron sinking pump has been lowered to water level in the 500-ft. working shaft and unwatering of the main workings has begun. After this is completed a Goulds pump will be installed and mining on the lower levels will commence.

TONOPAH NORTH STAR (Tonopah)—Stock certificates of this company have been forged and tampered with by clever forgers operating in New York, certificates for 100 shares were raised to 1000 shares and in other cases the shares were reproduced at their face value. It is said that New York brokers were caught for 20,000 shares. The company maintains no transfer office in New York and transfers are delayed because of the time required for certificates to reach Eastern purchasers from the San Francisco office; this facilitated the forgeries. A messenger sent to deliver a check to C. J. Wells, in whose name the forged securities were sold, was accompanied by a detective; they met a man who took the check, who proving quicker witted than the detective, escaped in a taxi. The directors have now agreed to transfer all shares free of charge until Sept. 1, in order to permit all certificates to pass through the office for examination.

## NEW MEXICO

### Grant County

SAVANNA COPPER (Pinas Altos)—Joe Franton, working a sublease from Bell & Wright, lessees on the Savanna property near Pinas Altos, struck some high-grade ore and cleaned up $10,000 from shipments to El Paso during the last four weeks.

## UTAH

### Beaver County

MAJESTIC (Milford)—A shaft is to be sunk on the Hoosier Boy claims belonging to this company. It will be sunk to a depth of 200 ft., then crosscutting will be started to get under old workings, in the past productive of silver ore. The shaft will ultimately be sunk to a depth of 500 ft. For some time the company has been making shipments of copper ore from the old Hickory, averaging [illegible] tons daily.

MOSCOW (Moscow)—The sinking of a new two-compartment shaft has been started about 1600 ft. northeast of the present working shaft. The shaft is to reach a depth of 1000 ft., and will open ground into which oreshoots opened in old workings appear to extend on their dip. The ore has been followed almost to the 800-ft. level, and is found to be richer at depth. The Mammoth vein will be cut at 300 or 400 ft., and another vein is looked for at 500 ft. The new shaft will be about 5 miles from Lalo station, reducing the wagon haul by 3 miles.

### Juab County

TINTIC SHIPMENTS for the week ended July 18, were 157 cars.

EAGLE & BLUE BELL (Eureka)—This company is reported to be acquiring a controlling interest in the Victoria Consolidated.

IRON BLOSSOM (Eureka)—The recently declared dividend of $100,000 will be paid July 25. After payment, there will be, it is stated, $300,000 still in the treasury. The dividend rate is being maintained from ore shipments; nineteen cars were shipped the week ended July 18. An ore-bearing fissure paralleling the main fissure has been opened recently, and ore followed for 20 ft. The ore is silver-lead of good grade.

### Salt Lake County

A CLOUDBURST IN LOWER BINGHAM, July 23, was followed by a flood which wrecked several houses, but in which no life was lost. The track of the Bingham & Garfield Ry. was damaged and traffic was delayed for 24 hours.

OHIO COPPER (Bingham)—Two members have been added to the executive committee, making five in all, and including all of the New York directors. The grade of the ore mined is stated to have improved lately.

### Tooele County

INTERNATIONAL SMELTING & REFINING CO. (Tooele)—Three reverberatory furnaces at the Tooele plant are in blast, with four blast furnaces in operation at the lead plant also. A fifth lead furnace will be ready for operation in about 30 days.

## WASHINGTON

### Ferry County

KNOB HILL (Republic)—Further development has been planned for this property, reported to be one of the most profitable in the district.

SAN POIL CONSOLIDATED (Republic)—The corliss engine and other equipment recently installed at this mine are now in operation, greatly increasing the output.

### Stevens County

FAITHFUL-SURPRISE (Danville)—The Harper Consolidated Mines has taken an option on this property. Regular daily shipments are being made.

KNOB HILL (Republic)—Determination to build a financial reserve, which may reach $50,000 or $100,000, has been reached by the directors of the Knob Hill company. In addition to the high-grade shoot, which has been yielding a carload a week of ore averaging $100 net in gold per ton, the company would open for large yield the bodies of milling ore exposed on the three existing levels. The campaign for additional resources contemplates a descent by shaft for 500 ft. below the main tunnel level.

## WISCONSIN

### Platteville District

THE LARGE PRODUCERS of the district are: The East End with an output of 900 tons of concentrates per month; Winskill, 800 tons; Fields, 850 tons; Kennedy, 720; Cleveland, 630; Frontier, 555; Vinegar Hill, 360; Northwestern, 377; Federal 300 and Fox, 272 tons. The output of pyrites now runs from 2500 to 3000 tons per month, which goes to the acid plants near Chicago.

SPENSELY (Benton)—This mine is being unwatered with new pumping equipment.

BIG HANDLE (Shullsburg)—The open cut of this mine is being reworked for drybone.

LAWRENCE (Hazel Green)—The shaft is completed and now a new mill and power plant are to be built on the property.

RUSBECK (Cuba)—This, one of the earliest of the sheet ground mines, has been abandoned after 20 years of almost continuous operation.

SCRABBLE CREEK (Hazel Green)—The Cleveland company is operating this mine under lease, milling the ore in its mill which is on adjoining property.

MINERAL POINT ZINC CO. (Galena)—This company, the largest one operating in the district, is to move from Mineral Point to Galena at the south end of the district, where its largest producers are situated, including the old Black Jack which was recently acquired.

## CANADA

### British Columbia

STAR (Sandon)—This mine is shipping about a carload a week of high-grade silver-lead ore. Extensive development is going on for the purpose of opening up the orebody at deeper levels.

BRADSHAW—Work is proceeding on these claims and others near Hedley in the Similkameen, which were recently bonded by shareholders in the Nickel Plate. Three diamond drills are working continuously.

RED POINT AND RACE HORSE—These groups, 22 miles up the Kitsault River from Alice Arm in the Portland Canal district, have been bonded recently for the sum of $101,000, by T. F. Hopkins, of Seattle, who is said to represent Butte interests. The ore is a chalcopyrite, on the Red Point assaying from $2.50 to $11 per ton, and on the Race Horse from a few dollars up to $53 in gold, silver and copper as reported.

PORTLAND CANAL TUNNELS, LTD.—The tunnel being driven to tap the Glacier Creek vein series at depth is now in over 1500 ft. The drilling has been hard recently owing to the greenstones being silicified and mineralized with iron pyrite. It is probable, according to General Manager Elmendorf, that the face of the tunnel is approaching the contact with the Bitter Creek argillites. The average progress is more than 50 ft. per week. The vein series should be reached in another 500 ft. At present there are 24 men on the payroll.

### Ontario

RIGHT OF WAY (Cobalt)—The charter affecting this property, which was recently surrendered, was not the charter of the Right of Way Mines, Ltd., the present owners, but that of the old Right of Way Mining Co., Ltd., which was taken over by them four years ago.

WETTLAUFER (Silver Center)—A financial statement shows cash on hand on July 11, of $158,631, and silver in transit or at the mine of an estimated value of $60,000, making a total of $218,631. Development has not been satisfactory and a contract has been let for diamond drilling in the hope of picking up new veins.

NORTHERN CUSTOMS CONCENTRATOR (Cobalt)—This mill has been purchased by the group of Englishmen operating the Cobalt-Townsite, Casey Cobalt, and other mines, at a price stated to be $250,000. They take over the property Nov. 1. The Northern Customs Concentrator, Ltd., will build another 100-stamp mill as soon as possible.

DOME (South Porcupine)—The new water line to Porcupine Lake has been completed and arrangements have been made whereby the township may obtain water for fire-fighting purposes if necessary. During the month of June, the greatest monthly tonnage yet obtained was put through the mill and a new low record was established for costs.

SILVER CLIFF (Cobalt)—The Orion Realty & Investment Co., which is operating this mine, issued 65 pay checks for last month's wages to its employees. When presented for payment it was found that there were no funds. One of the men took out a warrant of attachment against the company under which a carload of concentrates valued at $11,000 was seized.

JUPITER (Aura Lake)—At the annual meeting June 26, it was shown that the Drummonds, of Montreal, paid $300,000 cash and 500,000 shares of stock for the property. In addition, there has been expended a total of $203,157. The balance sheet shows $40,841 cash on hand and 157,214 unissued shares in the treasury. These shares will be issued to meet the cost of the mill. On the main vein, there is an oreshoot 300 ft. long on the 300-ft. level. It is expected to mill about $15. No work is being done on the other vein at present.

## MEXICO

### Sonora

W. G. WOLF WAS KILLED, July 16, near the Creston-Colorado property, by Mexican outlaws. He was a mining engineer whose home was in El Paso, Texas.

MINNEAPOLIS COPPER CO. (Cumpas)—Another car of copper matte has been shipped to the Copper Queen plant and a car of high-grade crude ore is on the way.

TRANSVAAL COPPER CO. (Cumpas)—Work has been suspended for the time being until a deal that is now pending can be straightened out; then development will be continued.

SAN DIEGO (Nacozari)—J. M. Archuleta the owner has sunk a shaft 30 ft. to develop the vein which has increased from 6 to 18 in. of shipping ore; a carload of the ore is ready for shipment.

EL TEMBLOR (Esqueda)—W. L. Rynerson, who is operating under lease, has opened new ore in the hanging wall. The new vein ranges from 12 in. to 2 ft. in width and the ore is of much better grade than that which he has been working. This will about double his present output.

## SOUTH AFRICA

THE RAND STRIKE SITUATION threatens the closing of all the mines of the Rand, states a cable from London to the "Sun." The Federation of Trades has elected a secret strike committee with power to issue absolute orders. This committee has a scheme for a "scientific strike," that is, to start a strike at some distant place where there are no troops and few police, or to have damage done at a score of places simultaneously. Nothing more may be done for weeks, but the government will be put to continuous expense in safeguarding property in the meantime. Householders are laying in provisions and trade is stagnant. Merchants are ordering shipments of goods stopped. The police have found considerable seditious literature in the native tongue among the natives which refers to trouble breaking out among the "white tribes." The government mining authorities have completed a plan for marching off all the native laborers in the Rand, numbering 250,000, in case of a strike. They also suggest that in case of a strike no attempt be made to work the mines with strike breakers, but that the whole industry be practically shut down.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—July 30

The metal markets have shown more strength, but close disturbed and excited. Tin has been active and irregular.

### Copper, Tin, Lead and Zinc

**Copper**—Since our last report the market has experienced a sharp advance but this has not been quite so extensive as has been reported by the daily papers, which have reflected what producers have asked and would like to get rather than what they have got. Sales of electrolytic copper have been made up to 15c., delivered, usual terms, but all through the week there has been a rather wide range of price, some of the agencies having been cheaper sellers than others. Also certain of the small producers and some dealers have been cheap sellers throughout, apparently having had no great confidence in the advance and being desirous of realizing. The relapse in the London market on July 29, which is ascribed partly to bear sales and partly to realizing sales, also had a weakening effect. Since then first-hands have been offering copper at 14⅞@14¾c. delivered, usual terms, although the largest agencies have maintained their last price of 15c. The transactions of the week attained a fairly large volume, but not so large as in the previous week. They were made chiefly with European buyers, domestic buyers not yet having figured in the market to any great extent. Their continued abstention is considered to be a source of underlying strength. As an interesting side light upon the business, it is reported that American buyers, who have the option of several alternatives in settling for their purchases, ½% discount for cash, 30 days' time for payment, or allowance upon unexpired time at the rate of 6% per annum, have lately been to a considerable extent choosing the alternative of the full time allowed under the usual terms. This has caused some of the agencies to be more interested in the European sales than in American, in view of the present high rates for money.

But relatively little business in Lake copper has been reported to us. Such as we have heard of has been scarcely more than of a retail character. It is difficult to quote what is the real Lake market. We quote 15c., net cash, New York, than which it certainly is not higher, but this quotation is more or less nominal. In consequence of the strike the Lake companies have not been offering copper in any large way.

As a result of the buying movement of the last two weeks, producers are now comfortably booked for the next 60 days. In view of the small stocks on hand and the strike at the Lake Superior mines, which continues, the position of the metal is an exceedingly strong one. At the close, the market has fallen off somewhat, due to the reaction in standard copper, and Lake is quoted nominally 15c.; electrolytic in cakes, wirebars or ingots 14.60@14.80c.; casting copper is quoted nominally at 14.30@14.35c. as an average for the week.

The London market for standard copper was £65 10s. for spot and £65 12s. 6d. for three months on July 24, and it jumped £1 to £66 11s. 3d. and £66 12s. 6d. respectively, on July 25. On July 28, under large transactions, it advanced further, to £67 7s. 6d. for spot and £67 5s. for three months. On July 29, however, under realizing sales and some bear sales, the market dropped back to £65 15s. for spot and three months. It closes on July 30 at £66 for both positions.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 7388 long tons. Our special correspondent gives the exports from Baltimore at 2796 tons for the week.

**Tin**—The Far Eastern interests, which of late had not been very aggressive, appeared as fairly large sellers the latter part of last week. This had an unfavorable effect on the London market, which declined easily. Good orders from this side and prospects of an improvement in the American statistics helped the market this week and prices again became firm. Transactions in this market were on a satisfactory scale, but mostly for July delivery, in anticipation of the favorable statistics. On July 30, the market had one of its inexplicable abrupt declines, and closes weak at £180 for both spot and three months, and about 39⅝c. for August tin here.

Shipments of tin from the Straits for July were 5200 long tons, making total of 35,930 tons for the seven months ended July 31. This is an increase of 2864 tons over last year.

**Lead**—The market has been active and strong. The producers having taken considerable business, prices advanced on Tuesday, July 29, to 4.50c. New York, and 4.35c. St. Louis, at which they remain at the close. There is talk of a strike among the mines of southeastern Missouri.

The London market, due to the continued scarcity of supplies from Mexico, is very firm, and during the week it was as high as £21 5s. It closes at £21 for Spanish lead and £21 10s. for English.

**Spelter**—There has been a good demand, which has not been freely met. Higher prices have been paid, and at the close St. Louis is quoted at 5.25@5.30c.; New York, 5.40@

### DAILY PRICES OF METALS

### NEW YORK

| | | | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| July | Sterling Exchange | Silver | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 24 | 4.8675 | 59⅛ | 14½<br>@14¾ | 14.25<br>@14.35 | 40¼ | 4.35 | 4.20<br>@4.22½ | 5.25<br>@5.30 | 5.10<br>@5.15 |
| 25 | 4.8675 | 59 | 14¾<br>@15 | 14.30<br>@14.35 | 40¼ | 4.35 | 4.25<br>@4.27½ | 5.27½<br>@5.32½ | 5.12½<br>@5.17½ |
| 26 | 4.8675 | 59⅛ | 14¾<br>@15 | 14.55<br>@14.65 | 40¼ | 4.35 | 4.25<br>@4.27½ | 5.30<br>@5.35 | 5.15<br>@5.20 |
| 28 | 4.8675 | 59⅜ | 15 | 14.70<br>@14.80 | 40⅝ | 4.35 | 4.25<br>@4.27½ | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 29 | 4.8665 | 59⅝ | 15 | 14.60<br>@14.80 | 40¾ | 4.50 | 4.35 | 5.35<br>@5.45 | 5.20<br>@5.30 |
| 30 | 4.8650 | 59⅝ | 15 | 14.60<br>@14.80 | 39⅝ | 4.50 | 4.35 | 5.40<br>@5.45 | 5.25<br>@5.30 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

### LONDON

| | | Copper | | | Tin | | | |
|---|---|---|---|---|---|---|---|---|
| July | Silver | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | Lead, Spanish | Zinc, Ordinaries |
| 24 | 27¼ | 65½ | 65⅝ | 70½ | 185½ | 185½ | 20¾ | 20¼ |
| 25 | 27 3/16 | 66 9/16 | 66⅝ | 71½ | 183½ | 183¼ | 20⅞ | 20¼ |
| 26 | 27¼ | .. | .. | | | | ... | ... |
| 28 | 27⅜ | 67⅜ | 67¼ | 72½ | 184½ | 184½ | 21 | 20¼ |
| 29 | 27½ | 65¾ | 65¾ | 71¾ | 185½ | 185½ | 21¼ | 20¾ |
| 30 | 27½ | 66 | 66 | 71½ | 180 | 180 | 21 | 20⅝ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

5.45c. The largest consumer figured as a buyer during the week. Transactions in the aggregate were fairly large. The bulk of the business was placed between 5⅛@5¼c., St. Louis basis.

The London market is firm, good ordinaries being quoted £20 12s. 6d.; specials £20 17s. 6d. per ton.

## Other Metals

**Aluminum**—Business is much quieter again and sales have been rather light. Prices are lower, No. 1 ingots being quoted at 23@23½c. per lb., New York. Foreign metal is quoted at 19@19½c. in bond.

The current price of ingots in London has dropped about £3 and is now £85@88 per ton, which is equal to 18.47@19.12c. per pound.

**Antimony**—The market has shown some improvement and business has been more active. Prices remain about the same, Cookson's being quoted at 8.40@8.50c. per lb., and Hallett's at 8@8.10c.; while 7.40@7.50c. is quoted for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business has been quiet and prices are just a shade off. New York quotations are $39@40 per flask of 75 lb. San Francisco, $39.50 for domestic orders and $37 for export. London is 5s. lower, at £7 5s. per flask, with £7 quoted from second hands.

**Exports and Imports of Metals,** other than iron and steel, in the United States, five months ended May 31, are reported as follows:

| | Exports | | Imports | |
|---|---|---|---|---|
| Metals: | 1912 | 1913 | 1912 | 1913 |
| Copper, long tons | 155,179 | 181,336 | 76,021 | 77,696 |
| Tin, long tons | 145 | 360 | 23,673 | 21,286 |
| Lead, short tons | 32,620 | 22,774 | 42,282 | 34,819 |
| Zinc, short tons | 5,486 | 5,505 | 1,565 | 383 |
| Zinc in ore, lb | 10,632,864 | 9,138,449 | 13,763,334 | 16,341,271 |
| Nickel, lb | 10,895,139 | 12,440,566 | 16,814,372 | 19,567,370 |
| Antimony, lb | 40,320 | 32,205 | 6,850,135 | 9,672,206 |
| Aluminum, lb | 9,656 | 27,725 | 10,149,082 | 12,974,918 |
| Quicksilver, lb | 10,299 | 29,698 | ........ | ........ |
| Platinum, oz | .... | 629 | 42,870 | 54,838 |
| Ores, etc. | | | | |
| Zinc oxide, lb | 15,649,983 | 12,529,349 | .... | .... |
| Zinc dross, lb | 364,695 | 56,786 | ....... | ........ |
| Zinc dust, lb | .... | 76,097 | ....... | 1,520,479 |
| Zinc ores, tons | 10,702 | 7,276 | 20,063 | 16,815 |

Copper, lead, nickel and antimony included the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately last year. The exports include reëxports of foreign material.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There is still some demand for Paris and Berlin, but not enough to induce payment of any premium.

Imports of gold at New York for the week were $321,410, chiefly from Mexico and the West Indies. Exports were $410,358, mostly to Holland. In addition to these imports by water $500,000 were received from Canada.

**Iridium**—Supplies are not increasing and demand remains steady. Dealers still ask about $85 per oz. for pure metal.

**Platinum**—There is again some talk of higher prices in the near future, but there has been no actual change so far. The dealers here ask $45@46 per oz. for refined platinum, and $49@52 per oz. for hard metal, according to iridium content.

Our Russian correspondent writes under date of July 18 that business has been rather small at St. Petersburg. The stock of platinum is increasing but is still not large and is firmly held. At Ekaterinburg the offers of metal by the starateli are increasing, and are promptly taken up by the speculators. Work at the mines is active and there is some complaint of scarcity of labor. Quotations are unchanged, at Ekaterinburg they are 9.75 rubles per zolotnik—$36.66 per oz.—for crude metal 83% platinum, at St. Petersburg 37,700 rubles per pood—$36.95 per oz.—for the same grade.

It is probable that the proposed law prohibiting the export of crude platinum from Russia will be abandoned altogether since it is held that it is contrary to some of the provisions of commercial treaties with other powers. It is now proposed, to force the refining of platinum in Russia by levying a tax of 30% on crude metal exported.

**Silver**—There has been more steadiness with advancing tendency in the silver market the past week, due chiefly to a demand from China, though the Indian Bazaars have also given some support. The political disturbances in China have also helped the firmer tone of silver. Monsoon reports from India continue favorable.

Exports of silver from London to the East, Jan. 1 to July 17, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £3,858,200 | £4,045,000 | I. £186,800 |
| China | 933,500 | 427,000 | D. 506,500 |
| Total | £4,791,700 | £4,472,000 | D. £319,700 |

Imports of silver at New York for the week were $259,498, mainly from Central and South America. Exports were $925,792, nearly all to London and Paris.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—July 26

The high price of zinc blende is $47, the base per ton of 60% zinc ranging from $42.50 to $44. Calamine sold on a base of $21@23 per ton of 40% zinc. Buying was active on a general reduction amounting to almost $2 per ton. The average of all grades is $40.68 per ton. Lead is higher $1, the base is $53.50 for 80% grades and the average of all grades $52.36 per ton.

SHIPMENTS WEEK ENDED JULY 26

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week | 10,017,420 | 846,700 | 1,408,500 | $257,847 |
| Seven months | 322,901,510 | 23,061,240 | 53,323,000 | $8,928,699 |

Blende value, the week, $210,906; 7 months, $7,232,880.
Calamine value, the week, $10,064; 7 months, $296,801.
Lead value, the week, $36,877; 7 months, $1,400,018.

### PLATTEVILLE, WIS.—July 26

The base price paid this week for 60% zinc ore was $43@44 per ton. The base price paid for 80% lead ore was $52 per ton.

SHIPMENTS WEEK ENDED JULY 26

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,703,660 | 52,400 | 1,036,600 |
| Year to date | 83,172,530 | 4,051,790 | 35,487,060 |

Shipped during week to separating plants 2,122,300 lb. zinc ore.

## IRON TRADE REVIEW

### New York—July 30

There seems to be some improvement in the tone of the iron market. There is a general impression that a new buying movement is coming and that lapse of the present contracts will not be followed by decreased activity at the mills.

There has been an increase in new orders for finished steel, notably in structural material and bars. In smaller building material also an improvement is noted.

Pig iron seems to have reached the turning point and a better feeling is noted, with slight gains in price. Eastern territory is taking a good deal of foundry iron, though mainly in small lots. There is also a better demand for basic pig, and inquiries are frequent.

**The United States Steel Corporation** report for the quarter ended June 30 gives the net earnings, after paying ordinary repairs and maintenance, as follows.

| | | |
|---|---|---|
| April | $7,509,207 | $13,072,710 |
| May | 8,846,821 | 14,554,566 |
| June | 8,746,237 | 13,592,537 |
| Quarter net | $25,102,265 | $41,219,813 |
| Depreciation, etc. | | $9,299,202 |
| Interest and sinking funds | | 5,642,546 |
| Total charges | | $14,941,748 |
| Surplus for the quarter | | $26,278,065 |
| Dividends | | 12,658,700 |
| Undivided surplus | | $13,619,365 |

Dividends were 1¾% on preferred and 1¼% on common stock. The net earnings for the quarter were $6,793,012 greater, than for the March quarter, and $16,117,548 more than in the June quarter of 1912. The quarter's earnings were the largest reported since 1907. For the six months ended June 30 the net earnings were $75,646,614, an increase of $32,717,375 over last year.

### PITTSBURGH, PENN.—July 29

There has been a slight increase in the volume of new business in most steel products, the buying being almost exclusively for quick shipment, and indeed some mills have to turn down business offered, because shipment in a week or two is frequently required. Production is maintained at full capacity, but some of the mills are closely approaching the end, having much business on books, for deliveries months ahead, but not enough to maintain full operations unless aided by a fresh buying movement. It would require only a moderate movement to fill the mills up through the winter. No extreme recession is regarded as at all probable.

**Pig Iron**—The Youngstown Sheet & Tube Co. has bought about 15,000 tons of bessemer at $15.50, Valley, and about 15,000 tons of basic at $14.25, Valley, for August and September. Several other sales of bessemer have been made at the same price. At these slightly reduced prices the market will not unlikely turn upward again. Foundry shows little activity, and large consumers seem now fairly well covered for a time. We quote: Bessemer, $15.50; basic, $14.25; malleable, $14; No. 2 foundry, $13.75; gray forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is quiet as to both prompt and future, with the regular price quoted at $58.50, Baltimore, freight to Pittsburgh being $2.16 per ton.

**Steel**—The market has been rather quiet, but billets and sheet bars are stiffly held at $26.50 and $27.50, respectively, maker's mill, Pittsburgh or Youngstown. Rods have softened and are quotable at $28@29, Pittsburgh.

### IRON ORE

Testimony has been taken in Chicago in the protest filed by certain iron companies against the railroads carrying iron ore to Lake ports. This appeal to the Interstate Commerce Commission is against the additional 5c. loading charge, which has been put on this season, and which is in addition to the freight rate.

**Imports and Exports of Iron Ore** in the United States five months ended May 31, long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Imports | 814,264 | 895,084 | I. 80,820 |
| Exports | 103,664 | 121,120 | I. 17,454 |

Imports of manganese ore for the five months were 95,836 tons in 1912, and 183,240 in 1913; increase, 87,404 tons.

### COKE

Connellsville coke makers are steadily holding out for $2.50 per ton for furnace coke on contract. They are getting their price too, though many of the contracts are for short time only, few of them running beyond third quarter. Shipments run good and very little coke is being stored.

**Coal and Coke Tonnage of Pennsylvania R.R.** lines east of Pittsburgh and Erie six months ended June 30, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 4,572,269 | 5,418,231 | I. 845,962 |
| Bituminous | 22,519,781 | 24,282,419 | I.1,762,638 |
| Coke | 6,374,293 | 7,386,908 | I.1,012,615 |
| Total | 33,466,343 | 37,087,558 | I.3,621,215 |

The total gain this year was 10.8%; the largest relative increase being in coke.

**Exports of Fuel from Great Britain** six months ended June 30 were: Coal, 35,526,235; coke, 499,670; briquettes, 1,022,232; coal sent abroad for use of steamships in foreign trade, 10,087,037; total, 47,135,174 long tons. This is an increase of 11,812,563 tons, or 33.4%, over 1912, when the general coal strike limited exports. Imports for the six months were 169,144 tons in 1912, and 13,534 in 1913; a decrease of 155,610 tons.

**Fuel Production of German Empire** five months ended May 31, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal mined | 70,817,532 | 77,648,129 | I. 6,830,597 |
| Brown coal mined | 33,212,644 | 35,041,459 | I. 1,828,815 |
| Coke made | 11,439,556 | 13,333,419 | I. 1,893,863 |
| Briquettes made | 9,683,358 | 10,965,057 | I. 1,281,699 |

Of the briquettes reported this year 8,576,457 tons were made from heavy coal or lignite.

## CHEMICALS

### New York—July 30

The general market is quiet with only an ordinary summer business doing.

**Arsenic**—The market is quiet. Quotations are $3.12½@3.25 per 100 lb. The imports have been cut down and stocks are not increasing.

**Copper Sulphate**—Sales have been good. Prices are steady at $5.25 per 100 lb. for carload lots, and $5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is quiet and but little business is forward. Prices are again off a shade, 2.32½c. being asked for spot and futures up to December. It is understood that about two-thirds of the Chilean producers have agreed to a curtailment of output. Another meeting is to be held soon.

### PETROLEUM

Rumanian oil production in May was 160,000 metric tons, an increase of 3000 tons over April. The Baku oilfield in Russia produced during March, 31,413,196 poods—511,848 metric tons—of oil, a decrease of 300,830 poods from last year.

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### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | March | April | May | June | July |
|---|---|---|---|---|---|
| Alaska shipments | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 | .... |
| Anaconda | 22,900,000 | 23,800,000 | 25,600,000 | .... | .... |
| Arizona, Ltd. | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 | .... |
| Copper Queen | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 | .... |
| Calumet & Ariz. | 4,250,000 | 4,500,000 | 4,300,000 | .... | .... |
| Chino | 4,464,723 | 3,925,409 | 3,883,611 | 3,682,706 | .... |
| Detroit | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 | .... |
| East Butte | 1,400,000 | 1,400,000 | 1,268,595 | .... | .... |
| Mammoth | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 | .... |
| Giroux* | 625,000 | 600,000 | 625,000 | .... | .... |
| Mason Valley | 1,608,492 | 1,264,304 | 1,186,560 | 1,097,014 | .... |
| Miami | .... | .... | 1,943,900 | 2,612,000 | .... |
| Nevada Con. | 5,555,320 | 5,650,000 | 5,933,275 | 6,344,863 | .... |
| Ohio | 591,651 | 690,001 | 650,071 | .... | .... |
| Old Dominion | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 | .... |
| Ray | 4,287,000 | 4,379,128 | 4,384,400 | .... | .... |
| Shannon | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 | .... |
| Sonth, Utah | 62,224 | 132,267 | 200,000 | .... | .... |
| Tennessee | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 | .... |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | .... | .... |
| Utah Copper Co. | 8,248,880 | 9,539,847 | 10,003,227 | 11,637,949 | .... |
| Lake Superior* | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 | .... |
| Non-rep. mines* | 6,203,606 | 6,000,000 | 6,300,000 | .... | .... |
| Total prod. | 102,619,054 | 104,224,079 | 109,824,500 | .... | .... |
| Imports, bars, etc. | 24,215,480 | 25,578,297 | 22,205,942 | .... | .... |
| Total blister | 126,834,534 | 129,802,376 | 132,039,442 | .... | .... |
| Imp. ore & matte | 11,911,041 | 7,177,363 | 10,528,562 | .... | .... |
| Total Amer. | 138,745,575 | 136,989,739 | 142,559,004 | .... | .... |
| Miami† | 3,102,200 | 2,312,900 | .... | .... | .... |
| Shattuck-Arizona | 1,234,450 | 1,158,326 | 1,026,170 | 1,059,625 | .... |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 844,735 | 794,000 | .... | .... | .... |
| Granby | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 | .... |
| Mexican Cos.: | | | | | |
| Boleo† | 2,204,720 | 2,811,200 | 2,424,800 | 1,984,640 | .... |
| Cananea | 4,772,000 | 3,581,690 | 2,272,000 | 2,908,000 | .... |
| Moctezuma | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 | .... |
| Other Foreign: | | | | | |
| Braden, Chile | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 | .... |
| Cape Cop., S. Af. | 732,480 | 586,880 | 387,520 | 414,400 | .... |
| Kyshtim, Russia | 1,478,400 | 2,544,640 | 1,490,000 | .... | .... |
| Spassky, Russia | 974,400 | 974,400 | 721,280 | 835,520 | .... |
| Exports from | | | | | |
| Chile | 7,840,000 | 7,616,000 | 3,584,000 | 5,824,000 | .... |
| Australia | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 | .... |
| Arrivals—Europe† | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 | .... |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

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### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VII, '12 | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | .... |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,843 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,452,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | .... | .... | .... | 52,904,606 | 71,904,000 | 124,808,606 |
| VIII | .... | .... | .... | .... | .... | .... |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Andes, Nev. | July 27 | Aug. 19 | $0.02 |
| Arlington, Ida. | July 5 | Aug. 4 | 0.002 |
| Atlas-Wonder, Nev. | July 14 | Aug. 6 | 0.01 |
| Belvidere, Calif. | July 22 | Aug. 11 | 0.10 |
| Blue Bird, Ida. | July 1 | Aug. 20 | 0.002 |
| Bonnie Bell, Nev. | July 14 | Aug. 18 | 0.02 |
| Carbonate, Ida. | July 25 | Aug. 25 | 0.001 |
| Challenge Con., Calif. | July 15 | Aug. 5 | 0.05 |
| Comstock, Ida. | July 24 | Aug. 23 | 0.001 |
| Eagle Mountain, Ida. | July 19 | Aug. 16 | 0.0005 |
| Emerald, Idaho (1st install.) | .. | Aug. 9 | 0.005 |
| Galena King, Utah | July 21 | Aug. 11 | 0.02 |
| Gould & Curry | July 14 | Aug. 5 | 0.03 |
| Iron Mask, Ida. | July 11 | Aug. 11 | 0.002 |
| Morning Star, Utah | Aug. 8 | Sept. 10 | 0.0025 |
| North Bunker Hill, Ida. | July 15 | Aug. 16 | 0.002 |
| O.K., Utah | July 26 | Aug. 12 | 0.005 |
| Overman, Calif. | July 24 | Aug. 13 | 0.05 |
| Rescue-Eula, Nev. | July 6 | Aug. 11 | 0.01 |
| Saltese, Ida. | July 20 | Aug. 20 | 0.002 |
| Savage, Nev. | July 14 | Aug. 5 | 0.05 |
| **Temple, Ida.** | **July** 19 | Aug. 23 | 0.002 |
| Tintic & Central Utah | .... | Aug. 9 | 0.005 |
| Tintic Delmar, Utah | July 16 | Aug. 16 | 0.0015 |
| Tuscarora, Ida. | Aug. 1 | Aug. 23 | 0.003 |
| Umatilla, Nev. | July 14 | Aug. 18 | 0.01 |
| Utah-United, Utah | July 19 | Aug. 11 | 0.01 |

### Monthly Average Prices of Metals

#### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | ...... | 24.286 | 27.919 | ...... |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ..... | 24.592 | 28.042 | ..... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

#### COPPER

| | New York, Electrolytic 1912 | New York, Electrolytic 1913 | New York, Lake 1912 | New York, Lake 1913 | London, Standard 1912 | London, Standard 1913 |
|---|---|---|---|---|---|---|
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | ...... | 17.353 | ...... | 76.636 | ...... |
| August | 17.498 | ...... | 17.644 | ...... | 78.670 | ...... |
| September | 17.508 | ...... | 17.698 | ...... | 78.762 | ...... |
| October | 17.314 | ...... | 17.661 | ...... | 76.389 | ...... |
| November | 17.326 | ...... | 17.617 | ...... | 76.890 | ...... |
| December | 17.376 | ...... | 17.600 | ...... | 75.516 | ...... |
| Year | 16.341 | ...... | 16.560 | ...... | 72.94 | ... |

New York, cents per pound, London, pounds sterling per long ton of standard copper.

#### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | | 202.446 | |
| August | 45.857 | | 208.351 | |
| September | 49.135 | | 223.762 | |
| October | 50.077 | | 228.353 | |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York in cents per pound; London in pounds sterling per long ton.

#### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | ...... | 4.603 | .... | 18.544 | ...... |
| August | 4.569 | ..... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | .... | 4.924 | | 22.292 | ...... |
| October | 5.071 | .... | 4.894 | ..... | 20.630 | ..... |
| November | 4.615 | ... | 4.463 | ...... | 18.193 | ..... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ..... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | .... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

#### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | ...... | 6.966 | ...... | 26.174 | ..... |
| August | 7.028 | .... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | .... | 7.313 | ...... | 27.048 | ..... |
| October | 7.426 | ..... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ..... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

#### PIG IRON IN PITTSBURG

| | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | ...... | 14.38 | ...... | 14.38 | ...... |
| August | 15.43 | ...... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ...... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | ..... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ..... |
| Year | $16.01 | ...... | $14.93 | ...... | $15.28 | ...... |

## STOCK QUOTATIONS

**COLO. SPRINGS** July 29

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02½ |
| Cripple Cr'k Con. | .01½ |
| C. K. & N. | .10 |
| Doctor Jack Pot. | .05½ |
| Elkton Con. | .54 |
| El Paso | 2.70 |
| Findlay | .02½ |
| Gold Dollar | .07½ |
| Gold Sovereign | .02 |
| Isabella | .11 |
| Jack Pot | .04½ |
| Jennie Sample | .05½ |
| Lexington | ‡.01 |
| Moon Anchor | ‡.007 |
| Old Gold | .01 |
| Mary McKinney | .52 |
| Pharmacist | .01 |
| Portland | .95 |
| Vindicator | .84 |
| Work | .005 |

**SALT LAKE** July 29

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .05 |
| Black Jack | .05 |
| Cedar Talisman | .00½ |
| Colorado Mining | .14 |
| Columbus Con. | .01 |
| Crown Point | .06 |
| Daly-Judge | 6.30 |
| Grand Central | .50 |
| Iron Blossom | 1.22½ |
| Little Bell | ‡.10 |
| Lower Mammoth | .01 |
| Mason Valley | 6.50 |
| May Day | .06 |
| Nevada Hills | .91 |
| New York | .02 |
| Prince Con. | .30 |
| Silver King Coal'n | 3.15 |
| Sioux Con. | .01 |
| Uncle Sam | .02½ |
| Yankee | .08 |

**TORONTO** July 28

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .08 | Foley O'Brien | .22 |
| Coniagas | 7.45 | Hollinger | 15.75 |
| T. & Hudson Bay | 68.00 | Imperial | .01 |
| Timiskaming | .10 | Jupiter | .34 |
| Wettlaufer-Lor | .11 | Pearl Lake | .34 |
| Apex | .01 | Porcu. Gold | .09 |
| Crown Chartered | .00½ | Preston E. D. | .02 |
| Dobie | .45 | Rea | .15 |
| Dome | 15.00 | Swastika | .04 |
| Dome Exten | .07 | West Dome | .15 |

**SAN FRANCISCO** July 29

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 6.00 |
| Belcher | .24 | Jim Butler | .70 |
| Best & Belcher | .06 | MacNamara | .15 |
| Caledonia | 1.40 | Midway | .47 |
| Challenge Con. | .05 | Mont.-Tonopah | 1.05 |
| Chollar | .01 | North Star | .96 |
| Confidence | .18 | West End Con. | 1.25 |
| Con. Virginia | .12 | Atlanta | .16 |
| Crown Point | .26 | Booth | .01 |
| Gould & Curry | .04 | C.O.D. Con. | .03 |
| Hale & Norcross | .08 | Comb. Frac. | .03 |
| Mexican | 1.12 | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | ‡.45 |
| Ophir | .23 | Round Mountain | .57 |
| Overman | ‡.50 | Silver Pick | .03 |
| Potosi | .01 | Tramp Con. | ‡.01 |
| Savage | .12 | Argonaut | 2.00 |
| Sierra Nevada | .09 | Bunker Hill | 1.50 |
| Union Con. | .12 | Central Eureka | .10 |
| Yellow Jacket | .21 | So. Eureka | 2.25 |

**N. Y. EXCH.** July 29

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 70½ |
| Am. Agri. Chem. | 47 |
| Am. Sm. & Ref., com | 63⅝ |
| Am. Sm. & Ref., pf. | 100¾ |
| Am. Sm. Sec., pf. B | 80¾ |
| Anaconda | 35⅞ |
| Batopilas Min. | 1¼ |
| Bethlehem Steel pf. | 73½ |
| Chino | 38 |
| Federal M. & S., pf. | 33½ |
| Great Nor., ore, ctf. | 36½ |
| Guggen. Exp. | 41½ |
| Homestake | 103 |
| Inspiration Con. | 15¼ |
| Miami Copper | 23⅛ |
| Nat'nal Lead, com | 49⅜ |
| National Lead, pf. | 106½ |
| Nev. Consol. | 16¼ |
| Phelps Dodge | 190 |
| Pittsburg Coal pf. | 82½ |
| Quicksilver, pf. | 4½ |
| Ray Con. | 19 |
| Republic I & S com | 24 |
| Republic I & S pf. | 85⅜ |
| Sloss-Sheffi'd com | 26 |
| Sloss-Sheffield, pf. | 85 |
| Tennessee Copper | 30⅞ |
| Utah Copper | 48¼ |
| U. S. Steel, com. | 58¾ |
| U. S. Steel pf. | 108¼ |
| Va. Car. Chem., pf. | 99⅞ |

**N. Y. CURB** July 29

| Name of Comp. | Clg. |
|---|---|
| Barnes King | ‡1.45 |
| Beaver Con. | .32 |
| Big Four | .41 |
| Braden Copper | 6⅜ |
| B. C. Copper | 2⅛ |
| Buffalo Mines | 2½ |
| Can. G. & S. | .25 |
| Con. Ariz. Sm. | $\frac{5}{16}$ |
| Davis-Daly | 2$\frac{1}{16}$ |
| Diam'field-Daisy | .02 |
| Ely Con. | .09 |
| Florence | .34 |
| Giroux | 1½ |
| Gold Hill Con. | ‡¼ |
| Goldfield Con. | 1¾ |
| Greene Cananea | 6¼ |
| Greenwater | .06 |
| Internat. S. & R. | ‡109 |
| Kerr Lake | 3$\frac{9}{16}$ |
| Keystone | ‡2 |
| La Rose | 2$\frac{3}{16}$ |
| McKinley-Dar-Sa | 1$\frac{5}{16}$ |
| Min. Co. of A. new | 2⅜ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 8½ |
| Ohio Copper | ½ |
| Pacific Sm. & M. | ½ |
| Puebla S. & R. | 2⅛ |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N.J. | 366 |
| Stewart | 1¼ |
| Tonopah | 4⅞ |
| Tonopah Ex. | 2⅛ |
| Tonopah Merger | .76 |
| Tri-Bullion | ⅛ |
| Tularosa | ⅝ |
| Union Mines | ⅛ |
| United Cop., pfd. | 3 |
| Yukon Gold | 2⅝ |

**LONDON** July 19

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 15s 0d |
| El Oro | 0 14 3 |
| Esperanza | 1 1 10½ |
| Mexico Mines | 5 5 0 |
| Oroville | 0 5 3 |
| Santa Gert'dis | 1 0 0 |
| Stratton's | 0 1 7½ |
| Tomboy | 1 5 0 |

**BOSTON EXCH.** July 29

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1 |
| Ahmeek | 275 |
| Alaska Gold M. | 18⅞ |
| Algomah | 1¼ |
| Allouez | 32 |
| Am. Zinc | 19¾ |
| Ariz. Com., ctfs. | 2½ |
| Bonanza | .32 |
| Boston & Corbin | .80 |
| Butte & Balak | 1½ |
| Calumet & Ariz. | 64½ |
| Calumet & Hecla | 405 |
| Centennial | 11½ |
| Cliff | 1½ |
| Copper Range | 38½ |
| Daly West | 2½ |
| East Butte | 12⅛ |
| Franklin | 5 |
| Granby | 59¾ |
| Hancock | 16¾ |
| Hedley Gold | ‡30 |
| Helvetia | .25 |
| Indiana | 5¼ |
| Island Cr'k, com. | 47½ |
| Island Cr'k, pfd. | 81 |
| Isle Royale | 20 |
| Keweenaw | 1⅞ |
| Lake | 6½ |
| La Salle | 4 |
| Mass | 3 |
| Michigan | 1 |
| Mohawk | 42¼ |
| New Arcadian | 1¼ |
| New Idria Quick. | ‡1⅝ |
| North Butte | 27⅛ |
| North Lake | 1⅛ |
| Ojibway | .70 |
| Old Dominion | 48 |
| Osceola | 75½ |
| Quincy | 56 |
| Shannon | 7⅛ |
| Shattuck-Ariz. | 25⅛ |
| Superior | 24⅞ |
| Superior & Bost. | 2¾ |
| Tamarack | 27 |
| Trinity | 4 |
| Tuolumne | .90 |
| U. S. Smelting | 37¼ |
| U. S. Smelt'g, pf. | 47⅛ |
| Utah Apex | 1¾ |
| Utah Con. | 9¼ |
| Victoria | .93 |
| Winona | 1 |
| Wolverine | 44 |
| Wyandot | .60 |

**BOSTON CURB** July 29

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 3 |
| Boston Ely | .48 |
| Boswyocolo | ‡.01 |
| Butte Central | .10 |
| Cactus | .04 |
| Calaveras | 2$\frac{5}{16}$ |
| Chief Cons. | 1⅜ |
| Corbin | 1¼ |
| Cortez | .25 |
| Crown Reserve | 3½ |
| Eagle & Blue Bell | .95 |
| First Nat. Cop. | 2$\frac{5}{16}$ |
| Houghton Copper | 3½ |
| Majestic | .34 |
| Mexican Metals | .50 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 1½ |
| New Baltic | .75 |
| Oneco | .75 |
| Raven Copper | .15 |
| Rhode Island Coal | .02 |
| Smokey Dev. | ‡.75 |
| S. W. Miami | ‡1½ |
| South Lake | ‡4 |
| Trethewey | .33 |
| United Verde Ext. | .63 |

‡Last quotation

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# An Iron Concentrator of Unusual Design

By L. O. Kellogg

*SYNOPSIS—The Mount Summit Ore Corporation owns a magnetite deposit in the Hudson Highlands. The concentrating plant employs permanent magnets which deflect the iron from a falling curtain of ore. Other machines adopted from different industries show interesting departures from current practice.*

⁂

The property of the Mount Summit Ore Corporation is situated at an elevation of 900 ft. in the Highlands of the Hudson, opposite West Point, N. Y. It lies about four miles southeast of the station of Garrison on the New York Central R.R. The holdings of the company include 40 acres of land in fee, with title to the mineral rights on 100 acres. The deposit is of magnetite and, so far as known, has the dimensions of a large vein, with a northeast strike and a dip of 45° to the southeast, as indicated by the hanging wall. It has been outlined by magnetic surveys and test pits on the outcrop for a distance of 3000 ft. on the strike; its width has not been determined, as no workings have as yet reached the true foot, but it is at least 60 ft. in the portion opened.

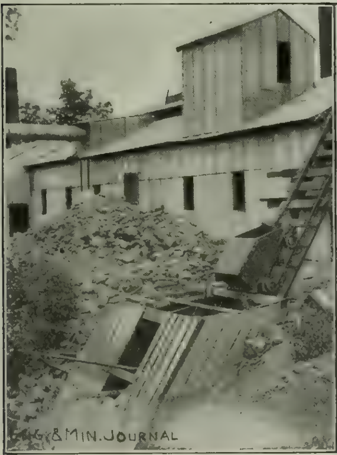

Fig. 1. Shaft Collar

Fig. 2. Corner of Old Pit

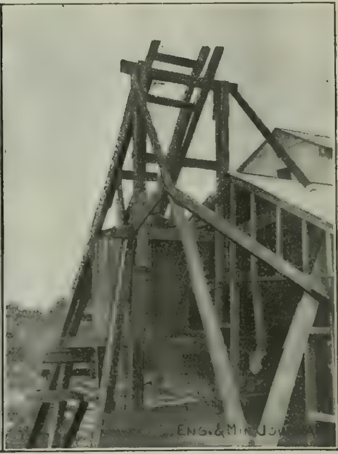

Fig. 3. Headframe and 10-Ton Bin

The country rock is gneiss with a definite structure which the deposit follows closely on its dip and strike. The deposit shows a banded structure, layers of almost pure magnetite alternating with bands of mixed gneiss and magnetite. The rich bands will run 65% in iron, and it is expected to hoist a product carrying 45%. In the shaft there were encountered two 4-ft. bands of the pure magnetite and between these another stringer of the same material. The gangue minerals are the typical minerals of the gneiss, such as hornblende, feldspar and quartz.

The deposit was discovered early in the history of the region and was first worked in 1810, a small shaft having been excavated in the southwest corner of the present opening shown in Fig. 2. Apparently, however, there was no work of any importance done until the Kingston Iron Co. took hold a few years ago. This company opened a surface pit, shipped some ore after hand cobbing, and left a large amount of mixed material on the dumps. The operations of this company were somewhat erratic, the management at first mistaking the dip for the strike. However, an inclined shaft 22x22 ft. in section was eventually sunk for 90 ft. in the ore and on the true dip. The present owners continued this shaft to the 165-ft. point after reducing its section to 8x12 ft.; and leaving a 10-ft. sump, crosscut to the hanging and drifted about 20 ft. each way. The product of this work, added to what was already on the dump, gives an estimated reserve of 25,000 tons running 30% in iron, which it is proposed to concentrate and ship before more mining is done. The workings are under water at present. The actual flow of water, however, is small.

### Equipment and Sequence of Operations

Hoisting was done in the 2-ton skip shown in Fig. 1. The hoist itself is a single-drum Lambert contractor's winch with two 8x10-in. cylinders. A four-drill Rand compressor furnished air for the piston drills while mining. It is of the duplex type with one side missing, designed to permit the addition of a duplicate set of cylinders when it becomes necessary to increase capacity. Steam is furnished by two Erie boilers, one of 80 and one of 150 hp. Soft coal costing $3.50 per ton at Garrison is burned. The 150-hp. mill engine is of the old Brown type, in which four gridiron valves are actuated by a longitudinal shaft, driven by gearing from the main driving shaft, no eccentrics being used. It is said to give unusual satisfaction.

The skip dumps into a 10-ton bin (Fig. 3) in the small headframe and passes through a 10x22-in. crusher made by the Climax Road Machinery Co. The moving crusher-plate is hinged at the top, as in the Blake type, but motion is not obtained by a toggle; instead there is an eccentric-turned portion in the center of the driving shaft which acts as a long cam against a roller on the end of an inclined lever, giving the latter a slight movement. This lever is pivoted almost under the crusher moving-plate and motion is communicated by a horizontal link-plate from the lever. There is thus no true toggle movement.

Fig. 4. General View of Mount Summit Plant

The 1½-in. product from this crusher is elevated by a Jeffrey link-belt bucket elevator and shot down into an American Process drier. This is of the revolving-cylinder type, 4 ft. in diameter by 30 ft. long, discharging into an 8x8x8-ft. dust chamber. The dried product—no roasting is needed—is again elevated by a similar elevator to a 70- or 80-ton bin of ordinary type. From this bin it is discharged through a Webster Manufacturing Co.'s rotary feeder to two No. 2 Gardner crushers. These are swing-hammer machines; the six hammers revolve at 850 r.p.m. on a horizontal shaft, catch the feed at the top, crush it by impact and sweep it over a ⅛-in. discharge screen which forms a half cylindrical bottom to the housing. The parts receiving hard wear are of manganese steel.

The ⅛-in. product is again elevated on a belt-and-bucket elevator to a bin built crib-fashion of 2x6-in. planks. This bin is 16 ft. long, 10 ft. wide and 8 ft. high. It extends over three of the concentrating units.

It will be noted that much of the machinery described is not of the makes or types commonly met with in mining practice; such as the Brown engine, the Climax crusher, the Gardner crusher, the Webster rotary feeder, etc. The unique feature of the mill, however, is the concentrating method, which is installed under the Carter patents.

### Permanent-Magnet Concentrators

Magnetic separation is made use of, but permanent magnets are used. These are ordinary small, steel, horseshoe magnets, such as are applied to magneto machines. They are set together in 4-ft., horizontal boxes and covered with sheet zinc; a film of ore is allowed to fall past their magnetized ends; the magnetite particles are deflected toward the magnet, the nonmagnetic material falls straight or slightly outward. A vertical knife-edge, parallel to the magnet box, splits the stream and separates the magnetite from the gangue. Part of the magnetite clings to the zinc cover until it builds out and falls by its own weight. The knife-edge is set so as to make a clean concentrate and the reject is conducted by a series of sloping shelves to successive boxes of magnets until it is left reasonably clean of iron. Five of the boxes, supported in a frame, one below the other, constitute a concentrating unit. The concentrate from each box is combined by a series of sloping shelves and removed by a belt conveyor on which it finally falls. The reject from the first set of three units is discharged on a belt conveyor running parallel to the concentrate conveyor and is elevated by a belt-and-bucket elevator to a crib bin similar to the first. This bin feeds two units, identical in construction with the others. The reject from these is discarded, being removed on a third belt conveyor. The concentrate is discharged on the concentrate conveyor. Thus the ore is passed in succession past 10 sets of magnets, which should give a tailing low in iron.

Fig. 5. Loading Chutes from Concentrate Bin

The concentrate, after discharge from the belt, is hoisted by a belt-and-bucket elevator to the concentrate shipping bin, a crib structure 16x16 ft. by 10 ft. high. The tailing is also hoisted to a similar bin 16x16 ft. by 17 ft. high. It is intended to ship the concentrate by motor truck to Garrison, and employ the tailing in building or road construction.

At the time of examination, work was suspended, as after a short run it was found that the dust and finer material interfered with operations and it became necessary to install a suction system to remove this at critical points. This system includes a Buffalo Forge Co.'s fan with galvanized-iron pipe connections to the dust chamber of the drier, to the two Gardner crushers, to the top of the bin over the first block of concentrators, and to a point behind each of the 25 magnet boxes. The dust is blown to a conical dust collector of the type used in lumber and planing mills.

When in operation it is expected that 200 tons of a 65 to 67% product will be made. No hand sorting is contemplated, although much of the ore would seem to offer an excellent opportunity for cheap sorting. The ore is low in phosphorus and sulphur, as can be seen by the analyses in the accompanying table. It is expected to add a sintering or nodulizing plant eventually.

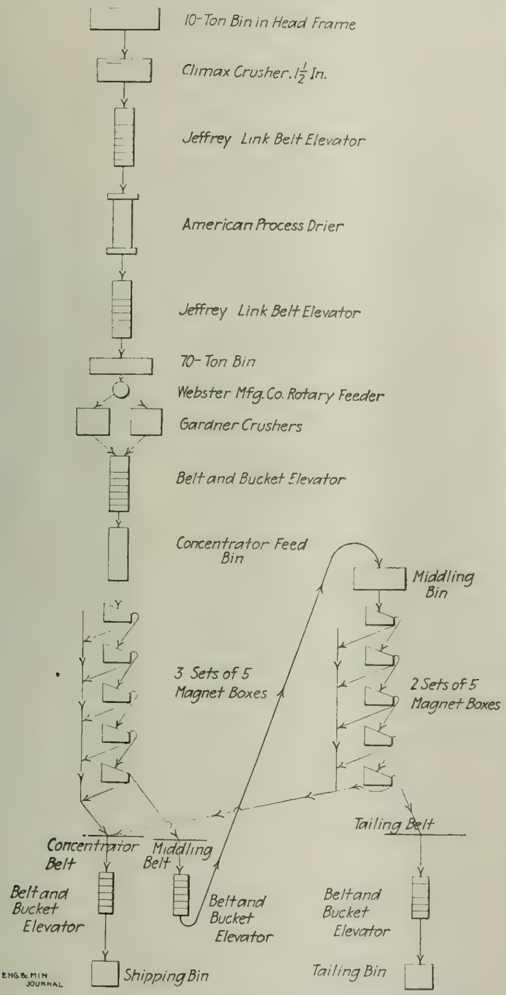

Fig. 6. Flow Sheet of Iron Concentrator

Operations have not been extensive enough as yet to permit giving any figures of costs, tonnage, etc. The cost of hauling fuel is $0.50 per ton at present. So far as the concentrate is shipped as return freight it will cost little, but the amount that must be handled by itself will bear an appreciable haulage charge. The availability of the concentrating method remains to be determined. It is absurdly simple and cheap in first cost and operation, without moving parts or power charges in the concentrator proper. If it works even moderately well, it may solve some problems for the small plant. A large loss in the discard could be tolerated for the sake of minimizing capital and operating charges.

ANALYSES OF MOUNT SUMMIT ORE AND CONCENTRATES

| | No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 | No. 9 |
|---|---|---|---|---|---|---|---|---|---|
| Moisture | . . | | 0.15 | 0.15 | 0.13 | . . | 0.12 | . . | |
| Iron | 51.34 | 66.59 | 60.02 | 68.95 | 64.40 | 66.57 | 69.94 | 66.57 | 66.42 |
| Silica | 19.56 | 3.63 | 12.14 | 2.12 | 3.27 | 0.94 | 1.12 | 0.94 | 4.75 |
| Sulphur | 0.49 | 0.26 | 0.19 | 0.16 | 0.27 | 0.13 | 0.12 | 0.13 | 0.15 |
| Phosphorus | 0.13 | 0.03 | 0.13 | 0.03 | 0.11 | 0.12 | 0.07 | 0.12 | 0.03 |
| Titanium | trace | trace | trace | trace | trace | 0.04 | none | 0.04 | 0.20 |
| Barium | 2.88 | 0.48 | . | | | 0.01 | none | none | |
| Manganese | 0.07 | . . | | | . | 0.07 | none | 0.17 | . |
| Chromium | | | . | . | . | . | . | 0.01 | . |

Nos. 1, 3, 5, 6, 7, 8 are ore from mine. Nos. 2, 4, 9 concentrates. The assays made by Simonds & Wainwright; Stillwell & Gladding; Low Moor Iron Co.; J. J. Fanheiser; I. Colony; Ledoux & Co.,

For the material of this article our thanks are due to L. J. Ferry, secretary, and John G. Pearse, president of the company, who offered every facility for examination.

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## New Circular Shaft on the Rand

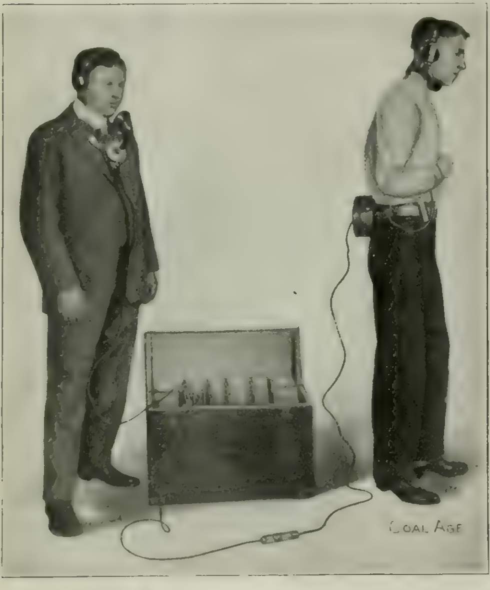
A circular shaft has been sunk on the advice of an English colliery engineer to develop the deeper areas of the New Modderfontein company. The mine is a large one, producing through outcrop incline shafts. The new shaft is 18 ft. in diameter. Sinking was started on Jan. 2, 1911, and was stopped at a depth of 2258 ft. on Nov. 16, 1912. Thus the average rate of sinking for 22½ months was 100 ft. per month. The cost of the shaft was £22 1s. 7d. per ft., of which £14 9s. 5d. was sinking and £7 12s. 2d. was bricking and lining. In comparing these costs with those of a modern five-compartment rectangular shaft, it must be noted that apparently no general charges are included in this statement. In the published costs of rectangular shafts on developing mines, from £1 to £3 per ft. is added for these.

The cost of this shaft cannot be considered cheap compared with the cost of sinking a five-compartment rectangular shaft, as practically no water was encountered in sinking. The speed of sinking is, of course, very low compared with rectangular shafts and the surface equipment is not adapted for rapid sinking compared with a shaft equipped with shops. The shaft around the collar is lined with concrete 36 in. thick, with two feet of brickwork to 100 ft. and one ft. to 1600 ft. Below this point it was not bricked at all until sinking was finished. Ordinary bricks were put in to 600 ft.; below this, concrete blocks were employed. These were made in segments at the mine. Lining and sinking went on alternately. Small machine drills and hand labor were employed. About 32 hand-hammer holes were put in to break from 2 to 3 ft. of ground. At the 1000-ft. level, a sump to hold 35,000 gal. was constructed. The general opinion of Rand engineers is that this shaft might be made equal to a five-compartment rectangular shaft in hoisting capacity, but that it offers few advantages to offset numerous disadvantages for this field. One of the objects of using the circular form was to provide a maximum cross-section together with a smooth lining for ventilating purposes. There will be no timbering and wire-rope guides will be employed. It will be interesting to observe how these answer the requirements of high-speed hoisting which presumably will be necessary.

## Portable Mine Rescue Telephone

Attention has been directed in mine-rescue work to the urgent need for some means of instant and continuous communication between an advance party equipped with its oxygen apparatus and a rear party outside the mine, by the fact that in the past loss of life could have been prevented by a quick and reliable means for summoning aid. The accompanying illustration shows a portable telephone set devised to meet this demand.

A man wearing an oxygen helmet, which covers his mouth, cannot use the ordinary type of telephone transmitter, so that a special type, known as the "throat" transmitter has been developed. This is light and compact and is provided with a soft rubber cup to adapt itself to the curves of the throat. It has been found by actual test to transmit practically as well as standard instruments. The telephone equipment used by the outside party is a standard switchboard operator's set.



Apparatus in Position

Connection between the parties is had by a small wire cable consisting of two copper conductors insulated with black enamel and two servings of silk, all of which is covered with a stout linen braid impregnated with moisture-resisting compound. This wire is in 500-ft. coils and is carried in a leather case fastened to the helmetman's belt, paying out as he advances. The coils weigh less than three pounds apiece; several of them can easily be carried and as one is run out, another can be connected by means of a plug and jack combination. The wire is so wound that it cannot tangle and will pay out from any position. The total weight of the telephone equipment and one coil is a little over five pounds. The battery is in a box at the outside point. By means of a key its condition can be determined. This is a necessary feature, since it would be a serious matter for the rescue party to enter the mine with batteries too weak for service.

It may be found desirable to use cable for carrying the talking circuit up to the edge of the danger zone. For this purpose a specially constructed large box is furnished, holding 1300 ft. of strong and flexible twisted-pair cable, having a 30% pure Para rubber insulation. The outfit is made by the Western Electric Company.

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## Tariff Discussions

### Washington Correspondence

Senator Smoot in his general attack on the new tariff bill during the past week has taken strong exception to the provisions of the new bill relating to lead, giving an elaborate analysis of the supposed effect of the new rates. In this connection he said "on dross lead in pigs, etc., there is a duty of 25% *ad valorem* imposed as compared with an equivalent specific duty now of 94.26%. There is a wide variety in value per pound of lead at neighboring ports, as shown by the Treasury figures. In 1911 the average at New York was 1.88c., at Perth Amboy 2.10c. and at Paso Del Norte 2.12c. This served to show the importance of the specific rates. Utah produces 15% of the country's total of lead, and 5% of the world's total, but no lead mine in the state could produce at a profit except for other metals. It costs 4c. per lb., he claimed, to produce and deliver that lead in New York, and, except for the value of the other metals obtained at the same time, the cost would be 8c. per lb. Without the lead-silver mines the production of precious metals in this country would fall away rapidly.

"In the Cœur d'Alene district of Idaho 117,000 tons of lead are produced annually, or more than 30% of the United States production. The mines in that state are carried on at a small profit and any reduction in the tariff on lead will lead to the vanishing point in many cases and to the point in others below the equitable return, causing distress and paralysis to business. Crediting the silver, the cost of production and marketing was 3.413c. per lb. (1909-1911) and the average selling price was 4.401c. Deducting amortization payments left less than 5% return on the investment. After investigation, W. R. Ingalls, a recognized expert, says that the cost of producing lead in the Idaho district is in the neighborhood of 4c. per lb. when silver is worth only 50c. per oz. The *ad valorem* 25% proposed in this bill would have admitted at all times during the past 10 years foreign pig lead so that it could have been sold below the price of the domestic lead. The effect of the proposed reduced rate would be to close many mines under development and decrease the production of gold and silver.

"The present duty on the zinc is a revenue duty, averaging $250,000 annually and the imports have increased under the present law. From 66 to 70% of the cost of manufacturing zinc is expended in mining and concentrating. It costs $39.61 to produce and deliver to the smelters a ton of average Joplin zinc ore. In Mexico the cost is $20.96 to produce and deliver 1½ tons containing the same quantity of zinc, the difference being principally in wages."

There is no apparent disposition to alter the rates of the present bill on lead and zinc and there is no reason to expect that they will be changed.

# Recent Cottrell Electric Precipitation Results

*SYNOPSIS—At the Raritan Copper Works in Perth Amboy, N. J., a plant to treat the gases arising from smelting slimes is about completed. Appreciable amounts of precious metals are thus recovered. Experiments on the gases of one converter of the American Smelters Securities, Garfield plant, have led to arrangements to install the process for all the converters. The Ohio & Colorado company has arranged to permit installations on either the roaster or the blast-furnace flue, at its Salida plant, Colo. Experiments at this plant showed the necessity of certain precautions in testing.*

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Shortly after the organization of the Research Corporation, last February[1], investigations were undertaken for the Raritan Copper Works, Perth Amboy, N. J., on the gases arising from the smelting of the slimes obtained in electrolytic copper refining and the results were so definite that a large plant for treating the entire volume of gases is now nearing completion. The copper, as received at the electrolytic refinery, generally contains some gold, silver and other precious metals, as well as arsenic, selenium, tellurium and many other elements, in small quantities. During the purification of the copper by electrolysis, most of these impurities settle out from the electrolyte. This sediment, called electrolytic slime, is then treated in another department, primarily for the recovery of the gold and silver. It is common practice in some refineries to dry this slime and then give it a furnace treatment. The volatile elements are driven off in the gaseous state and subsequently condensed in the flue. During the furnace treatment considerable silver is vaporized, some of which condenses quite near the furnace exit. At this point in the flue, dust may be found assaying very high in silver. Considerable gold may also be found at this point, probably having been carried over mechanically. Further along the flue, arsenic, antimony, selenium and other elements or their compounds, condense, thus forming a thick chemical fume. It is interesting to note the tendencies of the various compounds to deposit. For instance, some of the silver compounds, or metallic particles, are light and finely divided, and it is extremely difficult to effect a satisfactory recovery of settling chambers, centrifugal dust apparatus or by water sprays and scrubbers. Gold has been found a long distance from the furnace, but as a rule it is the first to deposit.

### CHARACTER OF SILVER REFINERY FLUE DUST

The influence of one, or several, volatile metals upon the volatility of other metals, especially at various temperatures, has not been studied extensively, but most authorities state that the loss of silver is increased in the presence of lead or zinc. Probably arsenic or antimony also exert an influence upon the loss of silver. It would be interesting and of considerable value to be able to consult curves of the vapor tensions of these various elements under the varying conditions of these refinery gases. Samples of this kind of dust from various refineries show it to have a range of at least from 100 to 2000 oz. of silver per ton. The gold content is not apt to vary so greatly. Fume has been collected after passing through water scrubbers (so arranged that the gas was saturated and carried water particles in suspension) and found to still contain large amounts of precious metals.

The character of the fume will depend, of course, upon the composition of the copper received at the refinery, as well as upon the operations of the refining furnaces. It is almost impossible to filter this gas, because of its corrosive action upon the filtering medium, and its tendency to clog it. Results obtained upon these gases have convinced us that practically all of the values now going to waste in these gases can be readily recovered by the electrical precipitation processes, thereby insuring a greater net profit in these departments. The problem of recovering the values from the dust collected is receiving considerable attention. If all the collected dust is fed back into the furnace, the highly volatile elements will again be driven off, subsequently condensed and, in turn, collected. This will permit the impurities to concentrate and increase to such a point as to be objectionable. Experiments have been conducted with a view to facilitating the recovery of the precious metals in a pure state from this precipitated fume. The proposed method may open up an opportunity for valuable improvements in the present practice of treating these electrolytic slimes.

### RECENT COTTRELL INSTALLATIONS

Arrangements have also been made to install the process upon the gases from all the copper converters at the Garfield (Utah) smelting plant of the American Smelters Securities Co. The fume contains considerable lead, and small amounts of silver and other elements. Apparatus has been installed to treat all the gases from one converter, and it has been operated successfully for a fairly long period of time without cleaning; the officials' operating results showed a normal clearance of about 98%. A large amount of valuable fume has already been collected. The volume of gas treated is about 100,000 cu.ft. per min. coming from one converter. The gases are treated while moving between the electrodes at a velocity of from 10 to 15 ft. per sec. The same company has also recently conducted some large-scale tests upon gases from the roasters, reverberatories and blast furnaces at this plant, and these were quite as successful as those obtained at the converter. A report of one of the employees of the works stated that some of the officials from New York had witnessed the operations and, to quote, "we had to prove it to them that we were pumping smoke into it." They were using a No. 80 Sturtevant fan to withdraw gases from the flues to deliver them to the Cottrell treater.

The Ohio & Colorado Smelting & Refining Co., which operated a lead smelter at Salida, Colo., has made arrangements permitting them to install the processes for precipitating the fume in either their roaster flue or blast-furnace flue. Godfrey machines and Dwight-Lloyd sintering machines are employed and deliver their gases to a common flue. This flue has a cross-section of such size that the average velocity of the gases is about 500 ft. per min. Some extensive testing has been conducted upon these gases, and interesting results obtained. It was endeavored to draw from the main flue, large average

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Note—An excerpt from a paper by Linn Bradley, published in "Proceedings of the Engineers' Society of Western Pennsylvania," April, 1913.

[1] "Eng. and Min. Journ.,' Oct. 19, 1912, p. 677.

samples of the gases for treatment, and from the results of the operations calculate the probable recovery of values which would be obtained when all these gases were being treated.

Fairly elaborate plans were made for ascertaining volumes of gases handled in the treater (averaging about 10% of the total in the roaster flue), volume of gases contained in the main flue, temperatures, drafts, resistance of flues and chambers, density of solids in the gases, total weight of dust and of the metals contained, and such other data as would enable one to draw reasonably accurate conclusions regarding the probable value of metals escaping into the atmosphere. Upon checking the work, it was found that we were not obtaining a fair sample of the gases from the main flue with the arrangement whereby the gases were withdrawn at right angles, through a hole in one of the walls of the flue, and even though we were drawing the gases through the opening at practically the same velocity as that of the gases in the main flue; the main reason being that the relative inertia of the suspended particles is much greater than that of the surrounding gases, and therefore a greater proportion of gases than solids was withdrawn, and the result was a gaseous body containing too small a percentage of suspended particles; hence when figures were calculated to the entire volume of gases in the main flue, the indicated weight of total suspended particles was lower than actually was the case.

Furthermore, in our methods for ascertaining the percentage clearances, we had a filtering scheme for determining the amounts of suspended particles in the entrance and also in the exit gases. It so happened that we were aspirating from the entrance gases at a velocity higher than that of the main body of entrance gases, thus giving figures upon fume density which were too low, while upon the exit gases our apparatus worked in such a manner that the aspiration was too slow and the results were too high; thus these two errors indicated a percentage of clearance by the treater operation which was lower than the truth. Even under such conditions the percentage clearances generally indicated high.

Tending to prove the statement that by aspirating at too high a velocity the results show a fume density which is too low, is the observation that even though we were not getting a 100% precipitation in the treater, nevertheless the actual amount of fume collected was greater than the total indicated fume content of the gases being treated as calculated from the volume aspirated through the filter and the solids collected therefrom, and compared to the total volume of gases being treated by the processes. With the arrangement of the filtering equipment on hand at the time, it was impossible to obtain checks. At the present time, other arrangements are being considered so that a more accurate calculation can be made of the values in the main flue after which it can be decided whether it will be commercially profitable to collect them. The expense of a bag house would be prohibitive there.

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**Fatal Mining Accidents in Australia** for the first quarter of 1913 numbered 37, out of a total of 52 in all industrial groups. The number of accidents incapacitating the victim for more than 14 days was 849 in the mining industry and [illegible] in all groups ("Aust. Labor Bull.," May, 1913). Figures of the number of men employed are not furnished, but it is evident that the mining industry makes a poor showing in comparison with the other industries considered, and this in spite of the fact that Australia stands exceedingly well relative to other countries in respect to its mining death rate.

# Manufacture of Barium Compounds in Germany

Until recently heavy spar, barium sulphate, served almost exclusively in Germany as raw material for the manufacture of barium oxide, barium hydrate, barium peroxide, and the various salts of barium, according to *Daily Consular and Trade Reports,* June 7, 1913. The sulphate was reduced by heating in kilns with coal to the form of sulphide. From the solution of the latter, barium carbonate was precipitated by the action of carbon dioxide, this carbonate serving as a starting point for the preparation of the chloride, the nitrate and the oxide.

By the recent process of W. Feld, German pat. No. 149,803, of 1901, it is possible to reduce directly natural barium carbonate (witherite), to the form of oxide by heating in retorts in the presence of a fuel free from hydrogen. Several other methods have been patented in Germany, but it is not known to what extent they have been introduced as technical operations. A. Frank, in 1901, took out German patent No. 135,330, a process obtained is of a high degree of technical purity and barium carbonate when mixed and heated. The reaction is:

$$3\,BaCO_3 + BaC_2 = 4\,BaO + 5\,CO$$

After evolution of gas ceases, the reaction is complete.

H. Schulze, of Bernburg, under German patent No. 240,267, of 1907, finds it possible to secure a porous form of barium oxide by the direct reduction of the carbonate, if the retort employed for the purpose is lined with carbon and if a narrow space is left free between the walls of the retort and the mixture of carbonate and coal. Otherwise compact crusts are formed adjacent to the walls and particles of the coal are inclosed in them. In a patent of a later date, this inventor described an additional method of effecting the reduction of the carbonate with coal. Use is made of an electric furnace and the mixture of mineral and coal is exposed to combined electrothermal and electrolytic action, forming itself a part of a circuit. The reaction mass is an excellent conductor of the electric current at high temperature. The barium oxide thus obtained is of a high degree of technical purity and possesses a uniformly porous structure.

A wet electrolytic process has been developed by the Siemens & Halske Co., of Berlin, under German patent No. 241,043 of 1910, which makes use of the facts that chloric and perchloric acids are only slightly affected by either the nascent oxygen liberated on an anode or the nascent hydrogen at the cathode. Solutions of barium chlorate or perchlorate serve as electrolytes. Barium carbonate is suspended in the anode cell so that the acid liberated is immediately neutralized, while the equivalent amount of barium oxide is formed in the cathode cell. M. Herzberg proposes in his patent of 1907 (German No. 195,278), to facilitate the decomposition of barium carbonate at a white heat, by introducing substances that react with carbonic oxide, and thus remove it. He accomplishes this by mixing barium peroxide with the carbonate. Siemens & Co., German patents Nos. 158,950 and 200,987, claim to secure good results by heating a mixture of barium carbonate, barium nitrate and coal, in an electric furnace to a white heat.

Decomposition of the carbonate begins as soon as nitrous vapors are evolved. Explosions are avoided by mixing the components with tar, and forming the mass into sticks.

Bradley and Jacobs claim to secure fair results by the reduction of barium sulphate with coal in an electric furnace. In practice, this operation uses a mixture of 60% BaO and 40% BaS. Brochet and Ranson secure the hydrate by submitting aqueous solutions of barium sulphide to electrolysis. H. Nordlinger has devised a method for decolorizing the solutions of barium sulphide obtained by the lixiviation of the crude product resulting from the reduction of heavy spar with coal. He adds 1 to 2% of a solution of caustic soda of 36° Baumé. All color vanishes and there is a marked increase in the readiness to crystallize, the crystals being perfectly colorless. Similar effects are produced by the addition of ammonia water. The introduction of a slight amount of formaldehyde overcomes all danger of oxidation.

W. Mostowitsch has investigated the reduction of barium sulphate by heating with coal. He finds that the reaction begins at 600° C., and is completed at 800° C. Barium sulphide remains unchanged at a temperature of 1000° C.

In producing barium hydrate from crude solutions of barium sulphide, D. Schreiber recommends the following method: The liquid is saturated with hydrogen sulphide and the resultant solution of barium sulph-hydrate is concentrated in a vacuum apparatus. This is treated with cold, concentrated solutions of the alkaline nitrates or of calcium nitrate, and barium nitrate is precipitated. The crystalline product is purified in a centrifugal. An important advance in this field has been achieved by K. Puls, K. Krug, and coworkers, who also make use of the cheap and relatively pure calcium nitrate, now supplied in increasing quantities by the Norwegian works. Witherite, $BaCO_3$, is finely ground and introduced into an aqueous solution of the nitrate. The mixture is then heated in a digester, provided with an agitator, under a pressure of 1 to 2 atmospheres for 4 hours. After removal from the digester, water is added and the mass is boiled. The precipitate of calcium carbonate is removed by means of a filter press and the residual solution of barium nitrate is evaporated to the point of crystallization.

Traine and Hellmers propose a variation to this method by using, instead of witherite, barium oxalate or barium phosphate, which has been precipitated from solution of barium sulphide. An important process for the reduction of barium sulphate that promises to simplify materially the manufacture of soluble barium compounds is due to C. A. Beringer, of Charlottenburg. He keeps a mixture of heavy spar, 7 parts, and clay, 3 parts, for some time at a bright-red heat and brings about the formation of a double silicate of barium and aluminum. This is readily decomposed by hydrochloric or nitric acid.

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## Cement Rates

Washington Correspondence

The Interstate Commerce Commission has handed down a decision in the case of the Allentown Portland Cement Co. versus the Philadelphia & Reading Co. in which it holds that the defendant's rates on cement in carloads to Baltimore, Philadelphia, New York and elsewhere, now the same from Evansville, Penn., as from the other cement-producing points in that district, subject the city of Jersey City to undue prejudice and disadvantage and it is directed that the defendants shall on or before Sept. 15 next establish fair and equitable rates.

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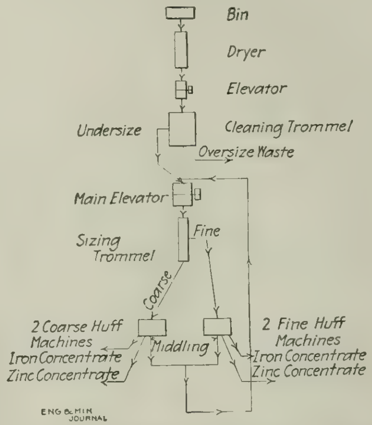
## Electrostatic Separation of Barstow Concentrate

By C. R. Wilfley*

The Barstow mine, in the Red Mountain mining district, 11 miles from Ouray, Colo., produces a gold-silver ore containing lead, zinc, copper, and iron sulphide, the ratio of concentration being 7.25:1. Prior to the tests herein described, the ore was milled by crushing through breaker and stamps, and concentrating on Wilfley tables and Wilfley multiple-deck duplex slime tables. From the first tables, a 20% lead concentrate was taken, assaying about 6% zinc and less than 1.5% copper, and constituting about 63% of the total product. From the second tables, treating tailing from the first, an iron-zinc product was taken, assaying about 17% zinc. The slime tables made a good mixed concentrate, and all products were sold direct to the American Smelting & Refining Co., at Durango, Colorado.



Ouray Electrostatic-Separation Plant

Shortly before closing the mill in November, for lack of water, two trial runs were made to determine the profit obtainable by separating the zinc and iron at the Huff electrostatic custom plant recently erected and operated by David Foerster, at Ouray. In this separator, concentrate is separated into iron and zinc products, middling returned to the system, and no tailing made.

The first run, herein called lot 1, was made on the regular zinc-iron product. For the second run, the mill scheme was changed, with the purpose of taking out some of the iron from the regular zinc-iron product, which should be under penalty limit in zinc, and of enriching the remainder as a zinc product. Further, it was intended to get additional table treatment of the final middling, to help the saving of gold and silver, and at the same time reduce the amount of these metals going into the zinc product. This was done by simply taking from the second tables an upper or iron streak, amounting to 40% of the original zinc-iron product, then sending the remainder, with a wide middling streak, to hydraulic classification and a third set of tables. This

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*Ouray, Colo.

SEPARATION OF BARSTOW CONCENTRATE

| | Au Oz. p.t. | Ag Oz. p.t. | Zn % | Cu % | Pb % | $SiO_2$ % | Fe % |
|---|---|---|---|---|---|---|---|
| Lot No. 1 | | | | | | | |
| Crude concentrate | 0 948 | 13 14 | 17 22 | 2 62 | 4 04 | 6 50 | 23 65 |
| Iron product | 1 117 | 15 48 | 5 48 | 3 51 | 5 00 | 4 42 | 35 33 |
| Zinc product | 0 566 | 7 83 | 43 75 | 0 48 | 1 77 | 11 89 | 6 00 |
| Lot No. 2 | | | | | | | |
| Crude concentrate | 0 53 | 8 03 | 26 18 | 3 65 | 1 52 | 10 54 | 20 62 |
| Iron product | 0 69 | 10 93 | 7 00 | 6 14 | 1 94 | 7 38 | 33 47 |
| Zinc product | 0 32 | 4 37 | 46 38 | 0 51 | 0 98 | 14 57 | 4 35 |

made a zinc product of about 26% zinc, while the iron product took a large part of the gold and silver.

The table shows the results. It indicates that a better separating product was made by the milling change, in spite of the fact that the amount "thrown" to the iron in separating was less for lot 2 than for lot 1.

In estimating the profits, net value at the railroad loading point is taken, using the same schedule, prices, and freight rate, to afford just comparison. As a matter

RECOVERIES IN SEPARATED PRODUCTS

| Iron Products | Au | Ag | Cu | Pb | Zinc Products | Zn | $SiO_2$ | Fe |
|---|---|---|---|---|---|---|---|---|
| Lot 1 | 81 7 | 81 2 | 93 0 | 86 6 | Lot 1 | 77 9 | 54 3 | 6 9 |
| Lot 2 | 73 1 | 76 3 | 93 8 | 71 3 | Lot 2 | 85 1 | 60 9 | 9 3 |

PROFIT ON SEPARATION

| | Lot 1 | Lot 2 |
|---|---|---|
| Value at R.R., separated | $29 27 | $21 92 |
| Value at R.R., crude | 21 14 | 10 08 |
| [illegible] | $8 13 | $11 38 |
| Profit per ton crude ore | $0 412 | $0 451 |

of fact, in this particular case, the actual profit was less than that shown, because the original material was hauled a shorter distance to market, while the separated products had to stand the longer haul. The mill scheme has been further modified, as a result of these tests, for the purpose of saving still more of the gold and silver in the lead and iron products, and of "crowding" copper and zinc into a third product; a more thorough scheme is expected to bring still better results. This will be done by classification of the original pulp to first tables, second-table retreatment of tailings, and classification and table treatment of the second-table middlings.

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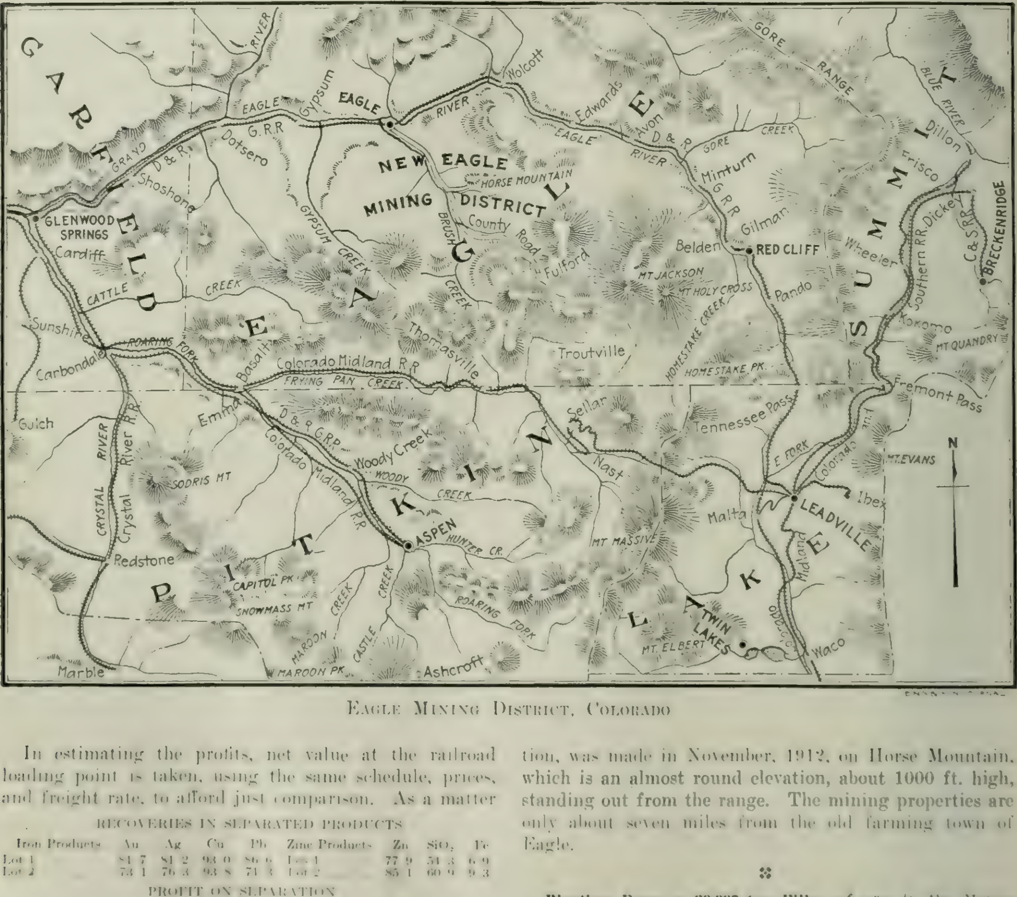
## Eagle Mining District

In the accompanying cut is shown a map of the new Eagle mining district of Colorado, furnished by the Denver & Rio Grande R.R. The Lady Belle, the first location, was made in November, 1912, on Horse Mountain, which is an almost round elevation, about 1000 ft. high, standing out from the range. The mining properties are only about seven miles from the old farming town of Eagle.



EAGLE MINING DISTRICT, COLORADO

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**Blasting Down a 20,000-ton Pillar** of ore, in the Morris mine of the Giroux company, at Kimberley, Nev., was effected by a single round of 257 shots. The blast was the outcome of months of preparation and is the first really tangible evidence to be given in this district of the cheapness of the much-lauded caving system. No further expense is attached to the handling of the ore except shoveling into cars and hoisting to the bins for shipment to the works at McGill. Following the big blast about half of the working force of the Giroux, about 160 men, were laid off. The Bunker Hill mine has been closed down for the present. With this big "stock pile" to draw from, 150 men can easily keep up shipments to the smelter from the Morris at the rate of from 800 to 1000 tons per day.

# The Cost of Copper

By Heath Steele*

*SYNOPSIS—An inquiry into the cost of the output of copper of the great American producers, and what is the cost to the ultimate consumer of the world's supply.*

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The actual cost of copper and the cost that has a bearing on the price of the metal are very different figures. It is probable that no one will ever be able to give the actual cost of copper or in fact the true cost of any commodity used in the world. If we are asked to give the cost of producing copper by a particular mining concern we must include all expenditures. Its cost at the end will be the total of expenditures for: Location, explorations, regardless of whether ore was found or not; development, equipment and operating. If we were to give the actual cost of copper produced by the State of Arizona, we would have to include expenditures of over 500 companies, yet there are only about 20 that amount to anything as producers. Out of a few thousand copper properties or companies that have existed at one time or another in North America, there are today less than 50 that stand out prominently as producers and almost 50% of the world's supply of copper is produced by about 25 of them.

## True Cost Would Consider Both Failures and Successes

Practically all the failures have been separate from the successful operations. If the industry had been carried on under one head, we would probably have to reckon with this cost as we do with explorations undertaken by the producers. However, like all other unsuccessful enterprises, the unprofitable copper mine is charged to the account of failures and forgotten. It is doubtful if this class adds anything to the cost of production that has any bearing upon the selling price, as practically all our mined and manufactured products come from profitable enterprises. It is, therefore, their cost of production we must consider as having a relation to the market price of the product. This cost will necessarily carry with it a proportionate amount of new equipment, experimental work or unsuccessful explorations.

As representative copper mines, I have selected the following, divided into three groups: The Lake Superior group, the porphyry group, and miscellaneous. The mines selected in the Lake Superior district are: Calumet & Hecla, Copper Range Consolidated, Mohawk, Osceola, Allouez, Isle Royale, Quincy, Ahmeek, Tamarack, Centennial, and Wolverine. The Copper Range Consolidated includes the operations of the Tri-Mountain, Baltic and Champion mines. The porphyries consist of Utah Copper, Nevada Consolidated, Ray Consolidated, Miami and Chino. Miscellaneous comprises Anaconda, North Butte, Tennessee, Shannon, Granby Consolidated, British Columbia Copper, Calumet & Arizona, Mason Valley and Old Dominion. The Lake Superior group of 11 mines produced 205,636,620 lb. of refined copper in 1912. From the five porphyry mines, the production amounted to 249,712,570 lb., and the miscellaneous group of nine mines produced 473,044,379 lb., a total of 928,393,569 lb. for the 25 mines in 1912, or about 42% of the world's production for the year. The Phelps-Dodge properties have not been included in the groups mentioned for the reason that the reports of the company do not contain sufficient data to obtain its exact cost. However, as a rough guess from the figures given I should say its cost was about 8.5 or 9c. per lb., after crediting all earnings from smelting outside ores, etc. The production of the Phelps-Dodge company from its own ores was 140,628,798 lb. of copper in 1912. This added to the production of the 25 companies mentioned, accounts for 1,069,022,367 lb., or about 48% of the world's production for 1912.

The cost of producing copper at these mines, representing as they do about one-half of the world's output, should give a fair representative average of the cost of copper. There is quite a difference of opinion evidenced in the reports of mining companies as to just what constitutes the cost of production. Some state operating costs only and charge "capital expenditures" off profit and loss or surplus accounts, while others write practically all such expenditures to property accounts. It would not be fair to take the statements of one company charging all expenditures to operating and compare them with costs made up from partial expenditures without calling attention to the fact. For this reason the accounts given in the annual reports have been gone over and their actual expenditures worked out. In some cases it was necessary to do this by working back from the balance of quick assets shown in the balance sheet. It is not my purpose to discuss cost details so expenditures have been brought under as few heads as possible to still allow some analysis. The main fact to be brought out is that a certain amount of money has actually been spent and so much copper has been produced within a certain period.

## Analysis of Lake Superior Costs

Starting with the Lake Superior group; the smelter production statistics credit this district with an output of 231,628,486 lb. of copper for 1912, or a little over 10% of the world's output. The mines selected from this district represent a mine output of 205,636,620 lb. of copper during the same period, or 89% of the output of the district and about 9% of the world's output.

LAKE SUPERIOR 1912 COPPER PRODUCTION AND COSTS

| | Copper, Lb. | Net Cost per Lb. Cents |
|---|---|---|
| Calumet & Hecla | 67,856,429 | 9.86 |
| Quincy | 20,634,800 | 11.6 |
| Osceola | 18,413,387 | 9.95 |
| Champion* | 17,225,508 | 8.88 |
| Ahmeek | 16,455,769 | 7.69 |
| Baltic* | 13,373,961 | 10.94 |
| Mohawk | 11,995,598 | 10.61 |
| Wolverine | 9,408,960 | 7.59 |
| Isle Royale | 8,186,957 | 11.4 |
| Tamarack | 7,908,745 | 13.05 |
| Tri Mountain* | 6,908,713 | 11.73 |
| Allouez | 5,525,455 | 13.4 |
| Centennial | 1,742,338 | 13.4 |
| Total | 205,636,620 | 10.58 |

*Copper Range Consolidated property.

The net cost is obtained after crediting earnings from rents, etc., to the cost of production. The total expenditures of this group for 1912 amounted to 10.58c. per lb.

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*52 William St., New York.

of refined copper. During the last five years Calumet & Hecla has produced 376,693,925 lb. of copper from 13,998,914 tons of ore, having an average yield of 26.9 lb. per ton at a cost of 8.92c. per lb. The productions and costs by year have been:

CALUMET & HECLA COSTS OF PRODUCTION

| Year | Tons Ore | Yield per Ton, Lb. | Total Lb. Copper | Cost per Lb., Cents |
|---|---|---|---|---|
| 1908 | 2,643,938 | 31.22 | 82,549,979 | 9.00 |
| 1909 | 2,842,880 | 28.18 | 80,096,995 | 8.28 |
| 1910 | 2,795,514 | 25.77 | 72,059,545 | 8.96 |
| 1911 | 2,909,972 | 25.47 | 74,130,977 | 8.52 |
| 1912 | 2,806,610 | 24.18 | 67,856,429 | 9.86 |
| Total | 13,998,914 | 26.90 | 376,693,925 | 8.92 |

The annual reports of the Calumet & Hecla do not contain statements of operating expenditures, however, a table of costs obtained from the tax reports giving the total cost of copper at 8.97c. per lb. for 1906-1910 shows the cost to be made up as follows: Mining, transportation and stamping, 6.54c.; smelting, 1.17c.; construction, 0.72c.; and general expenses, 0.54c. per lb. of copper.

The Quincy ore yields approximately 16 lb. per ton and during the last seven years the mine has produced 144,507,998 lb. of copper for a total expenditure of $16,927,257, or 11.7c. per lb. Miscellaneous earnings amounted to $170,642, leaving a net expenditure of about 11.58c. per lb. However, $693,050 of these expenditures were for mining lands, which, if deducted from the operating cost, gives a net cost of 11.1c. per lb. The following table gives the record from 1906 to 1912. Mining, transportation and stamping have averaged about 9.5c. per lb.; smelting and general expenses, 0.9c., and construction, 0.7c. per lb.

QUINCY MINING CO. COSTS

| Year | Total lb. copper | Total exp. per lb., c. | Land purchases per lb., c. | Miscellaneous receipts, c. | Net Cost per lb., c. |
|---|---|---|---|---|---|
| 1906 | 16,194,838 | 12.5 | 0.434 | 0.17 | 11.9 |
| 1907 | 19,796,058 | 12.4 | .... | 0.2 | 12.2 |
| 1908 | 20,600,361 | 11.4 | 0.24 | 0.07 | 11.1 |
| 1909 | 22,511,984 | 11.0 | 0.54 | 0.06 | 10.4 |
| 1910 | 22,517,014 | 11.2 | 0.67 | 0.13 | 10.4 |
| 1911 | 22,252,943 | 11.3 | 0.72 | 0.08 | 10.5 |
| 1912 | 20,634,800 | 12.5 | 0.70 | 0.2 | 11.6 |
| Total | 144,507,998 | 11.7 | 0.48 | 0.12 | 11.1 |

From 1905 to the end of 1912 the Osceola Consolidated has produced 8,274,961 tons of ore, yielding an average of 16.4 lb. of copper per ton, or a total of 135,481,801 lb. at a net cost of 9.82c., after deducting 0.38c. for miscellaneous credits. Construction has averaged 0.6c. and total expenditures 10.2c. per lb. The record by year is given herewith:

OSCEOLA CONSOLIDATED

| Year | Tons of ore | Yield per ton, lb. | Total lb. copper | Total exp. per lb., c. | Misc'l. credits c. | Net cost per lb., c. |
|---|---|---|---|---|---|---|
| 1906 | 1,016,240 | 18.4 | 18,588,451 | 10.9 | 0.6 | 10.3 |
| 1907 | 811,603 | 16.4 | 14,134,753 | 12.4 | 0.5 | 11.9 |
| 1908 | 1,241,400 | 17.1 | 21,250,794 | 10.53 | 0.24 | 10.29 |
| 1909 | 1,494,845 | 16.9 | 25,296,657 | 9.47 | 0.39 | 9.08 |
| 1910 | 1,217,720 | 15.9 | 19,346,566 | 9.37 | 0.29 | 9.08 |
| 1911 | 1,246,596 | 14.8 | 18,388,193 | 9.28 | 0.11 | 9.17 |
| 1912 | 1,246,557 | 14.8 | 18,413,387 | 10.36 | 0.41 | 9.95 |
| Total | 8,274,961 | 16.4 | 135,418,801 | 10.2 | 0.38 | 9.82 |

As stated, the Copper Range Consolidated consists of the Champion, Baltic and Tri-Mountain mines. These mines from 1906 to 1912, inclusive, have produced 282,176,555 lb. of refined copper from 12,912,108 tons of ore, yielding an average of 21.8 lb. per ton at a cost of 9.76c. per lb. Of this amount, the Champion produced 121,325,314 lb., at a cost of 9.27c.; the Baltic, 112,939,287 lb., at 9.20c., and the Tri-Mountain, 47,911,954 lb., at 12.5c. per lb. The average yield of the ore was 23.5 lb., 22 lb., and 18.1 lb., respectively. A table of yearly production and costs follow for each mine. Expenditures of the Copper Range Consolidated Co., not included in these costs, bring the total cost of copper produced by the three mines to 10.1c. per lb.

COPPER RANGE CONSOLIDATED

| Year | Tons of ore | Yield per ton, lb. | Total lb. of copper | Cost per lb., cents |
|---|---|---|---|---|
| | Champion Mine | | | |
| 1906 | 671,785 | 25.2 | 16,954,986 | 9.3 |
| 1907 | 708,685 | 23.2 | 16,489,436 | 11.8 |
| 1908 | 794,703 | 22.3 | 17,786,763 | 9.01 |
| 1909 | 753,908 | 23.9 | 18,005,071 | 8.45 |
| 1910 | 722,051 | 26.6 | 19,224,124 | 7.85 |
| 1911 | 734,392 | 21.3 | 15,639,426 | 9.08 |
| 1912 | 765,306 | 22.5 | 17,255,508 | 8.88 |
| Total | 5,150,830 | 23.5 | 121,325,314 | 9.27 |
| | Baltic Mine | | | |
| 1906 | 649,932 | 22.3 | 14,397,557 | 9.6 |
| 1907 | 761,288 | 22. | 16,704,868 | 10.3 |
| 1908 | 764,117 | 23.2 | 17,724,854 | 8.3 |
| 1909 | 814,260 | 21.9 | 17,817,836 | 7.99 |
| 1910 | 781,419 | 22.4 | 17,549,762 | 8.35 |
| 1911 | 696,795 | 22.06 | 15,370,449 | 9.13 |
| 1912 | 652,433 | 20.50 | 13,373,961 | 10.94 |
| Total | 5,120,244 | 22.00 | 112,939,287 | 9.20 |
| | Tri-Mountain Mine | | | |
| 1906 | 506,492 | 18.8 | 9,607,933 | 12.2 |
| 1907 | 444,358 | 18.4 | 8,190,711 | 13.3 |
| 1908 | 334,929 | 18. | 6,034,908 | 12.6 |
| 1909 | 323,408 | 16.4 | 5,282,404 | 13.9 |
| 1910 | 317,299 | 17.9 | 5,694,868 | 12.4 |
| 1911 | 347,885 | 17.59 | 6,120,417 | 11.55 |
| 1912 | 366,663 | 19.04 | 6,980,713 | 11.73 |
| Total | 2,641,034 | 18.1 | 47,911,954 | 12.5 |
| 3 mines | 12,912,108 | 21.8 | 282,176,555 | 9.76 |
| Including copper range expenditures | | | | 10.10 |

The Ahmeek, during the last seven years, has produced 67,563,693 lb. of copper from 2,973,090 tons, averaging 22.7 lb., at a cost of 10.8c. for total expenditures with a credit of about 0.1c. for miscellaneous receipts, making a net cost of 10.7c. per lb. This cost includes 2.33c. for construction, made up largely of expenditures for a new mill.

AHMEEK

| Year | Tons of ore | Yield per ton, lb. | Total lb. copper | Cost per lb., cents |
|---|---|---|---|---|
| 1906 | 166,960 | 18.5 | 3,077,507 | 18 |
| 1907 | 320,733 | 17.4 | 5,510,985 | 12.5 |
| 1908 | 298,178 | 21.1 | 6,280,241 | 13.8 |
| 1909 | 406,045 | 22.6 | 9,198,110 | 15.5 |
| 1910 | 530,365 | 22.3 | 11,844,954 | 11.05 |
| 1911 | 598,549 | 25.4 | 15,196,127 | 7.17 |
| 1912 | 652,260 | 25.2 | 16,455,769 | 7.69 |
| Total | 2,973,090 | 22.7 | 67,563,693 | 10.7 |

The Mohawk Mining Co., during the last seven years, has produced 76,502,593 lb. of copper, at a cost of about 11.08c. per lb. This copper came from 5,157,188 tons of ore, yielding 14.8 lb. per ton. The latest available figures show a cost of $1.34 per ton of ore hoisted, of which a little over 9% is sorted out, resulting in a cost of $1.47 per ton treated. The cost of smelting, freight, marketing and office expenses amount to about 0.87c. per lb. of refined copper. Construction during 1912 was 0.07c. per lb. The costs and production by year are given:

MOHAWK MINING CO

| Year | Tons of ore | Yield per ton, lb | Total lb copper | Cost per lb., cents |
|---|---|---|---|---|
| 1906 | 618,513 | 15.12 | 9,352,252 | 11.4 |
| 1907 | 640,777 | 15.77 | 10,107,266 | 11.6 |
| 1908 | 685,823 | 15.01 | 10,295,881 | 10.8 |
| 1909 | 819,019 | 13.73 | 11,248,474 | 11.2 |
| 1910 | 802,537 | 14.22 | 11,412,066 | 11.4 |
| 1911 | 802,548 | 15.07 | 12,091,056 | 10.4 |
| 1912 | 787,941 | 15.22 | 11,995,598 | 10.61 |
| Total | 5,157,188 | 14.8 | 76,502,593 | 11.08 |

The Wolverine is one of the lowest-cost copper producers. During the period 1906-1912, it has produced 67,189,788 lb. of copper at a cost of about 7.33c. per lb., after allowing miscellaneous credits of approximately 0.07c. To produce this copper, 2,589,093 tons of ore were treated, yielding 25.9 lb. of copper per ton. The reports of this company are issued for the fiscal years ended June 30, therefore, all figures stated are for years ending on that date. During the year ended June 30, 1912, the cost per ton of rock hoisted was $1.53, and after discarding about 3% by sorting, the cost was raised to $1.58 per ton stamped. The Wolverine vein is about 15 ft. wide and dips 37°. No timber is required and favorable working conditions, good grade of ore and good management are responsible for the low cost it obtains.

WOLVERINE

| Year | Tons of ore | Yield per ton, lb. | Total lb. copper | Cost per lb. c. |
|---|---|---|---|---|
| 1906 | 341,820 | 28.2 | 9,681,706 | 6.76 |
| 1907 | 344,062 | 27.2 | 9,372,982 | 7.45 |
| 1908 | 348,860 | 26.8 | 9,356,123 | 7.2 |
| 1909 | 373,694 | 26.8 | 9,995,748 | 7.28 |
| 1910 | 370,873 | 25. | 9,757,101 | 7.39 |
| 1911 | 388,476 | 24.75 | 9,617,168 | 7.55 |
| 1912 | 401,308 | 23.45 | 9,408,960 | 7.59 |
| Total | 2,589,093 | 25.9 | 67,189,788 | 7.33 |

There are still four mines of the Lake Superior group included in this calculation to be considered: The Isle Royale, Tamarack, Allouez and Centennial. The Tamarack costs have been increased on account of depth, and while profitable only during high-metal prices, it is still producing at the rate of over 7,000,000 lb. per annum. The other properties have some promise of being steady producers for several years. Isle Royale, since the end 1905, has produced 37,579,893 lb. of copper from 2,497,285 tons of ore, yielding 15.1 lb. per ton, at a net cost of 14.6c. per lb. Of this cost, about 2.68c. was for construction, lands, etc.; total expenditures amounted to 15.2c., from which a credit of 0.6c. was deducted for receipts from miscellaneous sources. Tamarack during the same period stamped 3,606,553 tons of ore, yielding 20.5 lb. of copper per ton, producing 73,717,010 lb. of refined copper. The total expenditures equalled 15c. per lb., of which 0.65c. was for construction, etc. Other receipts deducted from expenditures leave a net cost of 14.8c. per lb. The Allouez Mining Co. produced 27,661,250 lb. of copper at a net cost of about 15.4c. per lb., from the end of 1905 to Dec. 31, 1912. Receipts from miscellaneous sources deducted from total expenditures amounted to 0.2c. per lb. The average yield of the ore was 15.9 lb. and construction, etc., approximately 3c. per lb. Centennial stamped 1,027,451 tons of ore, yielding 14,215,495 lb. of copper, or 13.9 lb. per ton during 1906-1912. The net cost of this copper was 18.3c. per lb. Construction and land purchases included in this cost are equal to about 4.5c. A credit of 1.7c. per lb. was made for sale of mill interest and other receipts.

ISLE ROYALE

| Year | Tons of ore | Yield per ton, lb. | Total lb. copper | Net cost per lb., c. |
|---|---|---|---|---|
| 1906 | 192,210 | 15.3 | 2,937,098 | 13.5 |
| 1907 | 175,450 | 15.2 | 2,667,608 | 27.5 |
| 1908 | 218,940 | 13.8 | 3,011,660 | 28.3 |
| 1909 | 401,280 | 14.3 | 5,719,056 | 15.85 |
| 1910 | 520,860 | 14.5 | 7,567,394 | 11.3 |
| 1911 | 457,440 | 16.4 | 7,490,120 | 10.55 |
| 1912 | 531,105 | 15.4 | 8,186,957 | 11.4 |
| Total | 2,497,285 | 15.1 | 37,579,893 | 14.6 |
| | TAMARACK | | | |
| 1906 | 389,680 | 25.3 | 9,832,644 | 14.7 |
| 1907 | 533,600 | 20.8 | 11,078,604 | 16.5 |
| 1908 | 654,897 | 19.6 | 12,806,127 | 15.2 |
| 1909 | 689,099 | 19.6 | 13,533,207 | 14.1 |
| 1910 | 525,554 | 21.1 | 11,063,606 | 14.4 |
| 1911 | 392,338 | 19.1 | 7,494,077 | 15.4 |
| 1912 | 421,385 | 18.8 | 7,908,745 | 13.05 |
| Total | 3,606,553 | 20.5 | 73,717,010 | 14.8 |
| | ALLOUEZ | | | |
| 1906 | 178,292 | 19.5 | 3,486,900 | 13.7 |
| 1907 | 214,720 | 9.85 | 2,134,116 | 40.8 |
| 1908 | 220,905 | 13.80 | 3,047,051 | 16.9 |
| 1909 | 253,049 | 15.93 | 4,031,532 | 13.3 |
| 1910 | 247,119 | 18.84 | 4,655,702 | 11.1 |
| 1911 | 288,610 | 16.56 | 4,780,494 | 13.1 |
| 1912 | 333,618 | 16.56 | 5,525,455 | 13.4 |
| Total | 736,313 | 15.9 | 27,661,250 | 15.4 |
| | CENTENNIAL | | | |
| 1906 | 166,000 | 13.58 | 2,253,015 | 19.6 |
| 1907 | 200,040 | 11.85 | 2,373,572 | 27 4 |
| 1908 | 169,693 | 12.94 | 2,196,377 | 21.2 |
| 1909 | 196,525 | 13.15 | 2,583,793 | 15.5 |
| 1910 | 102,133 | 15.40 | 1,572,566 | 14.3 |
| 1911 | 86,543 | 17.26 | 1,493,834 | 12.7 |
| 1912 | 106,517 | 16.36 | 1,742,338 | 13.4 |
| Total | 1,027,451 | 13.9 | 14,215,495 | 18.3 |

### SUMMARY OF LAKE SUPERIOR GROUP

The production of this group for the last seven years has amounted to 1,303,227,001 lb. of refined copper from ore having an average yield of 20.4 lb. per ton. The net cost of this copper has averaged a little over 10.3c. per lb., which is less than the average obtained for 1912 by about 0.28c. per lb. Approximately 56% of the present output of the district is produced at or below this cost while the remaining 44% costs anywhere from 10.5c. up, as will be seen by referring to the table of costs and production for 1912, which accounts for about 89% of the entire output.

### THE PORPHYRY GROUP

Practically speaking, all the properties of the porphyry group are new mines, as not one of them has yet reached its maximum production, with the excepticn of the Nevada Consolidated. They have all expended large sums for development and equipment, as will be shown by figures given. The greater part of these expenditures are chargeable to future production and are being carried in deferred operating accounts or capital accounts that are given, but in figuring the cost of producing copper, the operating costs as reported by the companies are used. During 1912, the production from these mines was as follows:

PRODUCTION, PORPHYRY GROUP, 1912

| Mine | Tons of ore | Yield per ton lb. | Total lb. copper |
|---|---|---|---|
| Utah Copper Co. | 5,315,321 | 17.2 | 91,366,337 |
| Nevada Consolidated | 2,887,731 | 21.9 | 63,063,261 |
| Ray Consolidated | 1,565,875 | 22.2 | 34,674,275 |
| Miami Copper | 1,040,744 | 31.5 | 32,832,609 |
| Chino Copper | 1,122,666 | 24.7 | 27,776,088 |
| Total 1912 | 11,932,337 | 20.93 | 249,712,570 |

It will be noted that the total production of this group was 249,712,570 lb. of refined copper from 11,932,337 tons of ore, yielding 20.93 lb. per ton during 1912. This copper was produced at a net operating cost of 8.83c. per lb., after crediting 0.83c. for miscellaneous receipts and 0.57c. for receipts from sale of gold and silver contents. The Nevada Consolidated dividends received by the Utah Copper Co. are not included in the credits against operations. The operating cost as reported by these concerns is claimed to carry a proportionate amount of stripping of overburden from ore mined from openpits, underground development and depreciation on plants and equipment. The total amount expended by the group during 1912 amounted to $32,071,810, made up of: $25,561,221 for operations, $3,452,869 for deferred stripping and development, and $3,057,720 for construction and equipment. Miscellaneous receipts totaled $2,060,002, and sales of gold and silver, $1,446,208. In addition to the expenditures given, there were spent $1,039,797 for investments in subsidiary companies and $1,042,637 for additional property.

For details of costs for this group, reference is made to the table given for 1912.

1912 COSTS PER LB. COPPER FOR PORPHYRY GROUP

| Mine | Operating cost, c | Misc'l earnings credit, c | Gold and silver credit, c. | Net cost, cents | Deferred charges |
|---|---|---|---|---|---|
| Utah Copper | 9.98 | 0.054 | 0.956 | 8.97 | 2.80 |
| Nev. Cons. | 11.63 | 2.46 | 0.820 | 8.34 | 0.99 |
| Ray Cons. | 10.53 | 0.827 | 0.023 | 9.68 | 5.14 |
| Miami | 10.15 | 0.02 | 0.13 | 10.00 | 0.98 |
| Chino | 7.69 | 0.45 | . . | 7.24 | 4.75 |
| Total | 10.23 | 0.83 | 0.57 | 8.83 | 2.61 |

The Utah Copper Co., Bingham, Utah, in 1912 mined 78.81% of its tonnage by steam shovels and 22.19% from underground. The capacity of its Magna mill is 12,000 tons per day and the Arthur plant can treat 8000 tons, a total capacity of 21,000 tons per day. Allowing for delays in operation, this should give about 7,000,000 tons annual capacity and an output of something over 100,000,000 lb. of copper per year. Since June 30, 1907, this company has produced 375,183,676 lb. of refined copper from ore yielding from 17.2 lb. to 20 lb. per ton. This copper has been secured for an operating cost of 9.5c. per lb., with credits of 1.03c. for gold and silver, and 0.05c. for miscellaneous earnings, making a net operating cost of 8.42c., as reported. During this period there has been spent $4,571,714 for stripping and development and $5,587,316 for construction and equipment not charged to operations but carried in deferred charges. These charges to date equal about 2.79c. per lb. of copper produced, of which 1.22c. is deferred development and stripping and 1.59c. is for construction and equipment. The ore reserves are estimated to contain 316,500,000 tons of ore, averaging about 30 lb. of copper per ton, which, according to past records, should yield something like 18 lb. of refined copper. The present deferred charges amount to only about 0.177c. per lb. of recoverable copper in reserves. It is understood, however, that this charge is likely to increase before all development and stripping is completed. The actual construction necessary to keep the plant and equipment in repairs should be reckoned at not less than 0.7c. per lb. of copper. This figure is obtained from expenditures of numerous copper producers whose operations extend back for several years and may be applied to any operations which include milling.

In the table giving the record of this company by year, the first period is for 18 months, from June 30, 1907, to Dec. 31, 1908. The value of the gold and silver contents per pound of copper was: 0.91c., 1c., 1.18c., 1.07c. and 0.956c. in the order given in the table:

UTAH COPPER CO

| Year | Tons of ore | Yield per ton, lb. | Total lb. of copper | Costs per lb. copper<br>Operating, c | <br>Less credits, c | <br>Net Cost, c. |
|---|---|---|---|---|---|---|
| 1908 | not given | | 54,051,212 | 9.80 | 0.96 | 8.84 |
| 1909 | not given | | 51,749,233 | 9.80 | 1.05 | 8.75 |
| 1910 | 4,340,245 | 19.46 | 84,502,475 | 9.25 | 1.24 | 8.01 |
| 1911 | 4,680,801 | 19.95 | 93,514,419 | 8.89 | 1.11 | 7.78 |
| 1912 | 5,315,321 | 17.20 | 91,366,337 | 9.98 | 1.01 | 8.97 |
| Total | | | 375,183,676 | 9.5 | 1.08 | 8.42 |

The Nevada Consolidated Copper Co., Ely, Nev., to date has mined all its ore from openpits, but is planning to extract some of its present ore reserves by underground mining. The cost of production will naturally increase when this method is adopted; the present cost is about [illegible] per ton, underground mining will probably average $1 for all expenses. The company makes a large profit from its investments, which are nothing more than ownerships of subsidiaries operating its railroad and reduction works. The profits derived from this source are a part of the business, therefore are rightly a credit against operating expenditures. The income from these concerns amounts to approximately $1,500,000 per year, or a little over 2c. per lb. of copper. During 1910, 1911 and 1912, this company has produced 8,463,001 tons of ore, yielding 24.2 lb. of copper per ton, or 204,376,873 lb. of refined copper. Gold and silver contents have averaged 0.78c. per lb. of copper, and miscellaneous receipts from investments, 2.17c. Operating expenditures have equaled 10.35c. per lb.; deducting credits, the net cost of this copper as reported was 7.4c. per lb. Deferred stripping charges during this period are equal to 0.98c. per lb. of copper produced, and construction, 1.01c. per lb. The ore reserves are estimated to contain 38,853,551 tons of 33.4-lb. ore. The present deferred charges amount to something over 0.45c. per lb. of recoverable copper yet to be mined. The record for three years given herewith is for periods ended Sept. 30, 1910, and Dec. 31, 1911 and 1912. In 1912 the production was below normal on account of labor troubles.

NEVADA CONSOLIDATED

| Year | Tons ore | Yield per ton | Total lb. copper | Cost per lb. copper<br>Operating cost, c. | <br>Less credits, c. | <br>Net cost c. |
|---|---|---|---|---|---|---|
| 1910 | 2,237,028 | 28.1 | 62,772,342 | 9.8 | 2.8 | 7.00 |
| 1911 | 3,338,242 | 23.6 | 78,541,270 | 9.8 | 2.81 | 6.99 |
| 1912 | 2,887,731 | 21.9 | 63,063,261 | 11.6 | 3.25 | 8.35 |
| Total | 8,463,001 | 24.2 | 204,376,873 | 10.35 | 2.95 | 7.40 |

The remaining three mines of the porphyry group—Ray Consolidated, Miami and the Chino—are just entering their production period. In 1911 Ray Consolidated, Kelvin, Ariz., produced 14,935,047 lb. of copper from 681,519 tons of ore, yielding 21.9 lb. per ton at a net cost of 11c. per lb., after deducting 1.5c. for miscellaneous credits. For 1911 and 1912, the production was 2,247,394 tons, yielding 22.1 lb. of copper per ton, or a total of 49,609,322 lb. The average cost of this copper was 11.15c. per lb. for operating expenditures as charged, less credits, amounting to 1.05c. per lb., making a net cost of 10.1c. Present deferred development amounts to about 0.15c. per lb. of recoverable copper estimated to be in the ore reserves, and 0.28c. will about cover construction and equipment charges as carried in capital accounts.

The Miami Copper Co., Miami, Ariz., in 1911 produced 15,385,783 lb. of refined copper, making a total of 18,218,392 lb. for two years ended 1912. The cost reported was 9.8c. per lb. less 0.17c. for credits, or a net cost of 9.63c. per lb. The deferred charges of the Miami, as they stand at present, are equal to about 0.65c. per lb. of recoverable copper, estimated to be in reserve. Of this, 0.22c. is for development, and 0.434c. is for construction and equipment.

In 1911 the production of Chino was less than 1,000,000 lb. and as actual operations were not well underway until 1912, the production for 1912 is all that is considered in this calculation. At present the deferred charges for stripping and development at Chino amount to approximately 0.288c. per lb. of recoverable copper in ore reserves, made up of 0.244c. for construction and equipment and 0.044c. for development and stripping.

### Summary of Porphyry Group

The five companies mentioned are the only producers of any consequence of the so called porphyry group. The

Inspiration Copper Co., situated near the Miami and Ray Consolidated, will produce something over 50,000,000 lb. per year when operations are well under way. Its mill is now being constructed and it will be at least three years before its output reaches this amount. The Inspiration costs should compare with those of Ray Consolidated. The Braden Copper Co., of Chile, is just entering the productive stage and will, in all probability, reach an output of 70,000,000 lb. of copper per annum, though the present plant can turn out only about half this much. There is no reason why this copper should not be produced as cheaply as copper from the western porphyries, as the class of labor secured there is much above the average of other South American countries and other conditions are favorable for reasonable costs.

From the figures given, it will be seen that we have accounted for a total production of 705,164,351 of copper from the porphyry mines. The average cost of this copper, as computed from figures, given in the annual reports, is 9.8c. per lb. for operating, with credits of 1.53c., making a net cost of 8.27c. per lb. As the deferred charges of the group stood at the end of 1912, they amounted to approximately 4.74c. per lb. of copper produced, made up of 1.72c. for stripping and development and 3.02c. for construction and equipment. However, based upon the amount of copper expected to be recovered from the ores in reserve, these charges amount to only about 0.106c. and 0.188c., respectively, or a total of 0.294c. per lb. yet to be recovered from reserves. It will be noticed that the average cost for 1912 is higher than the average to date, due in part to labor troubles at the Utah and Nevada Consolidated, yet the costs of 1912 are by no means high, and if maintained as an average through the life of the mines, a new record in copper costs will be confirmed.

### MISCELLANEOUS GROUP

We now take up a group of companies which obtains its copper from ores yielding approximately 57 lb. per ton. The exact yield cannot be obtained as two of them do not give the tonnage treated. This estimate includes the Phelps-Dodge ores, which average over 70 lb. per ton from all mines operated by it. The other companies in 1912 obtained a yield of between 52 to 54 lb. per ton. The Calumet & Arizona and the Superior & Pittsburgh are practically one operating company, as is the case of the Old Dominion and the United Globe, but as their operating statements are made separately, they are so treated in the tables. The miscellaneous group's output for 1912 is given for each mine.

PRODUCTION OF THE MISCELLANEOUS GROUP, 1912

| | Tons of ore | Yield per ton, lb. | Total lb. copper |
|---|---|---|---|
| Anaconda | 5,069,242 | 58 | 294,474,161 |
| North Butte | 425,297 | 62. | 26,480,123 |
| Tennessee | 444,289 | 29.8 | 13,352,634 |
| Shannon | ..... | .... | 16,406,336 |
| Granby | 739,519 | 17.9 | 13,231,121 |
| British Columbia | 740,589 | 15 | 11,146,811 |
| Calumet and Arizona | 159,513 | 92.1 | 16,490,229 |
| Superior and Pittsburgh | 288,429 | 127 | 36,618,399 |
| Mason Valley | 241,822 | 66.5 | 16,058,493 |
| Old Dominion | ....... | .... | 16,533,999 |
| United Globe | 188,254 | 65 | 12,252,073 |
| | | | 473,044,379 |
| Phelps-Dodge output | | | 140,628,798 |
| otal | | | 613,673,177 |

The average cost of this copper was 9.6c. per lb., after allowing credits of 2.38c. for gold and silver contents and 0.18c. for miscellaneous receipts reported. The operating expenditures, as reported, amounted to 12.16c. per lb. and construction and other expenditures not charged to operations did not exceed 0.4c. per lb. Including the Phelps-Dodge production, it is safe to say that the copper produced during 1912 from the sources mentioned did not exceed a net cost of 9.5c., after allowing credits. The Tennessee Copper Co. is now deriving some profit from the production of sulphuric acid from its fumes, but from figures published, there is no way to estimate what its income from this source is.

The statement of the United Globe expenditures do not contain smelting charges, which are evidently deducted by the Old Dominion before making settlements for its ore. For this reason, the costs of the two companies are figured together. The Mason Valley began operations in 1912, and its costs will be lower when operations are on the basis contemplated.

1912 COSTS—MISCELLANEOUS GROUP, PER LB. COPPER

| | Operating, c. per lb. | Gold and silver, c. | Misc'l. receipts, c. | Net cost, c. | Construction, etc., not charged, c. |
|---|---|---|---|---|---|
| Anaconda | 12.3 | 2.66 | 0.24 | 9.40 | 0.01 |
| North Butte | 13.1 | 3.37 | .... | 9.73 | ... |
| Tennessee | .... | .... | .... | 11.00 | 0.04 |
| Shannon | 12.6 | 1.05 | .... | 11.55 | .... |
| Granby | 17.3 | 6.06 | .... | 11 24 | .... |
| British Columbia | 18.5 | 5.3 | .... | 13.2 | 3.1 |
| Calumet and Arizona | 10.66 | 1.96 | .... | 8.70 | 0.2 |
| Superior and Pittsburgh | 7.67 | 1.36 | 0.05 | 6.26 | 0.2 |
| Mason Valley | 14.8 | 0.23 | .... | 14.57 | 0.003 |
| Old Dom.—United Globe | 9.0 | 0.51 | 0.44 | 8.05 | 0.59 |
| Total | 12.16 | 2 38 | 0 18 | 9.6 | 0.4 |

The Anaconda Copper Co., Butte, Mont., in 1910, took over the Boston & Montana, Red Metal, Butte & Boston and several other important producers, so that now it produces practically all the copper from the Butte district. As stated, the output from the Lake Superior district in 1912 was 231,628,486 lb. The magnitude of the Anaconda and its importance in the copper industry may easily be realized by comparing its production with that of the Lake district, which is exceeded by nearly 63,000,000 lb., or by almost as much as the Calumet & Hecla output. Its present annual output is over 2½ times the maximum expected from the Utah Copper and about twice the present yearly output of the Phelps-Dodge properties. The Anaconda ores in 1912 yielded about 0.415c. gold and 0.0375 oz. silver per ton. The gold content has doubled since taking over the other properties mentioned, but the silver content has remained practically the same. Apparently the Anaconda has charged more depreciation on plants, etc., than it has actually spent in the past seven years. To get the actual expenditures the statements have been checked carefully. Since Jan. 1, 1906, to Dec. 31, 1912, the production of this company has been 1,076,913,905 lb. of refined copper. This came from ores yielding from 56.4 to 61 lb. per ton. In 1912, the yield was 58 lb. The actual expenditures to produce this copper have amounted to approximately 13.3c. per lb. Gold and silver credits were about 2.45c. per lb. The company has various incomes from investments and subsidiaries, which are a part of the business and should be credited to its expenditures. Income from this source has averaged about 0.45c. per lb., making a total credit of 2.9c., and a net cost of 10.4c. per lb. of copper produced in the past seven years.

Next to the Anaconda, the North Butte is the most important copper producer in the Butte district. Its ore has yielded about 77 lb. per ton in the last six years, in

1911 and 1912 the yield has been 60.5 and 62.1 lb., respectively. Gold and silver have averaged 2.26c. per lb., and during the last three years of the period this credit has amounted to 2.22c., 2.55c. and 3.37c. per lb. The production of copper from Jan. 1, 1907, to Dec. 31, 1912, was 163,115,127 lb., at a total cost of 10.75c. per lb., including all expenditures except investments and payments on mining lands. After deducting the precious-metal contents, the net cost of this copper has averaged 8.49c. per pound.

Beginning with 1909, the Tennessee Copper Co., Copperhill, Tenn., has not issued a statement of operating expenditures in a form that will permit working out its average cost, as is the case with most of the other concerns mentioned. However, I am confident that its actual net receipts from operations have been:

| | |
|---|---|
| 1907 | $808,523 |
| 1908 | 406,317 |
| 1909 | 337,621 |
| 1910 | 282,193 |
| 1911 | 356,507 |
| 1912 | 1,224,159 |
| Total | $3,415,321 |

These figures were obtained by working back from changes made in quick assets, after allowing for receipts from bond issues. For example, in 1912 the balance of quick assets was increased $230,640. No money was received from loans, so that all disbursements were evidently earned. Adding dividends paid, $500,000; bonds redeemed, $300,000; and interest paid on bonds, $80,250, we have an actual net gain of $1,110,890 for the year above all expenditures. The company has been compelled to control the fumes from its smelting plant, and has spent a considerable sum for several years in changes and the erection of a sulphuric-acid plant. These expenditures are properly chargeable to deferred or capital accounts. In 1912, this construction amounted to $113,269, which, added to the net gain of $1,110,890, gives actual receipts over operating expenditures and current construction of $1,224,159 for 1912, as shown. By these figures it is possible to get a good check on the cost, as reported by the company. During this 6-year period, the price of copper has averaged about 14.6c. per lb. The production was 80,613,141 lb. of refined copper, indicating a profit of 4.23c. per lb. for the period, or an average cost of about 10.4c. per lb. The actual price received by one company does not agree with the quoted average market price for the year, however, by this method the company's reported cost is checked to 0.3c. per lb., the average by its own figures being about 10.7c. per lb. Therefore, the reported costs should be accepted with confidence. We then have 80,613,141 lb. of copper produced by this company from 1907-1912 at a net cost of 10.7c. per lb., exclusive of smelting- and acid-plant construction. Gold and silver produced were about 0.03c. per lb. in 1912, but it is not plain that all this comes from the company's own ores. The ore has yielded about 33 lb. of copper per ton.

The Shannon Copper Co., Metcalf, Ariz., for seven years ended Dec. 31, 1912, has produced and sold 108,287,586 lb. of copper from ore which yields from 40 to 50 lb. per ton; an exact figure cannot be obtained from the reports as no tonnage figures are given. The total expenditures of the company were apparently 14.5c. per lb., or 13 [illegible] net, after allowing for 0.7c. gold and silver contents. The yield in silver is almost double the gold produced. These expenditures consisted of 0.43c. for construction, etc., and 0.27c. for development of outside properties, the remainder being direct operating cost.

At the Granby Consolidated Mining, Smelting & Power Co., Phœnix, B. C., during seven years ended June 30, 1912, there were treated 6,286,847 tons of ore yielding 21.2 lb. of copper, 0.34 oz. of silver, and 0.047 oz. of gold per ton. The total production of copper amounted to 133,218,126 lb. The company during this period has received about 57c. per oz. for its silver, with gold at $20 it should have a credit of about 5.35c. per lb. of copper produced for these metals. The company has spent, exclusive of new property purchased, 16.8c. per lb. of copper, crediting gold and silver, the net cost of this copper was about 11.45c. per lb. The yield of the ore smelted has been falling for the past four years; in 1908 it was 24 lb.; 1909, 22.3 lb.; 1910, 19 lb.; 1911, 18.1 lb.; and in 1912 it was 17 lb. per ton.

The British Columbia Copper Co., Greenwood, B. C., during four years ended Dec. 31, 1913, has smelted 2,164,542 tons of ore yielding 34,560,255 lb. of copper, or 16 lb. per ton. This includes custom ore smelted. The yield of the company's ore has been: 17.7 lb., 18, 16.4 and 13.6 lb. for 1909-1912, in the order named. Precious metals produced amounted to 100,212 oz. gold and 424,705 oz. silver. The total operating charges, including 2.6c. per lb. of copper for purchased ores and miscellaneous expenses, were 17.8c. per lb. of copper produced. Deducting precious metals the operating cost was 11.3c. per lb. In addition to this charge, construction and mining land purchases amounted to 2.24c. per lb., but there is no way to segregate these charges from the figures given in the reports.

The Calumet & Arizona, Warren, Ariz., during the period 1908-1912, has produced 121,677,650 lb. from ore yielding 99 lb. of copper and 1.1c. of gold and silver per lb. of copper. The net cost of this copper was 9.46c. per lb. after deducting 1.1c. for other metals and 0.61c. for miscellaneous earnings from an expenditure amounting to 11.17c. per lb. The dividends received from the Superior & Pittsburgh are not credited in this cost. All expenditures are included in this figure except those for investments and construction of a new smelting works, which has just been erected. Current construction included is about 0.036c. per lb. In addition to this all exploration charges on outside properties are included. At the end of 1912 the new smelting plant had cost $1,174,987. As its subsidiary, the Superior & Pittsburgh during the same period the production of copper was 137,635,480 lb., at a net cost of 8.46c. per lb. from ore yielding 119 lb. per ton. This cost is obtained after deducting 0.97c. for gold and silver contents and a small credit for other income. Stock investments and property purchases are not included. The ore has shown an increase in yield for the past two years.

The Mason Valley Mines Co., Thompson, Nev., began producing in 1912. Its cost of production was given in the table for 1912 costs, which in this case represented total expenditures for the year. The last of the miscellaneous group, the Old Dominion Co., operates the Old Dominion Copper Mining & Smelting Co. and the United Globe Mines, Globe, Ariz. During five years ended Dec. 31, 1912, the two companies have produced 139,219,259 lb. of copper at a net cost of 9.8c. for all expenditures.

This cost is obtained by including all operating and construction expenditures at the mines, expenditures apparent from an analysis of reports, and Boston expenses of the Old Dominion Co.; these amount to 10.5c. per lb. Besides the gold and silver contents of the ore (0.34c. per lb.) there are credits of 0.36c. for interest receipts of the Old Dominion Co., smelting profits and miscellaneous income. These deducted from the total expenditure make the cost 9.8c. for five years as stated.

In the miscellaneous group, 2,011,299,022 lb. of the last seven years' production has been accounted for. It will be seen in the table or summary of this group that this copper has been produced and marketed for 10.3c. per lb., after deducting 2.4c. for credits, from expenditures amounting to 12.7c. per pound.

SUMMARY OF MISCELLANEOUS GROUP FOR PERIODS ENDED 1912

| | | | | Cents per lb. copper | | | |
|---|---|---|---|---|---|---|---|
| | | | | | Credits | | |
| | Years | Yield per ton, lb. | Total production, lb. | Expenditures | Ag and Au | Misc'l. | Net cost |
| Anaconda | 7 | 56 to 61 | 1,076,913,905 | 13.30 | 2 45 | 0.45 | 10.4 |
| North Butte | 6 | about 77 | 163,115,127 | 10.75 | 2 26 | ... | 8 49 |
| Tennessee | 6 | 33 | 80,613,141 | ..... | .... | .... | 10.7 |
| Shannon | 7 | 40 to 50 | 108,287,586 | 14.5 | 0.70 | .... | 13.8 |
| Granby | 7 | 21.2 | 133,218,126 | 16 8 | 5 35 | .... | 11 45 |
| British Columbia | 4 | 16 | 31,560,255 | 17 8 | 6 5 | ... | 11 3 |
| Calumet and Ariz. | 5 | 99 | 121,677,650 | 11.17 | 1.1 | 0.61 | 9.46 |
| Superior and Pitts. | 5 | 119 | 137,635,480 | 9 43 | 0 97 | . | 8 46 |
| Mason Valley | 1 | 66.5 | 16,058,493 | 14 8 | 0.24 | | 14 57 |
| Old Dominion<br>United Globe | 5 | ...... | 139,219,259 | 10 5 | 0 34 | 0 36 | 9.8 |
| Total or average | | | 2,011,299,022 | 12.7 | 2.1 | 0.3 | 10.3 |

### Conclusion

We have now a record of 4,019,690,374 lb. of copper covering several years for each mine except the new producers included. The cost of this copper was just a fraction over 10c. per lb., after deducting all credits. This output and cost has been accounted for in the following manner:

| | | |
|---|---|---|
| Lake Superior group | 1,303,227,001 lb. | at 10.3 cents |
| Porphyry group | 705,164,351 lb. | at 8.27 cents |
| Miscellaneous group | 2,011,299,022 lb. | at 10.3 cents |
| Total and average | 4,019,690,374 lb. | at 10.0 cents |

It has been only within the last three years that the porphyry mines production has exceeded much over 100,000,000 lb. per annum. Their production has only affected the cost of copper a fraction of a cent per pound in the last seven years. In 1912 the Lake group produced 22.1% of the copper accounted for, not including the Phelps-Dodge output; the porphyries, 27%, and the miscellaneous group, 50.9%. Including the Phelps-Dodge Co., the porphyry group produced 22.3% of the output accounted for. The output and costs for 1912 are summarized:

| | | |
|---|---|---|
| Lake group | 205,636,620 lb. | at 10.58 cents |
| Porphyry group[1] | 249,712,570 lb. | at 8 83 cents |
| Miscellaneous group | 473,044,379 lb. | at 9.6 cents |
| Total and average | 928,393,569 lb. | at 9 6 cents |
| Phelps Dodge Co.[2] | 140,628,798 lb. | at 8 5 to 9c. |
| Total and average | 1,069,022,367 lb. | at 9.55 cents |

[1] Deferred and construction charges not included, 0.261c.

[2] Cost estimated.

The smelters' production from North American ores, including United States, Mexico, Canada and Cuba, for 1912, by the latest estimate was 1,489,168,562 lb. of copper. While the figures used in this calculation were reported mine productions, nevertheless they represent the actual amount of copper sold to the refineries, probably including a small balance on hand at the mines. Taking this output as a basis the cost has obtained on about 72% of the copper produced in 1912 from North American ores and, as stated in the beginning, about half of the world's output. The effect of the porphyry production during the past year is more evident. Yet again it is plain to see, although they are now producing almost 60% of their expected annual output, that they will lower the cost of the world's copper only a fraction of a cent per pound.

In the summary of all the groups for 1912 the average cost is shown to be about 9.6c. for 72% of the North American production against a general average of 10c. covering several years. The remaining copper produced from these ores and not accounted for undoubtedly costs more than 9.6c. or 10c. per lb. But if we include all expenditures during 1912 for deferred stripping, development, and new construction, which amounted to several million dollars, and should more than cover the additional cost of the remaining 28%, the cost is only raised to about 10.5c. per lb. The principal foreign producers obtain similar costs, so it seems reasonable to infer that if one-half the world's output can be produced at a cost of not over 10.5c., the remaining half should be produced at about the same cost.

### Future Costs

There is little prospect of the North American copper costing any less than it does today. The Lake district is not expected to increase its output; the district as a whole has reached its zenith and is now on the decline. Great improvement has been made in the operating costs of this district, but this will only serve to offset the decreasing grade of the ore and increasing depths of the workings. The same may be said of the mines of the miscellaneous group as a whole. The Anaconda, individually the most important factor in the copper industry, has recently completed improvements that will lower its costs, but it also faces the problem of securing its ore from greater depths than heretofore. There are some mines of this group that are expected to better their costs; on the other hand, some are now passing through the most favorable stage of operating conditions.

The orebodies of the porphyries are by no means delimited, yet the maximum production to be expected from these deposits as they are known today is not much over 11,500,000,000 lb. of copper. Economic conditions will necessarily limit the annual output from these mines. It is doubtful if it is materially increased beyond the capacity of their present plants. The minimum average cost of copper from this group will be about 9c. per lb. As a group they will rank among the low-cost producers, but their effect upon the cost of the world's copper will be insignificant.

### Cost to Consumer

With the record of increasing copper consumption so evident there is no reason to believe the world could do with less than it is getting today. Statistical evidence points strongly to the need of new sources of supply. Any marked curtailment in the output would only serve to increase the price of metal. If the less important producers do add a fraction of a cent a pound to the cost it is necessary because there is a demand for their product. The price of commodities is subject, first, to the law of demand; second, to the supply, and again the supply is regulated by the cost of production. In all business enterprises there must be sufficient return to induce people to furnish capital to carry on the business. If the price of copper should fall to a point where no profit remained for the producer, production would soon cease unless this condition changed. Not only the producer of the raw material must have his profit, but everyone through whose hands it passes must have his profit. Any operation involving the investment of capital is expected to return this profit. The consumer must not only pay the farmer his profit for producing his food, but the railroads for handling it, the warehouse that stores it, or the manufacturer who preserves it. There is also the merchant's profit to pay. This cost or profit forms no small part of the price the consumer has to pay.

In organizing a mining company there are usually large blocks of stock issued for promotion profits, this stock circulates on the market and is as much a liability as the stock sold for cash to start the business. The people who buy it demand their share of the profits. Besides stock issued for certain promotion services a large bonus of stock is sometimes given for the property. In the costs given certain profits for transportation, smelting, refining and selling have been included, as well as depreciation for plant and equipment. But the greater part of the cost of mine property is carried on the books as an asset. This charge must be returned to the investor out of the profits by the time the mine is exhausted. Some maintain that the profits from mining should be greater than from other enterprises. Regardless of whatever rate of interest return is sufficient, the consumer must pay this charge also. All these claims must be satisfied out of the margin between the cost of production as given and the selling price of the metal. To meet all these demands it is probably necessary that 40 to 50% should be added to the cost stated to get the cost to the consumer.

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## A Visitor's Estimate of Platoro

By S. Earl Bennett*

The chief problem now in the Platoro district in southern Colorado is transportation. On a recent visit to that old gold district, rejuvenated by Gilmore's discovery last autumn, as has been chronicled in the Journal[1], I found that the autos and roads for the people going and coming are all that could be desired, but that the distances to a railroad, 42 miles from Platoro and the 34 miles from Jasper, prevent regular shipping, even of sorted ore. The chief hope is that the Denver & Rio Grande R.R., which has already shown so much interest in the region and which has made some preliminary surveys, will construct a broad-gage line from Monte Vista, up Rock Creek to the Alamosa River, through Jasper and Stunner over the range into the valley of the San Juan River to connect with their line at Pagosa Springs. Until the advent of a railroad, heavy hauling will probably be done by teams and auto trucks.

The area, called the Gilmore district immediately after Gilmore's discovery of last year, but now usually referred to by the older name, Platoro, comprises the four districts of Platoro, Stunner, Gilmore and Jasper, the centers of the region being from 10 to 15 miles southwest of the towns of Alamosa and Monte Vista, in the San Luis Valley. There are excellent roads from these two towns to the four mining camps. They are being made better by the coöperation of the county and state departments, appropriations having been made by both. Worthy of special mention is the state highway through Jasper and Stunner to Pagosa Springs.

No mining district could be better situated in regard to such natural advantages as timber and water power. The mountain sides are covered by spruce, all in the forest reserve, but the forest supervisor concurs with the miners and his department will exert itself in the interests of the mineral development of the region. The townsite of Platoro has been released from the forest reserve so that deeds may be obtained by grant of the Department of the Interior, according to its rules; providing the claims which have been staked across the present townsite are set aside. The abundance of water, both in the Alamosa and Conejos Rivers, affords opportunities for hydro-electric developments. The patenting of many claims upon which work has been done off and on for many years, keeps the deputy mineral surveyors quite busy.

The impression abroad is that the ore is generally low grade. Most of the assays of surface run under $5. There are a few exceptional properties, such as the Valley Queen and Mammoth, at Platoro. The Valley Queen is under lease to John A. Traylor, of the Traylor Engineering Co., of Denver. The Mammoth is owned by Gerald Hughes and associates. Mr. Hughes is the son of the former United States Senator. The Asiatic, at Summitville, is another one of the better known mines. The Gilmore property, at Gilmore, and the Miser and Guadaloupe tunnels, at Jasper, yield at present mostly specimen ore. Sampling of the 200-ft. level of the Mammoth, samples taken at 20-ft. intervals for 1200 ft., indicated an average of $11 per ton in gold and silver. The average of 20 assays from one property in the district was $581 in gold and silver, some choice pieces of ore were exceedingly rich.

Cyanide tests are being made and it has already been shown that with the exception of ore containing arsenic and antimony, satisfactory recoveries can be obtained. The geology of the district has not been extensively studied. Professor Patton, of the State School of Mines, and 13 students, are making a geological map, a state appropriation having been made for that purpose. I found one vein with andesite hanging wall and syenite or granite foot wall. The quartz vein between was 12 ft. wide.

On the whole, the district makes a favorable impression. It is not a poor man's camp. Experienced millmen will be needed to solve the problems of ore treatment and no small sum of money will finance the prospecting of the large veins found in this widely mineralized district.

Some financially strong companies have been formed within the last month, and are preparing to prospect their properties at once. There is no boom on now and the floating population has drifted out, leaving Platoro and neighboring towns peopled with several hundred determined mining men of high average character.

The geology is the San Juan complex with considerable brecciation. Rhyolite predominates around Summitville, andesite south of Stunner, and syenite-granite at Jasper.

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*[illegible] St., Denver, Colo.

[1] [illegible] in Journal of Mar. 29, p. 679, Apr. 5, p. 730; Apr. [illegible], p. 77[illegible], May 24, p. 1069, May 31, p. 1122, June 7, p. 1167; June 14, p. 12[illegible]; map May 17, p. [illegible]

# DETAILS OF PRACTICAL MINING

## Aligning Concrete Forms in Shaft

By Robert H. Dickson*

The Calumet & Arizona Mining Co., of Bisbee, is concreting its Junction shaft by starting at the bottom and replacing the timbers with concrete. Since most of the shaft sets have been in place for 10 years, and in that time have moved more or less from their original position, permanent points had to be established at regular intervals in the shaft, for lining in the concrete forms.

A preliminary plumbing was done in order to ascertain the relative positions of the sets, and thus determine the best position for the permanent points. This plumbing was done by hanging two wires in opposite corners of the shaft, and measuring the distances from them to the wall plates and end plates.

The permanent points were placed in proper position by hanging two plumb lines the full length of the shaft. The lines were manipulated over hangers, shown in Fig. 1. These hangers were first set by hanging a short plumb line over them, and adjusting this into proper position by transit and tape. They were held by a 5-in. lagscrew and washer to a 10x10-in. stringer, projecting a little beyond the edge of the shaft. The ⅝-in. slot, through which the lagscrew passed, allowed the hanger to be moved transversely or longitudinally, and thus adjusted to exact position. The long plumb lines of piano wire were then hung over the hangers. Each line was 1500 ft. long and carried a 60-lb. weight partly immersed in crude oil.

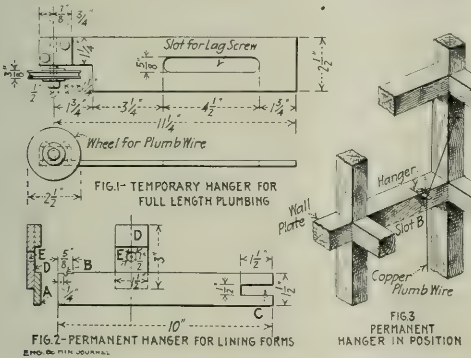

FIG.1- TEMPORARY HANGER FOR FULL LENGTH PLUMBING

FIG.2-PERMANENT HANGER FOR LINING FORMS

FIG.3 PERMANENT HANGER IN POSITION

Hangers for Shaft Plumb Wires

There was a strong upward draft in the shaft, due to the hot steam pipes supplying the pumps, which caused troublesome vibration of the wires. An ingenious scheme was devised by E. E. Whitely, chief engineer of the company, to minimize this vibration. It consisted of finding the center of swing of the wire at intervals of 300 ft. and then fastening it in this position. A strip of wood about ¼x1x12 in., with a $\frac{3}{16}$-in. hole near one end, slotted to insert the wire, was placed so the wire vibrated in the hole without touching the sides. When the center of vibration was at the center of the hole, the strip was nailed to the wall plate, and two halves of a pencil about 2 in. long, with the lead removed, were placed in the hole so that the wire passed through the groove left by the lead, thus holding the wire fast in place.

The next step consisted in placing permanent points or hangers at 35-ft. intervals. Their construction is shown in Fig. 2. They were made of ¼-in. iron plate sheared into strips *A*, 1½x10 in. One end of one edge of the strip was milled for a distance of ⅝ in. back and in this a file cut *B* was made so as to be vertical when the hanger was in place. The other end of the strip was slotted at *C*. Two of these were placed at each 35-ft. interval in opposite ends of the shaft but near the same wall plate. They were fastened to the wall plate by lagscrews through slot *C* so that the wire passed through the little slot *B*. By means of the washer *D* with a screw through the ½-in. hole *E*, the hanger was held firmly to the timber so as not to rotate about the screw through *C*. For actually lining in the concrete forms, a copper wire with a 10-lb. plumb bob is fastened to a post or other timber, as shown in Fig. 3, and then let down through the slot *B*. As the work proceeds upward, the hangers are taken out with the timbers and the next set above is used.

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## Safety Rules—Blasting*

(1) No explosive should be used unless there is plainly printed or marked in the English language, on every original package, the name and place of business of the manufacturer, together with the date of its manufacture and its strength.

(2) Use no frozen or chilled dynamite. Frozen dynamite, though not sensitive to blows, is peculiarly sensitive to friction, such as that produced by cutting or boring holes in it.

(3) The removal of a detonator from a frozen cartridge should be prohibited.

(4) Fuse should not be less than 2 ft. long for pops, block holes and shaking holes. When blasting holes the fuse should be at least 5 ft. long and always long enough to insure perfect safety, depending on the depth of the hole.

(5) Whenever practicable, after a raise has reached a height of 50 ft., blasting should be done by battery.

(6) In shaft sinking the manner of blasting shall be by battery or electric current, and the man who does the blasting should be the only one to connect the wires to the battery or switch.

(7) After shaking a hole, allow time enough for cooling before the charge is put in.

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*Mining engineer, Calumet & Arizona Mining Co., Bisbee, Ariz.

*From Inland Steel Co.'s book of rules.

(8) In tamping drill holes only wooden rammers should be used, never iron or steel. Tamping by strokes is forbidden and only direct application of pressure is permitted.

(9) One man should not fire more than five holes or fuses at one time, except with authority of the mine captain. In case more than five are to be fired, get assistance.

(10) Before blasting have a definite understanding with your partner as to which one is to return and light the fuse, after giving warning.

(11) When two gangs of miners are drifting toward each other, one gang should always notify the other before blasting.

(12) Miners about to fire should give warning in every direction and all entrances to the place where charges are to be fired should be guarded while such firing is going on.

(13) The number of shots exploding, except in case of electric firing, shall be counted by the miner firing them.

(14) If the miner is not certain that all shots have exploded, no one shall be permitted to enter the places where such charges were placed, for a period of 30 min. after the fuses were lighted.

(15) Do not go back to your place of work while the smoke is thick; there are poisonous gases present and you cannot see whether the roof and timbering are safe.

(16) It is strongly recommended that miners do not extract or attempt to extract explosives from a hole which has missed fire, but in every case insert a fresh charge above the missed hole and then explode; and that miners do not deepen holes or any part of holes left standing or abandoned and theretofore charged with explosives. If for any reason a hole is missed and the miners consider it necessary to remove the charge, this shall be done with picket, scraper and swab stick only, and no drill or metal tool shall be used in attempting such removal. Men are warned that there is great danger in attempting such removal, and are urged not to do so. Notify the shift boss and shift partners of missed holes so that they may be aware of the dangerous condition.

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## Difficulties with Flumes at Nome

For three reasons, wooden flumes in connection with the water-ditch systems of the Seward Peninsula are unsatisfactory. In the first place, the imported lumber is expensive, the landing cost is high, and the cost of freighting to the interior is even higher (Water Supply Paper No. 314, U. S. Geological Survey). On the Paragon ditch in the Council country the cost of flume lumber is said to have been nearly $200 per M.b.m. In the eastern part of the peninsula native lumber can be used for trestles and collars, but is too poor for the flume itself. A second objection to flume construction is its lack of permanency. For eight or nine months of the year it is out of commission and exposed to the elements. Snow slides may wreck portions of it; snow drifts may pile on it and in settling break the trestles, crush the bottoms and spread the sides. The worst difficulty is that of obtaining proper foundations in the frozen ground. Where a ditch settles a few inches no great harm results, but in the case of a flume, joints are opened and not only does leakage result, but the section may even fall to pieces.

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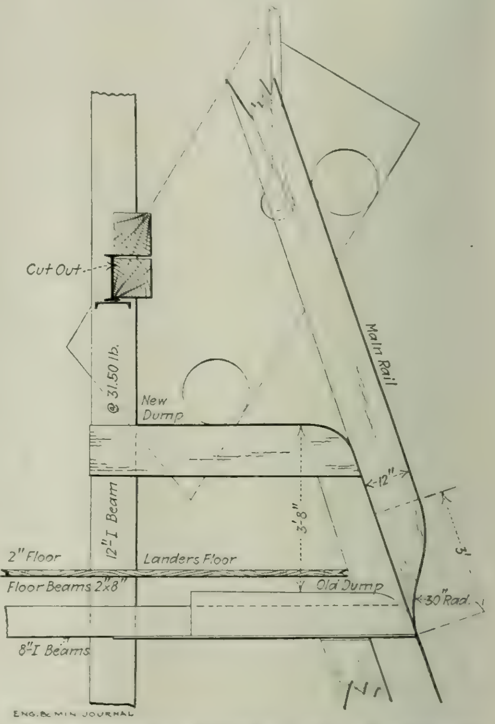
## Raising Inclined Skip Dump

The drawing shows a device applied to a skip dump, raised to a new position, which enabled the skip to dump in the same vertical plane. The construction of the dump is as outlined. The main rails are bent over for the front wheels to follow in the usual fashion, but the rear wheels are also raised somewhat as in the Angove dump, so that the dumping point is not moved forward, as it would be otherwise, an amount corresponding to the cosine of the dip.



Raising Skip Dump without Laterally Displacing Dumping Point

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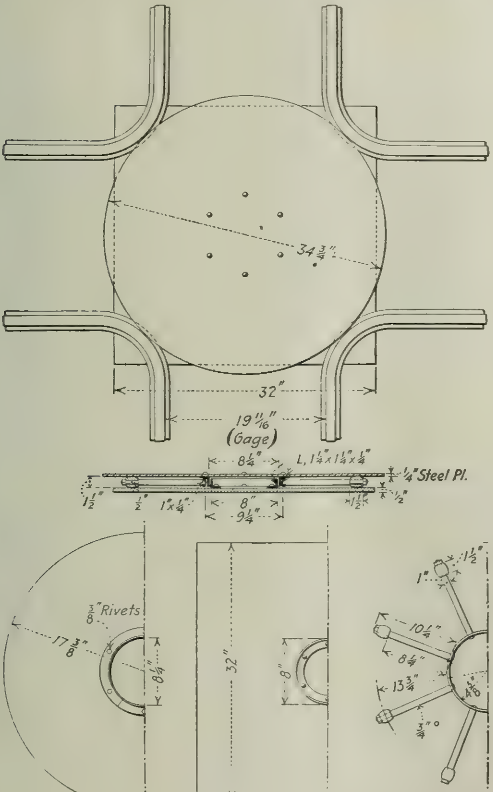
## Ore Sorting by Artificial Light

At the mines of Rammelsburg it was found impossible to separate iron pyrites from copper pyrites by the light from oil lamps, from incandescent lights, either with clear or colored globes, from either plain or enclosed arc lights, or Nernst lamps, says *Echo des Mines*. However, with Cooper Hewitt lights this separation proved easy. These lights were fitted with fluorescent reflectors, in order to overcome partially the excess of green rays Each lamp consumed 3.6 amp. at 110 volts.

## Cheap and Satisfactory Turntable

By L. O. Kellogg

For transferring mine cars from track to track, underground or on the surface, either a system of switches or a large well leveled and well backed slick sheet generally proves most satisfactory. In certain cases, however, the use of a turntable is advisable. This is especially the case where lack of room renders it necessary to make a sharp turn in direction. If a turntable is to be used, there is none better than that herewith illustrated. It is a design suggested at a Mexican mine by a mechanic engaged on a temporary erecting job. It proved an excellent device in practice and so far as known, has never been described in print.



Simple Home-Made Turntable for Mine Tracks

It consists of a fixed bottom-plate, a movable upper-plate and an intermediate spider carrying rollers. The relation of the three pieces is maintained by means of three collars which nest together. As shown, the table is applied to a track of 0.5 meter gage with 16-lb. rails; the dimensions are given in English units.

The bottom plate is here shown as made of a ½-in. iron casting taken from the scrap heap. Other types of plates would answer, such as wooden backing covered with an iron sheet fastened with countersunk screws. The top plate is of ¼-in. steel. The spider has eight arms of ¾-in. soft steel turned down at each end. One end enters a hole in the ¼x1-in. collar and is riveted over. The other end carried a roller free to revolve on the turned portion and held in by a nut. The roller is of the shape shown, a prolate spheroid with truncated ends, to be exact. If the threads are bradded down a little, there is no trouble experienced from the nut's working off. The spider collar is welded so as to be continuous. The plate collars are of bent angles, riveted to the plates, no attempt being made to weld the ends.

The diameter of the collars is such that the one on the upper plate fits loosely between that of the spider outside and that of the lower plate inside. Their height is such that the edges do not touch above or below in any case, the only contacts being those of the rollers. The car wheels come close enough to the line of the rollers so that for a 2400-lb. load with a ¼-in. steel plate, there was no dishing toward the center, so far as could be seen, which would make the collars bind. The tracks are laid as bends over the corners of the bottom plate and the thickness of the rollers is determined by the height of the rails, the top of the movable plate being at such a height as to take the bottom of the wheel flange as the tread leaves the rail. The edge of the revolving plate is made to come just below the inside edge of the rail head at the bend.

The table is cheap to put up; it can be made at any mine shop that has a lathe. It is reliable and durable; it can never wobble, as often happens with tables revolving on a central axis; and it is much simpler and less expensive than the rather elaborate tables offered by manufacturers.

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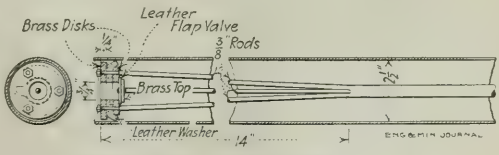
## Home-Made Hand Pump

A convenient hand pump for incidental work around a mine can be made at slight expense. The illustration represents such a pump, using a 2½-in. pipe. The pump in its simplest form will not suck, but the plunger must work in the water. By the attachment of a check valve at the bottom of the pipe, however, a suction lift could be had.



Simple Hand Pump for 2½-In. Pipe

For its construction, three ⅜-in. rods are welded to the end of a ½-in. rod, the latter of the same length as the pipe through which the pumping is to be done. The three rods are turned or swaged to $\frac{3}{16}$ in. at the lower ends to pass through the plunger and are threaded. The plunger consists of two brass disks ¼ in. thick with a piece of leather between. The lower disk fits loose in the pipe. The upper disk is slightly smaller. Thus the leather will have a slight upward turn on its edges and will be tight in the pipe when the plunger rises and loose enough when it descends, to permit easy working. A ¾-in. hole through the plunger is covered with a leather flap riveted to the plunger on one side and weighted down with a brass cap. This forms the working valve. The plunger pieces are held against the $\frac{3}{32}$-in. collars on the rods by nuts.

⁂

## Collapsible Skeleton Emergency Bucket

A recent invention of George S. Rice, chief mining engineer of the U. S. Bureau of Mines, has been dedicated to public use for rescue work around mines. It consists of a bucket or cage, built in the main of strap iron, and so constructed as to be collapsible for transportation but readily assembled for use in emergency cases. As can be seen by the illustration, it consists essentially of two vertical elliptical hoops of strap iron *A* and *B*, with three horizontal hoops *C*, *D* and *E*, and with top and bottom pieces, making what is in effect the skeleton of a bucket. Of the two vertical hoops *A* and *B*, one is smaller than the other, so as to fold inside of it when the device is knocked down. *A* and *B* revolve on a bolt at the bottom and on a draw-pin at the top, through which connection to the rope is made. This latter may work against a spring to give a cushioning effect. A cross-brace *F* of two angle bars, stiffens the top of the frame, and the bottom is reinforced with a bent angle. The construction of the head, Fig. 4, is evident. To hold the members together, a special bolt and nut, Fig. 5, is employed, the bolt having a flat head, which will not catch on obstructions in a shaft, and the nut being furnished with projections, so that it may be screwed up by hand like a butterfly nut, or by a tool acting as a lever between the projections. The size of the bucket depends upon the local use to which it is to be applied; for large buckets it may be desirable to use more than two of the vertical frame members.

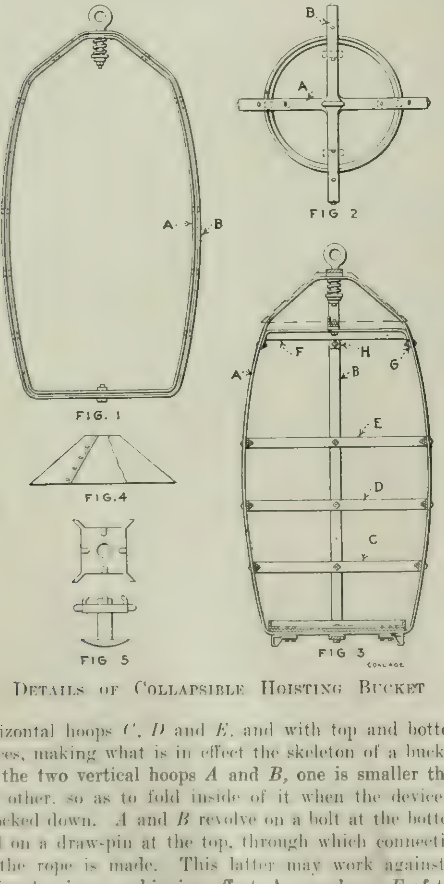


FIG. 1 FIG 2 FIG 3 FIG.4 FIG 5

DETAILS OF COLLAPSIBLE HOISTING BUCKET

The shape of the device is such that it can guide itself past possible obstructions in the shaft. One was used in a disaster in the South with great advantage, and perhaps prevented the loss of some men who had been overcome underground and might have fallen from an ordinary tub. As many as three or four men with breathing apparatus can be lowered at one time, well protected from projections which would be liable to upset another improvised conveyance. The idea occurred to Mr. Rice at the Cherry mine, where the tub used was so small that the men had to be strapped in and were unable to get off at the landing, so that a delay of half a day was experienced in building a special cage.

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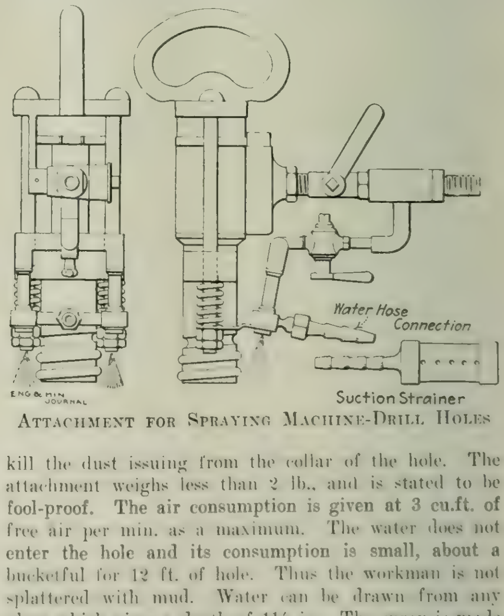
## Water Spray for Drills

An increasing amount of legislation looking to the abatement of the dangers of dust from machine drilling lends interest to the water spray herewith illustrated (*Iron and Coal Trades Rev.*, May 30, 1913). It consists of a pair of jets working on the injector principle. Air is supplied from the main air connection, water is sucked up from any convenient sump or receptacle, which may be as far as 25 ft. away. The strainer renders it possible to use dirty water. The object of the spray is to kill the dust issuing from the collar of the hole. The attachment weighs less than 2 lb., and is stated to be fool-proof. The air consumption is given at 3 cu.ft. of free air per min. as a maximum. The water does not enter the hole and its consumption is small, about a bucketful for 12 ft. of hole. Thus the workman is not splattered with mud. Water can be drawn from any place which gives a depth of 1½ in. The spray is made by the Bristol Engineering Co., Ltd., Fishponds, Bristol, England.



ATTACHMENT FOR SPRAYING MACHINE-DRILL HOLES

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**An Unusually Good Grade of Adobe** is being made by the Miami company for building houses. The ferruginous schist of the mountain side northwest of the Miami general-office building is screened through 1½-in. grizzlies and tamped into forms like those used for concrete buildings. The resultant wall is far more durable and even in structure than is the ordinary adobe, even approaching concrete in firmness.

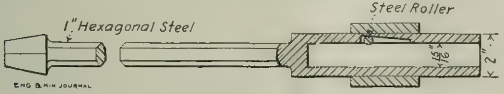
# DETAILS OF METALLURGICAL PRACTICE

## Withdrawing Stuck Bars

It frequently happens that when the forehearth is full of matte, and requires tapping in a hurry, a bar will have the head knocked off, says A. A. Summerhayes (*Min. and Eng. Rev.*, Australia, June 5, 1913). The accompanying illustration shows a useful tool for drawing the bars, and the following description should make the construction and operation of the apparatus clear.

The tool consists of a steel bar, generally made out of 1-in. hexagon steel, with a collar welded solidly on the end and bored about ⅛ in. larger than the bars in use. A slot is then cut 1½ in. long, ⅜ in. wide, and a steel wedge fitted in it flush with the outside of the collar so that a space is left in the inside of the slot of ⅜ in. on the front end of the slot and ⅝ in. on the back end. In this slot is dropped an ordinary piece of ½ in. round file or steel roller 5/16 in. long, the ends slightly conical, to prevent the roller dropping through into the bore on the tool. After putting in the roller, a steel collar is shrunk over the slot.

The operation of drawing the bar in the event of the head having broken is as follows: The tool is slipped over the bar, the roller riding on the bar until checked by coming to the end of the bore. The tool is then pulled in the direction it is desired to draw the bar. The roller immediately rides up the wedge and so grips the bar. The harder the bar is driven the tighter it naturally grips. This machine has pulled a ⅞-in. steel bar in halves, the tool gripping tight all the time. The advantage of the tool is that a tap with a hammer in the opposite direction will immediately release the implement, which is free to be used again.



APPARATUS TO DRAW STUCK BARS

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## Sampling Waste Dumps

In a suggestive series of articles on mine sampling, now appearing in the *South African Mining Journal*, Arthur S. Lejeune remarks that the question of mental bias—tempting a man to take the best and leave the worst, or *vice versa*—is of greater importance in selecting samples from a waste dump than in almost any other case, for the reason that the original sorting is never theoretically perfect, and, therefore, a considerable quantity of reef may find its way to the waste dump. This being the case, there is a tendency to include more reef in the sample than there should be. Probably the best time to sample a waste dump is on a moonlight night, when there is just sufficient light to work by but not enough to be able to distinguish reef from waste. Pieces large and small are thrown off the dump until about a ton is collected. This then represents the sample, which has to be broken down and quartered to a convenient size.

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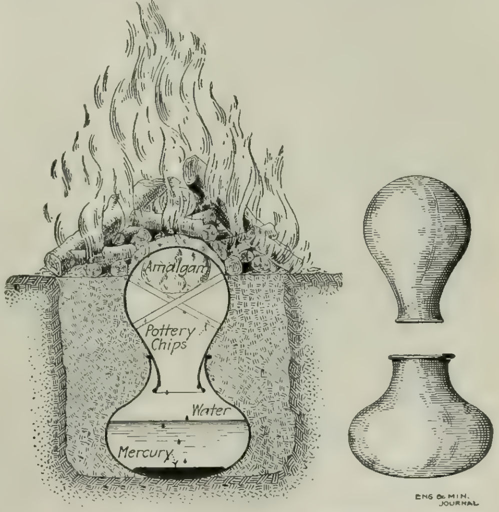
## Mexican Method of Retorting Amalgam

BY A. M. MERTON[*]

I have never seen described the remarkably simple but effective Mexican method of retorting amalgam obtained from the operation of *arrastres* or *tahonas*, as they are almost universally called in Mexico and Central America. The method of retorting used by the small operators in Mexico requires no iron retort. Everything is home-made, but the results are fully as efficient as those obtained from the use of the small retorts obtained from supply houses. These little wrought-iron retorts warp out of shape after being used once or twice and the top fits wretchedly. The Mexican appliance, which of course never fits, even at first, is always the same and will last several burnings before breaking. It can then be replaced at a maximum cost of fifty *centavos*. Possibly an account of this method will be interesting to engineers, as it has been useful to me a number of times.



PRIMITIVE MEXICAN RETORT

Several years ago I had a group of claims in southern Mexico in which a small body of rich ore was discovered. I decided to test this ground by treating the ore in *arrastres*. Incidentally I hoped to get a little revenue. I had in my scrapbooks a number of articles on the *arrastre*, but face to face with the problem of building one

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[*] Colorado City, Colo.

I decided that most of the accounts had been written by amateurs who had never actually built and run such a machine. I, therefore, engaged a native who had a local reputation as a *tahonista* (not *tahonero*, that term being applied to the mules that dragged the stones) to build and run a pair of 12-ft. *tahonas*. The construction of two really good appliances was completed in a week by the *tahonista* and a helper. The only tools used were an axe and an auger. Not a particle of iron entered the mechanism and the two completed machines cost something less than 25 pesos.

I conceived great respect for the skill and ingenuity with which the native Mexican treated gold and silver ores in very simple appliances. To run a *tahona* correctly requires as much ability as we formerly saw displayed in running silver-amalgamation pans. In the elemental metallurgy of gold and silver the Spanish-American cannot be excelled.

After about ten days' operation of the *tahonas,* two handsome balls of gold amalgam were obtained. The *tahonista* suggested that he should "burn" the amalgam and recover the quicksilver. We had no retort but that did not worry José María. His wife, he explained, was a *lozera* of ability, that is, she could make good *ollas* and such pottery. Being curious to see the native method of retorting, as well as desirous of having the gold in pure form, I consented.

The *tahonista's* wife made two *ollas,* one somewhat smaller so that it could fit into the mouth of the other. The smaller of the *ollas* was used as the retort proper, the ball of amalgam being placed within it and wedged tight against the bottom of the vessel with several pieces of old pottery. The larger *olla* was about half filled with water and was used as a condenser. A hole was dug in the ground deep enough so that when the large *olla* was buried the mouth was a few inches below the ground level. The small *olla* was placed mouth downward in the larger, the water being about an inch below the mouth of the retort. The sketch appended shows the general arrangement. Earth was filled in the hole and when buried, the bottom of the small *olla* projected a few inches above the ground. A dab of stiff clay was stuck on the bottom of the retort, to protect the fragile unglazed earthenware against a chance blow, and a fire was built over the hole. It was kept going briskly all day. In the evening the fire was raked away and the *ollas* taken up. In the small *olla* was as fine a retort of gold as ever I saw and absolutely free from mercury. In the large *olla* was the quicksilver.

Out of 124½ oz. of amalgam there was obtained 35¼ oz. of spongy gold and 76 oz. of quicksilver, indicating a recovery of about 84% of the latter. Certainly not a bad result for such a simple and apparently crude arrangement. The balls of sponge gold were melted down in a blacksmith's forge and gave a pretty bar which realized about 1100 *pesos*. The thought was thrust upon me that few indeed of our gold miners could have accomplished the result with only the tools nature had supplied them with as effectively as the illiterate Mexican *tahonista*.

It is the fashion in some circles to decry the honesty of the Mexican. It is but simple justice to say that this *tahonista* was an honest and reliable man. He proved it during the months he worked with me. Of course, he might have "nibbled" at the amalgam but there was not the slightest ground for suspicion. He was as honestly proud of his work as any man I ever saw.

An odd little trick of retorting amalgam was shown me by an old Guatemalan placer miner. We had tested some placer ground with the batea using mercury. To show up the pure gold the placer miner took a large potato, cut it in two, and in one of the halves gouged out a small hole which would comfortably accommodate one of the balls of amalgam. The two halves were wired together and the potato was placed in the ashes of a fire and slowly baked overnight. In the morning the potato, on being taken out of the ashes, was found to have absorbed the mercury, leaving the spongy gold in the cavity. The spongy placer gold made pretty and queer looking beads.

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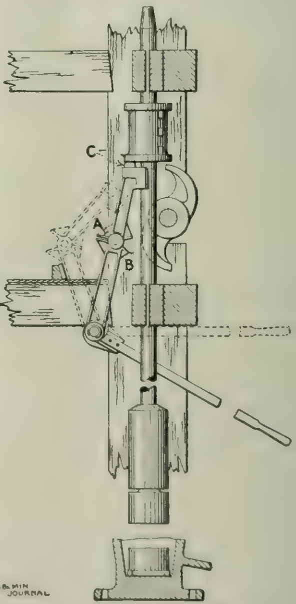
## A New Finger for Gravity Stamps

The ordinary method of hanging up stamps, with a cam-stick, has been generally considered a rather annoying one and often a little dangerous. Broken arms and crushed fingers have not infrequently resulted from its careless use. In this connection it is interesting to note the device shown in the accompanying drawing, by means of which the stamp can be hung up instantly by one standing on the lower floor in front of the mortar.



Finger for Gravity Stamps

The principle and operation is clearly shown in the drawing and is readily understood. The faces *A* and *B* are finished with a piece of leather or rubber packing, to prevent crumbling of the iron through vibration. At the point *C*, a wooden block is placed for the same purpose.

The advantages are obvious. It was invented by E. H. Moyle, of Los Angeles, Calif., and patented under U. S. No. 1,040,235 Some experiences of its practical operation would be of interest.

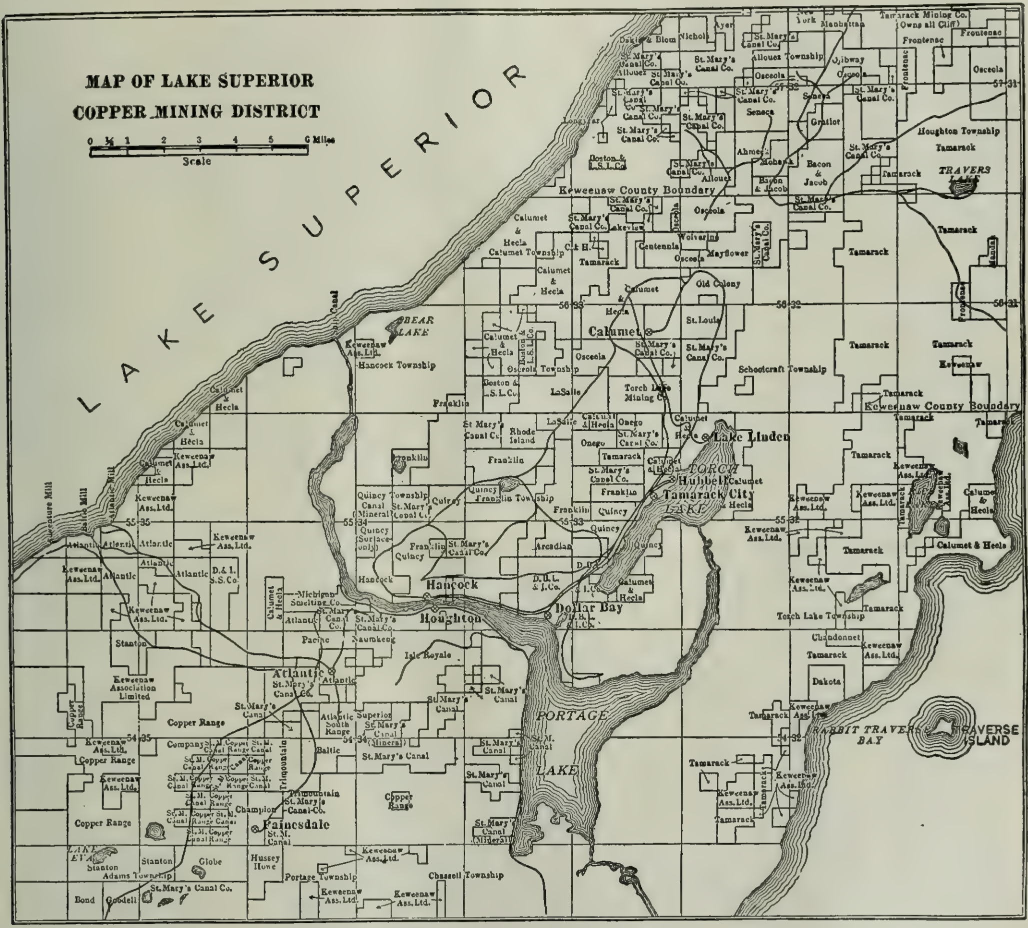
## The Strike in Michigan

For the benefit of the JOURNAL readers, who are following the course of the strike in Michigan, we herewith give a map of the copper district. The late news will be found under editorial correspondence, while illustrations of this section will be found in "Photographs from the Field."

*July 17*—Forty men were killed in a fire in a sulphur mine near Castel Termini, Sicily.—Five miners, entombed in the Spruce mine at Eveleth, Minn., as a result of a cloudburst, rescued.

*July 23*—General strike of miners in the Lake Superior copper country.

*July 24*—Militia called out to maintain order in Michigan copper country.



MICHIGAN COPPER-MINING REGION

## Chronology of Mining for July, 1913

*July 3*—General strike in the Rand gold field, South Africa.

*July 5*—Two men killed by cave-in at the Morris mine of the Giroux group at Ely, Nevada.

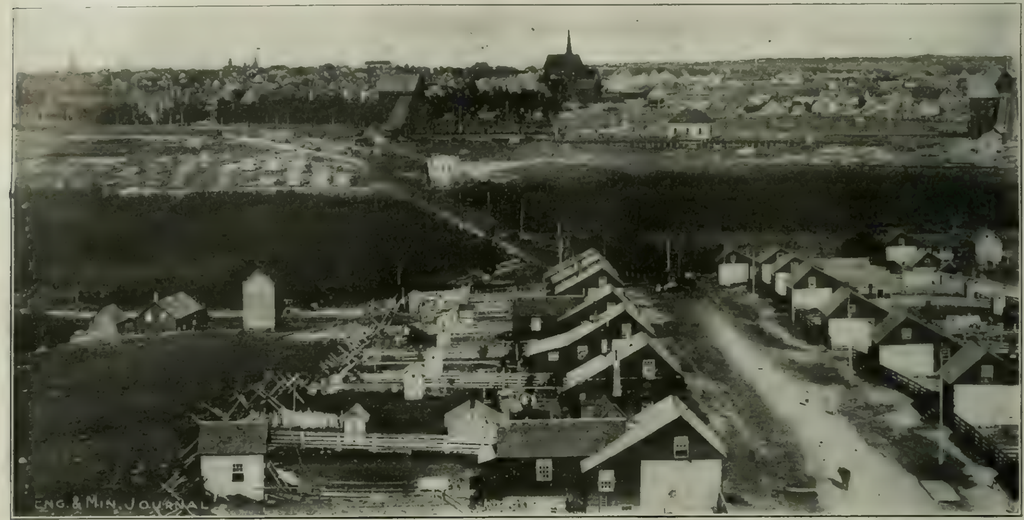
*July 7*—Rand strike ended, most of the gold miners returning to work.

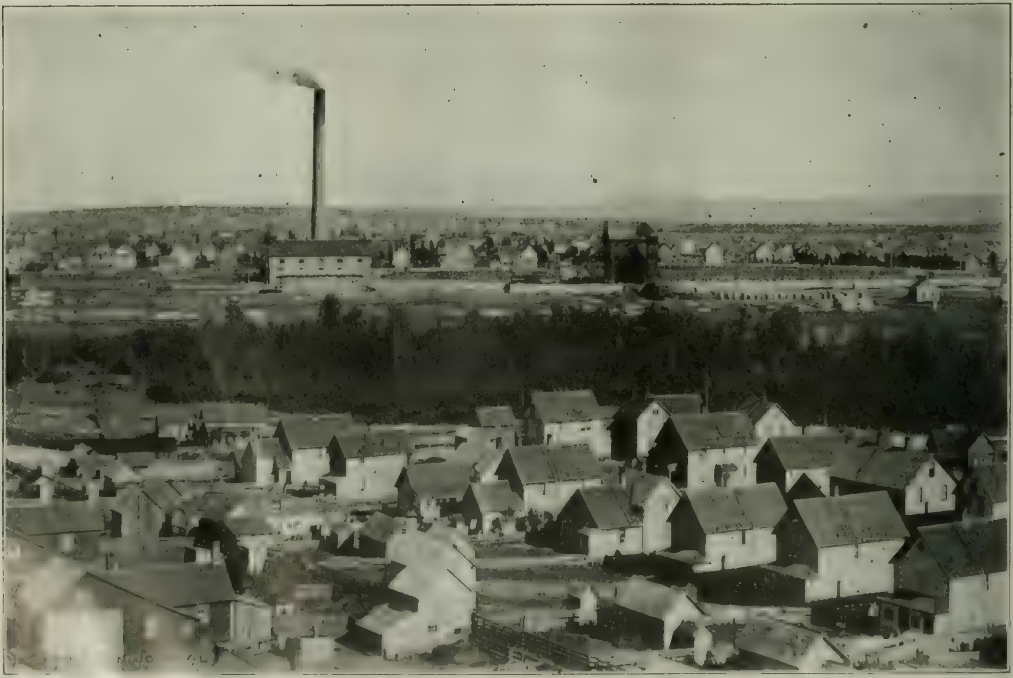
*July 8*—Suit filed for $3,000,000, by the Christmas Gold Mining Co., against the Golden Cycle Mining & Milling Co. to recover property.

*July 27*—Hearings in the Government's suit against the Southern Pacific R.R. to recover oil lands in Kern County, Calif., estimated to be worth $18,000,000, begun in the federal court at Houston, Texas.—Two men were killed in the wreck of the hoisting engine at the Green Hill mine, Mace, Idaho.

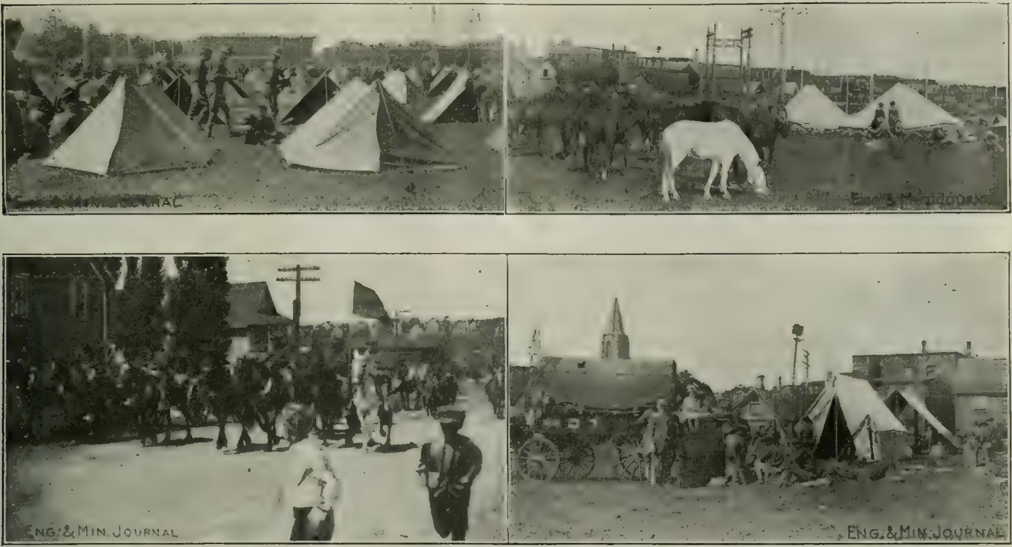
*July 30*—Miners of the Cabin Creek coal district of West Virginia settled the differences with the coal operators, and agreed to ratify an agreement between the operators and the local officers of the United Mine Workers of America.

# PHOTOGRAPHS FROM THE FIELD

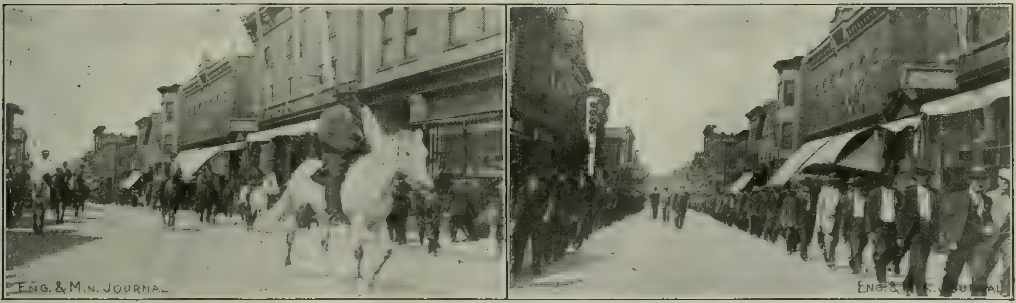




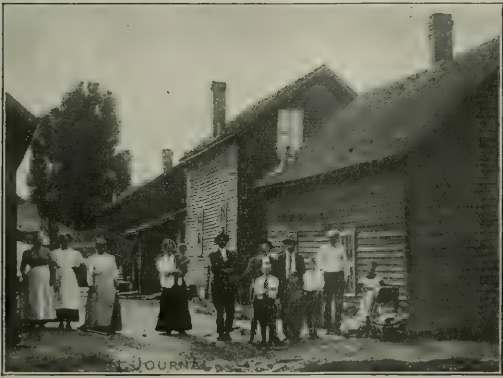
VIEWS OF THE MICHIGAN COPPER COUNTRY SHOWING TYPES OF HOUSES PROVIDED FOR MINERS



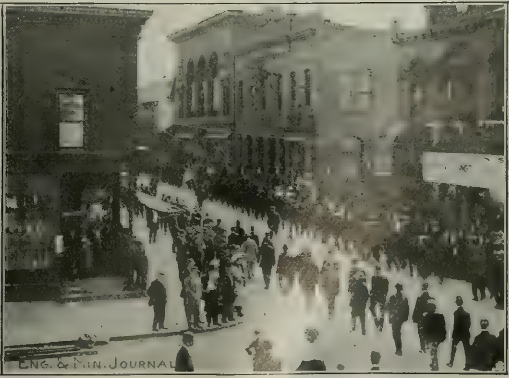
Militia Encamped in the Copper Country to Maintain Order



Federation Officials and Miners Marching in Calumet



A Miner's Family



July 30 in Calumet

## The Guggenheims

The recent testimony of Daniel Guggenheim, president of the American Smelting & Refining Co. and the Guggenheim Exploration Co., in the Ross-Burrage litigation brought out some interesting facts regarding the house of Guggenheim and the methods pursued in acquiring new properties, says the *Boston News Bureau.* The exact number of properties in which the Guggenheims are interested cannot be stated; in fact, Daniel Guggenheim says he himself does not know the number. When it was suggested to him that he was in somewhat the same position as a New England millionaire who testified he did not know how many automobiles he owned, he said he could easily answer that, as he owned four.

Daniel Guggenheim is a faultless dresser and, of course, appeared in a different suit of clothes on each of the four days he was in Boston. He is a great believer in vichy water and milk as a cure for indigestion, and while under the questioning of Sherman L. Whipple in the Ross-Burrage hearing, he frequently sipped his vichy and milk, consuming about a quart of the latter during the six hours he was daily on the stand.

The firm of M. Guggenheim was formed in 1879 and comprises the Guggenheim brothers exclusively. The senior partner is Murry Guggenheim, Daniel being the second brother and more active in the firm than the older brother. The executive work is in charge of S. R., Murry and Daniel. Murry is more particularly interested in the financial end of the business. In the next few months ex-Senator Guggenheim will again become active in the firm and, as his brother Daniel puts it, "he will come back to take up the white man's burden."

The business of the firm is concentrated at the New York office at 165 Broadway. Its main business is the development of mines as an industry, the firm rarely being identified with their flotation.

When the firm is invited to inspect properties to determine their worth the usual course of procedure is to turn the papers over to Chief Engineer Pope Yeatman, who has held that position since 1907, and he, with his assistants, Berry and Marsh, report on the same. Tests of the ore are usually made by experts Guiterman, Smith and Guess, the last being in Missouri. Franklin Guiterman has been identified with the smelting business for upward of 30 years, and is regarded as an eminent metallurgical expert. The Guggenheims have very great confidence in him. E. A. C. Smith is given as high an indorsement by the Guggenheims as Mr. Guiterman, his special business at the present time being the perfection of a leaching process at Perth Amboy to handle Chile ores particularly. Mr. Yeatman, the mining engineer, is highly esteemed by everybody, including the Guggenheims, with whom his word is law.

Daniel Guggenheim, in his recent testimony, stated that he first heard of the Chuquicamata mines in Chile about a decade ago, when Mr. Duval, of Beechey, Duval & Co., "a good friend of the firm and a gentleman with whom it had business in South America," called their attention to the property. He told Mr. Guggenheim about the grade of the ore, the distance from the railroad, [illegible] The firm did not take much stock in treating ores in those days, except by direct smelting, and as the ore was [illegible] and low grade the Guggenheims turned the proposition down.

Later, however, in June, 1911, through correspondence with A. C. Burrage, the firm became interested in the Chuquicamata mines, as it was believed the ore, running about 2% copper, could be profitably treated by the new so called Bradley process or by some other similar leaching process. In purchasing the property the Guggenheims were influenced to a great extent by the reports made by Fritz Mella.

In offering the property to M. Guggenheim Sons, Mr. Burrage stated to Daniel Guggenheim: "I don't want you to put in any money to pay me, or to take my interest over, but I would like to join you and I am willing to take for what I get for the property, a certain percentage of the stock in the new company."

A. C. Burrage did not own all the stock of the various companies purchased, the Lyon Co. and the Duncan Fox Co. being minority owners. As it is the policy of the firm to control all of a property, if possible, Daniel Guggenheim told Mr. Burrage that "it was absolutely necessary we should control the whole business because we didn't like to go into business of this kind and be compelled to do all the work and put up all the money and have a lot of stockholders on the outside, who would probably be dissatisfied with things we wanted to do and who were not reasonable and pliable; but we always respected the minority shareholders' interest; in fact, we were very sensitive about it. Our experience is that the small stockholder on the outside can be very pestiferous and very annoying, and usually is."

Mr. Guggenheim told Mr. Burrage that "if the Chile property was going to be a big thing it was for his interest to get it and keep it, as much for his interest as it was for our interest, until we had reached a position where the property was in such a state of development that we could say to our friends: 'This business is all right; you run no risk now in coming in.' Human nature is very peculiar. People who have a minority interest always imagine all sorts of things and they are very difficult to handle, and so we rarely put a large amount of money in any business where we don't—I don't mean dominate it—but where in the early stages, it is not our business."

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## American Institute of Mining Engineers

The local committee, of which C. W. Goodale, of the Anaconda Mining Co., is chairman, has completed the following program for the meeting of the American Institute of Mining Engineers, which will be held in Butte August 16 to 21, inclusive:

Saturday, Aug. 16, at Great Falls, with visits to Rainbow Falls, Giant Springs and Boston & Montana smelters; in the evening, technical session.

Monday, Aug. 18, at Butte, 9:30 a.m., technical session, morning and evening, with visits to mines in the afternoon.

Tuesday, Aug. 19, visit to Anaconda works, with a session at Anaconda and a social in Butte.

Wednesday, Aug. 20, visits to mines and two technical sessions; 12.30 p.m. luncheon at Silver Bow club.

Thursday, Aug. 21, visits to mines, and annual dinner in the evening.

# CORRESPONDENCE AND DISCUSSION

## Extremely Difficult Underground Connections

In the JOURNAL of July 26, 1913, p. 161, I notice a short article describing an underground connection at the Brakpan mine, South Africa. It is stated that both line and level holed through to about 1/8 in. The article comments upon this as a remarkably accurate job, but hardly does the matter justice. Such precision as this is rarely met with, even in mining practice and certainly reflects credit on the engineers responsible. It is difficult for the inexperienced to realize what it means to swing plumb bobs (I presume that this was the method used) at a depth of 3000 or 3500 ft. and prolong underground the line thus obtained. The achievement shows particularly beside a similar occurrence which is reported in the *Engineering Record* of July 26. The Astoria tunnel, driven under the East River from Long Island to the mainland by the Consolidated Gas Co., holed through to 3/4 in. in line and 3/8 in. in level. This tunnel is of approximately the same length as the Brakpan incline, but the shafts at the ends were only between 200 and 300 ft. There is thus no comparison whatever between the two jobs in point of difficulty, the advantage being all with the Astoria tunnel, and yet, note that the error in the connection was three times as great in one direction and six times in another.

It is hardly realized, I believe, by the public at large what accurate surveying is demanded and obtained in the mining industry. I submit these two jobs as an excellent example of what the highly specialized mining engineer can do in comparison with his brother in the ordinary branches of civil engineering.

ROBERT OLDS.

New York, July 29, 1913.

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## Salted Drill Samples of Elliptic Mine

In the JOURNAL of July 26, in the mining news, p. 189, under South Dakota, there is an item to the effect that a crew of men under the management of F. S. Stratton had unwatered the 700-ft. shaft on the Elliptic property and installed a diamond drill in the bottom, the object being to confirm the statement that former drilling had cut a body of remarkably rich free-gold ore at a depth of 600 ft. below the shaft bottom. The item concludes by saying that a great deal of interest attaches to the work, it being in a section outside of the recognized productive district, and that success will mean the stimulation of prospecting over a wide territory.

Believing that certain details in relation to this undertaking should be made public, I am writing you from my experience with the matter. As I understand it, the former drilling referred to was performed in the early part of 1909 by J. G. Leming, as superintendent for a Nebraska company known as the Elliptic Mining Co. Mr. Leming appears to have ceased work on the property in the fall of that year, and in the following year to have thrown away all of his drill cores. However, he appears to have retained the drill cuttings from around the cores, and some time after he had stopped the drilling referred to, had assays made of the cuttings obtained from near the bottom of the drill-hole. The depth of the shaft is given as 603 ft., and the depth of the drill hole 775½ ft. additional. At a vertical depth of slightly over 1300 ft. from the surface, the drill appears to have entered Archean schists, and when Mr. Leming had the cuttings of this material assayed the results ran from $300 to over $5000 in gold per ton.

The company owning the Elliptic property not being in financial position to undertake the work of continuing sinking the shaft, the proposition was brought to my attention by Mr. Leming's attorneys in the spring of 1911. These attorneys had also had assays made of the material submitted to them by Mr. Leming, the results ranging from $200 to over $4000 gold per ton. I requested that some of the drill cuttings be sent to me, and upon receiving these I sent about half of each of the four quantities received to Von Schulz & Low, of Denver. The assays they obtained ran from $240 to over $4500 per ton, but microscopic examination of particles of the gold secured by vanning the richest sample showed some of them to be spirals of flat ribbon that exactly resembled minute turnings, while striations, resembling tool-marks, could be observed on most of the flat particles. No gold could be found imbedded in rock particles or adhering to them, all the gold being loose and detached.

I communicated this result to Mr. Leming's attorneys, telling them frankly that everything pointed to the samples having been salted. At my suggestion, they then sent portions of the material to both the Henry E. Wood Ore Testing Co., of Denver, and Ricketts & Banks, of New York, for careful testing to determine whether the samples were regular or had been tampered with. The report returned by the Wood Co. showed that the material tested by them assayed over $1500 per ton, but their most careful tests failed to show the presence of metallic gold in the sample. While their conclusion given was that the sample was not a natural one, they were unable to positively establish the method of salting. The principal basis for their conclusion was that delicate vanning tests and a powerful microscope failed to show a single piece of sulphide mineral, and they considered it unlikely that at such depth from which the sample had presumably come material carrying iron should be so thoroughly oxidized and altered. Furthermore, they obtained a distinct reaction in testing for tellurium, indicating the possible method used in salting the sample. The sample tested by Von Schulz & Low was marked 770, indicating the depth of the drill-hole from the bottom of the shaft at the time the sample was secured, and was the richest sample in the lot; while the sample tested by the Wood Co. was marked 775, and was the next richest sample in the four lots of drillings submitted by Mr. Leming to his attorneys. The inference would be that different methods had been employed in salting the different lots of cuttings.

The test made by Ricketts & Banks was of material from the same lot as tested by Von Schulz & Low, and like Von Schulz & Low they had no difficulty in separating the gold by panning. Most of the metallics so secured exhibited distinct marks of abrasion under the microscope.

Furthermore, an assay of clean metallics showed the gold to be alloyed with copper, the proportion of gold being slightly higher than used in coin alloys, and in fact higher than the proportion of gold in any native gold they had ever met with in their experience. Their conclusion was that the sample was unusual and suspicious.

These three results were communicated to Mr. Leming by his attorneys, who believed Mr. Leming to be entirely sincere and to have no doubts of the genuineness of his samples. It appears that Mr. Leming, while superintendent for the company, had complete charge of the work of drilling, and that the drill cuttings had been boxed up and kept by him in a private place, and that he did not think it possible for anyone to have salted the samples. Mr. Leming's attorneys furthermore assured me that Mr. Leming's proposition to secure funds for opening up the supposed discovery was of such a nature that it would not bring him any profit of consequence unless the mine should prove valuable.

At first I thought these samples might have been salted as a hoax by someone who used filings from gold coins, but, as it afterward appeared, two distinct methods of salting were employed for the two richest of the four samples, and the matter took on a new aspect. I have never met Mr. Leming, and have no reason to doubt, in my experience, the sincerity of anyone concerned. Mr. Leming's attorneys were certainly trying to get at the truth of the matter. However, there must be a "nigger in the woodpile" somewhere, and while everyone concerned in the present experiment may know that the supposed rich ore has been tested by three of the best assayers and ore-testing firms in the country with the above results, I think, in view of the general interest which attaches to the matter, that I should write you fully.

L. H. Taylor, Jr.

Land Title Building, Philadelphia,
July 31, 1913.

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## Counter-Current Decantation of Slime

I note that H. A. Megraw, in his description of the Gold Road Mill in the Journal of July 5, speaking of continuous counter-current decantation without filters, says: "It is applicable in its present form only where solutions carrying low cyanide percentages can be used and where the amount of metal in solution is comparatively small."

The first part of this statement I consider incorrect because continuous counter-current decantation if the value of the pregnant solution precipitated is kept constant by increasing the amount precipitated with the increase in values dissolved, it will be found theoretically that not only does the percentage of recovery of dissolved values increase but the actual loss in tailing will decrease. A moment's thought will show that this must be the case, as the pulp will leave the first thickener with the same total amount of dissolved values and receive each time a greater dilution with low-grade and finally barren solution.

It may be objected that the necessity for such increased precipitation is a definite handicap to the use of this process on rich ore, but an examination of most plants using filters will show that the same practice prevails because most operators realize the necessity of complete precipitation and are not willing to take chances with too high-grade solution.

The mechanical loss of cyanide where comparatively strong solutions are used has always been recognized as one of the principal factors limiting the use of continuous decantation without filters. The use of a double circulation-precipitation system, which we have suggested and which the Gold Road company is now installing, allows this loss to be reduced about one-third. By supplying an extremely low-grade solution to be precipitated for weak barren solution it also gives insurance against losses from bad precipitation in the high-grade solution circuit.

In his discussion of the field for continuous decantation, Mr. Megraw has neglected to mention the influence of the physical nature of the pulp, which is most important. The mechanical loss of cyanide per ton of ore, when solutions of a given strength are used, depends, of course, on the ratio of solution and solids in the final discharge. With a product carrying much colloid, which can only be settled to 60% moisture, 1½ tons of solution are lost per ton of ore. A reground quartzite, which should be discharged at less than 40% moisture, would lose only ⅔ ton of solution at that figure. When considering the mechanical loss of cyanide in continuous decantation without the use of a filter, the loss met in filtration should be borne in mind. In two recent instances where I have had an opportunity to determine this loss in different types of vacuum filters, it has been found much higher than I expected and poor displacement was indicated. The determination of this loss in plants operating regularly will surprise many operators.

When thickening a mixture of fine sand with some colloid, it will be found that the thickener can be run for some time, perhaps several days, with a thick discharge, which in some cases has been low as 30% moisture. At this density, however, there is a tendency for the slime to hold back in the tank and gradually accumulate until it overflows. Reduction in the feed to the thickener will not help this condition, but a slight increase in the dilution of the discharge will cause the slime to pass out with the sandier portion. The density beyond which it is difficult to discharge the whole product delivered to the thickener will vary with each ore. The deeper the tank the greater will be the density at this point of separation. The increased use of continuous decantation in this country and abroad will undoubtedly give us more information on it within a short time, and determine how wide its field of usefulness will be.

John V. N. Dorr.

Denver, Colo., July 21, 1913.

# EDITORIALS

## The Tariff on Zinc and Lead Ore

It may be accepted as a foregone conclusion that Congress will within a short time enact a law making the duty on lead in ore ½ to ¾c. per lb.; and on zinc ore 10 to 12½% *ad valorem,* these being material reductions from the present rates in each case. As to the effects upon the industries we shall offer no argument now, but it is our duty to call the attention of Congress to certain inequitable and troublesome things that are going to happen if the proposed law be enacted in its present form.

Section 154 reads "Lead-bearing ores of all kinds containing more than 3 per centum of lead ½ (¾) cent per pound on the lead contained therein."

Section 164 reads "Zinc-bearing ores of all kinds, including calamine, 10 (12½) per centum *ad valorem.*"

Section 570 puts ores of gold and silver on the free list.

There is manifestly going to be a complication in the assessment of duties on zinc-bearing ores, which conceivably may amount to the prohibition of importation. Instead of assessing a specific duty on zinc contents in zinc-bearing ores, the bill as it passed the House contemplates a duty of 10% *ad valorem.* To this is to be added a specific duty on the lead contents. Assuming that an imported zinc-bearing ore contains lead in quantity sufficient to give the ore an added value for its lead contents, the ore is virtually to be assessed twice for the same element of value, viz.: First, 10% or 12½% *ad valorem* on the total value of the ore; second, ½c. or ¾c. per lb. on the lead contained therein. Furthermore, it is usual that foreign zinc-bearing ores contain valuable quantities of silver and gold. Ores of silver and gold are, and for many years have been, free of duty. In the pending tariff bill they are on the free list. Nevertheless, as the bill is now worded, zinc-bearing ore which possesses an added value on account of the presence of gold and silver will be assessable at 10% or 12½% *ad valorem,* so that the importation of such ore, even though it contained no lead, might conceivably be prohibited.

We imagine that the wording of sections 154 and 164 of the pending bill were designed in part to avoid the absurdity of the Payne-Aldrich Act, which causes the lead smelters to pay duty on zinc which they can not extract, do not want, and for which they penalize the shipper of the ore. If there were any well defined line between lead ore and zinc ore, and between ores used for making pig lead and spelter and those used for making oxides, there would be no great difficulty in framing simple and equitable tariff provisions, but existing conditions are so complex as to make this a problem that is well-nigh baffling. The introduction of arbitrary distinctions at certain percentages of the respective metals would naturally excite suspicion of being in the special interest of somebody, no matter how sincerely they might be offered.

However, complicated as the case may be, it is manifest that the lead and zinc sections must be altered if the obvious intention of Congress is to be fulfilled and if injustices, inequities and lawsuits are to be avoided. The phraseology of the pending bill, as it now stands, exempts from duty the gold and silver content of the lead ore imported by the lead smelters, but causes the zinc smelter to pay on what his zinc ore contains. It is even possible that gold and silver ores imported by anybody might have to pay an *ad valorem* duty which might be prohibitive, inasmuch as although such ores are specifically on the free list in section 570, they frequently contain zinc, which would bring them under section 164 and cause them to be subject to an *ad valorem* duty on all their valuable contents. Even the lead-bearing ore provided for in section 154 might be construed as coming under section 164 if it contained zinc. Thus the copper smelters, lead smelters and zinc smelters may all be embarrassed in a way that clearly is not intended.

It has been suggested that things could be made straight by discarding the proposed *ad valorem* rate on zinc ore and substituting a specific rate per pound of zinc contents, but this would simply continue the present Payne-Aldrich troubles. Although there are serious objections to an *ad valorem* rate on zinc ore for technical reasons other than those which we have mentioned in this article, we think that those objections may be overlooked for the sake of simplicity if the pending section be amended so as to avoid double duties.

The latter can be partially corrected by letting section 154 stand as at present, and adding to section 164 the proviso that zinc-bearing ores upon which duty has been paid *ad valorem* shall be exempt from the specific duty on lead stipulated in section 154. Assuming that it be the intention of Congress to collect duties on lead and zinc only, it should be further provided that a rebate be allowed on the gold, silver, cadmium, copper and all other substances specifically mentioned on the free list that may be recovered from zinc-bearing ores which have paid duty *ad valorem.* Such a proviso would probably eliminate also the danger with respect to gold and silver ores, now on the free list, but it would be wise to make the position of the latter even more clear.

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## Iron Production in 1913

While in Wall Street and some other places there has been talk of dull business for some months past, the blast furnaces of the United States have been active and have been turning out more iron than ever before. The Bureau of Statistics of the American Iron & Steel Institute reports that in the first half of 1913 the pig-iron production reached a total of 16,488,602 long tons, which was an increase of 5.3% over the make for the second half of 1912, and 17.1% over the first half. It was by far the largest quantity ever reported for a similar period. Moreover, this production, added to that for the second half of 1912, makes a total of 32,143,265 tons, which exceeds by 2,391,402 tons the heaviest make ever recorded in 12 consecutive months. To go back to the most recent year of iron-trade depression, the half-year's production was greater than that of the entire year 1908 by 552,584 tons.

This great production appears to have been pretty well absorbed, since there have been no complaints anywhere of the existence of large surplus stocks, such as were accumulated in 1909 and 1910. Early in the year, in fact, there was a scarcity of some kinds of iron, so great as to occasion an abnormal movement in prices, so that for two months or more No. 2 foundry sold at higher quotations than bessemer iron. This was an unusual condition, but quickly corrected itself. It is true that prices fell during the half-year and closed at a low point, from which there has since been a slight recovery. Thus bessemer pig at Pittsburgh declined from $18.15 in January to $17.11 in June, and basic iron from $17.31 to $15.40; No. 2 foundry at Philadelphia fell from $18.50 to $16.19, and No. 2 Southern from $13.70 to $10.80, at Birmingham. These are serious declines, but were not sufficient to check the output to any considerable extent.

While all the important classes of iron showed an increase during the year, the most notable point was the large gain in basic pig, which constituted 39.5% of the total make, considerably exceeding the bessemer output. It is not generally understood, perhaps, that more than half the pig iron—55% exactly—made in 1913 was not cast in any form, but was delivered in molten condition to mixers, converters and openhearth furnaces. Less than half, therefore, was remelted.

The great production of pig iron points to an equally large output of steel. The total make of ingots must have been nearer 17,000,000 than 16,000,000 tons for the half year—a production which certainly does not indicate a period of depression.

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## Head Room

Important factors of most milling machinery are the floor-space and head-room that they require. Of these two, head-room is often the more important consideration, because while more floor-space may increase the first cost of the building, more head-room may not only increase the first cost of the building by swelling the cubic contents, but also may add to direct operating expense so long as the mill continues to be run.

The ideal mill is one like the simple stamp mill wherein the ore is fed at the upper side and descends uninterruptedly by gravity, the exhausted material—the tailings—being discharged at the lower side. The several parts of the stamp-mill require but relatively little head-room and the arrangement herein outlined is commonly feasible.

In flat terrains, however, such an arrangement is infeasible and in such cases it is necessary to elevate the ore at least once. If after such elevation the flow is uninterruptedly downward we have the next simplest arrangement.

However, in modern practice the flow of ore is never uninterruptedly downward, but is rather up and down, according as middlings and other between products have to be treated. So much is this inevitably the case, that it is uncertain whether there be any advantage in a sloping location over a flat one. The old controversy respecting the side hill vs. the flat mill-site has not yet been thoroughly analyzed in spite of reams of discussion.

Nevertheless, there is no doubt that in either case unnecessary elevation ought to be avoided and types of machine have a good deal to do with that. Thus, one of the early forms of mechanical sampler—the old pipe sampler—required a high elevation just to permit the ore to be dropped through it. One of the excellent points of the Vezin sampler later introduced was that it required but relatively little head-room. So it is with crushers, especially those of the gyratory type. In a recent article on milling in southeastern Missouri a writer in the JOURNAL referred to a certain crusher being selected just because of its economy in head-room. This is a point that is borne in mind by several manufacturers of such crushers, besides the one mentioned by our contributor, among whose products there is excellence in this respect.

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## The Adminstration's Mexican Policy

During the last week the affairs of Mexico have figured more extensively in our newspapers than at any time since the fighting in the Mexican capital. Ambassador Wilson has been retired and the President has intimated the nature of his own policy.

This seems to be to try to persuade the Mexican factions to hold a prompt and fair election, and to promise to abide by the result, thus creating a government which the United States will recognize. If the Mexicans will not do this, the United States may let all parties have arms and fight things to a finish among themselves.

These proposals do not impress us as being effective. The idea of a fair election in Mexico is in itself rather a joke. The idea of letting the Mexicans fight things out has a certain merit. By the time they have done so they will have learned a lesson that may last a century, but the prospect of what might in the meantime happen to foreigners in the country is not pleasing.

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## Meetings of Societies

Mining engineers and metallurgists who are interested in attending the meetings of technical societies are often offered an embarrassment of riches. Thus, during this month, there are the meetings of the American Institute of Mining Engineers, at Butte, Mont.; of the Lake Superior Mining Institute, at Duluth, Minn.; and the International Congress of Applied Geology, in Canada. Many persons who would like to attend all three of these meetings are unable to do so. There ought to be a clearing house for society meetings, some central organization which might be consulted in the arrangement of dates, with the idea of avoiding coincidences.

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One of the great questions in American affairs of the day is the enactment of a new banking and currency system to take the place of the present inelastic machinery which has repeatedly failed to work in times of crisis. Many persons in Congress think that the proper persons to frame a new banking law are a cowboy from Texas, a backwoodsman from Arkansas, and a cotton-grower from one of the Carolinas. The bankers should have nothing to do with the matter, in the opinion of Messrs. Henry, Ragsdale and Wingo. On the same theory, if a navigator of a ship be needed, get a "Cousin Jack" miner.

## BY THE WAY

Concerning the rather widely published report that James MacNaughton, general manager of the Calumet & Hecla Mining Co., receives a yearly salary of $120,000. The *Boston News Bureau* makes the positive statement that from all of the companies under his charge, including the Calumet & Hecla and all its subsidiaries, numbering at least 12, Mr. MacNaughton receives but slightly over $40,000.

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The use of mine tailings—chats they are called locally—from the zinc and lead mines of Missouri for railroad ballast, for road making and in concrete structures, is increasing. The Geological Survey reports the sales of tailings for the year as follows, in tons:

| | Railroad | Commercial | Total |
|---|---|---|---|
| Southeast Missouri | 463,498 | 258,623 | 722,121 |
| Southwest Missouri | 1,449,207 | 553,075 | 2,002,282 |
| Total | 1,912,705 | 811,698 | 2,724,403 |
| Total, 1911 | 865,011 | 638,592 | 1,503,603 |

The increase last year over 1911 was 1,220,800 tons, or 81.1%. The material is sold at the mines at a low price, generally about $1 per carload, so that the chief cost to the consumer is the transportation.

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A correspondent of the *American Machinist* asks why is it that advice or information received from a person with a trade and from another with a profession should be viewed so differently, and relates this curious experience:

> I am reminded of a man, who at the time was considered a friend. He was a doctor; in other words, a member of a profession. He was interested in buying a car, but as his knowledge of cars was meager, he wanted outside assistance. I, at that time, dabbled a little in automobiles, and he asked me to call around and have a chat about them. I called and, after the doctor had inquired about the condition of a member of the family whom he had been treating, for two hours I advised him gratis in connection with the design, operation and repair of automobiles. Imagine my surprise when a month later I got a bill from him for $2 marked "professional services," which covered the visit I had made at his request and wholly in his own interests.

A good many mining engineers have asked why should they be expected to give their services, advice and information for nothing. This is an old complaint. Of course they shouldn't. If they do, the fault is their own. It is simple to say to any inquirer, "Mr. A., my fee for advising you in this matter will be $5," or $10, or whatever may be conceived proper. Why doesn't he say that? We fancy the deterring influences are something like these: (1 )The idea that Mr. A. will say, "Oh, if that be the case, I will withdraw my inquiry." (2) The conception that an answer to the inquiry, which is a small matter, scarcely worth charging for, may lead to some business that will be worth while. (3) The possibility that Mr. Engineer having answered the inquiry may want to say, "Mr. A., do you think that Amalgamated is a good purchase around present prices?" The great point of difference is that legal and medical men have organized a business on the basis of small fees. Engineers have not.

⁂

An engineer in Colombia writes from Istmina of a recent trip to the platinum country. He says: "It is an 8-day 'steamer' trip from Cartagena to Quibdo, which in former days was the center for the buying of gold and platinum. At present more gold than platinum is handled there and business is almost entirely in the hands of Syrians or 'Turks,' as they are called, who keep general merchandise stores and trade with the natives (negroes). Quibdo is on the Atlantic side of the continental divide, while the rich platinum country is on the Pacific side, or in the region tributary to the Rio San Juan. Istmina is the center of this district and is reached from Quibdo by means of a 3-day canoe trip to the headwaters of the Atrato system and a 2-hour or 6-mile muleback ride over the low divide into Istmina. Istmina is on the San Juan and is accessible by launch or canoe from Buenaventura, the Pacific port of Colombia, in two or three days. By far the greater part of the Colombian platinum is obtained in this vicinity. In the early days the value of the platinum was not recognized and it appears that when the natives brought in their gold, which was more or less mixed with the white metal, the storekeepers would sort out the platinum and throw it on the floor before weighing the gold. A few months ago, a firm of 'Turks' in Quibdo began remodeling their old store and began washing the dirt under the floors. I saw several pounds of platinum which they had recovered so far and the washing is still going on."

⁂

Due to the continued idleness of the United States Steel Corporation's Champion mine, practically the sole support of the once prosperous town of Champion on the Marquette range, the village is gradually becoming deserted. The mine has been closed for many months, and previous to its entire suspension, it had been operated on only a small scale for several years. Where formerly hundreds of men were employed, the crews had dwindled to one of a few score of members. The miners have sought work elsewhere, and while for a time the families remained behind, these are now joining the husbands and fathers, and the population is steadily waning. Already more than 50% of the dwelling houses have been vacated, and their doors and windows have been boarded up. Many of these buildings are owned by men who were employed at the mine in the palmy days of the town and who invested their savings in these little properties. Business is well nigh stagnant. The Steel Corporation has no present need for Champion ore. It is concentrating its mining activity on the Mesabi range, and it is hardly expected that the Marquette range property will be restored to the producing list until the lease to the Hill lands in Minnesota has expired and these holdings have reverted to the Great Northern interests. The Champion is owned in fee by the Steel Corporation. There is no lease binding the company to a production of any amount and, under the circumstances, it is not surprising the mine should be idle. A big tonnage of ore is in stock. Some of this was taken out as much as 15 or 20 years ago. The mine has shipped to date a total of 4,415,000 tons of ore, and there are fully 3,000,000 tons remaining in the deposit, with a possibility of new discoveries augmenting the extent of the reserves, so that it is generally credited with an assured future life of 25 years. It is about the deepest mine in the Marquette district, the bottom level being down 2000 ft.

# Zinc Discovery at Embreeville, Tenn.

Zinc ore in large quantities has been reported discovered on an old iron property near Embreeville, Tenn. The Embreeville Iron Co. owns the land, 1700 acres of which is included. This company was formed in the early '90s, when there was a general boom in iron making in this district, and has changed hands several times without ever making any financial success. It is now in the hands of a receiver, and the property was about to be sold, when the discovery of zinc changed the situation. The stock of the Embreeville Iron Co. is held by Pickands, Brown & Co., Chicago, 54%, and the Perin interests, New York, 46%. The Perin stock is said to be under option to the American Zinc, Lead & Smelting Co. until some time in August.

This newly discovered zinc land is in Unicoi County, only a few hundred yards from Washington County, in which Embreeville is situated. It is about 19 miles southwest of Johnson City in the valley of the Nolichucky River, just where that stream passes through the Cherokee mountains. The zinc discovery is in a cove about 4½x1 miles, and the formation a dark, dolomitic limestone. The rim of the cove on both sides is quartzite. Ore is said to occur in residual earth surrounding limestone pinnacles, conditions similar to those obtaining in the zinc deposits of Bertha, Va. The ore is in the form of zinc carbonate and silicate. Large amounts are said to have been washed into the Nolichucky River when iron development was attempted by hydraulic means. At the same time a large amount of zinc ore was developed.

Discovery was made by C. A. Morris, formerly of Bertha, Va., who was acquainted with the nature of zinc deposits and recognized the indications at Embreeville. He was in charge of the property for the receivers. Finding it impossible to convince them of the value of the property, Morris managed to collect and ship a car of ore, which is said to have brought $960 at the mine.

Two diamond drills are at work on the property and are said to have cut a large area of ore, 17 ft. thick. Ore shipped contains about 40% zinc and has a market value of about $20 per ton. The discovery has aroused intense interest in the district and surrounding property is in great demand. Local investigators speak of the discovery in superlatives and believe that an important zinc district will be developed.

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# Pig-Iron Production in 1913

A special bulletin of the American Iron & Steel Institute gives the production of pig iron in the United States for the first half of 1913 as below, comparison being made with three previous years. The figures are in long tons:

| | 1910 | 1911 | 1912 | 1913 |
|---|---|---|---|---|
| First half | 14,978,738 | 11,666,996 | 14,072,274 | 16,488,602 |
| Second half | 12,324,829 | 11,982,551 | 15,654,663 | |
| Total | 27,303,567 | 23,649,547 | 29,726,937 | |

The production of iron in the first half of the current year is the largest on record for a half-year. If we add the second half of 1912 to the first half of 1913, the total is [illegible]143,265 tons, by far the largest make recorded in any consecutive 12 months.

The production, according to fuels used, was as follows, compared with the first half of 1912:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coke | 13,840,251 | 16,075,264 | I. 2,235,013 |
| Anthracite | 65,657 | 237,156 | I. 171,499 |
| Charcoal | 166,366 | 176,182 | I. 9,816 |
| Total | 14,072,274 | 16,488,602 | I. 2,416,328 |

Coke is the chief fuel used in our furnaces. Only a very few use raw bituminous coal, while many anthracite stacks use some proportion of coke. This year, only 11,491 tons were made with anthracite alone, 225,665 tons being made with mixed coke and anthracite.

An interesting point given in the present statement is the disposition of the iron as taken from the furnace, as follows: Delivered in molten condition to mixers, openhearth furnaces, etc., 9,069,845 tons, or 55%; sand cast, 3,685,512 tons, or 22.4%; machine cast, 3,246,964 tons, or 19.7%; chill cast, 480,503 tons, or 2.9%; direct castings, 5578 tons, or 0.03%. These details for 1912 are not available.

### Division of Iron by Uses

The report gives a full statement of the uses for which the iron was intended, as follows:

| | Tons | Per cent. |
|---|---|---|
| Foundry | 2,808,364 | 17.0 |
| Forge | 221,776 | 1.4 |
| Malleable | 482,902 | 2.9 |
| Low phosphorus | 158,918 | 1.0 |
| Bessemer | 6,127,048 | 37.1 |
| Basic | 6,497,563 | 39.5 |
| Ferrosilicon | 46,181 | 0.3 |
| Ferro-alloys, etc. | 34,607 | 0.2 |
| Spiegeleisen | 54,387 | 0.3 |
| Ferromanganese | 56,856 | 0.3 |
| Total | 16,488,602 | 100.0 |

Comparisons cannot be made with previous years, as the data are in different form. The largest increase over the first half of 1912 was in basic iron, 1,092,187 tons. The gain in bessemer pig was 688,855 tons.

There were 304 furnaces in blast on June 30, 1913, as compared with 313 at the beginning of the year. The total number of stacks in blast during the half year was 348, and the average time worked was 163.3 days. On June 30, 1913, there were seven new stacks in course of erection, the aggregate capacity being 1,051,150 tons. One new furnace, Oriskany, at Lynchburg, Va., went into blast; its capacity is 50,000 tons yearly. Three furnaces, with a total capacity of 163,000 tons, were abandoned.

### Production by States

The total production in 1912 and 1913, by states, is as follows:

| | 1912 | | 1913 |
|---|---|---|---|
| | First half | Second half | First half |
| Massachusetts and Connecticut | 8,793 | 8,573 | 8,581 |
| New York | 880,581 | 1,058,650 | 1,138,671 |
| New Jersey | 2,773 | 34,103 | 54,779 |
| Pennsylvania | 6,935,773 | 6,516,358 | 6,885,058 |
| Maryland | 105,027 | 112,519 | 152,002 |
| Virginia | 120,127 | 136,040 | 192,530 |
| Alabama | 887,512 | 975,169 | 1,078,173 |
| West Virginia | 129,155 | 145,205 | 131,097 |
| Kentucky | 24,017 | 44,743 | 33,903 |
| Tennessee | 145,076 | 193,162 | 189,019 |
| Ohio | 3,285,752 | 3,516,741 | 3,660,473 |
| Illinois | 1,304,227 | 1,583,132 | 1,653,017 |
| Indiana and Michigan | 788,252 | 982,376 | 894,743 |
| Wisconsin and Minnesota | 153,420 | 149,950 | 222,167 |
| West of Mississippi | 190,789 | 197,942 | 194,389 |
| Total | 14,072,274 | 15,654,663 | 16,488,602 |

A table appended to the report gives the production of pig iron for 60 years. In 1854 the total was 657,337 tons, and it did not reach a million tons until 1864. It is of interest to note that the quantity of iron made with anthracite as fuel was greater in 1854 than in 1912, while the charcoal iron has increased only a few thousand tons. The growth has been in coke iron, which expanded from 48,647 to 29,132,733 tons in the 60 years.

## International Geological Congress

Two hundred delegates to the Congress, representing nearly every civilized country in the world, were entertained at luncheon on Aug. 1 by the Canadian Government at the Experimental Farm, Ottawa. An official welcome on behalf of the government was extended by Hon. R. L. Borden, Canadian Premier, and Controller Parent, of Ottawa, delivered an address of welcome from the city. An appropriate reply was made by Dr. Frank D. Adams, of McGill University, President of the Congress. A memorial tablet to Sir William Logan, first director of the Geological Survey of Canada, erected on a concrete pedestal in front of the Victoria Museum, was unveiled by Hon. T. W. Crottiers, Minister of Labor, who accepted the memorial on behalf of the Government. The delegates left for Montreal in the evening.

A special party of 18 of the geologists and engineers from the Sudbury-Cobalt excursion of the International Geological Congress on July 22, made a side trip into the new Kirkland Lake gold camp and were given an opportunity to inspect the geological conditions in the neighborhood of the most important developments, and to examine the vein conditions on the Tough-Oakes (Foster) and on the Burnside properties. A. G. Burrows, of the Ontario Bureau of Mines, who is engaged on the investigation of the geology of the district, was with the party and explained the geology of the area as far as determined. C. A. Foster, who is developing the Tough-Oakes property, conducted the visitors over the surface workings, and all of the party were taken to the 100-ft. level of the main shaft, where an opportunity to note the conditions of the veins in depth was afforded by the work of cutting a station at that level. After a supper served the visitors, at the mining camp boarding house, Mr. Bedford McNeill, of London, made a speech of acknowledgment of the courtesies offered and expressed his great interest in the possibilities of the new camp. The party were given a special permit to "high-grade" and many of them returned with a fine assortment of ores with visible gold taken from the stockpile and from the veins in the mine. The foreign visitors were much interested in the conditions involved in the opening of a new district in Ontario, and they made comparison with the beginnings of other gold camps now well established. The efforts the provincial government is making to provide a good road to the camp was favorably commented on; also the vigor with which the development operations, under way only since January, are being conducted.

The president and board of directors of the American Institute of Mining Engineers have issued a circular letter offering the hospitality and courtesies of the institute headquarters in New York to all members of the International Geological Congress, who may visit New York. A committee of welcome, of which Dr. George F. Kunz is chairman, has been appointed. Visitors are also invited to attend the meeting of the Institute at Butte.

The party visiting the Sudbury district arrived at Sudbury July 24, and spent nearly four days there. Visits were made to Creighton mine, Copper Cliff, Murray mine and two Frood mines, to the Coniston plant of the Mond Nickel Co. and the iron deposits of Moose Mountain at Sellwood. The outcrops at Windy Lake and Ramsay Lake were also visited. On July 25 the party was entertained at a banquet by the Sudbury Board of Trade.

## July Mining Dividends

Dividends paid for the month of July by United States mining companies making public reports, amounted to $7,234,529; those of iron-smelting, industrial and holding companies amounted to $4,433,193; and those of Canadian and Mexican mining companies to $3,107,528 There were a few unpleasant surprises, Ahmeek reduced its dividend from $10 to $5, American Zinc, Lead & Smelting passed its declaration, and United Verde is understood to have done the same.

| United States Mining Companies | Situation | Per Share | Total |
|---|---|---|---|
| Ahmeek, c. | Mich. | 5.00 | 250,000 |
| Anaconda, c. | Mont. | 0.75 | 3,249,375 |
| Arizona, c. | Ariz. | 0.36 | 554,002 |
| Bunker Hill Con., g. | Calif. | 0.02½ | 5,000 |
| Bunker Hill & Sull., l.s. | Ida. | 0.20 | 65,400 |
| Center Creek, z. | Mo. | 0.00½ | 5,000 |
| Copper Range Consol., c. | Mich. | 0.75 | 295,269 |
| Colo. Gold Dredging, g. | Colo. | 0.25 | 25,000 |
| Continental Zinc, z. | Mo. | 0.50 | 11,000 |
| Eagle & Blue Bell, g.s.l. | Utah | 0.05 | 44,657 |
| Federal M. & S., com., l.s. | Ida. | 0.75 | 45,000 |
| Fremont, g. | Calif. | 0.02 | 4,000 |
| Frontier, z. | Wis. | 2.00 | 2,500 |
| Golden Cycle, g. | Colo. | 0.02 | 30,000 |
| Hecla, l.s. | Ida. | 0.02 | 20,000 |
| Homestake, g. | S. D. | 0.65 | 163,254 |
| Iron Blossom, s.l.g. | Utah | 0.10 | 100,000 |
| Mammoth, g.s.c. | Utah | 0.05 | 20,000 |
| Mary McKinney, g. | Colo. | 0.02 | 26,185 |
| North Butte, c. | Mont. | 0.50 | 205,000 |
| Old Dominion, M.& S., c. | Ariz. | 1.25 | 202,500 |
| Osceola, c. | Mich. | 2.50 | 240,375 |
| Shattuck-Arizona, c. | Ariz. | 0.50 | 175,000 |
| Snowstorm, c. | Ida. | 0.01½ | 22,492 |
| Stewart, g. | Ida. | 0.10 | 123,862 |
| Tom Reed, g. | Ariz. | 0.06 | 54,573 |
| Tonopah Belmont, g.s. | Nev. | 0.25 | 375,000 |
| Tonopah Extension, g.s. | Nev. | 0.05 | 23,585 |
| Tonopah Mining, g.s. | Nev. | 0.40 | 400,000 |
| United, c. | Wash. | 0.01 | 10,000 |
| United Globe, c. | Ariz. | 7.50 | 172,500 |
| Utah Consolidated, c. | Utah | 0.50 | 150,000 |
| Vindicator, g. | Colo. | 0.03 | 45,000 |
| Wasp No. 2, g. | S. D. | 0.01 | 5,000 |
| Wellington, g. | Colo. | 0.05 | 50,000 |
| Yak, g. | Colo. | 0.40 | 40,000 |
| Yellow Aster, g. | Calif. | 0.05 | 5,000 |
| Yellow Pine, z. l.s. | Utah | 0.02 | 19,000 |

| Iron, Industrial and Holding Companies | Situation | Per Share | Total |
|---|---|---|---|
| Am. Ag. Chem., pfd. | U. S. | 1.50 | 275,730 |
| Am. Ag. Chem., com. | U. S. | 1.00 | 171,141 |
| Am. Sm. Sec., pfd. A. | U. S., Mex. | 1.50 | 255,000 |
| Am. Sm. Sec., pfd. B. | U. S., Mex. | 1.25 | 375,000 |
| Bethlehem Steel, pfd. | Penn. | 1.25 | 186,350 |
| Colo. Fuel & Iron, pfd. | Colo. | 4.00 | 80,000 |
| General Chemical, pfd. | U. S. | 1.50 | 150,000 |
| Guggenheim Exploration. | U. S., Mex. | 0.75 | 623,799 |
| Harbison-Walker, pfd. | U. S. | 1.50 | 144,000 |
| La Belle Iron. | Ohio | 0.50 | 49,577 |
| National Carbon, com. | U. S. | 1.50 | 82,500 |
| Old Dominion of Maine, c. | Ariz. | 1.25 | 366,691 |
| Penn Salt. | Penn. | 3.00 | 150,000 |
| Republic Iron & Steel. | U. S. | 1.75 | 357,296 |
| Sloss-Sheffield S. & I. | Ala. | 1.75 | 117,250 |
| U. S. Smelting, Refining & Min., pfd. | U. S., Mex. | 0.87½ | 425,530 |
| U. S. Smelting, Refining & Min., com. | U. S., Mex. | 0.75 | 263,329 |
| Virginia-Carolina, pfd. | U. S. | 1.50 | 360,000 |

| Canadian, Mexican and Central American Companies | Situation | Per Share | Total |
|---|---|---|---|
| Blanca y Anexas, g.s. | Mex. | 0.90 | 63,000 |
| Buffalo, s. | Ont. | 0.10 | 100,000 |
| Canadian Goldfields, g. | B. C. | 0.001½ | 60,000 |
| Consol. Min. & Smelt. | B. C. | 2.00 | 106,104 |
| Crown Reserve, s. | Ont. | 0.05 | 88,441 |
| Chontalpan, g.s.l.z. | Mex. | 0.50 | 3,500 |
| Dominion Steel, com. | Can. | 1.00 | 345,896 |
| El Favor, s.g. | Mex. | 0.01 | 35,000 |
| El Oro Min. & Ry., g.s. | Mex. | 0.24 | 278,843 |
| Esperanza, g.s. | Mex. | 0.24 | 165,847 |
| Hollinger, g. | Ont. | 0.15 | 90,000 |
| La Rose, s. | Ont. | 0.25 | 374,656 |
| Lucky Tiger, g. | Mex. | 0.05 | 35,767 |
| McKinley-Darragh-Savage, s. | Ont. | 0.10 | 224,769 |
| Mines Co. of America, s.g. | Mex. | 0.12½ | 112,500 |
| Nipissing, c. | Ont. | 0.37½ | 450,000 |
| Nova Scotia Steel & Coal, pfd. | N. S. | 2.00 | 20,600 |
| Nova Scotia Steel & Coal, com. | N. S. | 1.50 | 90,000 |
| Santa Gertrudis, s. | Mex. | 0.24 | 332,431 |
| San Toy, g.s. | Mex. | 0.01 | 60,000 |
| Standard, s.l. | B. C. | 0.02½ | 50,000 |
| Tilt Cove. | N. F. | 0.42 | 18,924 |
| Victoria, l.s.g. | Mex. | 0.50 | 1,250 |

Dividends paid for the first seven months of the year by United States mining companies amount to $45,450,722; iron smelting, industrial and holding companies to $64,083,425; and by Canadian, Mexican and Central American companies, to $13,879,295. The month's figures compare very favorably with those of 1912, which were: $6,888,977, $3,748,605 and $1,658,156, respectively.

## PERSONALS

A. W. Newberg gives as his present address the Tumco mine, Tumco, via Ogilby, California.

Robert H. Richards has been spending a few days at Ishpeming, Mich., on professional business.

E. F. Lake, consulting metallurgist, has removed from Bayonne, N. J., to 1453 Waterloo St., Detroit.

John L. Malm, of the Malm-Wolf Co., Denver, has gone to California to examine mines in Eldorado County.

M. W. Atwater, of New York, is about to make a complete examination of the Ohio Copper property, both mine and mill.

F. P. Dewey, chief chemist of the Bureau of the Mint, has gone to San Francisco, where he will be for about two months.

Arthur H. Gruber, of Milwaukee, Wis., who has been operating in Mexico mines, also in Arizona, is in Oregon looking over mining properties.

James W. Neal, head of a mining syndicate operating a gold dredge on Merced River, California, is looking over southern Oregon mining conditions.

W. H. Grant, E. K. Soper, F. C. Calkins, J. E. Thomas, and H. Wittingham, are at present assisting George H. Garrey in geological examination work in Mexico.

G. D. Van Arsdale, who has been engaged in hydrometallurgical research at Douglas, Ariz., during the last year for Phelps, Dodge & Co., Inc., will be in New York during August.

E. W. Honeyman has resigned as superintendent of the smelting works of the Detroit Copper Mining Co., at Morenci, Ariz. Smelting operations are at present in charge of V. P. Hastings.

We noted last week that Joseph McDonald was on trial at Juneau, Alaska, on the charge of murdering N. C. Jones. Mr. McDonald was acquitted by the jury, on the ground of self-defense.

Mr. Albert J. Bone is at Anyox, B. C., having resigned as smeltery superintendent of the Tennessee Copper Co. to become superintendent of the new smeltery of the Granby Consolidated Mining, Smelting & Power Co., at Anyox.

L. R. Palmer, of Pittsburgh, who for several years was safety expert of the Jones & Loughlin Steel Co., has been appointed chief of the state bureau of factory inspection. He will be in charge of the factory inspection throughout the state of Pennsylvania.

George J. Young has been appointed professor of mining at the Minnesota School of Mines. Mr. Young is a graduate of the Mining Department of the University of California and has been on the instructional staff of the University of Nevada since 1900. In 1908 he was made professor of mining and metallurgy, and since that date has been in charge of the Mackay School of Mines of that institution.

W. H. Schmal, superintendent of the South Eureka mine in Amador County, Calif., for the past four or five years, has been appointed general superintendent of the South Eureka, Oneida and Hardenberg. Under Mr. Schmal's superintendency the South Eureka has been advanced to the dividend class of mines in the Mother Lode region, and the Oneida has been reopened and put into the producing class. These two mines adjoin and are owned and operated by the same company. The Hardenberg is situated three miles south of Jackson and about four miles south of the Oneida and is owned by the same interests which control the South Eureka.

## SOCIETIES

**Oregon Agricultural College**—The most recent and approved mining apparatus, designed after patterns now in use by the Massachusetts Institute of Technology, will be installed in the School of Mines Building. Plans for this machinery were brought from Boston by George E. Goodspeed, instructor in mining at the college. The new machinery will be installed in sections, part being built during the summer so that mining students for the first semester may have the advantages derived from their use.

**American Mining Congress**—The annual convention will be held at Philadelphia, Oct. 20-24. The chief points for discussion will be safety in mining and the coal and iron industries of the United States.

**American Institute of Mining Engineers**—The semi-annual meeting of the institute will be held in Butte, Mont., beginning on Aug. 16 at Great Falls, and continuing at Butte until Aug. 21. At this meeting about 50 papers will be presented and discussed, and visits will be made to the mines and metallurgical works of the Butte district, which are to be thrown open both above ground and underground to an extent never before offered.

**Lake Superior Mining Institute**—The program for the annual meeting shows that the opening session will be held at Duluth, Minn., Aug. 26. The afternoon will be spent in a trip to the plant of the Minnesota Steel Co., which is now under construction. A special train will leave at midnight for the range, arriving at Biwabik in the morning, where the first stop will be made. The train will then run to Eveleth or Virginia, where the party will remain for the night, and where the first business session will be held. The greater part of Thursday will be spent in the Hibbing district and there will be a social entertainment in the evening. The party will reach Coleraine on Friday afternoon and the final business meeting will take place there. Saturday morning an inspection will be made of the Coleraine washing plant and the return trip to Duluth will start about noon. The partial list of the papers to be presented is as follows: "Sanitation for Mine Locations," by W. H. Moulton, Ishpeming; "Concreting the Hamilton Shaft at the Chapin Mine," by S. W. Tarr, of Iron Mountain; "Winona Stamp Mill," by R. R. Seeber, of Winona; "Mining Methods on the Mesabi Iron Range," by Willard Bayliss, J. S. Lutes and E. D. McNeil; "What Our Neighbors Are Doing in Mining Iron Ore," by Dwight E. Woodbridge, of Duluth; "Safety in the Mines of the Lake Superior Iron Ranges," by Edwin Higgins, engineer in charge of Mine Rescue Car No. 8.

## OBITUARY

Walter Brown, who for the past six years has been head of the power department of the Bethlehem Steel Co., was drowned recently in the Lehigh Canal, while canoeing. He was unable to swim. Mr. Brown was 41 years old.

Ephraim Bayard, 45 years old, superintendent of the American Steel & Wire Co.'s plant at Donora, Penn., died recently at the West Penn hospital, Pittsburgh. He had been superintendent of the plant for 23 years, and for some time previous to his appointment, was with the American Steel & Wire Co. at Cleveland.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

BLAST FURNACES—Improvements in Blast Furnaces. W. J. Foster, Walsall, Eng. (Brit. No. 12,390 of 1912.)

STEEL MANUFACTURE—Improvements in the Manufacture of Steel. F. Thuaud, Sheffield, Eng. (Brit. No. 27,978 of 1912.)

PIG IRON—Improvements in the Making of High-Grade Pig Iron. P. L. Troussaint Heroult, New York. (Brit. No. 25,858 of 1912.)

STAMP MILLS—Improvements in and Relating to Stamp Mills. R. R. V. Jeffreys, Bulawayo, South Rhodesia. (Brit. No. 8688 of 1912.)

TUBE-MILL LINING. William Alfred White and William Frederick Schmidt, East Rand, Transvaal. (U. S. No. 1,068,-289; July 22, 1913.)

DRILLS—Improvements in Valve Apparatus for Percussive Rock Drills and Like Tools. G. Rayner, Sheffield, Eng. (Brit. No. 19,424 of 1912.)

BARIUM AND STRONTIUM Process of Manufacturing Barium and Strontium Compounds. Arvid W. Elkstrom, Los Angeles, Calif. (U. S. No. 1,067,597; July 15, 1913.)

WROUGHT IRON—Method for Making a Material Having the General Properties of Wrought Iron. Bernard C. Lauth, Pittsburgh, Penn., assignor to Thomas S. Blair, Jr., Chicago, Ill. (U. S. Nos. 1,067,528 and 1,067,529; July 15, 1913.)

TIN—Improved Process for the Treatment of Tin Ores and Other Materials Containing Tin, for Example, Pyritic or Other Tin Ores, Tin-Ore Concentrates, Tin Waste, Tin-Plate Waste, Stanniferous Slag, Tin Slag and the Like. Jan Rueb, The Hague, Holland. (Brit. No. 27,148 of 1912.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—July 31

**Mining in Sierra County** is progressing in a small way in most of the districts. At Alleghany operations are more pretentious than in other places. There is no occasion for talk of a boom in mining in the county at present. In fact, there is not as much general work being done as at this time last year. There are several properties making fine showing, particularly the Tightner at Alleghany. The North Fork mine at Forest promises much, but there is no mill on the property, although it is said that one is to be built and that it will put the mine in the producing class. The Ironsides mine south of Downieville has produced rich ore in the last year and the owners are talking of building a small mill. The Sierra Buttes mine at Sierra City is being extensively developed and the extraction of ore is equal to the demands of the small mill and cyanide plant. The large mill is still idle. The Keystone is progressing favorably and the sovereign and Lee mines, it is stated on good authority, are to be reopened. Extensive development is in progress at the Kate Hardy near Forest, and the three-stamp mill is crushing ore from the old dump. Development at the Orient mine near Mountain House has reached the old workings, out of which a large amount of gold was taken in the early operation of the mine. Mining men in the district between Poker Flat and Downieville are contributing to a fund to build a new wagon road in order to avoid the necessity of traveling over a private toll road. The road was originally built as a state road at large cost several years ago, but was never completed. The changing of the route of the new wagon road between Alleghany and Nevada City has caused a good deal of complaint because the new route does not materially change present conditions and does not afford the desired relief to the upper side of Nevada County.

### DENVER—Aug. 1

**Cripple Creek Production for July** amounted to $1,206,683, with a gross tonnage of 81,863 tons. This is a decrease from June, owing to the three days' Fourth-of-July celebration, when practically all the mines and mills of the camp were shut down. The following outputs were reported: Golden Cycle, 83,000 tons, worth $660,000; Portland, 9665 tons, worth $212,630; Portland, Cripple Creek district, 13,600 tons, worth $35,360; Stratton's Ind., 11,073 tons, worth $24,692; Ajax, 4400 tons, worth $12,496; Kavanaugh, 1700 tons, worth $3740; Gaylord, 1600 tons, worth $4000; Rex, 1200 tons, worth $1320; Wild Horse, 1100 tons, worth $2420; Isabella, 700 tons, worth $1400; Smelters', 2825 tons, worth $248,625; total, $1863 tons worth $1,206,683.

**Newlin's Gulch Placers** are to be developed by Denver men, if a movement now on foot is carried out. These sandstone conglomerate reefs, 35 miles southwest of Denver, have been known for many years, and on a small scale considerable gold has been taken out by panning and sluicing. Now, however, it is proposed to excavate the conglomerate stratum, screening out the coarse rock and boulders and crushing and cyaniding the residue; $10,000 will be expended on this project, and a lease has been obtained on 140 acres of government land. The mill will start with 75 tons daily capacity. The formation is composed almost entirely of horizontal bedded stratified deposits, mostly coarse-grained sandstones or grits, and conglomerates, with occasional layers of rhyolite tuff. Parker, the nearest railway station, is 5½ miles distant.

### BUTTE—July 31

**The Flotation Process Litigation** at Butte, in which the Minerals Separation Process, Ltd., of London, brought suit for infringement of patent rights against James M. Hyde, who claimed to have invented a process of his own, has resulted in a decision being handed down in favor of the plaintiff, the court denying the damages asked for in the bill of complaint. Hyde will appeal. Judge Bourquin summarizing the evidence stated that the defendant was using the complainant's process and that the defendant's contention that he was using the Froment process is not sustained, the differences between the two processes being so obvious as to constitute different processes. The Hyde flotation process had been installed in the Butte & Superior mill when it was under the management of A. B. Wolvin, and before the present management came into control. The new interests naturally inherited this lawsuit, and have been active in defending the company's position. Should it ultimately be found that Butte & Superior will be compelled to pay a nominal royalty for the use of this process, the additional cost will not be a material factor adversely affecting the company's interests. The Minerals Separation company is at present seeking to make contracts for the treatment of porphyry copper slimes and the same interests influential in the management of the porphyries in question are also dominant in Butte & Superior. With this situation in mind it is inconceivable that there should be anything but an amicable adjustment of the present controversy between the Minerals Separation and the Butte & Superior companies. As a direct result of the decision, Butte & Superior stock dropped a few points. Approximaely 900 tons of ore are now being hoisted daily, principally from the 700-ft. level, as it is the policy of the management to mine the ore from the upper levels first. Superintendent Bruce stated that the June production of concentrates from the mill was 6800 tons, and that he expected the July production would slightly exceed 8000 tons. Mr. Bruce has figures to prove that the recoveries in the mill are gradually improving. It is shown that in 1912 the recovery was less than 60% of the zinc, whereas it is nearly 90% at present.

### SALT LAKE CITY—Aug. 2

**The output of Tintic** during the first half of 1913 has been estimated at 4659 cars, or approximately 232,000 tons of ore, the monthly shipments ranging from 875 cars in January to 674 cars in June, an average monthly output of 770 cars. The five largest shippers in the order of their output have been the Centennial-Eureka, Chief Consolidated, Iron Blossom, Eagle & Blue Bell and Grand Central.

**Park City shipments** during July amounted to 5504 tons, which shows a slight falling off as compared with the average of the first six months. The Silver King Coalition, Daly West, Daly-Judge, Thompson-Quincy and the American Flag were the principal shippers. The general condition of the camp is good, and an increased production is looked for during the remainder of the year. Several new properties should be added to the shipping list, and others will increase their production.

### CALUMET—Aug. 4

**General Strike Conditions** are little changed from last week with the exception that the mine pumps in practically all of the mines have been started. The men operating the pumps are under guard, and at some places are being cared for at night at the property. At the Calumet & Hecla and the Copper Range mines, work has been resumed in the shops, but at none of the properties have attempts been made to resume underground work. C. E. Mahoney, vice-president of the Western Federation of Miners, called on Governor Ferris and asked to have the military force withdrawn from the district. The strikers are resorting to mass picketing and reports of intimidations and violence continue to come in. Several arrests have been made, and one man was apprehended with three sticks of dynamite on his person, which he tried to ignite when he was being searched. Governor Ferris suggested that a conference be held at the executive offices, between five representatives of the two factions. To this the mining companies replied that under no circumstances would they either directly or indirectly confer with the Federation, but that they were willing at any and all times to meet the men as employees. In their statement to the governor, the mine managers put forth the conditions that have prevailed throughout the district for the last 50 years, and called attention to industrial conditions, and the consideration that has been given to the welfare of the men. They said that there had never been any serious labor trouble in the copper country, and that previously any disagreements between the employees and employers had been readily and satisfactorily adjusted. The present trouble, it was claimed, was brought about by professional agitators sent here by the Western Federation of Miners from the Western camps. The statement also contained a history of the lawlessness and violence that has accompanied the various strikes fostered by the Federation, and gives these as the companies' reason for not dealing in any way with the Federation. Nothing has been given out by the companies in regard to their future plans for the resumption of work and the developments are being awaited with much interest by the entire region, which is dependent entirely upon the mining industry; there being no industries of any consequence other than those directly affiliated with the mining industry.

### DULUTH—Aug. 4

**A Strike of Dock Hands** resulted from an accident at the Allouez docks, July 31. Three laborers are known to have been killed, two were fatally injured, four were badly hurt and a score more were unaccounted for as the result of a collision of ore trains. Indignant over the accident, 250 dock hands struck. The accident is blamed to careless switching. A moving ore train ran into a standing train, throwing the workmen into ore pockets and covering them with ore. All the ambulances in the city and a dozen doctors were summoned. The dock managers ordered work resumed, but the men who are foreigners refused. Special police then took charge of the docks. A number of boats loading will be delayed unless an agreement with the strikers is reached. Awaiting settlement of the strike, 19 ore boats are tied up at the Allouez dock. The dock superintendent has met the men half way in their demands for their protection. Wages was not a question.

### MARQUETTE—Aug. 2

**No Labor Trouble in the Iron Country** is anticipated. Contrary to sensational reports appearing in certain daily papers, the strike troubles in the copper country are not likely to be reflected on the Lake Superior iron ranges. The iron fields have been singularly free from threatening labor disturbances for several years past. There have been a few manifestations of discontent from time to time, notably on the Mesabi range in Minnesota two seasons ago, but these have been local. The men apparently are contented with wages and working conditions. These conditions have steadily developed for the better. The iron fields have not been the seat of such a persistent union propaganda as has been carried on in the copper region. The Western Federation of Miners has branches only in the Marquette district and on the Mesabi, it is understood, and its membership embraces but a small percentage of the whole number of workers. In general, the men in the iron mines have not responded to organizers and the campaign of envoys from the West has made comparatively little progress. So far as can be ascertained, the Federation is not represented in the Menominee and Gogebic district at all. There is one union at Ishpeming and one at Negaunee, on the Marquette range, but in neither case is the membership large. In the Mesabi region, where the Federation is the strongest, probably not more than 20% of the men are enrolled. The iron country is interested in the strike in the copper country naturally and its developments will be followed with the closest attention. So far as the Marquette range is concerned, a peaceful tone characterized a meeting held in connection with the union men's sixth annual picnic and at which the situation was discussed by speakers in four different tongues. Any purpose of inciting a strike was expressly disclaimed, it being asserted that the purpose was to consider ways and means by which the Marquette range members of the organization could help their copper-country brethren. Should it be necessary, temporary homes will be provided for families of strikers and a weekly assessment levied on the members of the union. The attitude of the Marquette leaders, in brief, is to conserve their resources for the aid of the copper-country men. It is realized that if the strike settles down to a long, hard pull, as is likely, since the copper mines are operated at a profit only by the exercise of the greatest economies, and since the operators are determined not to recognize the Western Federation, the union men in the red-metal district will need all the assistance they can obtain from their follows. No meetings in the interest of the strikers have yet been held elsewhere in the iron region.

A short-lived strike on the Cuyuna, several weeks ago, was the only labor trouble in the iron fields this year. This, it was claimed, was instigated by Socialists. The strike was [illegible] by the operators. The properties affected were closed [illegible] after the walkout took place and following a suspension of several days the men returned at the conditions that [illegible] prevailed. Later, there was a "strike" at the [illegible] near Winton, on the Vermilion range. The men [illegible] demanded that they should be paid on the tenth [illegible] instead of on the twentieth. This concession was [illegible]. In the meantime, the iron fields are reaping a [illegible] from the strike in the copper country, to the extent that [illegible] obtaining important additions to their working force. The [illegible] of men from the troubled zone is [illegible]. Many of the best miners are departing and in most instances they are going to the iron region. So extensive has been the exodus that the general manager and the general passenger agent of an important railroad have been on the ground personally to look after the traffic. In the great majority of cases, the men participating in the hegira are English-speaking mine workers, steady and industrious and not affiliated with the Western Federation, and it is noticeable that wherever possible the iron-mining companies are adding them to their payrolls.

### GALENA—Aug. 2

**A Great Prospecting Campaign**, one that is declared to be the greatest in the history of the Kansas zinc-mining field has been growing during the last month. S. R. Ping, a land owner greatly interested in the mines of the district, said recently that in all his experience in the last 20 years in the field he had never seen so many drill rigs at work in the Galena camp as are now being operated. He estimated that there are as many drill rigs at work in this field as there are in all of the other southwest Missouri camps combined, a condition that is surprising. However, this campaign is only part of the general campaign that has been going on in the territory stretching from the old Badger camp in Kansas to the new Miami camp in Oklahoma. Stimulated by the strikes made in what was known as the Klondike camp, many years ago, several prospectors have set to work to test a large area of ground in that vicinity and stretching southwestward along Spring River. Simultaneously the deep drilling and mining operations south of Galena on Shoal Creek by the Hartford Mining Co., which showed such exceptionally good ore at the deep level of 300 ft. started operators to testing out land in that part of the field and drilling companies are now entering upon work that will last until the winter season. Among the operators interested here is J. M. Short, who is setting two machines to work this month on a lease of 80 acres which he has just secured. The Empire Zinc Co. is also continuing its drilling and prospecting operations.

At Blue Mounds, just above the Kansas and Oklahoma line, is found the northern advance guard of prospecting drills. These have been steadily advancing from Hattonville tracing the orebodies in a northerly direction until it now appears that the zinc-blende ore deposits of the district are going to be found extending much further under the Carboniferous Pennsylvanian shales and sandstones than has been anticipated from previous study and experience. The steady advance of the prospectors to the north has already demonstrated the existence of promising deposits of ore already far past the margin where the Pennsylvanian overlaps the Mississippian rocks. Previous study of the district had indicated that it was unlikely that profitable bodies of ore would be found beyond the general margin of the coal measures. It now appears that this opinion will have to be modified and there are those who now believe that there is a possibility of tracing the present "run of ore" as far north as Columbus, where some of the best coal mines of Kansas are now being operated. Hardly less important has been the extension of the prospecting operations to the southwest of Hattonville and the development of the fact that there exists there a stretch of territory about one mile wide by six miles long of demonstrated mining ground. This is comparable to the famous Oronogo-Duenweg "run of ore" in the Missouri district from which has come 50% of the ore production for a good many years.

### FLAT RIVER—Aug. 1

**A Demand for Higher Wages** has been made by the miners of this region and unless the mine owners grant the desired increases, the question of a strike will be put to a referendum vote. The miners some time ago gave the owners until July 31 to grant them a straight increase of 50c. per day, recognition of their union, and adoption by the company of the check system, whereby the companies deduct union dues from the pay of the union members and turn it over to the union officials. The miners contend that they are the poorest paid of any mineral workers in the country, and say that even if the demands are granted the average salary will be only $2.50 per day.

### GRANTS PASS—July 29

**A Railroad to the Coast** is to be built from Grants Pass. Actual construction work has been begun. Such a railroad will open this section and the country to the west to development of its mineral resources. Many efforts have been made to build a railroad from this town to the seaport town, Crescent City, Calif., but this is the first actual construction work to be done. A construction company has been organized in Oregon and California to build this road. The capital is $2,500,000. Offices of the company have been opened at Grants Pass and contracts have been let for the first 10-mile section, which will be owned by the city of Grants Pass.

# THE MINING NEWS

## ALASKA

MIZPAH (Fairbanks)—Twenty tons of ore were crushed at the Fursteneau mill at the head of Fairbanks Creek. The recovery was $30 per ton, and $17 was lost in the tailing.

HOMESTAKE (Fairbanks)—A recent 25-ton shipment milled about $100 per ton. The effort to sink a winze has been abandoned, as considerable water was encountered at a depth of 8 ft. below the tunnel level.

NEWSBOY (Fairbanks)—A clean-up from 202 tons of ore was made June 30; it yielded $3600, or $18 per ton. The ore was from the 150-ft. level, where the vein is 6 to 8 ft. wide. The mill is now crushing ore from the 215-ft. level.

COOK BROTHERS (Fairbanks)—A test shipment of three tons from a recent discovery on the left limit of Fairbanks Creek yielded $27, per ton by amalgamation. The concentrate, which comprised 2½% of the ore, assayed $175 per ton.

ALASKA UNITED (Douglas Island)—In the Ready Bullion mill, 18,242 tons of ore milled in June, yielded $40,362, or $2.23 per ton, $15,980 being estimated as profit. In the 700-Ft. Claim mill, 17,955 tons of ore yielded $49,155, or $2.76 per ton, $18,548 being estimated as profit.

GUESSMAN (Fairbanks)—From a vein discovered last winter on the right limit of Bedrock Creek, just above the Rhoads-Hall mine, five tons of ore milling $150 per ton have been shipped. The vein is on one of the claims embraced in the group owned by the Tanana Quartz & Hydraulic Mining Co., and is being developed by Guessman & Kipps under lease.

CRITES & FELDMAN (Fairbanks)—A shipment of 40 tons of ore from the Helen S. claim on Moose Creek was recently put through the Willis mill on Chatham Creek. The ore returned $60 per ton, much less than was obtained last mill-run. Another shipment of 40 tons of about the same grade will be made soon. In the mine, two shifts are driving the adit, stoping and raising. Definite plans have not yet been made, but it is probable that a small mill will be built before winter.

RONAN & SPALDING (Fairbanks)—The last clean-up at the mill returned $2500 from a run of three days; or $130 per ton of ore. The lease expired July 15; Brumbaugh & Spalding will continue operations under a new lease. Development work, which has been allowed to lag because of the short time available to the lessees for the mining of ore, will be hastened. The little mill of three 250-lb. stamps, which was destroyed by fire last winter, will be rebuilt, and will be used to crush the occasional pockets of high-grade ore. The ore of lower grade will go, as before, to the larger mill.

## ARIZONA

### Mohave County

COPPER GIANT (Hackberry)—This property was recently purchased by the Clark interests, of Jerome. The shaft is being sunk to the 300-ft. level and it is reported that a large shoot of copper ore has been found. The ore contains some gold and silver, as well as copper.

YELLOW JACKET (Aubrey)—This property is under bond to C. L. Davidson and George Theis, Jr., of Wichita, Kan. At present the shaft is being sunk and drifting is in progress on the 100-ft. level. The ore contains gold, silver, lead and copper; some of it also carries zinc. It is expected that a hoist will soon be placed on the property.

SAN FRANCISCO (KINGMAN)—This property is in charge of J. E. White, formerly manager of the Quartette mine at Searchlight, Nev. He has a small force of men at work sampling the workings preparatory to outlining a plan of development. The ore contains gold, lead and some copper, and some of it has been found richer than was anticipated.

KINGMAN COPPER CO. (Mineral Park)—This company recently purchased a new standard drill rig on account of the difficulty it experienced in drilling to depth with the old rig. The new rig has been put in operation on the claims at Ithica Peak and an effort will be made to drill to a depth below the 800-ft. level. At present, the first hole is down about 100 ft., and copper-bearing quartz has been penetrated.

WHITE ELEPHANT (Cerbat)—The Pacific Investment Co., which is operating this property, has just completed improvements which will increase production. A 60-ton ore-bin has been built and two ore wagons have been secured for the 4-mile haul to the railroad . There is a large tonnage in sight, of ore carrying gold, silver, lead and some copper, silver, however, is the principal valuable metal, considerable native silver being found.

## CALIFORNIA

### Alpine County

IN THE MONITOR DISTRICT the Curtz and the Morning Star mines owned by Captain Curtz, and the adjoining mines bonded by Gunn-Thompson are being extensively developed. The Curtz property has developed a large body of milling and concentrating ore carrying silver and copper. An electrically driven mill and concentrator will be built this summer. If warranted, small smelting plants will be built. The activity at these two properties is attracting attention to the entire district. which is sometimes called the Loope district.

### Amador County

MARKELEY (Volcano)—A new development shaft will be sunk to 500 ft. at a point 600 ft. east of the old shaft. The mine formerly produced high-grade ore.

BUNKER HILL (Amador City)—The electric hoisting motor used in sinking the shaft was recently shipped to San Francisco for repairs. The shaft has been deepened 200 ft. below the 1950-ft. level. During the suspension of sinking the cutting of the 1100-ft. station is in progress. Dividend No. 86 of 2½c. per share was paid July 15.

### Butte County

GOLD BANK-GOLDEN QUEEN (Forbestown)—The mill and cyanide plant are temporarily closed down for lack of water. The demand for irrigation water by the farmers is the cause. The South Feather Land & Water Co. is unable to supply both the farms and the mines since the present season is exceptionally dry. Recent development in the Gold Bank mine has disclosed large orebodies that were believed by the former owners to have been exhausted. The Forbestown Consolidated under the management of M. J. Cooney has proved that the mines were not worked out as claimed by the former owners.

### Calaveras County

WHEELOCK (Sheepranch)—High-grade quartz is reported at the 200-ft. level. The vein is said to average 3½ ft. wide, carrying free gold ore and sulphides.

CALAVERAS COPPER CO. (Copperopolis)—It is reported that creditors have assumed charge of the mine for the purpose of settling accounts. The June payroll for labor, which was passed at the end of June, was paid in July. The liabilities are said to be $54,000. Copper matte on hand is valued at $18,000.

### Lassen County

FROM SKEDADLE CREEK DISTRICT comes news of a gold strike at Stacey. It has caused a small rush of prospectors to the district which lies east of Honey Lake. The region has never been mapped as a gold-producing district, and there is no available information as to the prospects for uncovering either quartz or gravel commercially profitable for gold mining.

### Modoc County

FORT BIDWELL MINES CO. (Fort Bidwell)—George H. Kent has filed suit against the company for compensation for caretaking. The mine is situated at 8000 ft. elevation, and during the winter there was 20 ft. of snow at the mill. In his complaint Kent sets forth the facts of isolation and the illness of his wife, who was carried out over the snow to secure medical attendance.

### Nevada County

GASTON (Graniteville)—The 10-stamp mill is being removed from the upper workings to the tunnel level. The tunnel is 4000 ft. long, and the development of the mine is such that greater economy may be practiced by tramming the ore than by hoisting.

### Siskiyou County

SISKIYOU MINES CO. (Happy Camp)—George P. Burbank, manager, has gone to New York, and William Maguire, of Nevada City, has been appointed manager. Mr. Burbank is still largely interested in the company and will return in the fall. The machinery will be overhauled. Ten men are employed. In June the mine was running on a full ditch, and it is reported that the last cleanup was about $16,000.

### Tuolumne County

ATLAS (Tuttletown)—This mine and the Soldiers' Gulch mine, with about three acres of adjoining land, have been purchased by J. L. Witney. The Atlas mine was formerly known as the Waters, and was reopened last year by Mr. Witney.

## COLORADO

### Eagle County

LADY BELLE (Eagle)—Notwithstanding all the sensational reports from the Brush Creek district, the fact remains that this is the only mine that is shipping ore or that has ore in place. The extension of the ore has not been found.

### El Paso County

HOLLINGSWORTH VS. TUFTS—In the district court at Colorado Springs the litigation involving mining property in Mexico, which has been in the courts for 10 years, was practically settled in favor of Edward R. Tufts. Judge W. S. Morris declined to accept the report of the referee, O. E. Collins, awarding Dr. J. G. Hollingsworth, of Kansas City, title to 1,500,000 shares in the Grand Union Mining Co., and a personal judgment of $351,000 against Tufts. Hollingsworth's attorneys will probably take the case to the appellate courts. Hollingsworth claimed that in 1899 he grubstaked Tufts for a mining trip into Mexico. He claimed that he had advanced several thousand dollars and that he was entitled to half of the profits of the mines. Tufts, on the contrary, claimed that he had borrowed only $350 from Hollingsworth and had repaid him. Later, Tufts' ventures in Mexico were exceedingly profitable.

### Lake County

THE ARKANSAS VALLEY SMELTING WORKS is now operating five furnaces in full blast.

LITTLE ELLA (Leadville)—The lots of zinc ore that have been shipped by the lessee contained 40% zinc, so he is now blocking out reserves for stoping. The usual amount of lead-silver ore is being shipped daily.

MILLER (Leadville) The Miller mine bids fair to be as productive as the Mount Champion, as in a new drift started recently in the intermediate tunnel between the upper and lower workings on the Miller vein ore, has been opened that extends the entire width of the tunnel. From the bottom the assays give returns of 6.70 oz. gold and 4.6 oz. silver per ton. Another orebody, from 2 to 3 ft. wide, worth $15 a ton, has been opened near the end lines of the Mount Champion, it is reported.

### Pitkin County

TIN CUP (Tin Cup)—The power plant of this dredging company will be built on Chalk Creek, in the Leadville national forest, near St. Elmo. The first installation will be about [illegible] hp. The power line will cross the continental divide at an elevation of 12,000 feet.

### San Juan Region

GENESSEE VANDERBILT (Ironton)—This mine in the Red Mountain district is being unwatered and shipments of ore will be made next month. The ore is covellite, and the vein was struck 3000 ft. in from the portal of the tunnel, which was driven by the Red Mountain company prior to its being sold out for debt.

### Summit County

ARCTIC (Breckenridge)—The 10-stamp mill was started last week on gold ore from the mine. The property is operated by electricity.

SAND MINING CO. (Breckenridge)—Amalgamating tables will be added to the mill on the Ohio River as there is much free gold in the ore.

ST. JOHNS M. & M. CO. (Breckenridge)—This company will operate a steam shovel on the dump, which contains 65,000 tons of good concentrating ore.

REILING GOLD DREDGE (Breckenridge)—This dredge will be moved up-stream a mile to very rich ground. It is said to have yielded cleanups of $1000 per day.

### Teller County

ISABELLA (Cripple Creek)—A rich strike by a lessee is reported through the camp, but the company will give out no information until the shoot has been more developed. McIntyre & Butler, lessees, have made a strike of good ore on the eighth level and a carload sent out a few days ago ran $40 per ton.

PORTLAND (Victor)—The mine is now being developed with the object of going 150 ft. deeper. Through the deep drainage tunnel the water is receding 7 ft. per month. For the quarter ended July 30 the mine made a net profit of $243,043; of this $60,000 was paid as a dividend and $180,000 carried to the reserve fund.

## IDAHO

### Coeur d'Alene District

PLACER MINING OPERATIONS are well under way in the Murray district. The late rains and heavy snows of last winter giving ample water supply for extensive operations. One of the largest crews at work is on East Slagle Creek, where Dunlap & Smith, pioneer placer miners, are washing a large strip of rich pay. Ten miners are employed, and booming is practiced in getting to bedrock, which lies at a depth of 8 to 12 ft. Assured of a strong water supply, the owners are working a larger strip this summer than for many seasons, and from the present outlook will make one of the largest cleanings of the North Side. The gold is coarse and averages $18 per oz. Nuggets worth from $25 to $55 have been taken from the creek, but the bulk of the gold is nuggets averaging from $1 to $5 each. The season's cleanup will probably be close to $10,000.

LACLEDE—(Burke)—Extensive development of this mine, between the Hercules and the Tamarack & Custer and adjoined on the north by the Interstate-Callahan, is planned. Operations have been hampered by the heavy flow of water in the main tunnel, but recently the workings became dry. It is supposed that the mine is being drained by the others in the vicinity. The No. 2 tunnel is now in 2200 ft., 1600 ft. of which is a crosscut to the vein and the remainder a drift on the vein. The showings in the bore were not satisfactory, and recently sinking was started 1800 ft. in from the portal. Certain stockholders report that after a visit to the mine they found conditions were never more promising in the Coeur d'Alenes than now. Every prospect of any promise is being worked and the producing mines are shipping to the limit of their equipment. More men are employed in the mines and mills than at any time since the first property was opened, and it is thought that the output for the current year will be far in excess of all previous records. The district is attracting attention from mining operators and investors all over the country, and the hotels in the different towns are being taxed to provide accommodations for prospects, while practically every train in and out of the [illegible] is crowded with passengers.

## LOUISIANA

### Caddo Field

[illegible] OF A BURNING GAS GUSHER, 20 miles from [illegible] was recently made by the conservation commis[illegible] will be held until the owner, D. D. Davis, of [illegible] pays a fine for the waste of oil. The well [illegible] gasser and has been wild for five or six [illegible] effort on the part of the owner to close [illegible] oved futile and it was accidentally set on fire. [illegible] commission will make a renewed effort to [illegible] closed. It is expected that the cost will be [illegible] and $15[illegible]

## MICHIGAN

### Iron

TOBIN (Crystal Falls)—Corrigan, McKinney & Co. closed this mine at Crystal Falls last week because there is more ore on hand at present than the company can dispose of this season. The mine is the next to the largest in Iron County, and employed a large force of men, most of whom found employment at other properties in the district.

FLORENCE (Florence, Wis.)—Felix A. Vogel, general manager of mines for Ladenberg, Thalman & Co., visited Florence a few days ago and left orders to close down the mine. The pumps will continue in operation, so it is believed that the shut-down will not be for long. The company has experienced some difficulty in disposing of its product, and there is quite a large stock pile at the property.

CLEVELAND-CLIFFS IRON CO. (Crystal Falls)—It is now certain that this company has found a mine in the Mastadon section near Crystal Falls, but it has not been learned when mining operations will be commenced. The company's drilling in the Iron River field has also brought good results and a mine has been located there, on the north range. The company has two geological parties working in the district in good territory, and it is not unlikely that other orebodies will be discovered.

AMERICAN (Ishpeming)—The management of this property states that good results are now being secured at the concentrating mill, although it was necessary to make a number of changes from the original plans. All of the tables had to be rebuilt. The low-grade ore that goes through the mill averages from 38 to 45% iron, and the product 60%. Many mine managers are watching these operations, and it will probably not be many years before similar concentrating plants will be erected for the treatment of low-grade ores, which abound in the Lake Superior field.

## MINNESOTA

### Mesabi Range

OLIVER IRON MINING CO. (Coleraine)—Mining activities were curtailed in the Canisteo district when men were laid off and several shovels and locomotives were transferred to other parts of the range. For the remainder of the season only day crews will be employed, all night work having been discontinued.

GILBERT (Gilbert)—President Olcott, of the Oliver Iron Mining Co., visited Gilbert a few days ago and gave orders to suspend operations at the mine, but no reason for the action was given out. The mining was being done on leased ground, and the company had removed the minimum quantity required by the fee owners, which is probably the reason for closing down.

### Cuyuna Range

THE NUMBER OF MINES ON THE CUYUNA range, according to the annual report of the mine inspector, for the year ended June 30, is 12, of which 10 are in operation. The average number of men employed at the 10 properties is 1327; average daily wage underground, $2.86; surface, $3.03; ore shipped, 443,460 tons; stripping removed, 1,018,456 cu.yd.; fatal accidents, two.

BARROWS (Barrows)—This mine of M. A. Hanna & Co. will enter the list of Cuyuna shippers about Aug. 15. This will be the first shipping mine on the south range of the Cuyuna district. The company is about to install a 30-hp. turbine on the mine's waste water line, which will supply power for electrically lighting the surface plant. The water is raised 30 ft. above the collar of the shaft, and there is 25 ft. head at the point of discharge.

PITTSBURGH STEEL ORE CO. (Crosby)—Hydraulic stripping is something new on the Minnesota ranges, but this company has been getting fine results at the Riverton property, and the stripping outfit will be increased in order to move about 15,000 yd. of earth per day. Only one unit is being operated at present, but four more will be added, and it will not be long before the orebody is laid bare. The overburden is sand, with a strata of pebbles here and there, but the pebbles are not permitted to enter the sand-sucker, which picks up the loose sand and water as it comes from the dump and carries it far into Little Rabbit Lake. Some of the Riverton ore carries clean quartzite, and a concentrating mill will be erected to remove it.

## MISSOURI

### Joplin District

WILSON (Duenweg)—The capacity of the 300-ton mill on this property is to be increased to treat ore now being taken from a 40-ft. face of ore. The company expects to hoist 1600 tubs daily. The ore is being mined at the 175-ft. level. Operations will continue while the plant is being enlarged

OAK ORCHARD (Joplin) -The ground is being drained, preliminary to an extensive drilling campaign. It has been idle for several months and the 40-acre lease has been flooded Previous operations did not extend over the entire tract and many good turn-ins were made For that reason the new company leasing the property believes the ore has not been worked out.

LINDO MINING CO (Verona)—The third drill hole was terminated in a run of blende at a depth of 190 to 210 ft of virgin land immediately south of Verona The nearest developed mining lands are at Aurora, several miles away and the new properties are considered important as a new mining camp may be opened. Other prospecting is now contemplated by other landowners.

KAIL LAND (Joplin)—Preparations are being made for building a mill on this land by Baum Bros and associates Following the drilling of eight drill holes which developed a promising deposit of blende, a shaft was sunk and the ground is now being rapidly opened The ore taken out is galena at the 60-ft level and blende at 80 ft The land has hitherto been used exclusively for agricultural purposes

## MONTANA

### Butte District

BUTTE & LONDON (Butte)—Preparations are being made to continue sinking the shaft at this property in the eastern part of the Butte district from the 1100- to the 1600-ft. level. Electric sinking equipment has been ordered and it is expected that operations will be commenced Sept. 15. The work is to be done by the Rainbow Lode Development Co., in which Thomas F. Cole, E. C. Congdon and others, of Duluth, are interested. The mine has been closed since 1907.

ELM ORLU (Butte)—W. A. Clark, owner of this zinc and copper property in the northern part of the district, has announced his intention of sending the zinc concentrates from the mill now in the course of construction, to the smelteries of the National Zinc Co., which has leased the plants of the United Zinc & Chemical Co., with works at Bartlesville, Okla., Kansas City, Kan., and Springfield, Ill. Mr. Clark decided upon this course after a thorough investigation of the feasibility of establishing an independent plant, using Wyoming gas or coal for fuel.

CORBIN COPPER (Butte)—In a recent week a new record for shaft sinking in Butte was made. The shaft on the Gambrinus was sunk 35 ft., and has now been sunk to a depth exceeding 130 ft. At a depth of 85 ft. a crosscut was driven south to prove the apex, the vein being encountered 35 ft. from the shaft, where it is composed of 4 or 5 ft. of quartz and 20 ft. of lode matter. In the Rochester district the company is developing a group of claims and has just cut the second vein in driving for the main vein at a depth of 500 ft. Two parallel veins 15 ft. apart have been cut, assaying 3 to 7% copper.

TUOLUMNE (Butte)—Strong opposition to the proposed increase of capital is developing, and Lee Mantle, a former senator, is heading a minority interest which threatens litigation to prevent the proposed increase and purchase of the Butte Main Range company's undeveloped ground. The announcement of the plan to double the capital of the Tuolumne cut the market value of the stock in half and shareholders are rather hostile. "As a matter of principle," says Senator Mantle, "I question the wisdom of the men behind Tuolumne buying Butte Main Range with Tuolumne's money, when the ownership is largely the same in both cases."

NORTH BUTTE (Butte)—The work of sinking the Granite Mountain shaft is progressing at the rate of 100 ft. per month, and it is expected that before the end of the year it will have reached the 2800-ft. level, the present depth of the Speculator shaft. As soon as this depth is reached a connection will be made with the Speculator shaft so that in the event that it becomes necessary to close the latter temporarily for retimbering or other purposes, the Granite Mountain shaft can be used for hoisting, thus keeping up the output until the main shaft is in commission again. The mine is producing 2,250,000 lb. of copper per month.

### Broadwater County

BLACKSMITH (Hassel)—Charles Muffly, of Helena, has taken an option upon this property of the Thomas H. Carter estate, and it is probable that mining will be started in a short time. There is a 20-stamp mill at the mine, but on account of the refractory nature of the ore on the lower levels it was found impossible to make a sufficient saving and work was suspended several years ago. Mr. Muffly is contemplating making alterations in the mill.

### Deer Lodge County

ORO FINO (Georgetown)—Charles Bostrom and W. H. Dunnigan, of Anaconda, recently took a lease on this property. They have installed a hoist capable of sinking to a depth of 400 ft. and will operate on a large scale. Ore assaying from $15 to $20 per ton has been encountered on the 200-ft. level.

### Madison County

WATSEKA (Rochester)—The owners of this old mine are having tests made of the tailing dump with the idea of erecting a cyanide plant should the results indicate that the material can be retreated at a profit.

## NEVADA

### Douglas County

WINTERS (Gardnerville)—This mine was sold recently for $90,000, an initial payment of $20,000 having been made, the balance to be paid in 24 months. The mine is on the east side of the summit of the Pine Nut range, about 18 miles east of Gardnerville and two miles north of the Longfellow mine. It will be fully equipped at once and placed in condition for operation, probably $50,000 will be spent in this work.

### Humboldt County

GOLD AND SILVER DISCOVERIES have been made recently in Rochester by lessees on the Abe Lincoln, Turpin and Moore, Buck & Charlie, St. Valentine and Nonpareil properties.

### Lincoln County

WOOLLEY VS. PALMER—Suit has been filed by Ernest R. Woolley against William J. Palmer, president of the Amalgamated Pioche Mining Co., to collect $125,000, the amount of a promissory note given to Woolley, for his part in the formation and promotion of the company. Woolley was the principal owner of the Nevada-Utah Mining Co. which later took in several other properties in the Pioche district and was reorganized under the name of the Consolidated Nevada-Utah Mining Co., which in turn took up other mining properties of the district. Woolley alleges in his suit that, acting for the Vogelstein interests of New York, represented by William J. Palmer, he was instrumental in the promotion and organization of the Amalgamated Pioche, and for this service was to receive $125,000. After the formation and consolidation of the various companies, Woolley alleges, the Amalgamated refused to pay the promissory note given him for his work in organizing the company.

### Lyon County

BLUESTONE (Mason)—The experimental concentrating plant has finished its test run and is temporarily closed down. The results of the test, it is said, were quite satisfactory. Development work in the mine is being continued.

BLUE JAY (Yerington)—The retimbering of the shaft has been completed. The hoist is in operation and the bucket will be replaced by a cage at once. Drifting on the 200-ft. level is in progress and the shaft station on the 400-ft. level is being cut out.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended July 24, 1913, were as follows: From Mason Valley Mines Co., 2026 tons; from Nevada-Douglas, 1126 tons; from other mines, 1046 tons; total, 4198 tons, or a daily average of 600 tons. During the same week four cars of matte were shipped.

YERINGTON BULLION COPPER CO. (Ludwig)—This property is about two miles north of the Nevada-Douglas. Shaft No. 1 is 4x5 ft. and is 400 ft. deep. It is equipped with a 40-hp. gasoline engine and compressor, and a 15-hp. hoist. Two air drills are working on development. On the 400-ft. level the shaft station has been cut and about 200 ft. of drifting and 130 ft. of crosscutting have been done, opening some good-grade copper ore. Good-grade ore has been cut in the tunnel 300 ft. west of the shaft, and also in the tunnel 300 ft. north of the shaft. A crosscut will be driven from the 400-ft. level to the west oreshoot. Higher on Bullion Hill a shaft has been sunk 116 ft. and which has cut an oreshoot dipping to the west. North of this shaft, about 200 ft., ore to a depth of 30 ft. has been exposed in an open cut and in a shaft. In addition to the copper the ore contains gold.

### Mineral County

WEST EXTENSION GROUP (Mina)—This group is under option to Los Angeles men, it is reported, for $40,000. A preliminary examination has been made and a final examination will now be begun.

CINNABAR KING (Mina)—In the bottom of the shaft a 5½-ft. shoot of good-grade cinnabar ore is exposed. A bond has been given on this group to Eastern men for a consideration of $60,000 cash payment when the property is taken over. The property will be reported on in the near future.

DAVENPORT MINING AND DEVELOPMENT CO. (Mina)—This property, situated at Douglas, six miles west of Mina, has been developed by tunnels on the main vein and a shaft sunk to a depth of 350 ft. at a point below the lower tunnel. A large shoot of free-milling gold ore of good grade has been opened. Test runs have been made on this ore at the newly erected custom mill of the Gold Range Mining, Milling & Leasing Co., and after some necessary changes at this plant, regular shipments will be made. There is a promise of greater activity in this district as a result of recent discoveries.

### Nye County

ROUND MOUNTAIN MINING CO. (Round Mountain)—Settlement has been effected of the pending litigation between John F. Davidson and this company by the company paying to Davidson and the men interested with him the sum of $15,000 and 15,000 shares of treasury stock, for a release and satisfaction of judgment of $165,157. A dividend of 4% per share is payable Aug. 25.

### White Pine County

NEVADA CONSOLIDATED (Ely)—It is reported that after a series of laboratory experiments with the oil-flotation process of concentration it has been decided to build an experimental plant. Laboratory tests are said to have been successful.

COPPERMINES (Kimberley)—Repair work which is being done on the reservoirs near the main Giroux shaft is about the only indication of any intention to place the old Giroux mill in commission as an experimental plant. The reservoirs have been empty since the pumps at the Giroux shaft were shut down at the time of the strike last autumn. Water from the Giroux shaft would be the necessary source of supply for the mill. A. J. Sale, chief engineer for the Giroux company, is in Butte and it is rumored that he went to attempt to pacify the Butte & Ely stockholders who object to the proposed consolidation and have applied for a receiver for their company.

## OREGON

### Baker County

POWDER RIVER GOLD DREDGING CO. (Sumpter)—This company is now operating its dredge in the river at the edge of the town and the clean-up exceeds $10,000 per week. The pay is found at a depth of 10 ft. The company contemplates installing other dredges.

GEM (Baker)—This mine, 29 miles east of Baker, is now opened to a depth of 600 ft. and there is 6 ft. of good ore in the face of the drift. Drifting is now being done in the North drift of the 500-ft. level. Electric power is being installed and the work will be completed by September.

PACIFIC LIME & GYPSUM CO. (Huntington)—This subsidiary of the Acme Plaster Co. has extensive holdings of gypsum beds near Huntington. The plant has just recently been completed and is now in full operation; 450 hp. is required to operate the plant and is furnished by the Idaho-Oregon Light & Power Co. There are 75 men employed and from three to four cars of lime and plaster are shipped daily.

BEN HARRISON MINES Co. (Baker)—W. C. Fellows, manager of this mine, charges improper weighing of ore shipped from his mine, and states that the Sumpter Valley R.R. is not giving correct weights. The case is being heard at Baker, before Clyde B. Atchison, of the state railroad commission. Mr Fellows states that there is a considerable difference between weights made at the mine and at Midvale, Utah, where his concentrates are shipped, and the weights made by the Oregon-Washington R.R. & Navigation Co. on the scales in the Baker yards. An effort is also being made to reduce the rate on concentrates lower than the present tariff, which is now $2.65 per 100 lb. in carload lots.

### Josephine County

HORSESHOE BAR—This placer mine, 25 miles below Galice, on the Rogue River, is undergoing extensive development work, and three giants are now in operation. A good clean-up has recently been made and another and larger one will be made later in the season.

ALAMEDA CONSOLIDATED (Galice)—Corporation Commissioner R. A. Watson has requested the attorney-general to ask for a receiver for this company, with offices at 207 Board of Trade Bldg., Portland, Ore. The report of the corporation examiner, S. B. Vincent, states that the company is capitalized for $15,000,000, and has issued and has outstanding stock for $13,375,550, which Mr. Vincent reports was issued at a discount of $11,806,456, minus large commissions. There is in the treasury $1,624,450 in stock and $203 in cash. Mr. Vincent states that the company is running behind constantly, and, according to the statement of the secretary, owes about $130,000, a large proportion of which is due for salaries and personal accounts of some of the directors. He thinks that the company is hopelessly involved and the corporation commissioner will not allow the management to sell any treasury stock. John F. Wickham, manager of the company, states that it is at present in hard financial straits, but declares that the mines can be put on a paying basis for $50,000, which he says, will equip the smelting works and then $300,000 net could be made annually; the company did not run behind until 1911, when the smelting works was built and that but very little of the indebtedness is due for salaries. A later dispatch states that Corporation Commissioner Watson has reversed his action upon a showing made by the company that it owns a profitable mine and the promise that it will suspend the selling of stocks.

## SOUTH DAKOTA

WASP NO. 2 (Deadwood)—A system of belt conveyors will be installed under the tanks for removing the tailing, thus doing away with hand tramming, and also reducing the time consumed in dumping.

RATTLESNAKE JACK (Galena)—The owners have purchased the Saginaw mill, at Custer, and will move it to the property, and equip it with a cyanide department. The plant contains 20 stamps, and is practically new and uptodate.

HILL CITY MINING & DEVELOPMENT (Hill City)—This company is working energetically on its property in the Hill City district, and is securing results of a highly encouraging nature. The deposit is largely free milling and from present indications is of large extent. It is planned to erect a mill at an early date.

MINERVA—Peterson & Co., leasing on this property, in Blacktail Gulch, are getting encouraging results, and are preparing for a mill run. The Esmeralda mill has been secured, and may be repaired for their use. The property is in the conglomerate belt, and the present tunnel is following a course destined, should it continue, to intercept a shoot that produced some fabulously rich ore some years ago.

REPUBLIC—W. T. Boley is making an examination of this property, in Blacktail Gulch, and will outline plans for future work. During last winter and spring considerable development was done, but operations were suspended in April. Officials of the company, residents of Chicago, are at the property. It is reported that Mr. Boley will have charge of work upon resumption. The property contains several good shoots of ore, and a mill is among the possibilities of the near future.

IRONSIDE—Leasers at this mine in Squaw Creek are getting out high-grade smelting ore, and as soon as the wagon road to Maurice station on the Burlington, is repaired, shipments will commence. The ore is the richest sylvanite ever found in the Black Hills. The property lay idle for over 10 years. The present leasers have been working about three months. Their work is being confined to drifting and crosscutting 15 ft. below extensive lateral workings opened by the former operators, giving an illustration of how easy it is in mining to miss a good thing by a narrow margin.

## UTAH

### Juab County

BLACK JACK (Mammoth)—This mine is to be closed for the present. There is considerable low-grade ore in the upper workings as well as on the dumps.

GRAND CENTRAL (Robinson)—At the July meeting the directors failed to declare a dividend for the quarter just ended. Eleven cars of ore were shipped the week ended July 18. It is reported that the mine is soon to be electrified.

EMERALD (Mammoth)—The work of repairing the shaft has been practically completed, and work is to be resumed on the 1100-ft. level, where drifting will be done. A winze will later be sunk from the 1100 in search of ore stated to have been encountered, when the mine was being worked through the 2000-ft. level of the Opex.

### Summit County

SNAKE CREEK TUNNEL—Work has been resumed on this tunnel, which has attained a length of almost 6000 ft., and the ultimate length of which is to be 14,000 ft. The tunnel will [illegible]ter and develop a large territory.

[illegible]VER KING CONSOLIDATED (Park City)—A station [illegible] cut on the 1550-ft. level, a switch cut and a hoist, [illegible] installed. Shaft sinking is being continued, and as soon [illegible] it has been completed to the 1800-ft. level the de[illegible] of the orebody cut at 1480 ft. will be undertaken.

[illegible] KING COALITION (Park City)—During the year [illegible] 1913, 18,229 tons of crude ore and 12,485 tons [illegible] from 31,997 tons of second-class ore were [illegible] first-class ore averaged 31.2% lead, 64.48 oz. [illegible] 571 oz. gold, and the concentrates 35.55% lead, [illegible] and [illegible] oz. gold. Net earnings were $745,102.

## WISCONSIN

### Platteville District

WILSON (Potosi)—This company has unwatered the Preston Point mine and begun milling.

MIDLAND LEAD & ZINC CO. (Elmo)—This new company has taken over the Beloit-Elmo mine and resumed operations.

B. M. & B. (Livingston)—This company struck the ore range in its shaft on the Biddick land, adjacent to the Ellsworth mine at Livingston.

MINERAL POINT ZINC CO. (Highland)—This company has purchased the Minter property, at Highland, formerly operated by the Milwaukee-Grange Mining Co. The carbonate mines at this camp which were purchased during the last year by the Mineral Point Zinc Co. have been reopened.

## CANADA

### British Columbia

PROGRESS ON THE HIDDEN CREEK reduction works of the Granby company is being made rapidly. There are 1125 men on the payroll at Granby Bay, most of whom are engaged in construction work at the smelting plant. It now appears that the furnaces and converters may be ready for operations by the end of the year.

BROKEN HILL MINING CO. (Lillooet)—Preparations are being made by this company, owning property in the Lillooet district, to proceed with development on an extensive scale.

NICKEL PLATE (Hedley)—The Dickson incline from No. 4 tunnel has three compartments and is being sunk at the rate of 100 ft. per month in hard ground. The ore averaged for the first half of 1912 a little more than $1 per ton more than the average of last year.

BRITISH COLUMBIA COPPER CO. (Greenwood)—A concentrator will be built at the Voigt properties, near Princeton. The company has developed 1,500,000 tons of ore carrying 1½ to 2½% copper and $2 in gold in the properties it has under option; $20,000 per month is being spent in development work.

SLOCAN-PAYNE (Sandon)—A contract was let early in July by Carlson & Co., of Spokane, for driving approximately 1700 ft. of crosscut tunnel at the Payne mine. The completion of the contract will mark the addition of the Payne mine to the list of Slocan shippers once more, as the tunnel is intended to tap the oreshoots at depth. This property still ranks as the largest dividend payer in the Slocan and one of the largest in British Columbia, having netted its owners considerably more than $1,000,000 in the bonanza days when the big oreshoots were easily reached from the surface.

RAMBLER CARIBOO (Kaslo)—High-grade shipping and milling ore has been struck on the tenth and twelfth levels. One foot of shipping grade and 2 ft. of concentrating grade were encountered on the tenth level June 22 and had been followed by a drift for 38½ ft. up to July 2. Similar conditions have been developed on the twelfth level, where a drift has been advanced on ore for 41 ft. up to the same date. Two carloads of ore were shipped July 2 and three more loads stood in the bins awaiting cars. Of the five cars, one is of crude ore, the remainder concentrates. The value of previous shipments ranged from $1800 to $2700 per carload. The mill is running day and night in the production of concentrates.

### Ontario

TIMISKAMING (Cobalt)—Considerable uneasiness is felt by some of the shareholders over the failure of the company to declare the regular quarterly dividend. It is stated that the company has a credit balance of $166,000, while the dividends will call for only $75,000. The last dividend was paid Apr. 30.

CROWN RESERVE (Cobalt)—Arrangements for the draining of Kerr Lake by the Crown Reserve and Kerr Lake mining companies are expected to be completed about the end of the month. The pumps employed to pump the water through pipes into Giroux Lake will be of the semi-dredging centrifugal type, and will be operated against a head of 175 ft. It is estimated that at least three months will be required for the work. The drainage of Kerr Lake will render it necessary to procure a new reservoir for the water supply for the working of the Crown Reserve, Kerr Lake and Drummond mines. A tank is being erected with a capacity of 45,000 gal. on a hill behind the Crown Reserve workings, which will be kept supplied with water pumped back

## SOUTH AMERICA

### British Guiana

EXPORTS OF GOLD from British Guiana for the half-year ended July 1, 1913, were 26,621 oz., or $550,256, an increase of $183,310 in value over the first half of 1912. Exports of diamonds this year were 2507 carats, valued at $23,204; an increase of 354 carats and $11,816 in value over last year.

## AFRICA

### Belgian Congo

REPORTS FROM KATANGA, forwarded from Elizabethville, the capital of the province, state that a gold field has been discovered in the southern part of the district and that the ore is high grade.

### Rhodesia

GOLD PRODUCTION IN JUNE was 56,991 oz., being 3116 oz. more than June, 1912. For the half year ended June 30 the total gold output was 318,038 oz. in 1912, and 335,497 oz.—or $6,931,310—in 1913; an increase of 17,439 oz. Other production in June included 12,789 oz. silver, 31 tons lead, 2544 ton chrome ore and 19,844 tons coal.

### West Africa

GOLD PRODUCTION OF THE GOLD COAST AND DAHOMEY in June was 30,503 oz., being 2719 oz. more than in June, 1912. For the half-year ended June 30, the total was 161,924 oz. in 1912, and 203,995 oz.—or $4,216,577—in 1913; an increase of 42,071 oz. this year.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Aug. 5

The metal markets have been rather unsettled. Firmness has developed in some lines, others are weaker, and again there have been advances. The general tendency, however, is toward improvement in prices.

### Copper, Tin, Lead and Zinc

**Copper**—A good business has been done at advancing prices. The market is strong, principally owing to the fact that considerable copper has still to be bought for September shipment and the supplies for early delivery are scant. The strike at the Lake continues and there is no prospect of an early resumption of production there, while some of the electrolytic refineries which have had labor troubles have not yet been able to reach their normal rate of production. The Lake copper that is on hand is selling at higher prices, but our quotations of this week are based on what is relatively retail business, which is all that we have heard of. Electrolytic copper is offered by the agencies at 15⅛@15¼c., delivered, usual terms. Those who are ostensibly holding for 15¼c. apparently allow themselves to be tempted when real business offers itself. Although the market is strong, the business that has been done at over 15c. is much less than was done under that figure. At the close we quote Lake copper at 15.30@15.40c.; and electrolytic at 15@15.05c., basis New York, cash. Casting copper is quoted nominally at 14⅝@14¾c. as an average for the week.

The London market for standard copper has been active. On Aug. 5 it reached £67 17s. 6d. for both spot and futures, and on Aug. 6 it closes somewhat easier at £67 10s. for both positions.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16@16½c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 6265 long tons. Our special correspondent gives the exports from Baltimore at 3741 tons for the week.

**Tin**—The sensational decline of July 30, which was described as purely and simply a bear maneuver, was recovered quickly in the London market. American consumers had taken advantage of the lower prices quoted here, and in consequence liberal orders were sent to London from this side. The London holiday interfered with trading here on Aug. 4, sellers not being willing to commit themselves in the absence of a London market. The close is very strong at £188 for spot, and £187 15s. for three months, and about 41⅝c. for August tin here.

Visible stocks of tin on July 31, are reported as follows: Great Britain, 6043; Holland, 2686; United States, excluding Pacific ports, 3334; total, 12,063 long tons, an increase of 962 tons over June 30, but a decrease of 1283 tons from July 31, last year.

Production of the Nigerian tin district in Central Africa, half-year ended June 30, is reported at 2574 tons concentrates. These vary at different mines in tin contents and value.

**Lead**—The market is quiet and unchanged. New York lead is quoted at 4.50c., and St. Louis at 4.375@4.40c. It is reported that a strike of the miners in southeastern Missouri is threatened.

The London market continues firm and Spanish lead during the week sold as high as £20 15s. The close is cabled at £20 10s. for Spanish and 10s. higher for English.

**Spelter**—There is a fair demand from day to day and higher prices have been paid. Consumption is good, while production continues to suffer on account of the reduced supplies of ores, many Western mines having had to suspend shipments for the reason that they cannot make a profit at the present level of prices. At the close St. Louis is quoted at 5.40@5.45c. and New York at 5.55@5.60c. The strike of smelters at Collinsville, Okla., which last week led to the closing of one of the plants there, has been settled.

The London market for spelter is firmer, and at the close good ordinaries are quoted at £20 15s. and special 5s. higher.

Base price of zinc sheets was again advanced ¼c. per lb. on July 29, and is now $7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

**Exports of Metals and Minerals from Spain,** four months ended Apr. 30, as reported by the "Revista Minera," in metric tons:

| | Metals | | Ores | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Iron | 20,444 | 4,815 | 2,882,106 | 3,393,398 |
| Copper | 6,972 | 7,678 | 53,647 | 55,642 |
| Copper precipitate | 3,688 | 1,798 | ....... | ...... |
| Lead | 58,169 | 73,857 | 1,117 | 647 |
| Zinc | 815 | 42 | 43,324 | 40,376 |
| Quicksilver | 1,037 | 1,038 | ....... | ....... |
| Manganese | ..... | ..... | 10,563 | 8,030 |
| Pyrites | ..... | ..... | 948,588 | 1,105,573 |

Pyritic ores carrying 2.5% or more in copper are classed as copper ores; below that they are included in pyrites. Exports of salt were 193,484 tons in 1912, and 215,458 in 1913; increase, 21,974 tons.

### DAILY PRICES OF METALS

#### NEW YORK

| | | | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| July-Aug. | Sterling Exchange | Silver | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 31 | 4.8650 | 59⅜ | 15.00 | 14.70<br>@14.80 | 40⅛ | 4.50 | 4.35 | 5.50<br>@5.60 | 5.35<br>@5.45 |
| 1 | 4.8650 | 59¼ | 15.30<br>@15.40 | 14.80<br>@14.90 | 40⅝ | 4.50 | 4.37½<br>@4.40 | 5.50<br>@5.60 | 5.35<br>@5.45 |
| 2 | 4.8655 | 59⅜ | 15.30<br>@15.40 | 14.85<br>@14.95 | 40⅝ | 4.50 | 4.37½<br>@4.40 | 5.50<br>@5.60 | 5.35<br>@5.45 |
| 4 | 4.8660 | 59⅜ | 15.30<br>@15.40 | 14.95<br>@15.00 | 40⅝ | 4.50 | 4.37½<br>@4.40 | 5.50<br>@5.60 | 5.35<br>@5.45 |
| 5 | 4.8660 | 59¼ | 15.30<br>@15.40 | 15.00<br>@15.05 | 40¾ | 4.50 | 4.37½<br>@4.40 | 5.50<br>@5.60 | 5.35<br>@5.45 |
| 6 | 4.8660 | 59⅛ | 15.30<br>@15.40 | 15.00<br>@15.05 | 40⅝ | 4.50 | 4.37½<br>@4.40 | 5.55<br>@5.60 | 5.40<br>@5.45 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

#### LONDON

| | | Copper | | | Tin | | | |
|---|---|---|---|---|---|---|---|---|
| July Aug. | Silver | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | Lead, Spanish | Zinc, Ordinaries |
| 31 | 27⅜ | 67⅜ | 67⅜ | 72½ | 182¼ | 182¼ | 20⅞ | 20½ |
| 1 | 27 5/16 | 67⅜ | 67⅜ | 72¾ | 184½ | 184½ | 20⅝ | 20⅝ |
| 2 | 27⅜ | . | .... | .... | | . . . | | . |
| 4 | . . | . . . | . . . | .... | | .... | . . | |
| 5 | 27 5/16 | 67⅞ | 67⅞ | 73 | 185 | 185 | 20¾ | 20½ |
| 6 | 27¼ | 67½ | 67½ | 73 | 188 | 187¾ | 20½ | 20¾ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—Business is quiet and sales have been only fair. Prices are unchanged. No. 1 ingot being quoted at 23@23½c. per lb., New York. Foreign metal is quoted at 18¾@19¼c. in bond.

**Antimony**—The market has continued fair. Prices remain about the same, Cookson's being quoted at 8.40@8.50c. per lb., and Hallett's at [illegible] 10c., while 7.40@7.50c. is quoted for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business is steadier and prices rather firm. New York quotations are $40 per flask of 75 lb. San Francisco, $39.50 for domestic orders and $37 for export. London is £7 5s. per flask, with £7 quoted from second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.90 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

**Nickel**—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb. according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

## Gold, Silver and Platinum

**Gold**—While the demand for gold on the open market in London has been strong, especially from Berlin, it has not been enough to cause any premium to be offered. Prices remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. India is still taking some gold.

Imports of gold at New York week ended Aug. 2, were $627,093, mainly from France and Mexico. There were no exports.

Imports of gold in Great Britain six months ended June 30 were £26,476,141; exports were £18,841,946; excess of imports, £7,643,195, an increase of £2,365,883 over last year.

Sales of gold bars from the New York Assay Office in July amounts to $2,183,140, which is high for a summer month. For the seven months ended July 31, total sales were $16,490,088 in 1912, and $19,178,788 in 1913; an increase of $2,688,700. These sales are to jewelers and other for use in the arts.

**Iridium**—There is no change in the demand, which is good. Supplies are only a trifle better, and the price remains about $85 per oz. for pure metal.

**Platinum**—The market is quiet, and is rather curious about the new Russian export tax. There is talk of some advance, but prices remain at $45@46 per oz. for refined platinum and $49@52 per oz. for hard metal.

**Silver**—The market, as a whole, has been quiet and steady, and buying orders, which have come chiefly from China, have been easily filled. The steadiness which has so long prevailed seems likely to continue with slight fluctuations. Market closes quiet at 27¼d. in London.

Exports of silver from London to the East, Jan. 1 to July 24, reported by Messrs. Pixley & Abell.

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £4,068,200 | £4,196,500 | I. £128,300 |
| China | 933,500 | 432,000 | D. 501,500 |
| Total | £5,001,700 | £4,628,500 | D. £373,200 |

Imports of silver at New York week ended Aug. 2, were $168,708 from South America and the West Indies, exports were $632,743 to London and Paris.

Total imports of silver in Great Britain six months ended June 30 were £7,968,367, of which the United States furnished £5,905,580. Exports were £6,795,774, excess of imports £1,172,593, an increase of £698,312 over last year.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Aug. 2

The base price paid this week fof 60% zinc ore was $43@44 per ton. The base price paid for 80% lead ore was $52@54 per ton.

SHIPMENTS WEEK ENDED AUG. 2

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,177,810 | 122,400 | 1,015,500 |
| [illegible] | 82,290,340 | 4,174,190 | 36,502,560 |

Shipped during week to separating plants, 2,267,070 lb. zinc ore.

### JOPLIN, MO.—Aug. 2

The high price of zinc is $47, the base per ton of 60% zinc ranged from $43 to $4[illegible] for choicest grades, with as high as $4[illegible] base paid for blende carrying an excess of iron. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades is $40.16 per ton. Lead sold as high as $55, though the bulk of ore sold on a base of $54 per ton of 80% metal. The average of all grades is $53.90 per ton.

SHIPMENTS WEEK ENDED AUG. 2

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week | 10,856,030 | 1,168,140 | 1,700,270 | $287,382 |
| Thirty-one weeks | 333,757,540 | 24,229,380 | 55,023,270 | $9,217,081 |

Blende value, the week, $229,136, 31 weeks, $7,462,016.

Calamine value, the week, $12,415; 31 weeks, $309,216.

Lead value, the week, $45,831; 31 weeks, $1,445,849.

# IRON TRADE REVIEW

### NEW YORK—Aug. 5

The iron trade appears to be increasing in confidence and the volume of new orders is larger than for several weeks, though hardly up to rate on which the mills are running. Structural steel bars and riveted steel pipes are the more active lines.

Pig iron is more active and firmer. July sales were probably the largest of any month this year. Large orders are not much in evidence, but there is a considerable volume of smaller ones, which make up a good total. It may be too soon to say that the turn has come, but prices are distinctly firmer. If there have been no quotable advances, there have been no declines.

**Freight Rates on Pig Iron** from Virginia furnaces are attacked in a complaint filed with the Interstate Commerce Commission by the Low Moor, Alleghany, Oriskany, Princess, Virginia and Pulaski Iron companies. They charge that the rates on pig iron to Eastern points discriminate against this product and should be made to correspond with those from Pennsylvania furnaces. The present rates from Low Moor are $3 to Philadelphia, $3.95 to New York and $3.75 to Boston; while those from Pittsburgh are $2.25, $2.45 and $2.65, and from Youngstown, O., $2.65, $2.85 and $3.05 to the respective consuming points named.

### PITTSBURGH, PENN.—Aug. 5

The improvement in sentiment in the steel trade continues, but the gain is chiefly in sentiment. On the whole, however, there has been a slight increase in actual orders, and in several departments figures show an increase. Several mills find their July bookings, of actual shipping orders, greater than those of June. The total volume, however, remains considerably below the tonnage being shipped, so that the mills are running out of business and require a more definite buying movement in order to maintain their position. Such a movement is predicted for September, which will be in time.

Shipments of steel products continue practically up to the producing capacity, which as usual for this time has been restricted by hot weather. Consumption is clearly heavy, for shipments are well taken, and in many instances mills are being importuned to make better deliveries. This is particularly true in tubular goods, and conditions in this branch are distinctly better than at the beginning of June.

There is a possibility that the "unfilled tonnage" of the United States Steel Corporation for July 31 will make a much better showing for July than for the preceding three months, which showed an average loss of over 500,000 tons per month.

**Pig Iron**—The buying movement in pig iron seems to have lost considerable of its force, as the majority of large consumers are now covered to Oct. 1 at least, but there continues to be fairly active buying by smaller consumers. The Youngstown Sheet & Tube Co. has bought bessemer and basic iron in addition to the 30,000 tons reported last week, and seems to have purchased a total of 50,000 tons in the fortnight, or about 75,000 tons in the past 30 days. Foundry iron is harder to secure at $13.75, Valley, $14 being frequently paid on ordinary lots. The pig-iron averages for July, as computed by W. L. Snyder & Co. from actual sales in the trade, are given out at $15.4085 for bessemer and $14.227 for basic, showing losses from June of 83c. for bessemer and 27c. for basic. The tonnages involved were larger than for a long time, about 53,000 tons bessemer and 37,000 basic. The market stands today quotable about as follows: Bessemer, $15.50; basic, $14.25, malleable, $14.25; No. 2 foundry, $13.75@14, gray forge, $13.50@$13.75, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is very quiet, and concessions might be obtained, particularly on prompt lots. The regular quotation remains $58.50, Baltimore, with $2.16 freight to Pittsburgh.

**Steel**—The market has been quiet, but with prices very well maintained at a minimum of $26.50 for billets and $27.50 for sheet bars, f.o.b. maker's mill, Pittsburgh or Youngstown. Some mills hold to a minimum of $27 for billets. Demand is not large, but is expected to increase before the end of the month. Rods remain at $28@29, Pittsburgh.

**Pig Iron Production in Germany** in June is reported by the German Iron & Steel Union at 1,608,305 tons, or 33,341 tons less than in May. For the six months ended June 30 the make was as follows, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Foundry iron..... | 1,581,754 | 1,812,434 | I. 230,680 |
| Forge iron.......... | 269,137 | 261,856 | D. 7,281 |
| Steel pig .... | 1,037,902 | 1,269,563 | I. 231,661 |
| Bessemer pig..... | 193,763 | 174,483 | D. 19,280 |
| Thomas (basic) pig......... | 5,482,432 | 6,049,330 | I. 566,898 |
| Total..................... | 8,564,988 | 9,567,666 | I.1,002,678 |

Total increase this year 11.7%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

**British Exports and Imports** of iron and steel and manufacturers thereof are valued by the Board of Trade returns as follows for the six months ended June 30:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel... | £27,932,692 | £7,662,575 | Exp. £20,270,117 |
| Machinery, hardware, etc. | 29,381,668 | 7,938,931 | Exp. 21,442,737 |
| Total..................... | £57,314,360 | £15,601,506 | Exp. £41,712,854 |
| Total, 1912................ | 45,829,951 | 12,994,092 | Exp. 32,835,859 |

Quantities of iron and steel exported were 2,253,688 long tons in 1912, and 2,503,994 in 1913; quantities imported were 888,673 tons in 1912, and 1,110,703 in 1913. Exports include new ships built for foreign countries.

**Foreign Trade of Germany** five months ended May 31 was as follows, in metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel.... | 2,722,361 | 262,629 | Exp. 2,459,732 |
| Machinery | 225,094 | 39,397 | Exp. 185,697 |
| Total.. ... . ...... ... | 2,947,455 | 302,026 | Exp. 2,645,429 |
| Total, 1912...................... | 2,617,402 | 304,809 | Exp. 2,312,593 |

The totals show an increase this year of 330,053 tons, or 12.6% in exports; and a decrease of 2783 tons, or 0.9%, in imports.

## IRON ORE

Shipments from the Lake country are being pushed. So far there has been little congestion at the Lake Erie docks, and ore boats have been able to move with little delay. August shipments promise to be large.

Texas ore has begun to come to Philadelphia, the first regular cargo having arrived at that port.

## COKE

Besides making the reductions ordered by the Interstate Commerce Commission on coke from the Connellsville region to Wheeling and other points, the Baltimore & Ohio R.R. has made an equal reduction on coke from the Fairmont district in West Virginia to the same points.

**Fuel Imports and Exports in Germany** five months ended May 31 were, in metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Coal.............. .......... | 13,687,651 | 4,071,183 | Exp. 9,616,468 |
| Brown coal. .. .. | 26,073 | 2,911,166 | Imp. 2,885,093 |
| Coke.. . . . . | 2,868,838 | 236,150 | Exp. 2,632,688 |
| Briquettes....... . .... | 1,398,240 | 60,902 | Exp. 1,337,338 |
| Total..................... | 17,980,802 | 7,279,401 | Exp. 10,701,401 |

Of the briquettes exported 374,660 tons were made of brown coal or lignite.

# CHEMICALS

### NEW YORK—Aug. 6

The general market is still quiet, but there are signs of improvement manifest.

**Arsenic**—The market remains quiet, with very little business going. The quotations are unchanged at $3.12½@3.25 per 100 lb., but these prices are rather nominal.

**Copper Sulphate**—Sales continue fair and prices are unchanged at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—There is not much business doing. Current demand is small and sales are not being pressed. Quotations are 2.32½c. per lb. for spot and futures up to December.

## PETROLEUM

The monthly statement of the "Oil City Derrick" gives the number of new oil wells completed in July as follows: Pennsylvania grade, 735; Lima-Indiana, 128; Kentucky, 18; Illinois, 170; Kansas-Oklahoma, 1092; Texas-Louisiana, 199. This shows that in all 2342 wells were completed, with a new production of 65,976 bbl. Of the completions 435 were dry, and 157 gas wells. Compared with June, this was an increase of 15 in completed wells, a decrease of 7891 bbl. in new production, increase of 25 dry holes and 14 fewer gas wells. On July 31 there were 661 rigs up and 2546 wells drilling.

## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | March | April | May | June | July |
|---|---|---|---|---|---|
| Alaska shipments | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 | ..... |
| Anaconda | 22,900,000 | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 |
| Arizona, Ltd... | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 | .... |
| Copper Queen .. . | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 |
| Calumet & Ariz. | 4,250,000 | 4,500,000 | 4,300,000 | 4,000,000 | 3,200,000 |
| Chino ..... | 4,464,723 | 3,925,409 | 3,883,611 | 3,682,706 | 4,686,250 |
| Detroit........ | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 | 1,519,224 |
| East Butte. | 1,400,000 | 1,400,000 | 1,268,595 | . | .. . |
| Mammoth.... | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 | ... |
| Giroux*.... | 625,000 | 600,000 | 625,000 | .... .... | .. . |
| Mason Valley..... | 1,608,492 | 1,264,304 | 1,186,560 | 1,097,014 | . . . |
| Miami.. ... | ..... | ....... | 1,943,900 | 2,612,000 | ..... . |
| Nevada Con...... | 5,555,320 | 5,650,000 | 5,933,275 | 6,344,863 | .... |
| Ohio .... .. | 591,651 | 690,001 | 650,071 | .......... | .... |
| Old Dominion | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 | . ... |
| Ray........ | 4,287,000 | 4,379,128 | 4,384,400 | ........ | ...... |
| Shannon . | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 | 880,000 |
| Sonth, Utah.. | 62,224 | 132,267 | 200,000 | .......... | ...... |
| Tennessee........ | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 | ..... . |
| United Verde*.. | 3,000,000 | 3,000,000 | 3,000,000 | .......... | ..... |
| Utah Copper Co.. | 8,248,880 | 9,539,847 | 10,003,227 | 11,637,949 | ... . |
| Lake Superior* ... | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 | . . |
| Non-rep. mines* | 6,203,606 | 6,000,000 | 6,300,000 | . . . . | |
| Total prod... | 102,619,054 | 104,224,079 | 109,824,500 | . | . |
| Imports, bars, etc. | 24,215,480 | 25,578,297 | 22,205,942 | . . | |
| Total blister.. | 126,834,534 | 129,802,376 | 132,039,442 | | |
| Imp. ore & matte. | 11,911,041 | 7,177,363 | 10,528,562 | | . |
| Total Amer... | 138,745,575 | 136,989,739 | 142,559,004 | . | .. |
| Miami†.. . | 3,102,200 | 2,312,900 | ... ...... | . | 2,890,000 |
| Shattuck-Arizona | 1,234,450 | 1,158,326 | 1,026,170 | 1,059,625 | . |
| Brit. Col. Cos: | | | | | |
| British Col. Cop.. | 844,735 | 794,000 | .......... | .......... | .. . . |
| Granby. . . . | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 | . .. |
| Mexican Cos.: | | | | | |
| Boleo†......... . | 2,204,720 | 2,811,200 | 2,424,800 | 1,984,640 | .. . |
| Cananea......... | 4,772,000 | 3,581,690 | 2,272,000 | 2,908,000 | .. |
| Moctezuma....... | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 |
| Other Foreign: | | | | | |
| Braden, Chile..... | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 |
| Cape Cop., S. Af... | 732,480 | 586,880 | 387,520 | 414,400 | .... . |
| Kyshtim, Russia.. | 1,478,400 | 2,544,640 | 1,490,000 | ........ | ...... . |
| Spassky, Russia... | 974,400 | 974,400 | 721,280 | 835,520 | .... . |
| Exports from | | | | | |
| Chile ........ | 7,840,000 | 7,616,000 | 3,584,000 | 5,824,000 | . .. |
| Australia......... | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 | ... |
| Arrivals—Europe† | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 | ...... |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

## STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VII, '12 | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII .. | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX..... | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X .. . . | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI..... | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII..... | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,412,582 | 78,491,840 | 183,904,422 |
| II.... . | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III.. . | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV..... | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V.... . | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI .... | 121,860,853 | 68,452,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII.. | ......... | ....... | ...... | 52,904,606 | 71,904,000 | 124,808,606 |
| VIII. | .. .. ... | ....... | ...... | .. | .......... | ......... |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq | Sale | Amt. |
|---|---|---|---|
| Andes, Nev | July 27 | Aug. 19 | $0.02 |
| Belcher, Calif | July 21 | Aug. 14 | 0.10 |
| Blue Bell, Ida | July 15 | Aug. 20 | 0.002 |
| Blue Bull, Nev | July 11 | Aug. 18 | 0.02 |
| Carbonate, Ida | July 25 | Aug. 25 | 0.001 |
| Central Eureka, Calif. | ........ | ........ | 0.025 |
| Comstock, Ida | July 24 | Aug. 23 | 0.001 |
| Eagle Mountain, Ida | July 19 | Aug. 16 | 0.0005 |
| Eastern Star, Ida | July 25 | Aug. 25 | 0.002 |
| Emerald, Utah (Install.) | ....... | Sept. 13 | 0.005 |
| Galena King, Ida | July 21 | Aug. 11 | 0.02 |
| Independence Placer, Ida | July 25 | Aug. 29 | 0.002¼ |
| Iron Mask, Ida | July 11 | Aug. 11 | 0.002 |
| Morning Star, Utah | Aug. 8 | Sept. 1 | 0.0025 |
| North Bunker Hill, Ida | July 15 | Aug. 16 | 0.002 |
| O.K., Utah | July 26 | Aug. 12 | 0.005 |
| Overman, Calif | July 24 | Aug. 13 | 0.05 |
| Rescue Eula, Nev | July 6 | Aug. 11 | 0.01 |
| Saltese, Ida | July 20 | Aug. 20 | 0.002 |
| Syndicate M. & E., Ida | July 23 | Aug. 23 | 0.003 |
| Tar Baby, Utah | Aug. 1 | Aug. 27 | 0.0025 |
| Temple, Ida | July 19 | Aug. 23 | 0.002 |
| Tintic Delmar, Utah | July 16 | Aug. 16 | 0.0015 |
| Tuscumbia, Ida | Aug. 1 | Aug. 23 | 0.003 |
| Umatilla, Nev. | July 14 | Aug. 18 | 0.01 |
| Utah-United, Utah | July 19 | Aug. 11 | 0.01 |
| Wilbert, Utah | Aug. 1 | Aug. 23 | 0.025 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | NEW YORK | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | ...... | 17.644 | ...... | 78.670 | ...... |
| September | 17.508 | ...... | 17.698 | ...... | 78.762 | ...... |
| October | 17.314 | ...... | 17.661 | ...... | 76.389 | ...... |
| November | 17.326 | ...... | 17.617 | ...... | 76.890 | ...... |
| December | 17.376 | ...... | 17.600 | ...... | 75.516 | ...... |
| Year | 16.341 | ...... | 16.560 | ...... | 72.942 | ...... |

New York, cents per pound, London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | .... | 208.351 | |
| September | 49.135 | .... | 223.762 | |
| October | 50.077 | .... | 228.353 | |
| November | 49.891 | .... | 227.619 | |
| December | 49.815 | . | 226.875 | |
| Average | 46.096 | | 209.322 | |

New York in cents per pound; London in pounds sterling per long ton.

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | ...... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | ...... | 4.924 | ...... | 22.292 | ...... |
| October | 5.071 | ...... | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | ...... | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | ...... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ...... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | ...... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ...... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | ...... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ...... |
| Year | $16.01 | ...... | $14.93 | ...... | $15.28 | ...... |

# STOCK QUOTATIONS

| COLO. SPRINGS Aug. 5 | | SALT LAKE Aug. 5 | |
|---|---|---|---|
| Name of Comp. | Bid. | Name of Comp. | Bid. |
| Acacia | .02½ | Beck Tunnel | .05 |
| Cripple Cr'k Con. | .01½ | Black Jack | .06 |
| C. K. & N. | .10 | Cedar Talisman | .00¾ |
| Doctor Jack Pot | .05½ | Colorado Mining | .14 |
| Elkton Con. | .55¾ | Columbus Con. | .07 |
| El Paso | 2.86 | Crown Point | .01½ |
| Findlay | .02½ | Daly-Judge | 6.35 |
| Gold Dollar | .06¼ | Grand Central | .51 |
| Gold Sovereign | .02¾ | Iron Blossom | 1.22½ |
| Isabella | .12 | Little Bell | ‡.10 |
| Jack Pot | .04½ | Lower Mammoth | .01 |
| Jennie Sample | .06¾ | Mason Valley | 6.00 |
| Lexington | ‡.01 | May Day | .05 |
| Moon Anchor | ‡.07 | Nevada Hills | .87 |
| Old Gold | .01 | New York | .02 |
| Mary McKinney | .55 | Prince Con | .35 |
| Pharmacist | .01 | Silver King Coal'n | 3.32½ |
| Portland | .94 | Sioux Con. | .02½ |
| Vindicator | .80 | Uncle Sam | .02½ |
| Work | ‡.005 | Yankee | .08 |

| TORONTO Aug. 4 | | | |
|---|---|---|---|
| Name of Comp. | Bid | Name of Comp. | Bid |
| Bailey | .07 | Foley O'Brien | .22 |
| Coniagas | 7.00 | Hollinger | 15.00 |
| T. & Hudson Bay | 65.00 | Imperial | ‡.01 |
| Timiskaming | .29 | Jupiter | .29 |
| Wettlaufer-Lor | .11 | Pearl Lake | .36 |
| Apex | .005 | Porcu. Gold | .08 |
| Crown Chartered | .00½ | Preston E. D. | .02 |
| Doble | .26 | Rea | .15 |
| Dome | 14.00 | Swastika | .03 |
| Dome Exten. | .07 | West Dome | .10 |

| SAN FRANCISCO Aug. 5 | | | |
|---|---|---|---|
| Name of Comp. | Bid | Name of Comp. | Bid |
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 6.25 |
| Belcher | .22 | Jim Butler | .65 |
| Best & Belcher | .08 | MacNamara | .12 |
| Caledonia | ‡1.40 | Midway | .46 |
| Challenge Con. | .06 | Mont.-Tonopah | 1.00 |
| Chollar | .01 | North Star | .86 |
| Confidence | ‡.18 | West End Con. | 1.22½ |
| Con. Virginia | .12 | Atlanta | .14 |
| Crown Point | .23 | Booth | .01 |
| Gould & Curry | .04 | C.O.D. Con. | .03 |
| Hale & Norcross | .07 | Comb. Frac. | .03 |
| Mexican | 1.05 | Jumbo Extension | .11 |
| Occidental | .70 | Pitts.-Silver Peak | .45 |
| Ophir | .21 | Round Mountain | .51 |
| Overman | ‡.50 | Silver Pick | .02 |
| Potosi | .01 | Tramp Con. | ‡.01 |
| Savage | .12 | Argonaut | 2.00 |
| Sierra Nevada | .07 | Bunker Hill | 1.50 |
| Union Con. | .11 | Central Eureka | .10 |
| Yellow Jacket | ‡.21 | So. Eureka | 2.75 |

| N. Y. EXCH. Aug. 5 | |
|---|---|
| Name of Comp. | Clg. |
| Amalgamated | 71½ |
| Am. Agri. Chem. | 46 |
| Am.Sm.&Ref.,com | 66 |
| Am. Sm. & Ref., pf. | 100½ |
| Am. Sm. Sec., pf. B | 80½ |
| Anaconda | 36⅛ |
| Batopilas Min. | 1¼ |
| Bethlehem Steel pf | 73 |
| Chino | 40⅛ |
| Federal M. & S., pf. | 36 |
| Great Nor., ore., ctf. | 36 |
| Guggen. Exp. | 45 |
| Homestake | 104 |
| Inspiration Con. | 15⅛ |
| Miami Copper | 22½ |
| Nat'nal Lead, com. | 48¾ |
| National Lead, pf. | 106 |
| Nev. Consol. | 16⅞ |
| Phelps Dodge | 190 |
| Pittsburg Coal, pf. | 85½ |
| Quicksilver, pf. | 3 |
| Ray Con. | 19⅜ |
| Republic I&S, com. | 24⅝ |
| Republic I & S, pf. | 87 |
| Sloss Sheffi'd, com. | 27½ |
| Sloss Sheffield, pf. | 85 |
| Tennessee Copper | 31 |
| Utah Copper | 49¾ |
| U. S. Steel, com. | 61⅝ |
| U. S. Steel, pf. | 107⅞ |
| Va. Car. Chem., pf. | 99 |

| N. Y. CURB Aug. 5 | |
|---|---|
| Name of Comp. | Clg. |
| Barnes King | 1.73 |
| Beaver Con. | .32 |
| Big Four | .40 |
| Braden Copper | 6¾ |
| B. C. Copper | 2⅛ |
| Buffalo Mines | 2⅜ |
| Can. G. & S. | ⅛ |
| Con. Ariz. Sm. | ¼ |
| Davis-Daly | 2⅛ |
| Diam'field-Daisy | .02 |
| Ely Con. | .08½ |
| Florence | .27 |
| Giroux | 1½ |
| Gold Hill Con. | ‡¼ |
| Goldfield Con. | 1 11/16 |
| Greene Cananea | 6⅜ |
| Greenwater | .05 |
| Internat. S. & R. | ‡109 |
| Kerr Lake | 3⅝ |
| Keystone | ‡2 |
| La Rose | 2⅜ |
| McKinley-Dar-Sa. | 1 13/16 |
| Min. Co. of A. new | 2½ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 8½ |
| Ohio Copper | ½ |
| Pacific Sm. & M. | ⅛ |
| Puebla S. & R. | 2 3/16 |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N.J. | 370 |
| Stewart | 1¼ |
| Tonopah | 4⅛ |
| Tonopah Ex. | 2¼ |
| Tonopah Merger | .73 |
| Tri-Bullion | ⅛ |
| Tularosa | ⅜ |
| Union Mines | ⅛ |
| United Cop., pfd. | 2½ |
| Yukon Gold | 2½ |

| LONDON July 26 | |
|---|---|
| Name of Com. | Clg. |
| Camp Bird | £0 14s 6d |
| El Oro | 0 14 3 |
| Esperanza | 1 0 0 |
| Mexico Mines | 5 5 0 |
| Oroville | 0 5 0 |
| Santa Gert'dis | 0 16 3 |
| Stratton's | 0 1 7½ |
| Tomboy | 1 5 0 |

| BOSTON EXCH. Aug. 5 | |
|---|---|
| Name of Comp. | Clg. |
| Adventure | 1⅛ |
| Ahmeek | 275 |
| Alaska Gold M. | 19½ |
| Algomah | 1⅛ |
| Allouez | 34 |
| Am. Zinc | 20⅝ |
| Ariz. Com., ctfs. | 2½ |
| Bonanza | .32 |
| Boston & Corbin | .99 |
| Butte & Balak | 1¼ |
| Calumet & Ariz | 64½ |
| Calumet & Hecla | 405 |
| Centennial | 12½ |
| Cliff | 1⅜ |
| Copper Range | 39 |
| Daly West | 2⅜ |
| East Butte | 12⅝ |
| Franklin | 4½ |
| Granby | 60¾ |
| Hancock | 17½ |
| Hedley Gold | 30 |
| Helvetia | .35 |
| Indiana | 5 |
| Island Cr'k, com. | 49 |
| Island Cr'k, pfd. | 81 |
| Isle Royale | 20 |
| Keweenaw | 1⅛ |
| Lake | 6⅝ |
| La Salle | 3¾ |
| Mass | 3 |
| Michigan | ¾ |
| Mohawk | 44 |
| New Arcadian | 1¼ |
| New Idria Quick. | ‡1⅞ |
| North Butte | 28⅝ |
| North Lake | 1⅛ |
| Ojibway | .70 |
| Old Dominion | 49 |
| Osceola | 77 |
| Quincy | 58 |
| Shannon | 7 |
| Shattuck-Ariz. | 24 |
| Superior | 25½ |
| Superior & Bost. | 2⅜ |
| Tamarack | 28 |
| Trinity | 4⅛ |
| Tuolumne | .85 |
| U. S. Smelting | 38¾ |
| U. S. Smelt'g, pf. | 47¾ |
| Utah Apex | 1¾ |
| Utah Con. | 9⅝ |
| Victoria | 1 |
| Winona | 1½ |
| Wolverine | 44 |
| Wyandot | ⅜ |

| BOSTON CURB Aug. 5 | |
|---|---|
| Name of Comp. | Bid |
| Bingham Mines | 3 |
| Boston Ely | 48 |
| Boswyocolo | ‡.01 |
| Butte Central | .06 |
| Cactus | .02 |
| Calaveras | 2 1/16 |
| Chief Cons. | 1¼ |
| Corbin | .97 |
| Cortez | ¼ |
| Crown Reserve | 2¼ |
| Eagle & Blue Bell | .95 |
| First Nat. Cop. | 2½ |
| Houghton Copper | 3½ |
| Majestic | .34 |
| Mexican Metals | .53 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 1½ |
| New Baltic | .60 |
| Oneco | .85 |
| Raven Copper | .16 |
| Rhode Island Coal | .02 |
| Smokey Dev. | 1½ |
| S. W. Miami | ‡1½ |
| South Lake | 3½ |
| Trethewey | .32 |
| United Verde Ext. | .58 |

‡Last quotation.

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# New Smeltery of United Verde Copper Company

By Richard H. Vail

*SYNOPSIS—The United Verde Copper Co. is constructing a new smeltery at Clarkdale, Ariz., about five miles below Jerome in the Verde Valley. It will have an initial capacity of 2500 tons per day, or double that of the present works, which is situated over the mine and is incapable of enlargement, owing to topographic limitations and surface subsidence. To supply the new works, the output of the mine will be practically doubled; more custom ore will also be smelted after the completion of the Clarkdale plant.*

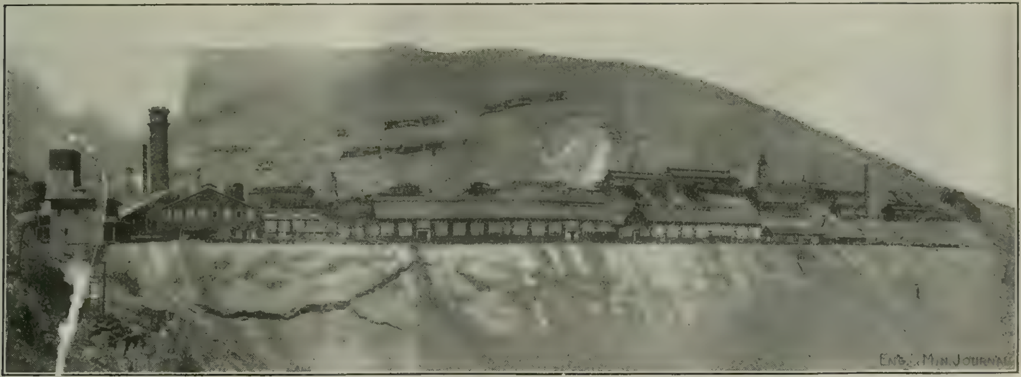
⁂

The new smelting plant of the United Verde Copper Co. will be situated at Clarkdale, Ariz., a new town on the west side of the Verde River, about five miles in an air line from the present works and mine at Jerome. A mine that has produced for nearly 25 years as Senator Clark's United Verde has done is deservedly remarkable; and it is noteworthy that after such a production the mine still warrants the building of a new plant of double the capacity of the old one. The increased scale of operations will permit the handling of low-grade ore that it was impracticable to smelt in the old works; the new Clarkdale plant will thus not only effect an economy in the treatment of the low-grade material, but will also smelt the high-grade ore at greater profit.

The new works will have an initial capacity of 2500 tons per day as against 1000 to 1200 tons in the present plant. The new works was designed by Repath & McGregor, of Douglas, Ariz., who have drawn plans for most of the large smelting plants erected in this country during the last few years. The first steel for the new works was raised on May 26, 1913, and it is expected that it will be ready to blow in about July 1, 1914. Briefly, the smelting equipment will comprise six Wedge roasting furnaces, three reverberatory furnaces, 19x100 ft., four 48x320-in. blast furnaces, and four upright converters.

With this increased equipment, it will be the policy of the company to handle more custom ore and to take ores from developing properties in the district, which was impracticable in the past owing to the limited capacity of the works.

The Clarkdale smeltery site is on a bench in the Verde Valley at an elevation of about 3460 ft. and sufficiently high above the Verde River to provide ample dump room for slag on the flat above the river. A standard-gage railroad has been built up the Verde Valley to connect with the Santa Fé, Phœnix & Prescott Ry. at Cedar Glade, 39 miles. This standard-gage road will in itself effect a great saving in smelting operations, as it will eliminate the transfer expense heretofore necessary on all coke, machinery and supplies. The rough country traversed by the old United Verde & Pacific railroad did not permit of converting it to standard gage, as both the grades and curves are excessive, the maximum curves being 45° and the grades 4%; this narrow-gage road connecting with Jerome Junction will probably in time



United Verde Smelting Plant, Jerome, Ariz.

be abandoned. The Clark interests have organized the Verde Tunnel & Smelter R.R. Co. to build a standard-gage road from the new smeltery site to the mouth of the Hopewell tunnel, an adit at the 1000-ft. level of the mine. As this adit will become the main artery of the mine, ore bins will be constructed there and the new railroad, approximately 10 miles in length, with all its connections, will deliver the ore to the smeltery receiving bins. This new road will have 75-lb. rails and a maximum grade of 4% compensated for curves, the sharpest of which will be 25°. The ore will be hauled in 50-ton bottom-dump cars by oil-burning Climax geared locomotives.

Ground was broken at the new site in September, 1912, and the general grading, involving about 75,000 cu.yd., was completed in April, 1913. The foundations for the entire plant will be of concrete, about 15,000 cu.yd. being required. For the concrete El Toro brand cement is used, the general mixture for foundations being 1:3:5, and 1:2:4 where reinforced concrete is used. All smeltery buildings and trestles will be of steel and where inclosed will be sheathed with corrugated iron, except in the case of the dust chambers and the power house. About 9000 tons of structural steel will be required for the buildings and trestles, and this is to be delivered at the rate of about 1000 tons per month.

Some of the work on the new smelting plant is being done on contract: the grading having been done by T. C. Snider, of Prescott; the structural-steel work by the Kansas City Structural Steel Co., Kansas City, Mo.; the brick plant was built and is at present operated under contract by the Barker Construction Co., of Denver, Colorado.

### AN ADMIRABLE CONSTRUCTION CAMP

The company has established an unusually complete and attractive construction camp, where its men have practically the same comforts and accommodations as at an operating property. The company's policy in this respect has been admirably carried out by the constructing engineer, F. J. Brulé, who has inaugurated a daily garbage collection, tight garbage cans, and regular disinfecting of all outbuildings. Sewers are being laid and a concrete septic tank will be built to serve the smeltery and the construction town. A concrete latrine will also be built for use of the smeltery employees. The more or less permanent character of the construction camp, which will later become the "Mexican town," has permitted more expensive construction than is usually possible. All frame cottages of two, three and four rooms have been equipped with screened sleeping porches, and the bunkhouses represent a decided departure from usual practice. There is in reality no bunkhouse in the ordinary sense of the word, these buildings being divided into rooms occupied by two men; each room here also has a screened sleeping porch. An emergency hospital has been built, a trained nurse provided for the construction town, and the various foremen instructed in first-aid work. This is in striking contrast to the usual construction camp which seldom provides such accommodations either [illegible] comfort or health.

The site is particularly fortunate in its natural facilities for construction. A gravel-washing plant, having a capacity of [illegible] cu. yd. per hr., has been built near the bed of the Verde River and supplies three sizes of gravel for the concrete work and a washed sand for use in mortar, plastering, and for brick making. A convenient bank of clay led to the establishment of a brick-making plant with a capacity of 20,000 brick in nine hours. An eight-mold Brewer brick machine is used, and it is contemplated that the permanent town of Clarkdale will be built of brick upon the mesa a short distance to the south of the present construction town.

### STANDARD-GAGE TRACKS THROUGHOUT PLANT

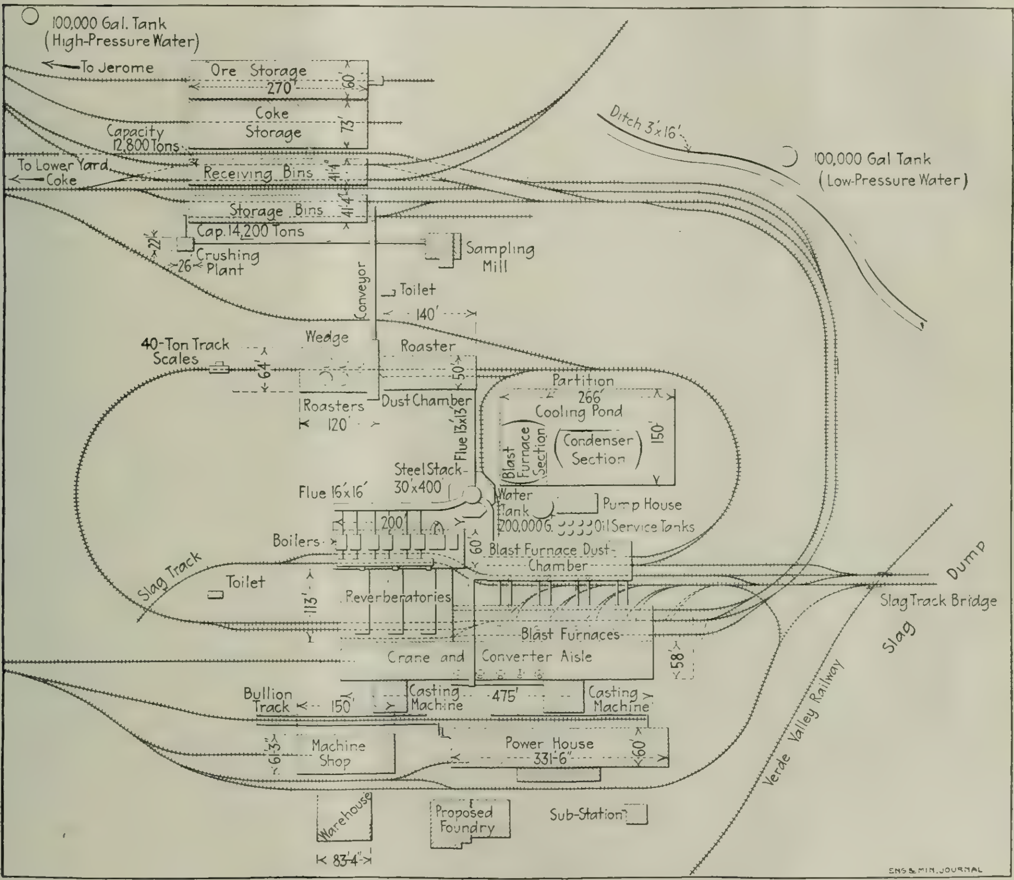
All ores entering the works will be weighed on a 150-ton Buffalo track scale situated above the works; the copper bullion or other products leaving the plant will be weighed on another similar scale in the Verde Valley J. R. yards. The industrial-railway system of the smelting plant will be of standard gage throughout, 60-lb. rails being used, and a feature of the design is the elaborate intercommunication of tracks, it being intended to expedite transport and reduce to a minimum any stoppage of operation from blocked tracks. Tramming will be done by means of 10-ton electric locomotives.

The Verde Tunnel & Smelter railroad will deliver the ore either to steel receiving bins or to the storage yard. The receiving bins have a capacity of 12,800 tons and are 41x270 ft.; east of the receiving bins are steel storage bins that cover the same area, but have a larger capacity, 14,200 tons, owing to different hopper arrangement. West of the storage and receiving bins there are steel trestles over the storage yard with an area of 73x270 ft. for coke storage and of 60x270 ft. for ore, thus providing a large amount of storage in case of emergency. As shown in an accompanying illustration, the ore in the bins may be drawn either into weighing hoppers and thence to furnace-charge cars, or may be delivered on 30-in. belt conveyors that travel underneath and parallel with the bins; this ore is then dropped on a conveyor traveling at right angles to the bins and delivering into the crushing plant. After crushing in a 30x18-in. Blake crusher the ore is taken to the sampling mill by a conveyor having a capacity of 100 tons per hour at a speed of 300 ft. per minute.

The crushing and sampling mill is 42x40 ft. and consists of a crushing section and a sampling section. The crushing section will contain two 4x14-ft. trommels, one with double screen having 1-in. and ½-in. perforations respectively, the other trommel having a screen with ½-in. perforations and an outer jacket that is blank; a 20x10-in. Allis-Chalmers Blake crusher; a set of 54x24-in. Allis-Chalmers rolls crushing to ⅜ in. This set of rolls may be cut out if it is desired to send the oversize from the last screen directly to the coarse bins. The sampling section will contain four Snyder samplers of the following sizes and percentages of cut: One 60-in., 10%; one 42-in., 20%; one 27-in., 20%; and one 27-in., 10%. The sample is recrushed between the sampling stages by the following machines: Between the first and second samplers by one 20x10-in. Blake crusher; between the second and third samplers by one set of 36x12-in. rolls; between the third and fourth samplers by a set of 24x1-i2n. rolls. The final sample is collected in a sample safe. The quartering and bucking rooms are contained on the first floor, partly in the main portion of the sample mill and in an annex. Suitably arranged belt conveyors deliver the fine and coarse products of the sampling mill to the storage bins.

### SIX WEDGE ROASTERS

In the roaster building, which is 64x120 ft., there will be installed initially six Wedge mechanical roasting furnaces; they are air cooled and are 21 ft. 6 in. in diameter. Two 25,000-cu.ft. fan blowers, direct connected to motors, will supply cooling air at 2-oz. pressure. Provision is made for two additional furnaces in the present building, when required, and there is ample room for extension of the building as is the case throughout the entire plant should the future require any further increase of smelting capacity. The fine ores from the storage bins are brought to the roaster building by belt conveyors, of which 18 are used in the handling of the ores to and from the bins, crushing plant, sampling mill, and roaster building.



THE NEW UNITED VERDE WORKS, CLARKDALE, ARIZ.

The roaster gases pass into a dust chamber, 50x140 ft. long. It has a double-hopper bottom with 45° slope, and is 21 ft. high above the hoppers, the vertical depth of the latter being 14 ft. The building is of steel and brick with 24-gage copper roofing. There will be baffle curtains in the end panels, and in the center panel, chains and wires will be used; the end-panel baffle curtains will consist of 6-in. 10-lb. bars, one inch apart. The individual bars are fastened at the top to two angles that rest on 6-in. channels, and they extend practically to the bottom of the chamber and about midway into the hoppers. A flue, 13x13 ft., connects the dust chamber with the main stack.

The calcines are transported to the reverberatories by 10-ton electric locomotives in specially designed calcine cars having double-hopper bottoms. The cars are 6 ft. 3 in. in height from the bottom of the hoppers to the top of the car and are 7 ft. 8 in. wide by 16 ft. long, and have two sets of trucks. On leaving the roaster building the calcines are weighed on a 40-ton Buffalo track scale.

### THE REVERBERATORIES

The main furnace building will be 475 ft. long, of which 143 ft. will be devoted to the reverberatory furnaces. There will be three of these, 19x100 ft., built of Standard silica brick and fired with oil. The reverberatory gases will pass into a main-header flue in a boiler house, 60x200 ft., where branch flues lead to six Stirling water-tube boilers of 713 hp. each. There will be two waste-heat boilers for each furnace and it is expected to realize 70% of their rated capacity, or from 30 to 35% of the thermal efficiency of the oil used in the reverberatories. The boilers will be equipped with superheaters to give the steam 100° of superheat. There will also be in the boiler house, three reserve oil-fired Parker water-tube boilers. The reverberatory gases finally pass to the main stack by a 16x16 ft. flue, 207 ft. long.

The oil for the reverberatory furnaces and for the separately fired boilers will be drawn from eight 111-bbl. steel tanks near the pump house, in which are situated the boiler-feed pumps, three Aldrich triplex pumps being used. Additional oil storage is provided by one 10,000-bbl. tank near the trestle of the receiving bins at the northwest corner of the plant. This tank is so situated that oil may be unloaded by gravity, and it may also be taken out by gravity for railroad engines and other uses about the plant.

### Blast-Furnace Equipment

The blast-furnace equipment will include four furnaces, each 48x320 in., situated to the north of the reverberatory building. The furnaces will have single-tier jackets with tuyeres spaced 13¼ in. apart. The matte and slag will be tapped from the end of the furnace. Above the charge floor, the furnaces will be supported on a structural frame and will have a steel air jacket for preheating the blast. The gases will be taken away from each furnace by two 6½-ft. uptakes. The furnaces will have an oval settler, 26 ft. long by 12 ft. 9 in. wide, set transversely with the main axis of the furnace; the settlers will be lined with chrome brick.

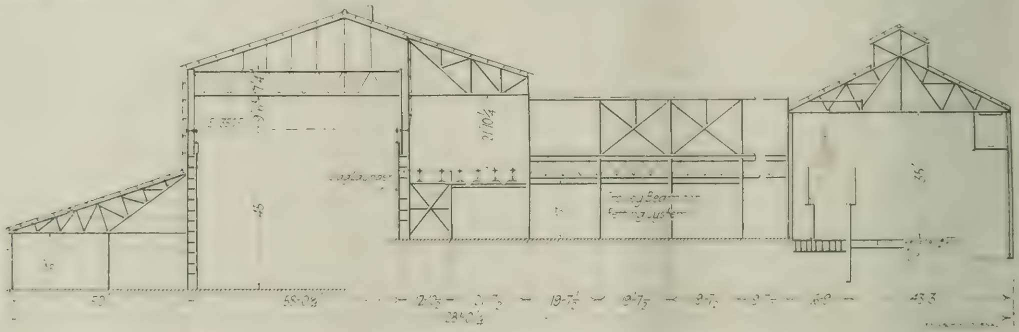
The blast-furnace charges will be brought to the feed floor in Anaconda-type charge cars, 7 ft. wide by 5 ft. 6 in. long by 2 ft. 6½ in. deep. In dumping, the doors on the furnace side of the cars release as the car body is raised by a compressed-air hoist. Coke will be brought to the blast-furnace building in railroad cars that will be set on a track parallel with the furnaces, but behind the charge track; the coke will be unloaded from the railroad cars directly into the charging barrows.

The slag from the blast furnaces and reverberatories will be taken away in electrically tilted slag pots of 225 cu.ft. capacity drawn by 18-ton electric locomotives. The slag tracks will cross the Verde Valley R.R. Co.'s tracks at an elevation of 26 ft. on a reinforced-concrete viaduct. The sides of the latter will be protected by side walls, so that there will be no spilling of molten slag on the railroad right-of-way.

### Upright Converters

There will be four 12-ft. upright converters installed at present and these will be lined with magnesite brick. The converters will be of Allis-Chalmers make, tilted by 50-hp. motors. They will be served by two 40-ton Morgan electric cranes operating in a converter aisle, 475 ft. long by 58 ft. wide. The converter slag will be poured into the reverberatory furnaces, or may be poured into the blast-furnace settlers if it should be found desirable. Slag skulls will be dumped into a pocket, and means will be provided for breaking them to a size suitable for blast-furnace charge.

The copper will be poured from the converters into ladles, which will be transferred by overhead crane to the casting-machine tilting stands. Straight-line casting machines of special design will be used. Directly behind the converters is the bullion yard, served by a depressed loading track on which the car floors will be at the level of the bullion yard.



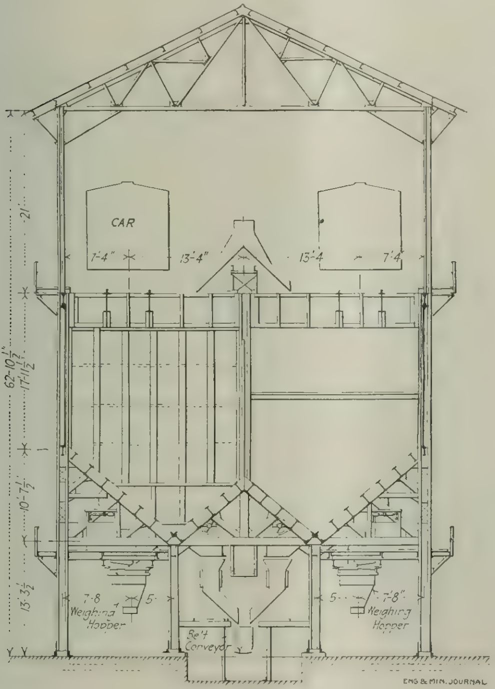
Section through Converter, Reverberatory and Boiler Buildings

The converter gases will be carried by a balloon flue delivering into the blast-furnace dust chamber, which is 60x220 ft. long and of similar construction to the roaster dust chamber. It is of greater height, being 29 ft. above the hopper line, and the hoppers have a vertical depth of 19 ft. The baffles are arranged in a manner similar to those in the roaster dust chamber, except that a longitudinal set of baffles extends nearly parallel on one side, thus making a duct for leading the gases from the blast furnaces to one end of the dust chamber.

A 12x14-ft. steel flue, 72 ft. long, leads to the main smeltery stack. The latter will be of steel, 30x400 ft. high—an unusual height for a steel stack, reported by the engineers to be the highest in the world. The stack will be lined with a 4½-in. course of selected red brick. It will rest on a reinforced-concrete base, 70 ft. in diameter by 10 ft. deep, containing 1320 cu.yd. of concrete and 20 tons of second-hand rails. The steel for the stack will be furnished by the Chicago Bridge & Iron Co., which will erect the stack, also a 200,000-gal. water tank and the eight oil-service tanks.

The water supply will be derived from two sources: (1) From Haskell Springs for the high-pressure system; (2) from the Verde River for the boiler-water and low-pressure system. Haskell Springs are about 3½ miles from Clarkdale at an elevation of 3868 ft.; the elevation of the 100,000-gal. high-pressure tank at the smeltery is 3643 ft. Haskell Springs supply about 350 gal. per min. and the water will be conveyed through an 8-in. American Ingot Iron pipe for a distance of 9051 ft. to a 500,000-gal. concrete reservoir at an elevation of 3755 ft. From the reservoir an 8-in. pipe will convey the water through the proposed town of Clarkdale, where branches for fire and domestic service will be taken off, a 6-in. line continuing to the high-pressure redwood tank at the smeltery. From this tank an 8-in. American spiral-riveted pipe, with suitable branches, will serve the various buildings and the fire-protection system.

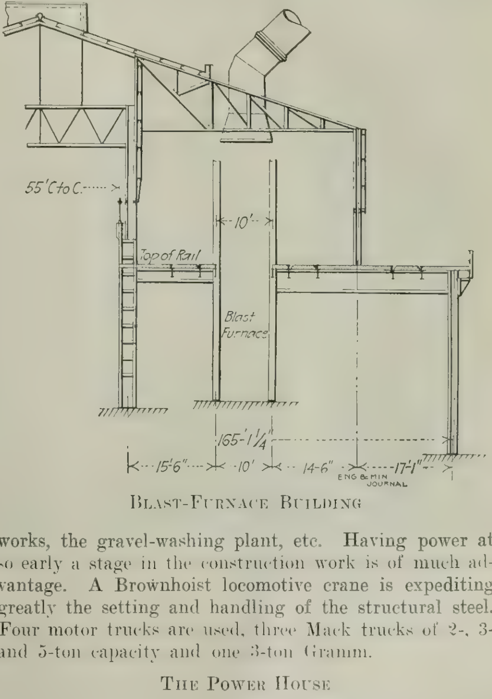
The low-pressure system will be supplied from a pump house at the Verde River, where are two Aldrich triplex pumps, having a capacity of 600 gal. per min. each. The suction end of these pumps leads to a concrete well sunk in the bed of the river. A 12-in. American spiral-riveted pipe takes the discharge from the river pumping station 1500 ft. into the smeltery yard, where an 8-in. branch is taken off and interconnected with the high-pressure system; from the same point a 10-in. line continues to the low-pressure tank at the northwest corner of the smeltery site. This is also a redwood tank of 100,000-gal. capacity. From both the high-pressure and low-pressure mains, branches are taken to a 200,000-gal. steel tank. This tank furnishes storage for blast-furnace needs.



RECEIVING BINS

A cooling pond, 150x266 ft., with a capacity of 1,100,000 gal., will receive the hot condenser water and the jacket water from the blast furnaces. The pond is built of reinforced concrete, lined with asphalt to prevent leakage. The furnace water will be received in the south 73 ft. of the pond, a partition wall separating this portion from that receiving the condenser water. The blast-furnace section will have eight sets of five nozzles each, and the condenser section will have 44 sets or 220 spray nozzles. In the adjacent pump house, besides the boiler-feed pumps, are two centrifugal pumps for pumping the jacket water to the spray nozzles, and two pumps for returning the cooled water to the 200,000-gal. tank that supplies the blast furnaces by gravity.

The power house, machine shop and warehouse will be along the east side of the plant, and work has been carried forward on these three buildings first so as to take advantage of the facilities for construction purposes. Electric power is now supplied from a substation, taking current from the Arizona Power Co.'s 40,000-volt line, and transformed down to 2300 volts in the substation, where a temporary compressor is installed to supply air for riveting the steel work. The electric current is again stepped down to 440 volts for outside motors at the brick works, the gravel-washing plant, etc. Having power at so early a stage in the construction work is of much advantage. A Brownhoist locomotive crane is expediting greatly the setting and handling of the structural steel. Four motor trucks are used, three Mack trucks of 2-, 3- and 5-ton capacity and one 3-ton Gramm.



BLAST-FURNACE BUILDING

### THE POWER HOUSE

The power house will be a steel-frame building, 331x60 ft., with sides of brick and Detroit Fenestra sash, giving approximately 75% of window area in this building; it will have a high concrete basement, similarly equipped with a liberal amount of ventilating sash. In the power house much of the blowing machinery now in use at the old works will be utilized; all the details of the equipment in this building have not been decided, but the principal items will be:

One 400-cu.ft. Roots blower driven by a 16x32x36-in. Allis-Chalmers tandem-compound engine.

One 400-cu.ft. Roots blower driven by a 400-hp. motor.

One 300-cu.ft. Roots blower driven through rope transmission by a three-cylinder Diesel double-unit oil engine.

One 300-cu.ft. Roots blower driven at both ends by two 200-hp. motors.

One 224-cu.ft. Roots blower, driven at one end by a 200-hp. motor.

One Nordberg converter blowing engine, with 32- and 64-in. steam cylinders, 60- and 60-in. air cylinders and 54-in. stroke. this engine delivers 351 cu.ft. of air per revolution and operates at about 60 r.p.m., supplying air at 16-lb. pressure.

One Southwark converter blowing engine, with 28- and 52-in steam cylinders, 60- and 60-in. air cylinders and 60-in. stroke, delivering 351 cu.ft. of air at 16-lb pressure and operating at about 60 revolutions per minute.

One E. P. Allis converter blowing engine, with 20- and 36-in. steam cylinders, 44- and 44-in air cylinders and 42-in. stroke, operated at from 60 to 70 r.p.m. and delivering 132 cu.ft. of air at 16-lb pressure.

One Rateau-Smoot turboblower, built by the Southwark Foundry & Machine Co., and having a capacity of 2500 r.p.m. of 25,000 cu.ft. of air per minute at 16-lb. pressure.

One Nordberg air compressor with 22- and 24-in steam cylinders, 18- and 32-in air cylinders and 48-in. stroke; capacity, 1800 cu.ft. of free air per minute at 100-lb. pressure.

One 1500-kv.a. Allis-Chalmers Parsons turbogenerator, to operate at 3600 r.p.m. delivering 60-cycle, three-phrase, 2300-volt current.

One 500-kv.a. Westinghouse Parsons turbogenerator, to operate at 3600 r.p.m. delivering 60-cycle, three-phase, 440-volt current.

Two 200-kw. motor-generator sets supplying direct current for the cranes, electric locomotives and casting-machine motors.

Two Weiss condensers, each having a combined capacity of approximately 75,000 lb. of steam per hour, connected to two Southwark dry vacuum pumps, one of which is 12-30x24-in. and the other 14½-36x30 in.

One Allis-Chalmers condenser, having a capacity of 40,000 lb. of steam per hour, and connected to one 12-30x24-in. Union dry vacuum pump.

Six centrifugal pumps to handle condensing and circulating water and miscellaneous switchboard apparatus will be situated in an alcove on the east side of the power house.

### THE OLD SMELTING WORKS

The present smelting plant is situated directly over the mine, and the removal of smelting operations to a new site has been made imperative both by the topographic limitation to increasing the size of the plant and by the serious caving of the mine under the present surface plant. While smelting operations have not at any time been completely interrupted as a result of caving, it has been avoided at times only by extraordinary activity. Some idea of the difficulties that have been overcome will be appreciated when it is stated that practically the entire main power-house site has caved and on account of the limited ground space on the abrupt mountain side, the company has been compelled to dispose its power machinery in four different power houses.

The present works is the outgrowth of the initial operations with a Fraser & Chalmers cylindrical water jacket of 50-tons capacity; the works have in effect been rebuilt several times. Subsidence of the surface has been taking place for a number of years. The foundation of the cylinder end of the largest blowing engine at one time sank until it was five feet lower than the other end and nine feet below the original foundation; closing the smelting plant was at first thought to be unavoidable, but this engine was operated in this position until new blowing capacity was provided. In 1904 the tilting reverberatory furnace used for smelting flue dust had to be discarded. As new works were under consideration at that time the reverberatory was not rebuilt and the flue dust, which amounts to about 1% of the furnace charge, has since been returned to the blast furnaces after wetting. Other temporary expedients had to be adopted both in mining and smelting, as it was impracticable to install new equipment pending the erection of the new works.

While the smelting practice is somewhat backward, the delay in the construction of new works, due to the indecision of railroad companies in regard to building extensions, has contributed to this condition, as well as having increased greatly the trouble of the operating officials. The costs, nevertheless, have been kept lower than might have been expected under the circumstances, as will be noted from the following figures for the 1912 operations: Smelting and converting, $3.25 per ton of ore; $72.67 per ton of copper.

*(To Be Concluded)*

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## Beaver Consolidated

The annual report of the Beaver Consolidated Mines, Ltd., covers the year ended Feb. 28, 1913. During the year there were shipped 689,921 oz. of silver. Actual ore sales brought in $333,052; corrections for ore in transit at the beginning and end of the year bring the production to $415,424; interests, rent, profits on boarding house, etc., give total receipts of $419,671. Operation expenses were $211,252; administration expenses, $20,086; leaving earnings of $188,333. Depreciation on plants and equipment, development, furniture, etc., was written off to the extent of $13,809, and $180,000 was paid in dividends during the year.

Development includes 3414 ft. of drifting, 745 ft. of crosscutting, 185 ft. of sinking and 157 ft. of raising. Stoping was done to the extent of 4316 sq.yd., and stations were cut on the 600- and 700-ft. levels. These two new levels show excellent indications of ore. It is found that the 530-ft. level in the diabase is giving excellent results. It is impossible to estimate the unbroken ore underground, but the broken ore amounts to 12,500 tons, containing approximately 30 oz. per ton, and there is on the dumps 20,000 tons, containing approximately 20 oz. per ton. The estimated profits on these reserves after treatment and marketing expenses, is about $280,000. The capacity of the concentrating mill was increased to almost 100 tons per day during the year. There was milled 17,842 tons, producing 289 tons of concentrates containing 278,512 oz. of silver and giving a net profit after milling and marketing charges of $123,655. The mill heads averaged 21.48 oz. and the tailings 3.9 oz., giving an extraction of 81.8 per cent.

The Erie Cobalt property was purchased during the year, principally to acquire the water rights of Kirk Lake, part of the property lying under this lake. A three-quarter interest in the Donaldson claims in the Elk Lake district was also acquired, and a new company was organized, the Beaver Auxiliary Mines, of which the Beaver Consolidated owns 75%, with the right to purchase the additional 25% in preference to any other buyers. Excellent indications have been obtained by the development work performed on this property, but the occurrence is such as to prevent an estimate of the tonnage or value.

The system of an independent mine inspector having complete charge of all work at the Beaver mine, so far as its safety is concerned, has given excellent satisfaction, and, since the installation of the system, no serious accident has occurred underground.

# Unusual Design of Overhead Tramway

*SYNOPSIS—A 3000-ft. aërial tramway, designed for a heavy tonnage. The buckets are detachable and are mounted on trucks for use as mine cars. A cost of 1¾c. per ton is obtained. The tramway generates an appreciable amount of power.*

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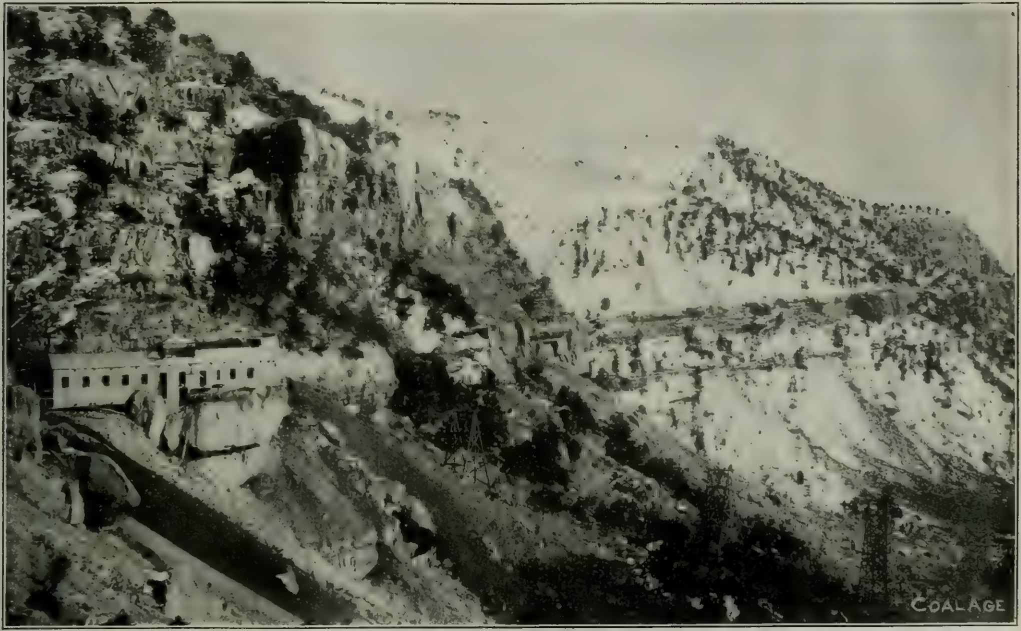
An overhead aërial tramway, in use in Utah since early in the year, presents some highly interesting features of design. The tramway connects the mine outlet with the loading bins on the railway 3000 ft. away and 321 ft. lower. Owing to the abrupt topography of the cañon and the situation of the tramway, considerable ingenuity was necessary in the design of some of the supporting structures. At one point, where a sharp change of grade takes place, the vertical curve in the cable is divided between four saddles. One side of this structure rests on solid rock, while the other is cantilevered over the edge of the precipice. At the loading terminal, one end of the structure is carried on a 50-ft. arch truss. The line is of 10-ft. gage and the towers are so designed as to allow ample clearance when the buckets are swinging. This was necessary on account of the high winds that prevail in the winter. Lock-coil cable is used for the tracks, that for loaded buckets being 1⅝ in. in diameter, and that for empties, 1¼ in. These cables rest in grooved saddles supported by 10-in. steel channels on the towers. Each is anchored at one end, while at the other it is attached to chains, which, in turn, pass over heavy sheaves and are fastened to weight boxes. This method of back-balancing at all times maintains a uniform tension on the cables independent of the loading or weather conditions. The gross weight of box and stone on the loaded cable is 35 tons, and on the smaller cable, 16 tons. The weight boxes are so suspended, that when the loads are off the line, the box rests on the ground, and when the line is loaded, the box springs clear. This relieves the cable from the total strain when not in use, and increases its life.

Of the 321-ft. difference in elevation of the terminals, 225 ft. occurs in the first 1300 ft. from the loading terminal. This inclination is sufficient not only to run the tramway, but to develop considerable power. The tramway is motor-driven and required 12 hp. to start off with the empty buckets going up hill. After being limbered up, about 15 hp. was developed, with a loading equal to 75 tons per hr. At the ultimate capacity of 250 tons per hr., approximately 50 hp. will probably be developed.



THE HEAD OF THE CONVEYOR LINE, SHOWING ROUGH COUNTRY

This power is not wasted. The motor acts equally well as a generator and returns surplus current to the power line, at the same time acting as a brake to regulate the speed of travel. Other brakes are provided on both the main drive and pinion shafts for stopping the line and controlling its speed, should any accident occur to the motor or other connections.

The traction rope is a ⅞-in. Lang-lay cable and is maintained at proper working tension by a 5000-lb. back-balance. The rope speed is 500 ft. per min., this having

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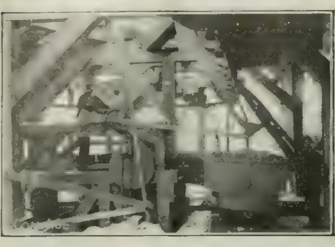
Note—Excerpts from an article by W. R. Elliott in "Coal Age," July 26, 1913.

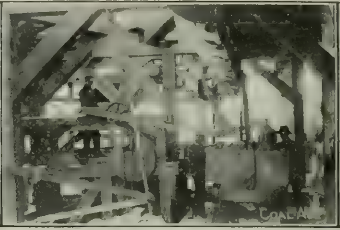
been found most desirable for the loads handled. The tension sheave of the traction rope is 10 ft. in diameter and is located at the discharge terminal. This sheave rests upon a carriage mounted on a truck connected to the weight box and set at a considerable inclination from the horizontal to compensate for the difference in level between the empty and loaded tracks.

The most remarkable feature of the installation lies in the tramway buckets, which are so made that they may be placed, two at a time, upon a truck, which is run into the mine and otherwise handled exactly as an ordinary mine car. The loaded buckets are transferred from trucks to cableway at the loading terminal by means of an apparatus called the "transfer table." Trucks come from the mine carrying two buckets, each of a nominal capacity of 2000 lb., although in actual practice, the average weight of contents is 2300 lb. The mine locomotive pushes the cars over a knuckle, whence they coast to the scales. Immediately in front of these are set the blocks or squeeze-brakes, consisting of a pair of heavy timbers, one on each side of the track, clearing the wheels slightly. The other ends are connected with links and levers to allow of their being closed sufficiently to pinch and stop the cars. When the operator releases this brake, the cars coast across the scales into the loading terminal of the tramway.

After passing the scales the cars are stopped upon the adjoining transfer table. This is a large platform pivoted at one end, the other being connected to a pair of cranks driven by an electric elevator machine and capable of being raised or lowered as desired. The track crosses this platform near the center, where there is a vertical movement of about 12 inches.



Car in Position on Table



Hangers Engaging Trunnions

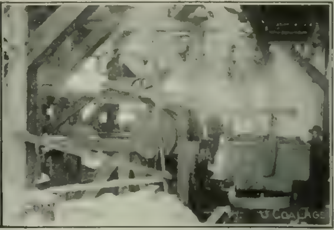
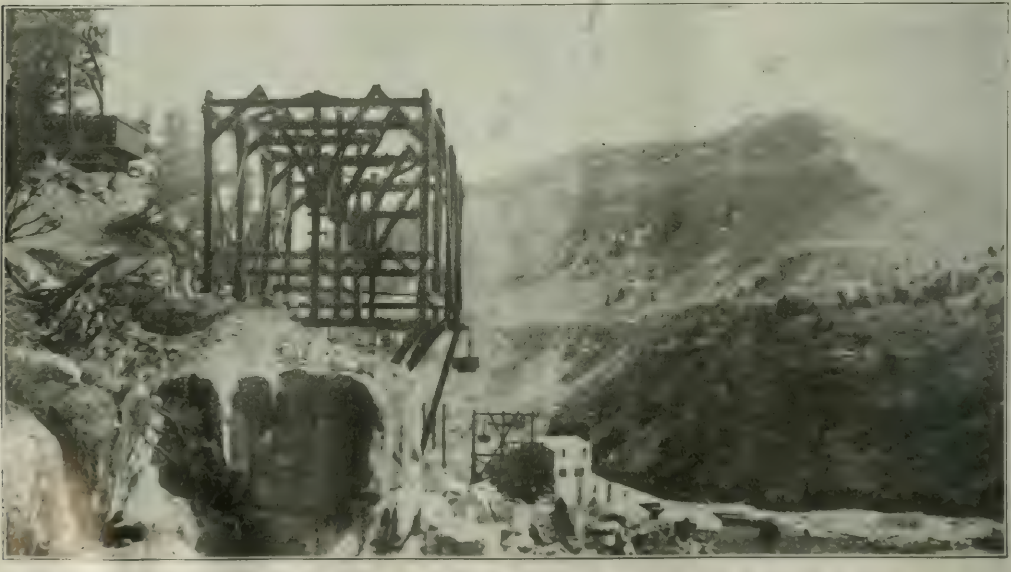


Table Depressed, Bucket Hanging

A pair of hangers having been previously positioned on the overhead rail above the transfer table and pushed outward to clear the approaching loaded truck, the table is raised. This operation brings the platform track level with that of the scales. The car is run upon the platform and the hooks forming the ends of the hangers allowed to fall beneath the trunnions of the buckets. The platform is then lowered which leaves the buckets suspended by the hangers from the overhead rail. They immediately coast to the front of the terminal, where an operator is stationed to space them at regular intervals on the cable. A gong geared to a sheave wheel gives warning when to attach the bucket.



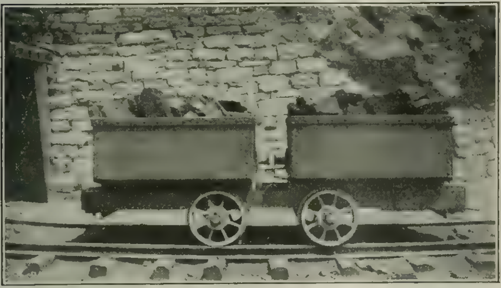
The Fox-Saddle Overhanging Tower Where a Decided Change in Grade Is Made

The platform meanwhile remains down until two empty buckets have been positioned over the truck. The operator then throws a switch; the platform rises and the empty truck thereon lifts the buckets clear of the hangers, which are then pushed outward and the latch holding the truck in position on the platform withdrawn. This allows the car to run through a switchback and coast into the mine.

In order to facilitate the rapid handling of buckets two transfer tables are provided, so arranged that one man can operate both at the same time, or either independently. The time for a complete operation on one table is 40 sec., or for the two tables, 50 sec.; but four buckets are transferred with the two tables, while only two are handled with the one.

### General Design of Terminals

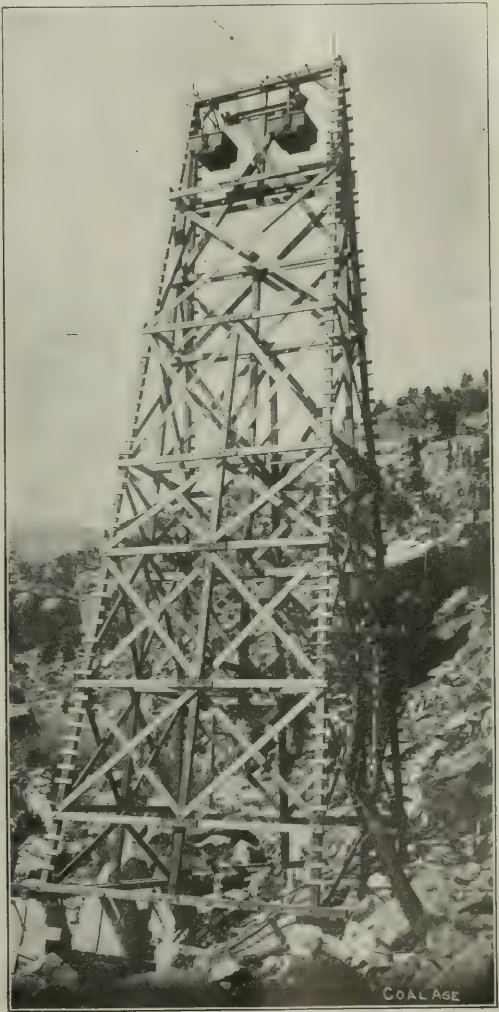
The loading terminal is located on a ledge of rock, and all available space is utilized to the best advantage. The driving and braking mechanism is placed in an excavation beneath the floor, the traction rope passing around sheaves 8 ft. in diameter to eliminate bending stresses. The track to the kick-back passes directly over the wheel pit and between the incoming and outgoing parts of the traction rope.


The Two-Bucket Mine Car Showing Trunnions for Attachment to Cable Hangers

The track- or suspension-cables for the buckets entering and leaving this station have a difference of elevation of 4 ft., to give necessary grade for the buckets to run freely anywhere in the station without assistance from the operators. The difference in elevation of the cables here required a difference of half that amount on the first tower from the loading terminal. On other towers the empty and loaded cables are carried at the same elevation with the exception of the tower next the discharge terminal, where a difference also exists.

The discharge terminal presents only one unusual feature—that of having the hopper located under a sharp curve in the overhead rail at the extreme end of the structure. This necessitates bringing the buckets to a complete stop in order to dump. The grips employed to secure a hold upon the traction rope are operated directly by the weight of the load they carry. Thus, the heavier the load, the greater the pressure exerted by the jaws. These grips can be relieved only by bodily lifting the load and depressing the tracks simultaneously. This is accomplished in the terminal by attachers and detachers wherein the load is lifted by side rollers rising on incline planes at the same time the track is depressed. This causes the jaws to remain open long enough for the rope to enter or leave the grip as the case may require. This operation is entirely automatic, the grip at all other times remaining closed.

A freight elevator is installed at the discharge terminal to facilitate the transportation of material brought in on the railroad for use in the mine. This elevator is 10x6 ft., with a lifting capacity of 2500 lb. It is equipped with modern safety speed governor and automatic limit stop, which prevents the platform from running beyond the terminal landing and thereby causing accidents. Material elevated from the ground to the floor of the discharge terminal is conveyed to the mine over the tramway in the coal buckets or by special hangers adapted to such material as steel rails.



One of the High Tramway Towers

Particular attention has been paid to the problem of lubrication, grease cups being provided for all bearings, sheaves and rollers on the entire tramway. The terminals are housed with corrugated iron, which has been painted, as have also the towers, furnishing a pleasing contrast with similar installations often left in the rough state.

A total force of 10 men at $35 per day is required to handle an output of 2000 tons. This brings the transportation charge from mine to tipple to 1¾c. per ton. Had the conditions governing the location of loading terminal and tipple been favorable, this would have been materially reduced.

The tramway was installed by the Spring Cañon Coal Co., an affiliated interest of the Knight Investment Co., of Provo, Utah, to develop its coal land, situated about five miles up Spring Cañon from Helper, on the Denver & Rio Grande. The unusual method of handling the material in detachable buckets is chiefly due to the necessity which always exists in coal mining of handling the coal as gently as possible. In the typical metal mine, the lack of storage capacity, the awkward and easily tipped cars, etc., would prove grave objections. The capacity of the tramway is noteworthy, as is the utilization of the power generated by the descending loaded buckets.

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# The Waste of Natural Gas

The causes of waste and their prevention are enumerated by Ralph Arnold and Frederick G. Clapp (Bureau of Mines Technical Paper 38, Petroleum Technology 6) as follows:

(1) Waste in drilling and casing wells. In drilling for oil in some districts, gas flows are encountered in sands above the oil. Where the pressure is great, it interferes with drilling and the gas is allowed to escape until the pressure is reduced. In other cases, when penetrating loose formations, the gas may escape around the casing, loosening the ground, and often causing a blowout. Such waste may often be prevented by drilling with muddy water, which tends to clog the pores in the gas sands. In other fields the plan of cementing around the casing is frequently adopted.

(2) Waste from high-pressure wells. In the early days of a gas field, pressure may be so great that a well cannot be capped with means available on the ground. In cases where a heavy flow is expected the size of the bit should be reduced before penetrating the gas-bearing sand. In some fields, the casings are tied together with anchor rods and clamps. It is incorrect to state that wild wells cannot be controlled. Various methods are available, among which are drilling an adjacent well and forcing mud into the interstices of the sand furnishing the flow to the wild well, putting out fires, when present, with steam from a battery of boilers and covering the flowing well with a steel hood.

(3) Waste in oil production. All flowing oil wells are also gas wells to a greater or less degree, and in many [illegible] the value of the gas exceeds that of the oil. The [illegible] ready market often operates against saving and [illegible] gas, and in the early days of oil drilling, gas [illegible]ed a nuisance, as interfering with drilling and [illegible]ace from its liability to ignition. Even in [illegible]lds a great deal of gas obtained in connec[illegible] wells is wasted. In California, much of the gas is exceedingly rich in gasoline; it is estimated that in the wasted gas there is gasoline to the extent of 10% of the value of the oil production. A partial solution of the difficulty in new fields is to compress the gas and ship it in steel cylinders. Better than letting the gas go to waste is to burn it under the boilers of the drilling-machine engines. Legislation requiring oil wells to be shut until gas mains can be built would not be disadvantageous to either industry in the long run. The California gas is being utilized more and more for the production of gasoline.

(4) Waste owing to improper care of wells. Such waste includes the handling of wells so that much of the gas is put beyond the possibility of recovery. Gas wells flowing at their full capacity allow pools of salt water to flood the gas sands. It is customary to free gas wells of salt water by blowing the well for half an hour every morning. It is advisable to use only a part of the volume of gas obtainable from a well and thus maintain a back pressure which excludes water. The amount of capacity which should be used varies from 15 to 50%. There is no excuse for blowing the gas in the morning to rid the well of water, since this water can be siphoned off. Many wells are lost through a failure to clean them when the grains of the gas sand have become coated with paraffin or salt. This cleaning should be done by steaming.

(5) Waste in transportation. This is a minor factor in the total of gas waste, but it is important. It takes place through leaks in gas mains; these should never be permitted.

(6) Waste owing to improper plugging. Dry and abandoned wells when unplugged permit water to flow in and drown the gas sand. Legislation requiring such holes to be plugged should be provided in all states.

(7) Waste in utilization. The elimination of waste in consumption is unquestionably the most important field in which the principles of conservation can be applied. This applies to gas as well as other natural resources. Such waste includes the sale of gas at a flat rate, its burning in improper burners, its use under boilers, its burning during the day time, and its sale at too low a rate. It should be used for the purpose for which it is most valuable, in the manner that is most efficient, and as near as possible to its point of production. The most valuable purpose for which natural gas can be used is as domestic fuel and illuminant. When it is to be used for the generation of power, it should be applied to an internal-combustion engine and not burned under steam boilers. For transportation to any distance, extensive mains and pumps are necessary. It is cheaper to establish the industry utilizing the product near its source. As an illuminant, gas should be used always with a mantle, which increases its efficiency almost 10-fold. Its economical use should be promoted by its sale at a higher rate, inasmuch as when it is abnormally cheap there is an irresistible tendency for the consumer to waste it at the ultimate expense of the community. Further, waste by the consumer should be discouraged by its sale on the meter system, which it is estimated will cause a saving of 60 to 70% over the flat-rate method.

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**The Leadville Tonnage of Zinc Carbonate Ores** which was largely decreased owing to the low price of spelter, will from now on be increased again, as the smelters' contracts have been modified to benefit the shipper.:

# Nechi River Placer Mining, Colombia

By William F. Ward*

*SYNOPSIS—Pato and Pochet dredges are operating with success. Farley and San Carlos hydraulic properties are somewhat important. Other small placers contributed to total output. Transportation chiefly by river. Placers capable of more rapid development than are the lode properties.*

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There has been much interest taken recently in both placer and lode mining in Colombia, South America. The portion of Colombia with which I am most familiar is comprised in the lower Cauca and Nechi River districts. At present, the Nechi River district is the best developed and several successful placer and lode mines are now in operation there. The map, Fig. 1, shows the situations of these mines.

The placer mines are represented by the Pato company, the Pochet company, the San Carlos mine, and the Farley mine; and the lode mines by the Frontino Bolivia, Sucre, and Guamaco. In addition there are numerous small mines, both placer and lode, which are working successfully.

## Pato Dredging Properties

The Pato company is controlled by Oroville Dredging, Ltd. It has large holdings on the west side of the Nechi River, owning all the placer land from San Juan Creek to a point opposite the mouth of the Bagre River, with the exception of one or two claims opposite the town of Zaragoza.

A 9-cu.ft. modern electric dredge started to operate on Jan. 2 this year. On Jan. 14 an accident caused a shutdown for about a month and a half; since that time it has been operating satisfactorily. This dredge was expected to be in operation over a year ago, but much time was lost and more money than at first estimated had to be expended on the San Juan Creek dam for the electric-power plant.

In excavating for the dam foundation, it was found that the rock was not firm, and a great deal of material had to be removed before it was safe to start the concrete work. At the dam site, the creek was on bedrock and the sides were of rock. But, as often happens in the tropics, rock decomposition was extensive both in depth and laterally. A ditch was proposed at first, but mainly owing to the experience of the Frontino Bolivia company with its power-plant ditch, this was given up as impracticable. The heavy tropical rains cause frequent washouts and landslides.

The dredge is starting on a tract of 300 acres, proved by drilling to run about 31c. per cu.yd., chiefly in the first bench of the Nechi River. This first bench, as well as the higher and older benches, is red, due to extensive oxidation. The bedrock of the first bench here is at about the level of the river, and the dredge is able to start work in Pato Creek and work up into the bench gravel. There is an older and higher bench near by that has been partly worked by native methods. This will probably be worked by some sluicing method, making use of the extra power provided by the electric plant. Up to the present time much of the property, especially the most northern portion, has not been drilled.

## Pochet Dredging Company

The next most important operation is that of the Pochet company. Near the mouth of Hebilla Creek a 5-cu.ft. steam-driven dredge has been working since 1909, and small-scale sluicing operations are carried on in the upper, older bench. This last work is conducted only in the rainy season on account of the small water supply available.

As the Pochet dredge is the first successful dredge to operate in Colombia, a detailed description may be of interest. Fig. 2 gives an idea of its size and design. It was built by the Werf Conrad company, Haarlem, Holland.

The hull and all the framing is of steel. The chain carries 5-cu.ft. alternate buckets, and digs to a depth of 26 ft. under water. The dredge is of the Risdon type, working with a head line, and has the usual bow and stern lines. It has a revolving screen and the usual tables; the stacker is of the steel-bucket, old Risdon type. The dredge is steam driven, using two locomotive boilers, fired by wood fuel. One large upright engine drives by belt the bucket chain, revolving screen and stacker. Another upright engine runs the centrifugal pump. A duplex pump furnishes water for the surface condenser and part of the wash water. A small winch on the left side operates the head line, and the left bow and stern lines. Another winch on the right side operates the ladder hoist, and the right bow and stern lines.

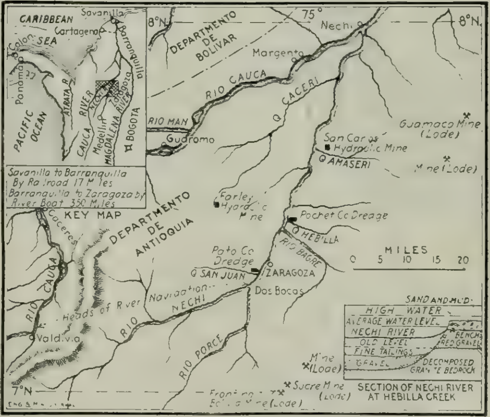

Fig. 1. Map of the Nechi River Mining Region

## Native Colombian Crew

In place of one winch man, as is the American practice, there are three required, one at the digging-engine valve and one each at the left and right winches. The rest of the crew consist of an engineer, a fireman, a wood passer, a table man, an oiler and two deckhands. These 10 men with the dredge master constitute the regular crew, and most of them are of negro blood, picked up locally.

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*Mining engineer, 416 E. & C. Bldg., Denver, Colo.

There is also a master mechanic, blacksmith and helpers, in the machine and carpenter shops. The wood is cut by contract and taken to the dredge in canoes. Clearing the ground is an important feature, and keeps a special crew busy. The usual Colombian native does not care to work steadily, so that, counting all men more or less employed outside, on the dredge, in the shop, store and office, the total is about 70. The total expense, however, is small, the usual laborer getting a dollar a day and boarding himself.

The dredger and mine owner, L. G. Pochet, has made his home in Barranquilla for some time, and was successful in other lines of business in Colombia before taking up dredging. It is due to his energy and competent management that dredging here has been a success. The remarkable part of it is that he has attained his success entirely with native Colombian mechanics and laborers.

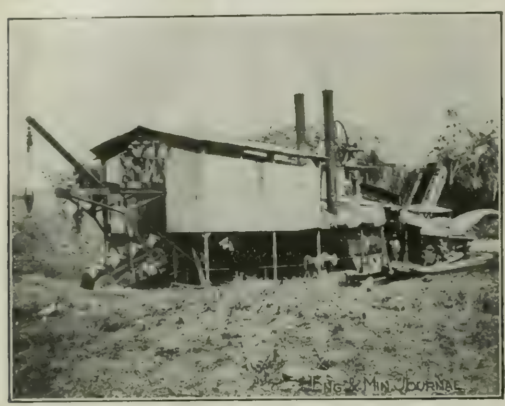

Fig. 2. The Pochet Dredge at Work

### Former Failure of the Dredge Converted into Success

The dredge works only in the day time and occasionally up to 10 p.m. with the same crew. The occurrence of large stumps and buried timbers operates against night work. With all the disadvantages of tropical work, however, the cost per cubic yard compares favorably with that got with steam-driven dredges in the United States. Also I may mention that the yield per cubic yard is much higher than that of any dredging ground in the United States.

The dredge was first assembled at Barranquilla by Colombian mechanics and towed far up the Magdalena River, where a foreign company tried to operate and failed. It was then towed back and up the Cauca and the Nechi Rivers to the point where it is now working. The foreign company here again failed to make good. It did not work long enough to overcome the usual little mechanical difficulties that are familiar to all dredge operators, nor could it save the fine gold with a small surface of coco matting and in the absence of riffles and mercury.

When Mr. Pochet came into possession, he made the necessary changes and scored a success, an example of a man of good judgment and a thorough knowledge of native labor succeeding where a foreign company with seemingly the best of foreign engineering advice, failed to make good.

The chief changes Mr. Pochet made were to increase the furnaces to burn wood fuel properly, adjust the machinery properly, increase the table surface and use riffles. He also uses woolen blankets next to the screen. These blankets are followed by riffles of the usual California type with mercury.

The gold obtained is extremely fine. A fair sample gave about 13 colors per mg. This was gold obtained from the blankets where no mercury had touched it. Once in a great while colors weighing as much as ½ mg. can be seen. The gold is extremely pure, as is usually the case with small-sized colors. Some shipments have assayed as high as 920 fine.

### Nature of the Ground

Fig. 1 shows a section near the mouth of Hebilla Creek, where tailing due to former placer operations in the upper Porce and Nechi Rivers, has filled up the river bed for about 30 ft. Of this, 15 ft. has been filled in during the memory of the oldest natives on the river. So at present the first-bench red gravel, which was formerly above the level of the river, is now for the most part under water. Large stumps and fallen trees that once grew on the first bench are now buried 10 ft. deep in sand and muck; there is also a growth of trees upon the sand and muck; and since most of the tropical woods sink in water, the trouble given to a small, light dredge is tremendous. Ground that at present looks like swamp and low timbered ground, may have below it the valuable first-bench gravel. Mr. Pochet found his richest ground by prospecting with the dredge into the river banks. Now, however, he uses a hand drill to advantage.

The valley is flat, about four miles wide, and entirely covered with muck, sand and tailing deposited since the Spaniards occupied the country. The main bed of fresh river gravel may also be valuable, but in either bench or river gravel systematic drilling is necessary to locate pay ground.

The red oxidation color of the first-bench gravel shows that it was originally above water level. At times old native tools, such as parts of wooden *bateas* and rusty picks are dug up by the dredge from near the bedrock of the first-bench gravel, now 15 ft. below the lowest water. Generally these old workings are found under 25 ft. of sand and muck, and invariably the few feet of undisturbed gravel remaining is extremely rich. The first-bench deposit, except for the sunken timber in the muck proper, is ideal dredge ground, the gravel being small, bedrock soft, usually decomposed granite and gneiss, and the colors rarely lying directly on the bedrock itself.

As the dredge digs only 26 ft., it is necessary to work at different places according to high or low water. Sometimes this means changing position every few days. There is no danger to the dredge from floods, as the Nechi is a large, navigable river. When extensive repairs are required, the dredge is simply towed down to the shop. Ordinarily repairs are made by taking the parts to the shop and back in native canoes.

The Farley hydraulic mine is situated on the upper part of Caceri Creek, at an elevation of about 1000 ft.; it is owned and run by an American. Two monitors operate night and day on the 100-ft. bank of gravel.

While the ground is not rich for Colombia, the mine pays well. The equipment and methods are not uptodate, but results are successful. The greater part of the gravel is small in size and of the usual red color.

There is some coarse gravel and a few boulders in the lower part. The bedrock is a hard and somewhat uneven gneiss. The tailing is taken care of by the swift Caceri Creek. The boulders and coarsest pebbles are piled up by hand after the native method. Mercury is used in the long sluice. The water supply is good, being helped out by a reservoir in the dry season.

### San Carlos Hydraulic Mine

The San Carlos mine is situated about two miles north of Amaseri Creek and six miles east of the Nechi River. It is owned by a French company that worked it for several years by the hydraulic method, pressure being supplied by a steam plant. A great deal of gold was taken out, but the expense is said to have equaled the returns.

At present the mine is leased to a storekeeper in Zaragoza, who makes it pay on a small scale by using the natural water pressure. He attempts to work only during four or five months of the year when the water supply is sufficient. The tailing is run off into a small stream that leads into the Nechi River. This bank of gravel is about 60 ft. high and differs from anything I have seen in the district, in that it is white in color. Although it is distinctly bench gravel, it carries so great a percentage of quartz pebbles and rocks and so little iron that its color is practically white. It must be mainly old Amaseri Creek gravel. So far only a small part of the total has been worked.

### Small Native Placers

Several Colombian-owned mines are in operation on the richer channels of the bench gravels. They are known as "bar" mines from the use of the crowbar in breaking down the gravel. A small stream of water is allowed to flow over the bank and the gravel is washed, the coarser tailings being piled by hand. Lack of sufficient wash water and lack of grade for the dump is a common disadvantage in these large bench deposits. From these mines the Zaragoza storekeepers buy about 40 lb. of gold monthly.

There are also in the district numerous old workings and old tailing piles. Judging from the native working costs today, the ground formerly worked must have averaged at least 40c. per cu.yd. At a few places close to the Nechi River can be seen the remains of machinery of foreign companies, none of which made a success. They were all intended to work unprospected ground supposed to average $5 and $10 per cu.yd., but never got beyond clearing, erecting houses and setting up a steam pumping plant. Some ran for a few days and possibly recovered 5c. per cu.yd. Colombian natives do not leave rich banks of gravel close to the river; they are placer miners themselves and have more sense than most foreigners give them credit for.

### Climate, Transportation and Future Development

The climate in the Nechi placer field is tropical, the elevation running from 400 to 500 ft., the temperature being often 90° in the shade in the day, and 70° to 75° at night. Malarial fever is common and practically all natives and foreigners get it sooner or later. The climate in the high elevations, 4000 to 6000 ft., is delightful and fairly healthful.

At any time of the year the river steamboats can get up to the mouth of the Bagre River on the Nechi, and up to the mouth of the Man River on the Cauca. To reach the upper heads of navigation, Dos Bocas or the junction with the Porce on the Nechi River, and Valdivia on the Cauca River, there must be medium or high water.

There has been for some years a regular boat to Zaragoza, due to the operations of the Frontino Bolivia lode mines, and to the regular cattle trade with the upper country. At all times freight canoes are going up and down the river, and a person can travel the river by canoe and can also go many miles up the side streams.

Development along placer lines should be most rapid, since the navigable rivers reach close enough to the gravel deposits to enable prospecting drills to be brought in. Lode-mining development will be slower on account of difficult transportation, but possibly will be finally far more important. Lode prospecting also is slow, as the tropical growth of trees, grass and underbrush greatly retards the work.

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## California Mineral Industry

The California State Mining Bureau has been engaged in collecting statistics regarding the mineral production of the state for 1912, which, while not yet complete, are enough so to give a clear idea of the condition of the industry for the year. Forty-two mineral substances were commercially produced, varying in value from petroleum, with an approximate value of $45,000,000, down to manganese, worth about $200. The mineral products, which were valued at over $1,000,000, include petroleum, gold, cement, copper, crushed rock, brick and borax. The value of these seven materials is about $80,000,000, or eight-ninths of the value of the entire mineral output. The remaining 35 substances make up the balance.

The sole United States production of borax, magnesite and chrome is from the State of California, while 80% of the domestic supply of quicksilver is mined in the state. Tungsten is produced in but two or three other states. The production of petroleum and also of gold is greater than that of any other state in the Union.

It is first of all states west of the Mississippi, with a value of total mineral production, and is only outranked by a few of the great iron and coal-producing states in the East. Each of the 58 counties in California produces mineral of some description, with values ranging from Kern with a $22,000,000 output, down to Tehama, with a production of only a few hundred dollars.

Kern County is the leader in petroleum production, while Amador and Yuba are close rivals for first place in gold output. Shasta produces 80% of the total copper output. Los Angeles leads in brick and crushed rock, while Inyo is first in borax, lead, soda and zinc. San Benito is first in quicksilver production, and San Diego County produces half of the gems found in the states. Placer County is first in granite and building stone, Santa Cruz in lime, San Bernardino in limestone, and Tulare in magnesite.

# A New Refractory Material

It has been found that boron nitride is completely infusible at the highest heat of the electric arc and also is chemically inert. It has extremely high resistance to the passages of electrical current, even at the temperature of the carbon arc. These facts have been discovered by Ezechiel Weintraub, of Massachusetts, and patented under the U. S. No. 1,063,083. The patent is assigned to the General Electric Co., of New York.

Carbon is about the only other substance known to have such refractory nature. Unlike carbon, boron nitride has no chemical tendency to unite with other materials which are likely to be used as a charge in an electric furnace. When finely divided, it has the property of being self-bonding, so that no binder is necessary and the purity of this material may be preserved when making containers of all kinds. It should be heated in an inert environment such as in a neutral gas or in a vacuum. For this reason furnaces designed to use this material should be equipped with pipes through which any particular gas may be continuously passed in and out of the furnace, or which may be closed and the furnace evacuated.

Boron nitride can be prepared by any one of the methods recommended in the literature, such as passing ammonia over boric anhydride mixed with calcium phosphate at a red heat, or by passing ammonia over amorphous boron, or by bringing together boron chloride and ammonia and decomposing afterward the double compound formed.

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# The Economy of Dry Blast

In a paper read before the Iron & Steel Institute, May, 1913, Professor Joseph von Ehrenwerth considered the economy of dry blast in smelting operations. Gayley's system, as practiced at the Etna blast furnaces, consisting of freezing out the moisture in the blast, proved so astonishing that additional investigation was undertaken by Professor von Ehrenwerth, who arrived at the following conclusions:

That the economic advantage of drying the blast is greater the lower the temperature of the blast and the higher the temperature of the waste gases at which the furnace previously worked. This resulted naturally from the saving in fuel, from the smaller expenditures of heat in decomposing the small amount of moisture left in the blast, and from the formation of a smaller quantity of gases which give up their heat more quickly and completely as they rise through the furnace more slowly and escape at a lower temperature. The heat losses due to conduction and radiation are therefore also reduced in proportion as the waste-gas temperature is lowered.

In consequence of the economy in fuel, the total quantity of material charged, and therefore also its volume, is less, and the volume of blast required is smaller per unit of production. If the periods between tapping remain the same, the blowing engine and stoves, without increasing their duty, should cope with a larger production, and the furnace yield should therefore be increased. This in general proved to be the case in practice.

The quantity of gas formed within the furnace being less owing to the drier condition of the blast, the temperature in the melting zone must be higher. The melting process is therefore theoretically not only accelerated but the silicon percentage is increased, and the quality of the pig iron as regards sulphur is improved. This too has been found in practice to be the case.

The removal of five grams of moisture per kilogram of air is accompanied by a rise in temperature of about 32° F. to 35°, which corresponds to an increase in the temperature of the blast of about 40° to 45°. In this respect the drying of the blast is similar in effect to the heating of the blast, though with the important difference that, by drying, the quantity of the waste gases diminish, whereas by heating only they remain the same.

Another natural consequence of using blast with a uniform quantity of moisture, such as can be effected by drying, is that more regular working of the furnace is assured, an advantage which Gayley regards as superior to that of economizing the fuel. As is well known the fuel charged into the blast furnace adjusts itself to the performance of three functions during the course of the whole process, namely, one portion effects reduction, another the carburization of the iron, a third is utilized for heating, while a fourth portion is wasted through being carried off in the form of dust in the gas.

Practical tests have shown that by reducing the moisture of the blast the smelting process is accelerated and the quantity of dust in the gas and the losses of material charged are reduced, this being the natural result of the lower velocity at which gases escape. Gayley reported the same experience at the Etna works.

In practice the difference in fuel consumption due to the different moisture conditions of the atmosphere in summer and in winter, is not so great in modern coke blast furnaces as one might expect. This is undoubtedly due to the fact that the furnaces are, as a rule, not well protected, and the radiation losses, which are at all times proportional to the time taken to reduce the charge, are higher in winter than in summer, and so more or less counteract the effect of the dryer air.

Apart, however, from the other advantages resulting from drying the blast and having regard to the saving effected in fuel consumption alone, it has been shown that whereas the economical result of drying the blast in some instances is remarkable, it varies considerably, and the question of introducing it must be settled on its own merits. The advantages are dependent in every case on local conditions, such as the dampness of the atmosphere and the cost and quality of the fuel. They are influenced besides by the kind of products, the quantity of output, the reduction period, and the type of furnace. Assuming that the condition of the atmosphere as regards moisture is high enough, the adoption of dry blast is certain to prove advantageous under the following conditions:

(1) For blast furnaces working with high blast temperature, and yet with high waste-gas temperature, such as furnaces smelting ferromaganese, ferrosilicon, or ferrochromium. (2) For blast furnaces in localities where the atmosphere is particularly moist, such as on the coast, more especially in southern countries. (3) For blast furnaces which work with high fuel consumption and with waste gases at high temperature and produce pig iron, the composition of which requires careful control, according to the purpose for which it is destined, such as bessemer pig, foundry pig, and high-silicon pig generally.

## Michigan Copper Strike

The proposal of Governor W. N. Ferris, of Michigan, for a meeting between five representatives of the mines and five of the miners was refused by the companies on Aug. 1. The text of the companies' letter explaining this refusal follows. This was presented through General Abbey.

In response to the message from his excellency, the governor of Michigan, to the mine owners and employees involved in strike, to which we have given careful consideration, we, who are the managers and superintendents of the mines affected by the existing situation, on behalf of the several companies and their numerous stockholders, as well as on behalf of the employees who in a large majority have been and are, not only willing, but anxious, to continue at work, desire to express to you, and through you, to the governor, our high appreciation of the offer of his services in the pending dispute and our deep obligation to him therefor.

With great regret that the circumstances seem to us to render it necessary, we feel obliged to say that for the welfare and good name of the state as a whole, for the best interests of our employees, for the interest of this entire community, and as making for continued and lasting industrial peace and quiet in this district, we should not and cannot enter into or take part in a joint conference with the leaders or representatives of the Western Federation of Miners, which organization is solely responsible for the conditions now existing, nor with any representatives of those who are actively engaged in the strike, and who falsely assume to represent the great body of our employees.

In thus stating our position, we feel that it is due to his excellency, as well as to yourself, that we should also state our reasons for this conclusion.

### FIFTY YEARS OF PEACE

The copper-mining district of Michigan has operated its mines on an extensive scale for upward of 50 years. In all that time there has been no general strike among the employees. There has never been any serious labor disturbance or dispute. The few which have occurred locally at some mine locations have been speedily and satisfactorily adjusted between the managements and the employees. There have been satisfaction and contentment on the part of those employed and good feeling and mutual respect between employers and employees. We believe it can be said truthfully that in this mining district the conditions of labor, the consideration for the employees, the means taken for their comfortable housing, for their general welfare, for their health, for the education of their children, and their fair and generous treatment in every respect have not been excelled anywhere in any industry of like kind.

### FEDERATION'S RECORD

The history of the Western Federation of Miners is well known. That organization was directly responsible for the strike in the Cœur d'Alene district, the Homestake strike, the strike on the Mesabi range in 1907, the recent strike in the Porcupine district in Ontario, the strikes at Bingham and at El Paso, and others which may be recalled. Each of those strikes was accompanied by lawlessness, riots, assaults, volence, destruction of property and bloodshed. They resulted in the bloody riots of Colorado, the blowing up of the railroad station with great loss of life, the assassination of Superintendent Collins, of the Smuggler Union, the blowing up of Bulkley Wells, of the Smuggler Union, the murder of ex-Governor Steunenberg, of Idaho. Some of these strikes were under the leadership of some of the leaders of the present one. All of them were organized, incited, instituted and called by the Western Federation of Miners.

About the year 1907 this federation, with such a record behind it, began to send its organizers from the West into this district. They have carried on a systematic attempt to secure the complete domination of the mine laborers of this district.

They have attempted to breed and engender discontent among some 20,000 employees of the mining industry and it is but natural that they secured many recruits. For a long time it has been definitely known that as soon as their leaders felt that they were strong enough, a strike would be called.

It is reliably known to us that the federation succeeded only in a small measure in attracting to itself the employees of the mining industry in this district. The majority and, on reliable information the large majority of the employees declined to affiliate with them. On direct information, a large number believed that they had no grievance to strike for and did not wish to strike; on reliable information, the greater part of them desired to continue at work, and now desire to resume work.

### CAMPAIGN OF RIOT

On July 23, the strike called by the Western Federation of Miners took place. It was and is under the direction of skilled and experienced strike leaders of the federation, who are not residents of this district, or of this state. The strike took out only those affiliated with that organization on the morning when it went into effect. Many of our employees continued at work for the day. A campaign of violence and riot was at once instituted. The officers of the counties were without power to maintain order or to restrain lawlessness.

By threats publicly made, including threats of destruction of their homes in their absence, violence to their families and death to themselves, the men of the night shift were deterred from going to work underground.

Mechanics and laborers were driven from their employment by riotous mobs, armed with firearms, clubs, rocks, iron bars and other weapons. Mechanics, miners and laborers who desired to work or while at work, were cruelly beaten and many were severely injured.

One man, 75 years of age, who had worked in the mine for more than 30 years, was beaten and seriously injured. Another of like age was driven from his work at the point of a gun. The officers of the law were helpless, derided, cursed and their authority ignored.

### OFFICERS ASSAULTED

A deputy sheriff's star was a signal for an attack on the wearer. Officers were assaulted and beaten. Active resistance undoubtedly would have resulted in the destruction of property and the loss of many lives. A store building and its contents were burned after the proprietors announced that they must refuse credit.

The men were driven from the pumps and the mines were flooded with water, causing great destruction and damage. At some of the mines, even the operation of pumps for the fire protection of the community was forcibly prevented and the men driven out. At every branch of the mining industry at the several mining locations, the labor of the employees willing and anxious to work was stopped forcibly, riotously by threats and intimidation, by violence and assault, by woundings and beatings.

For the remainder of the week, every mining location was wholly at the mercy of these rioters, and millions of dollars worth of property absolutely in their hands. All this was but the repetition of the results which have invariably followed the calling of a strike by the councils of the Western Federation of Miners. Of their membership in this community, many of our employees, since the strike was instituted, have been taken from their homes and intimidated and forced under threats into joining the Federation. The strikers have paraded by day and by night, armed with weapons of all kinds, and have forced men, unwilling to do so, to join their parades. The large majority of our employees at the mine location were for the time terrorized into submission to these riotous strikers, who are those who have affiliated with the Western Federation of Miners, and none others.

There was no call by these strikers for conference, or for mediation or for adjustment while they thus completely dominated the situation.

There is, therefore, no industrial dispute between the mine owners and employees. Under the circumstances, and because of our knowledge that the majority of our employees have at no time sympathized with the purposes of the federation, and have been and are now willing and anxious to continue in their employment, we cannot recognize the right of the Western Federation of Miners to intervene or to assume to represent our employees with respect to the present conditions, or in any other manner whatsoever.

### WILL NOT RECOGNIZE FEDERATION

The suggested joint conference of both sides could mean nothing other than a conference in which one side would not be our employees or representatives of our employees, but would be the Western Federation of Miners, or its representatives, whose sole object is undeniably to establish the federation in a dominant control of the mining industry of this district. With them we cannot confer, and with all respect to his excellency we feel that we cannot enter into a joint conference with, or in any manner recognize, that organization, which most certainly to our knowledge does not represent our employees, with the great majority of whom we have no dispute of any kind

It has continuously been the practice in the past, and will continue to be the practice in the future, for managements of the various companies to confer in a friendly way with their own employees, or with representatives of their employees, on [illegible] matter re[illegible] improved working conditions, or real or supposed grie[illegible] [illegible] willingly to redress or correct any wrongs. No [illegible] [illegible]tion of any kind was or will be necessary for such [illegible] conferences, but to confer or treat with an organiza[illegible] [illegible]gn to your territory and to the interests of our emplo[illegible] [illegible]d not in any manner representing them, is someth[illegible] [illegible] we cannot contemplate.

We des[illegible] [illegible] clear and emphatic in conveying to you our opposi[illegible] [illegible] the Western Federation of Miners, in the firm belief, [illegible] upon its record, which is a matter of history, that [illegible] [illegible] of this district by that particular organiza[illegible] [illegible] which purpose alone this strike has been created [illegible] [illegible] by that organization, can result in nothing [illegible] [illegible] to the best interests and welfare of our employees and of this community, and can conduce to nothing [illegible] [illegible] of discontent, which is their doctrine, and a [illegible] [illegible] of lawlessness and disorder, which seem to follow upon their methods.

DANGER CONTINUES

In spite of the beneficent effect of the presence of the Michigan National Guard under your efficient command, which has given to the people and the business interests of this community a feeling of confidence and a comparative peace and quiet, yet the intimidation of our employees, threats of personal violence, of the destruction of property and even of the taking of human lives, continue to this day. No later than yesterday employees of more than one of our companies, nonsympathizers with the Western Federation of Miners, were set upon and cruelly beaten. Under no circumstances would we consent to confer with strikers or representatives of strikers or to compromise any differences or consider alleged grievances with a body of men who are thus lawlessly conducting themselves.

Under all the trying circumstances of the riotous proceedings of the days before your arrival, we have refrained from the employment or the use of private armed guards. In the belief that the prevention of bloodshed was the first and highest consideration, we prohibited and prevented the use of firearms or deadly weapons against those who were attacking our property and our employees. We have relied solely upon the constituted authorities for their protection. The local officers of the law with consciousness and zealous desire to that end, found themselves without power to cope with the lawlessness, disorder, violence and riotous conduct which ensued from the first inception of the strike. Through the request of his excellency preferred by officials charged by law with the exercise of discretion in the matter, the Michigan National Guard under your command has come to this community for the sole purpose of the maintenance and enforcement of law and order, without favor either to mine owners or strikers.

NO IMPORTED MEN

We have imported no strike breakers. We have imported no mechanics, miners or laborers. Our old employees, to a large majority within our own knowledge, who have no grievance and with whom we have no dispute, are willing and anxious to resume their work from which they have been driven by force and violence on the part of a comparatively small, but well organized and well officered body of strikers who have submitted themselves to the influence and domination of the Western Federation of Miners.

Our only request to the great commonwealth of Michigan is that our old employees who are willing and anxious to resume work, may be permitted to do so without molestation from those who have undertaken and thus far succeeded by intimidation and personal violence, in preventing them in the exercise of the right which the laws of Michigan assure to them, to labor without interference or molestation. If our employees could today be assured of their entire freedom from unlawful molestation, if they could feel sure that their homes and their families would be safe in their absence, we should be assured of an immediate or speedy settlement, not of an industrial dispute which has no existence, but of a situation which, if continued, will mean that the organization known as the Western Federation of Miners, its local unions and those of our employees who have affiliated with it and who alone constitute the active strikers, are not amenable to the laws of this state.

We have every assurance and a confident belief that our [illegible] as herein stated to you, with reference to the present [illegible] situation and with reference to the domination [illegible] to be [illegible] by the Western Federation of Miners, has [illegible] support and approval of the entire business in[illegible] [illegible] responsible citizenship of this community [illegible] [illegible] the best and highest welfare of this [illegible] [illegible] Michigan demands as a foremost con[illegible] [illegible] the laws be enforced, that lawlessness, viol[illegible] [illegible] trained, and that the miners, me[illegible] [illegible] desire to work be permitted to do so without violation, on the part of any organization, combination of strikers or individuals, of the statutes which make it an offense against the peace and dignity of the people of the commonwealth, by threats or intimidations or otherwise, and without authority of law, to interfere with or in any way to molest or disturb any mechanic or other laborer in the peaceful pursuit of his lawful vocation.

We again wish to express our profound appreciation of the offer of his excellency communicated to us through you. If the situation were such as to admit of the suggested joint conference, we should gladly and thankfully accept the offer of his excellency, the governor. We trust that we have shown by the statement of a situation which can be fully substantiated, sufficient reasons for respectfully declining to enter into any conference with the Western Federation of Miners or its representatives.

We also wish to express to his excellency and to yourself our full appreciation of the prompt action which resulted in the presence in this district of the Michigan National Guard, which under your efficient command, with favor toward no interest either of mine owners or employees, has in so large a measure restored to this community that peace and order and observance of law which makes in the highest degree for the welfare of the community and of the entire state.

THEODORE DENGLER, JAMES MACNAUGHTON,
R. M. EDWARDS, F. W. DENTON,
J. L. HARRIS. CHARLES L. LAWTON,

July 30, 1913.

⁂

# Mineral Production of Japan

A report on the mineral industry of Japan submitted by the British Legation at Tokio, gives some interesting figures. The production of coal and other non-metalliferous minerals is given as follows:

| | 1911 | 1912 | Changes |
|---|---|---|---|
| Coal, tons | 17,632,710 | 19,794,870 | I. 2,162,160 |
| Peat, tons | 97,656 | 102,830 | I. 5,174 |
| Graphite, lb | 254,265 | 328,933 | I. 74,668 |

The production of metals and ores is stated as follows:

| Metal | 1911 | 1912 | Changes |
|---|---|---|---|
| Copper, lb | 118,670,320 | 137,752,866 | I. 19,082,546 |
| Lead, lb | 9,166,615 | 7,962,146 | D. 1,204,469 |
| Tin, lb | 55,205 | 79,536 | I. 24,331 |
| Pig iron, tons | 53,426 | 57,155 | I. 3,729 |
| Steel, tons | 10,366 | 12,265 | I. 1,899 |
| Ores. | | | |
| Tungsten ore, lb | 262,767 | 359,144 | I. 96,377 |
| Manganese ore, tons | 9,613 | 8,632 | D. 981 |
| Chrome ore, tons | 1,500 | 1,459 | D. 41 |
| Iron pyrites, tons | 72,569 | 87,172 | I. 14,603 |

Lead was the only metal showing a decrease last year. The mineral industry appears to have been generally active and prosperous.

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# Goldfield Consolidated

Total production of the Goldfield Consolidated, Goldfield, Nev., during June, 1913, was 30,486 tons of ore, from which resulted net realization of $180,782. Mining realized $57,005, and milling, $123,777. Development amounted to 3323 ft., and cost $5.99 per ft. The accompanying table shows the combined operating cost of mining and milling companies.

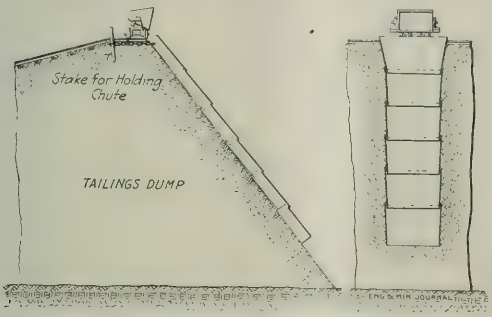
| | Mines Co. | Milling & Trans. Co. | Total |
|---|---|---|---|
| Mining-stoping | $2.89 | | $2.89 |
| Development | 0.45 | | 0.45 |
| Moving dumps | 0.12 | | 0.12 |
| Transportation | | $0.49 | 0.49 |
| Milling | | 1.01 | 1.01 |
| Marketing | | 0.45 | 0.45 |
| General expense | 0.16 | 0.12 | 0.28 |
| Bullion tax | 0.06 | | 0.06 |
| Construction | 0.04 | 0.02 | 0.06 |
| Marketing ore shipped | 0.98 | | 0.98 |
| Total costs | 4.70 | 2.09 | 6.79 |
| Miscellaneous earnings | 0.03 | | 0.03 |
| Net costs | $4.67 | $2.09 | $6.76 |

# DETAILS OF PRACTICAL MINING

## Improved Distributor for Fine Material on Dumps

The accompanying sketch shows Chergwin & Tregoning's apparatus as used at the tailing dumps of the Robinson and City Deep Mines. As quartz sands tend to accumulate toward the top of the dump, rendering necessary the moving of the track frequently, it has been customary on the Rand to keep a gang of 10 to 20 natives stationed below the brow to shovel away the contents of the trucks as tipped.

The apparatus consists of a number of chutes. In these the angle of repose of quartz grains is much steeper than of sand on sand, so that it is possible to convey a large quantity of material to the base of the dump at first with a long chute. This may then be flattened until the material will no longer run. The chute is then shortened by taking off a section. The cost of a section of a chute suitable for single trucks is £1 and four complete chutes can be erected for £100, the sections being of light steel riveted plates. Besides these only a chain and a stake are necessary.



SAND TAILING DISTRIBUTOR

⁂

## Sinking an Untimbered Shaft

The method of sinking shaft No. 6 of the St. Louis Smelting & Refining Co. in southwestern Missouri was novel in that it was carried down through limestone for 557 ft. without timbering and by means of a derrick instead of a headframe. The manner of using the derrick has been described in the JOURNAL, July 19, 1913. Air pipe was not installed in permanent form until the completion of the shaft. No pumping was necessary, and only some slight timbering, where the limestone was badly shattered. A speed of 100 ft. per month was maintained. After the bottom was reached, timbering was done, working from the bottom up. Electric lights were strung through the shaft while the permanent timbers and pipe were being set. The end of the derrick boom also carried a cluster of electric lights for illuminating the ground around the collar of the shaft. Mucking was done by means of a cluster of electric lamps on the end of a wire raised and lowered by a reel at the collar. To provide against failure of the current, two torches were always kept tied to the bucket.

⁂

## Safety Rules—Electrical Haulage Underground*

(1) Operators should see that their motors are in good working order and furnished with the necessary tools, supplies and signals. They should thoroughly inspect the motor and test the brakes at the beginning of each shift; see that they have a supply of sand; and immediately report any defects to the master mechanic.

(2) They should not leave the motor except in case of necessity, and then have some competent person in charge. No one except motormen and electricians should be permitted to operate the motors.

(3) Operate cars at such a speed as to have full control at all times. Avoid bumping cars violently.

(4) The trolley pole should follow and not lead the motor, except in places where this is impossible. When the trolley pole is ahead the motor should be moved slowly.

(5) The trolley pole should not be turned while the motor is in motion.

(6) There should be a red light on the advancing end of all trains when the motor is not in front and the light on the motor should be kept lighted at all times when the motor is in use.

(7) Motormen should ring the bells on their cars at frequent intervals and especially when approaching crossings, curves, narrow places in the drifts or crosscuts, or points where men are known to be working on or near the track.

(8) Motormen should promptly report to the electrician, mining captain or shift boss any defective condition of electrical equipment.

(9) No one except motormen and brakemen should ride on a motor or cars, without special permission from the superintendent or captain.

(10) Men not employed as motormen or switchmen should not couple cars, throw switches or alter the lineup of switches.

(11) Trammers, or other employees, should not leave cars at or near switches or crossings, in such a position that they will not clear motors or cars moving on another track.

(12) When cars are pushed from where they have been filled to a point where they can be handled by the motors, the trammers should notify the crew of the motor either by remaining near the cars or by placing lighted candles on them. The same rule should be followed in the case of timber trucks or other equipment left standing on the tracks where motors are liable to approach from either direction.

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*From Inland Steel Co.'s book of rules.

(13) Men having occasion to work on motor-car tracks should protect themselves by placing blue lights on the track.

(14) Do not place any strain on mine timbers when [illegible] cars on track.

(15) Do not carry high explosives on electrically operated cars.

(16) Brakemen should always carry lanterns.

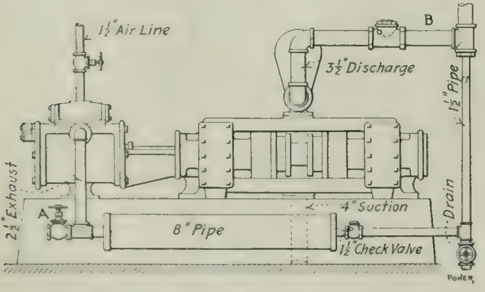
(17) Brakemen should not ride on the front end of cars except in case of urgent necessity.

(18) Operators and brakemen should exercise great care not to get caught between cars and timbers. When riding, do not stick your feet out at the side of the car, as you are apt to do if in a kneeling position.

⁂

## Combination Pump and Air Lift

An extremely ingenious method of connecting an air-actuated mine pump is described by Walter L. Houston in *Power*, April 22, 1913. The device was installed to eliminate freezing troubles in the exhaust passages. It was not practicable to reheat the air, so the connections shown in the illustrations were made. The pump was a 12 and 6x13-in. machine, working against a 400-ft. head under an air pressure of 90 lb. The exhaust was piped to a receiver made of an 8-in. by 4-ft. pipe. A connection *A* was provided for exhausting into the open if desired. The receiver was connected to the discharge *B* of the pump, and in this connection, a check valve was set to prevent the return of the water to the air-end of the pump.



Pump Exhausting into Discharge Column

The air working in the pump cylinder nonexpansively left the cylinder at approximately 90 lb. It was thus able to force its way into the pump column provided this was not filled to a point to produce a head greater than 90 lb. Once mixed with the water, the air acted like an air lift, forming a mixture in the pump column much lighter than water, expanding in its upward course and assisting in raising the water. With the proportions of the air end, the water end and the lift here given, there could be no further possibility of the air not being able to exhaust against the pressure in the discharge column. The freezing difficulty was effectually overcome, but [illegible] would seem to be capable of more important development. A mine pump with cylinder ratios designed for a certain lift could have its possible lift thus increased, something often desirable where sinking pumps must be adapted for station work. Furthermore, a permanent installation could be designed with the ratio of the cylinder diameters so adjusted to the lift and quantity of water to be handled, that the air should be exhausted at the discharge end of the pump column at atmospheric pressure and be made to do all the work possible, thus utilizing all the potential energy in the compressed air.

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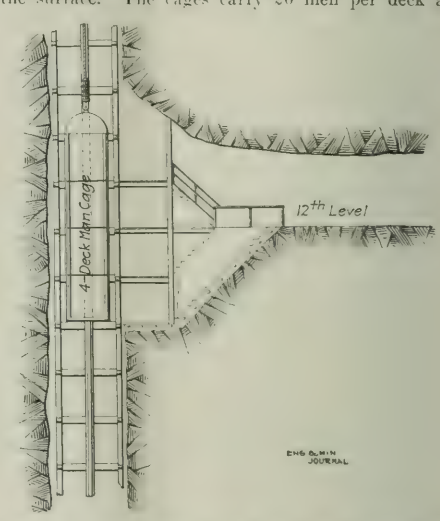
## Simultaneous Loading on Four-Deck Man Cage

The accompanying sketch from an article by R. C. Warriner ("Journ. South African Inst. of Eng.," April, 1913), illustrates the method used underground to load the men on the four-deck cages of the No. 5 shaft of the Crown Mines, Ltd. A similar arrangement is in use at the surface. The cages carry 20 men per deck and have doors of the rolling shutter pattern, which allow a full width opening, and facilitate loading and discharging the men. It takes 1¾ hr. to raise the shift of 3200 men with two cages run in balance by an electric hoist.



Underground Station for Four-Deck Man Cage

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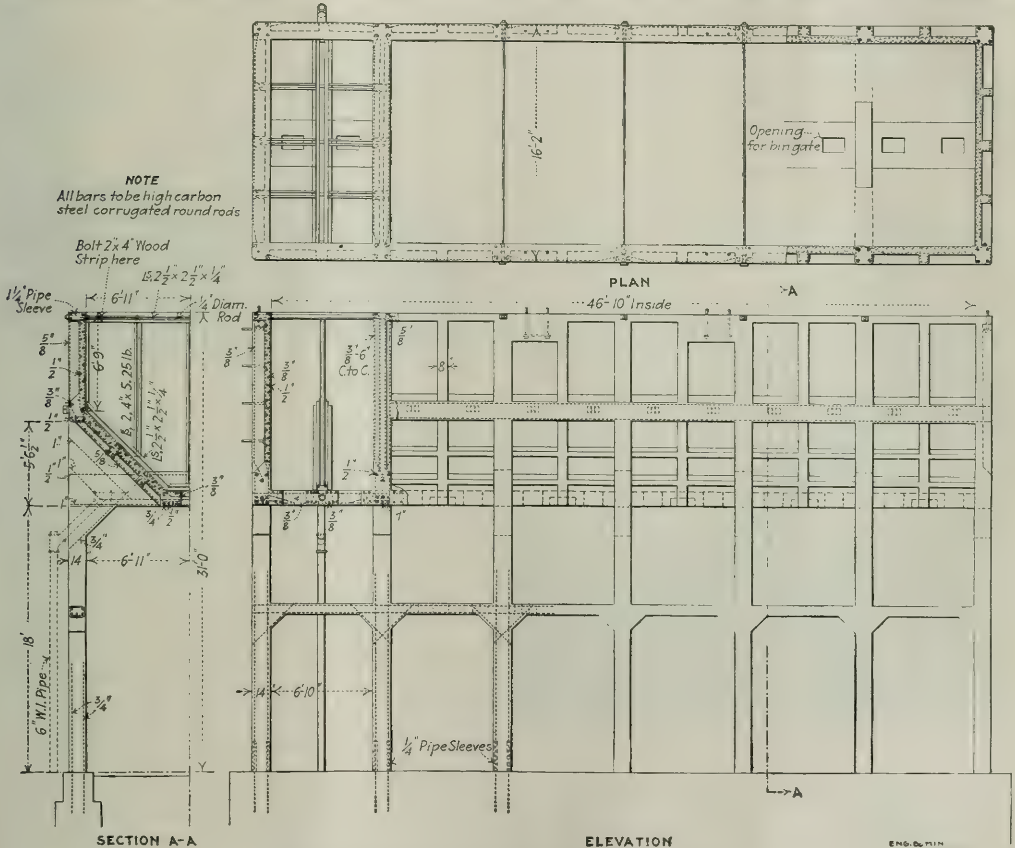
## Steel vs. Wood Guides

For two rectangular shafts sunk by the Brakpan mine on the Rand, Wood's slotted steel guides were installed. The considerations governing their selection as given by Charles B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture) are: (1) They provide a smoother running way for the skips; (2) they strengthen the whole shaft, due to the long length of steel which ties the timber set together; (3) accidents from broken guides are entirely prevented; (4) the expense of upkeep is less than when wood is used, and interruptions to hoisting are fewer. These guides are much more expensive than wooden guides, adding about $1.25 per ft. per guide to the sinking costs. They have not been found satisfactory in all cases, and clearly would not do if acid water were encountered. Apparently their advantages would increase with the depth of shaft, as they permit the highest possible hoisting speeds, and also with the life of the mine, as a long life would allow their high first cost to be returned.

⁂

## Reinforced-Concrete Tailings Bin

In the accompanying drawings are shown the details of the design of a reinforced-concrete bin for receiving tailings prior to loading them into railroad cars. Such a tailings bin is in use at the Leadwood mill of the St. Joseph Lead Co., while another has been erected at No. 3 mill of the Doe Run Lead Co., near Rivermines, Mo. At present the bins are used only when tailings are required for ballast on the railroad.



TAILINGS BIN BUILT OF REINFORCED CONCRETE

These bins were made out of a concrete mixture of one part portland cement, two parts sand, and four parts of coarse mill tailings approximately 9 mm. in size. These components were mixed with water to a thick batter. The reinforcement is "corrugated bar," a product made by the Corrugated Bar Co., of St. Louis, Mo. The accompanying drawings show the manner of putting in this reinforcement, which was arranged with interlocking hooks in a somewhat complicated manner, making it difficult to set in its proper position in the forms, and to hold it there while the concrete was being tamped. In all probability the arrangement of the reinforcement would be considerably simplified in case another bin were to be erected.

The bars were tied in position in the forms by No. 10, soft, annealed wire, and with the exception of the stirrup pieces, the different bars were wired together with No. 16 soft, annealed wire, where they intersected one another. All the bars larger than ⅜ in. were bent to shape at the factory, while the smaller reinforcement was bent to the proper shape as it was put in place. The vertical posts, as well as the crossbeams that reinforce the hopper bottom of the bin, were strengthened by wrapping the main rods with ¼-in. plain rodding as straps to tie the main rods together. This rodding is tied around only one of the bars in each loop of the spiral, but as in the next loop it is tied around the next main rod of that member, all the vertical rods are firmly bound in their proper positions according to a regular plan. The rods of the posts were spliced to the rods of the foundations by means of pipe sleeves, while the tie rods at the top of the bin also pass through pipe sleeves, placed in position when the concrete was being poured.

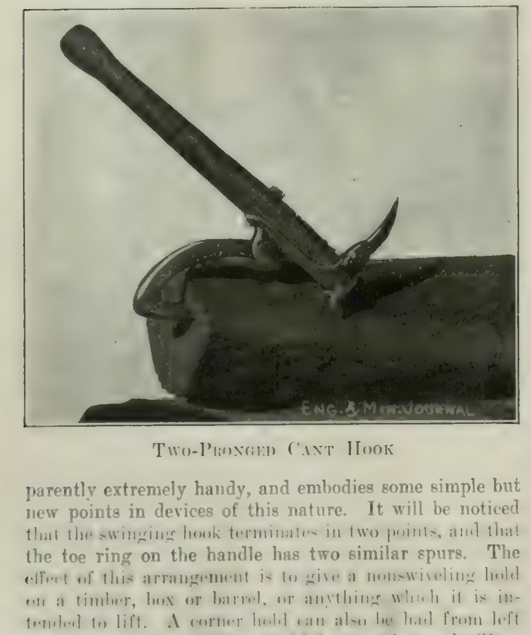
The bin is divided into two parts. One is for the coarse tailings such as are delivered by the dewatering wheels, while the other is for the fine sand that overflows from the tanks of the wheels. The fine tailings are pumped, while a belt conveyor is used to carry the coarse tailings to the bin. The compartment for the fine tailings is divided in half by a longitudinal partition near the bottom that carries a screen. This holds back all but the finest of the tailings, and the water drains off before the fine tailings are loaded into the railroad cars for their final disposal. The filtering diaphragm is built up of channels, angles and Z-bars. The bin is served by bottom-opening doors operated by a screw on the end of the axle of a wheel driven by a rope loop so that it can be whirled rapidly.

The bin was designed by H. R. Wahl under the supervision of O. M. Bilharz, the general manager of the Doe Run Lead Co., and is, I believe, the first bin designed for the disposal of coarse and fine tailings by means of railroad cars.

⁂

## Handy Timber and Box Hook

The accompanying illustration shows a timber hook, especially intended for use around plants for treating railroad ties (U. S. pat. No. 1,065,468). The tool is apparently extremely handy, and embodies some simple but new points in devices of this nature. It will be noticed that the swinging hook terminates in two points, and that the toe ring on the handle has two similar spurs. The effect of this arrangement is to give a nonswiveling hold on a timber, box or barrel, or anything which it is intended to lift. A corner hold can also be had from left or right, and an end-lifting hold for carrying and piling. On the handle, at a point opposite the spurs, is situated a log hook for use on poles. The special applications of the tool will be in handling short timbers around the framing shed, in timber-preserving plants, at the [illegible] collar or shaft stations underground, and also for handling heavy boxes of castings, hardware, etc. The tool illustrated is 48 in. long, a size adopted for standard ties; two larger sizes are contemplated for use on mine timber and on carriages in sawmills. The device is for sale by the Eureka Tie & Timber Hook Co., Helena, Montana.



Two-Pronged Cant Hook

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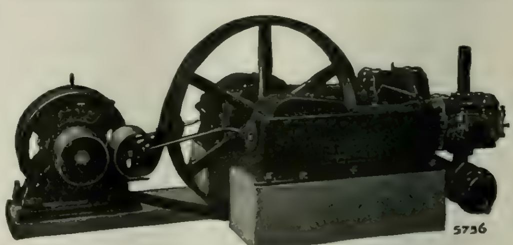
## Short Belt Drive for Compressor

It may happen in installing a belt-driven compressor that limited floor space prevents the use of a sufficiently long belt, if ordinary drive is used. An ordinary belt drive on short centers gives too small an arc of contact between the belt and the pulleys to provide sufficient grip and driving power. The trouble is only aggravated by increasing the belt tension, since this increases the friction losses and crossing a belt causes friction, wear and uneven stretching.

The device illustrated is designed to permit the use of an extremely loose belt on short centers and thus increase the arc of contact without permitting slippage. The lower side of the belt is made the tension side and the floating idler is swung from the compressor frame itself by means of two arms. If the load increases, the tension in the tight side of the belt increases, the length of the slack side increases, the idler drops somewhat, and automatically extends the contact arch to take care of the greater power demands. The device is put on the market by the Ingersoll-Rand Co., and is said to combine economy, simplicity and reliability.



Air Compressor Rigged for Short Belt

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## Slip Joint Siphons

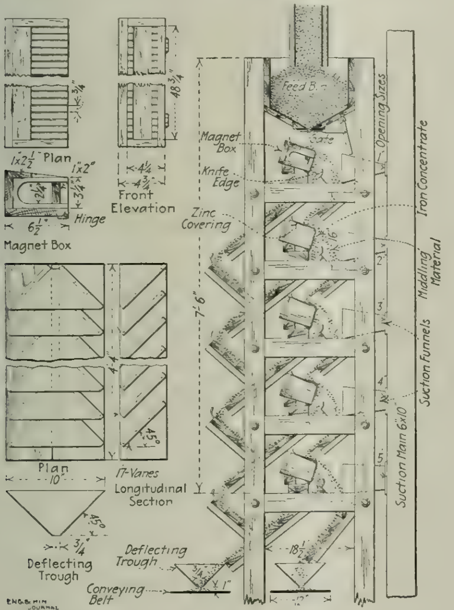
In taking the water systems of the Seward Peninsula across gulches, siphons are frequently employed, as in other regions. Riveted steel and wood-stave pipes have been used, but in most of the siphons slip-joints are made (Water Supply Paper, No. 314, U. S. Geol. Surv.). In making such joints, the pipe, the end of which is of larger diameter is heated by placing burlap dipped in kerosene around it, and igniting. The pipes are driven together by means of a heavy ram directed against a driving plate covering the opposite end of the pipe. The ram is handled by two men, or if the pipe is large is swung from a tripod. The joints are driven to give a lap of 4 to 6 in., depending on the size of the pipe. The method is cheaper and more rapid than riveting, although a certain amount of pipe length is wasted. In long lines, expansion and contraction due to changes in temperature, may cause heating and break some of the joints. This difficulty can be minimized by keeping the pipes full of water and protected with sod or earth. In cases where two sections pull apart, a lead joint is necessary in repairing.

# DETAILS OF METALLURGICAL PRACTICE

## Home-Made Magnetic Concentrator

By L. O. Kellogg

In an article published in the Journal of Aug. 9, 1913, mention was made of a magnetic concentrator installed at the property of the Mount Summit Ore Corporation and a brief description of the device was given. I present it here in more detail. The ore flows vertically from the bottom of a bin into a box extending over the top of the concentrator unit. The box is lined with sheet iron and its bottom has sloping sides. The edge formed in the center of the bottom is cut back to give a flat surface 5 in. wide, and a ⅛-in. iron plate with a ½-in. slot along the center is fastened to it. Another plate sliding across the bottom of this from the side, and actuated by a lever, acts as a gate. The dry ore, crushed to ⅛ in., falling in a stream through this slot, hits the top of the first box of magnets and slides over the edge, as shown. This box of magnets is shown in detail. The magnets are of the type used in small magneto machines. They are set together, 61 in a box, in the manner illustrated, and are covered with sheet zinc on the top and bottom.



Iron Concentrator, Using Fixed Permanent Magnets

The falling ore, slipping over the edge of the box, is given a certain amount of outward motion. Some of the magnetic particles are held in toward the magnets, fall on the left side of the knife edge, and slide down the inclined shelf. The knife edge and the shelf cover are of zinc sheet. The falling concentrate is caught on another shelf sloping in the reverse direction and brought to a third shelf which is carrying the concentrate from the second magnet box, and so on down.

The discard from the first box, falling to the right of the knife edge, lands on a zinc-covered shelf sloping to the left, and is conveyed to the top of the second box of magnets, where operations are repeated. Thus the ore is subjected to the influence of the magnet five times, it being desired to take out a small portion of clean concentrate each time. The final combined concentrated product of the five boxes slides down the last shelf to a galvanized-iron V-shaped trough which is placed 1 in. above a conveyor belt. The trough is also illustrated in detail.

It contains 17 deflecting vanes, which turn the direction of flow of the sliding ore at right angles and discharge it on the center of the belt through a ¾-in. slot. The vanes are so placed that the top of each overlaps the bottom of the preceding one. The tendency of the concentrate to overload one side of the belt or to spill, is overcome by this device.

Behind each box is a rectangular funnel of galvanized iron connected to a vertical suction pipe. Its function is to catch the dust and draw it out of the falling stream. The size of the opening of this funnel increases from 1x8 in. for the top box to 5x8 in. for the bottom box, in order to compensate for a loss of suction in the lower boxes.

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## Settling Slime with Glue

The rapid settling of fine slimy material resulting from crushing ores has presented obstacles which have been encountered by most metallurgists, but whose overcoming has never been remarkably successful. It is claimed that the fine material which thus escapes in crushing and concentrating plants carries a large part of the value of the ore with it, and is opposed to successful recovering of the contained mineral.

A. G. French, of British Columbia, under U. S. Patent No. 1,065,678, proposes a method for rapidly settling all this material. The method consists simply in adding gelatin or glue to the pulp at the points where the material is delivered into settling tanks or tailing-recovery tanks, a very weak solution of gelatin or common glue, in the proportion of about one part of ordinary glue in 250 parts of water being used. One part of sulphate of zinc, iron, copper, or any other metallic sulphate is to be added where sulphates do not already exist in the ore.

The principle of the treatment lies in the fact that each particle becomes coated with an exceedingly thin film of a colloid substance consisting of an insoluble combination of the metallic salt and the gelatin.

The particles so coated lose their affinity for water and sink rapidly to the bottom of the containing vessel. It is said that the time required to effect complete settlement in a tank containing six tons of effluent will not exceed five minutes.

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## Laboratory Sintering Apparatus

An appliance suitable for conducting sintering experiments in the laboratory is described by H. B. Pulsifier, in the *Chemical Engineer,* April, 1913. It comprises a small cast-iron roasting pot or pan, a fan and a motor to drive it, connected as shown in Fig. 1. A suction gage is connected to the pan bottom and shows the amount of suction in inches of water. The drawings in Fig. 2 show the pan-construction details and Fig. 3 the construction of the exhaust fan.

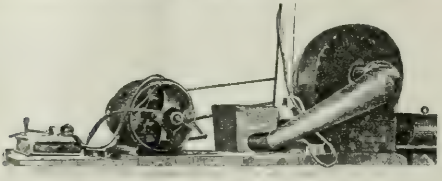

FIG. 1. ARRANGEMENT OF SINTERING APPARATUS

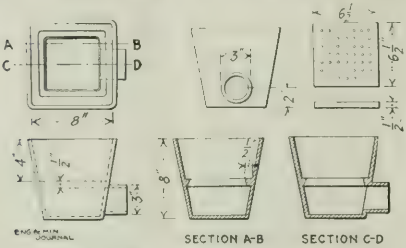

FIG. 2. DETAILS OF SINTERING PAN

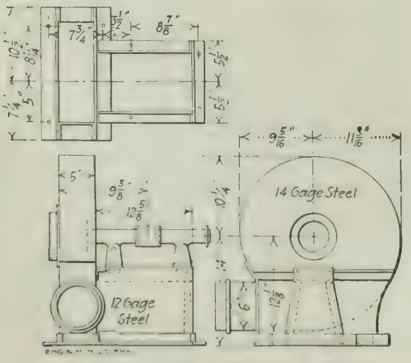

FIG. 3. DETAILS OF EXHAUST FAN

In sintering a good deal depends upon the proportions of the mixture, such items as fuel, moisture, etc., requiring close attention, but most important of all is the manner of placing the prepared charge in the sintering pot. It is essential that it shall have been thoroughly mixed and reasonably homogeneous, and laid in an evenly porous bed of the same thickness at all points. Ignition may be by excelsior broken and spread over the surface of the charge, or in the same way by using sawdust, igniting in each case with a match. An oil burner which will spread the flame over the surface of the charge is better than either excelsior or sawdust.

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## New Merrill Method of Precipitation

A new idea in the precipitation of gold and silver from cyanide solutions has been devised by Charles W. Merrill, of Berkeley, Calif., for which he has been granted U. S. Patents Nos. 1,063,568-69-70. The idea has occurred to Mr. Merrill that both zinc shavings and zinc dust are accompanied by disadvantages and expenses inseparable from their manufacture and transportation which it would be desirable to overcome. The ideal striven for is to manufacture and use the precipitant in the quantity required and at the same time. This result has not been heretofore accomplished, but the system proposed by Mr. Merrill seems feasible. The process covered in the patents above mentioned makes use of a small tube mill through which the pregnant solution is drawn without previously having received any precipitant, but which is made and furnished inside the mill itself. The precipitant is to be furnished by using pebbles, or balls, inside the tube mill, made of zinc or an alloy of zinc and some other metal which will precipitate the precious metals from cyanide solutions. The lining of the tube mill may be made of the same zinc or alloy or may be of an abrasive material, such as carborundum.

Metallic zinc, in a pure state, or when alloyed with small quantities of lead, is so malleable that it will not readily grind in such a device as this tube mill, and for this reason the pebbles, or balls, which furnish the precipitant, are to be made of zinc alloyed with some material or metal which will make the combination extremely brittle and easy to grind. In practice such an alloy may be composed of zinc, lead, magnesium, aluminum or some similar combination of metals. In order to make this material more easily ground, abrasives, such as carborundum, quartz or other form of silica, may be mixed in with the metal alloy at the time it is being made.

The solution, after passing through this grinding apparatus and receiving its charge of precipitant, is pumped to a filter press which removes both the precipitant and the precipitate, and, if necessary, precipitation is continued by the more or less pregnant solution passing through the unused precipitant retained in the press. The whole arrangement is simple and it is probable that the method may hold some advantages.

⁂

**Sieves and Sieve Cloth** will be tested by the U. S. Bureau of Standards, Washington, D. C., according to information appearing in Circular No. 39 of the Bureau. The fees for this work are graded as follows.

| | |
|---|---|
| (a) Test and certification of any sieve conforming to the specifications of the Bureau of Standards.... | $2.00 |
| (b) Test and report on any sieve which is rejected for mesh outside the tolerances.... . . ......... | 1.00 |
| (c) Test and report on any sieve which passes specifications as to mesh, but is rejected for average diameter of wires.. ........................ | 2.00 |
| (d) Test and report on any sieve not conforming to other parts of the specifications or purchased on any other specifications .................... | 2.00 |
| (e) Test and report on the mesh of warp wires of a piece of sieve cloth, per lin ft.................. | 0.60 |
| (f) Test and report on the mesh of shoot wires of a piece of sieve cloth, per lin.ft .................. | 0.60 |
| (g) Determination of the average diameter of a number of wires in each direction in a piece of sieve cloth .......................... | 1.00 |
| (h) A discount of 10% on the fees above under (a) to (d), inclusive, will be allowed when sieves are submitted in lots of five or more at a time. | |

# THE ASSAYER AND CHEMIST

## Bone Ash vs. Cement Cupels

By Donald M. Liddell*

The wish to be rid of the bone-ash cupel is present with every assayer. Bone ash is comparatively expensive, a good quality is not always to be obtained in out-of-the-way places, when corrected assays are to be run the bone ash is difficult and costly to flux, and the bone-ash cupel is constantly shedding dust over its surroundings. Hence the constant procession of Moseses who will lead us out of the bone-ash wilderness by the cement route. For cement is inexpensive, found in every uptodate plant, more easily fluxed than bone ash, and is more coherent.

Elaborate experiments were run by Holt and Christensen (Eng. and Min. Journ., Sept. 17, 1910) who decided that the loss in cupelation with cement cupels differed only immaterially from that with bone ash, and by Benner and Hartmann (*Journ. Ind. and Eng. Chem.*, November, 1911) who got over 1% higher loss in cement than in bone ash. However, as I have before pointed out ("The Mineral Industry," Vol. XX, p. 891) their results showed excessive losses even on bone-ash cupels, and it is doubtful whether their results were obtained under commercial conditions.

From recent personal correspondence it appears that other assayers are going over the same ground, and I wish to point out what I briefly hinted at in a short Journal contribution in 1910, which has been confirmed by later experiment, that to weigh fine silver out, run an assay on it, and weigh up the silver recovered is not enough.

If the purity of the recovered lead be tested the assayer may find that all that glitters is not silver. In my own experience I have found my apparent losses on cement cupels less than on bone ash, but that the actual silver recovery was practically identical, that is, the cement-cupel buttons carried more impurity (lead and bismuth) than did the bone-ash cupel buttons. When corrections were run, the entire amount of silver recovered was found to exceed 100% of the silver taken plus the test-lead correction. This is a serious matter, particularly when corrected assays are run, as is done in much copper-refinery work.

It would then appear, although like all work based on one man's experience, these conclusions may be subject to vital correction from other Journal readers, that anyone experimenting with cement cupels would do well to test the purity of his assay beads from time to time, and to run correction assays occasionally.

It would also appear that the line of least resistance would be to experiment with mixtures of cement and bone ash (as did Bannister and Stanley, Eng. and Min. Journ., Dec. 11, 1909) or perhaps cement with magnesite, or with magnesite and bone ash. On this point it is hoped that some results will be communicated to this department.

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*Associate editor, "Engineering and Mining Journal."

## Strontium Compounds in Blende

Attention is drawn to the presence of strontium compounds (from 0.05 to 0.8% SrO) in certain blendes, by E. Beyne ("Bull. Soc. Chim. Belg.," p. 159, 1913), and it is pointed out that this, if not taken into consideration, may lead to injustice in cases where contracts for roasted blendes are based on the difference between the total sulphur and the so called fixed sulphur (i.e., sulphur combined with lead, calcium, magnesium, and barium).

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## Assay of Tin Ores

Some experiments on the assay of tin ores were made by J. Caspell and J. J. Beringer, and reported in the Proceedings of the Mining, Mechanical and Metallurgical Society of Cornwall and Devon. About two grams of finely powdered tin ore were mixed with a little zinc oxide in powder and placed in a crucible, in the bottom of which was a piece of pure zinc. The crucible cover being put on, the whole was placed in a furnace heated to 1000° C. for ten minutes. The evaporation of the zinc reduces the tin oxide, leaving metallic tin.

The whole of the contents of the crucible, after allowing a minute to cool, were then put into a flask with 50 c.c. of HCl, the whole being brought to boil over a bunsen flame, and allowed to boil gently for five minutes. This transforms the tin into stannous chloride. A small nickel coil is then stirred in the boiling solution to insure that no portion of the test remains as stannic chloride. Great care has to be taken to prevent the admission of air to the flask during the period of cooling, for which reason it is attached by a rubber tube to a reservoir of carbonic-acid gas.

The final determination is by iodine titration, previously poured in the main solution. One cubic centimeter iodine solution equals 0.00503 grams tin.

Subsequent inquiries showed that certain ores required various preliminary processes—thus, mispickel ores should be previously roasted, while ores containing copper pyrite should be previously treated by acid, as should also wolfram ores.

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## Rapid Antimony Determinations

For the determination of antimony in antimony glance, according to H. Nissenson, 1 gram is dissolved in concentrated hydrochloric acid, the hydrogen sulphide is expelled, and, after diluting, the boiling solution is titrated with N/10 potassium bromate, indigo being added shortly before the end of the titration (*Zeit. anorg. Chem.*, p. 46, 1913), a determination is complete in about an hour and a half. The indigo solution is prepared by treating 1 gram of finely ground indigo with 6 c.c. of cold concentrated sulphuric acid, and, after two to three days, adding 100 c.c. of water and pouring off the clear solution. The electrolytic method is rapidly carried out by dissolving 0.5 gram of substance in caustic soda, adding 80 c.c. of a cold saturated solution of sodium sulphide, heating to boiling, filtering into a tared platinum dish, and electrolyzing with a current $ND_{100}$=1.5 amp. Under these conditions, the deposition requires about 75 min., and 1% must be deducted from the weight found (compare Foerster and Wolf, *Jour. Soc. Chem. Ind.*, p. 644, 1907).

With oxide ores and slags, in absence of arsenic, 1 gram is heated for about 10 min. with 6 grams of sodium peroxide, the mass is extracted with water, and the solution acidified with hydrochloric acid and evaporated to dryness; silica is filtered off, the filtrate saturated with hydrogen sulphide, the precipitated antimony sulphide dissolved in concentrated hydrochloric acid, and the boiling solution titrated with potassium bromate. In presence of arsenic, the sulphide precipitate is boiled for a long time with water and, after filtering, the solution containing the arsenic is acidified with hydrochloric acid and titrated boiling with potassium bromate, the antimony sulphide being dissolved in hydrochloric acid and similarly titrated. Decomposition with sodium peroxide may also be effected in the presence of arsenic by dissolving the melt in concentrated hydrochloric acid and precipitating the arsenic with hydrogen sulphide; the mixture is filtered through asbestos, the residue washed with hydrochloric acid, dissolved by boiling with water, the solution acidified with hydrochloric acid, boiled, and titrated with bromate. Antimony is precipitated as sulphide from the diluted filtrate, and the precipitate dissolved in hydrochloric acid and titrated as before.

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## Law of Volatility in Chemical Reactions

In a recent issue of *Comptes rendus*, p. 1536, 1913, C. Matignon generalizes Berthollet's "law of volatility" in the following form. "Every system of liquid or solid bodies, which is capable of giving rise to a system containing volatile substances, will undergo reaction in that sense at a convenient temperature." The reaction $2\,Al + 3\,MgO = 3\,Mg + Al_2O_3$ is possible because magnesium is quite volatile at comparatively low temperatures. In the same way it is probable that baryta will be reduced by silicon, owing to the relative volatility of the barium produced. The law can also be extended as follows: A reaction which has volatile bodies in its initial stage and also in its final stage, is facilitated when the number of volatile molecules in the final stage is greater than that in the initial one, i.e., of two reactions which are equally endothermic, the one complying with this condition will proceed at a lower temperature.

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## Determination of Asphalt in Oils

The proportion of asphalt contained in asphaltic oils of California, Texas and Oklahoma varies within wide limits. This is largely due to great variations in the asphaltic oils themselves, but there are also deplorable differences in the method of determining the asphalt in crude petroleum. Asphalt in an oil may be determined in either of three ways: First, by Holde's method, which consists of distilling off the light oils which may exist in the crude oil and then shaking the residue with 40 times its volume of gasoline, boiling between 65° C. and 95° C., and as free as possible from unsaturated hydrocarbons; it is then allowed to stand for 24 hr. and is filtered. By this means the solid asphalt in the oil is obtained upon the filter, together with the clay and other mineral impurities contained in the oil. The asphalt is dissolved by washing with benzol. The benzol is evaporated in a weighed porcelain dish and the weight of the asphalt obtained. There is usually considerable liquid asphalt present in the oil which is not separated by this means, therefore another method is often employed, which gives the total asphalt, hard and soft. This is called the ether-alcohol method. It is well described by Dr. Albert Sommer as follows: "Ether-alcohol precipitates not only asphaltenes, but also the softer components of asphalt, and is, therefore, used especially to determine the total amount of asphaltic matter in crude oils, etc. This method can also be well adapted for the determination in fluxes and harder bitumen. The procedure is as follows: 2 grams of the asphalt are weighed into a 100cc. graduated cylinder with a well-fitting glass stopper and 40 c.c. of a mixture of alcohol-ether consisting of four parts alcohol and three parts ether, poured into the same cylinder, which should then be attached to a shaking device and shaken well for about 20 minutes. After this time it should be left to stand overnight, and should be filtered in the same manner as described with petroleum ether, only the same mixture of alcohol-ether should be used until all the soluble parts are removed from the precipitate. Benzol is then used in the same manner as above described, and the weighing and calculation made in the same manner as with the asphaltenes. In the case of oils which are rich in paraffin this method sometimes precipitates part of the latter also, therefore the precipitate of such oils is repeatedly extracted with hot alcohol."

The third method of determination of asphalt is by evaporation, also described by Dr. Sommer, as follows: "A certain quantity of asphalt is evaporated in a dish of certain dimensions at a certain temperature. The loss is taken and the consistency of the residuum determined by the usual methods, such as penetration, *i.e.*, the number of tenths of millimeters which a needle weighted with 100 grams penetrates into the asphalt at 25° C. Ten millimeters of '100 penetration' is usually the chosen standard and the percentage of remainder of that consistency is usually called the asphaltic contents."

The oils of the Coalinga district in California have been analyzed by I. C. Allen, now petroleum chemist of the Bureau of Mines, in "Bulletin" No. 398, U. S. Geological Survey. Samples were studied from 83 wells. The method of determining the asphalt is different from that used by either Holde or Sommer. The crude oil was distilled to 250° C. at atmospheric pressure and the distillation was then continued under a vacuum of about 40 in. of mercury "to a temperature to 330 to 350° C.," that is, until practically all liquid is over and only a hard brittle mass of asphaltum remains when cooled.

By this means Coalinga oils were found to vary in asphalt contents from a minimum of 1.89% to 57.42%. The average for this series is 26.5%. These methods of analysis were published in a pamphlet on the "Production of Asphalt, Related Bitumens and Bituminous Rock," by David C. Day, issued by the U. S. Geological Survey.

# Notes On Lake Superior Copper Mines

SPECIAL CORRESPONDENCE

*SYNOPSIS—A résumé of recent developments at some of the Lake Superior copper mines immediately prior to the strike.*

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Until the general strike of the miners of the copper country was declared, July 23, the Superior copper mine had been making a record for efficiency and for earnings that had come pretty well up to the expectations of the management. Underground operations had been confined to drifting and stoping, with the result that the property was reaping the reward for the extended openings which had been made in a period covering two years when developments underground were carried on at a scale which did not show much actual copper output, but which meant a great deal in assurance for the future.

THE CALUMET & HECLA PLANT FROM THE WEST

Immediately prior to June 23 there had been no sinking under way at the property, and all efforts had been directed toward getting out rock. The maintenance of rock shipments to the Points Mills plant continued up to expectations, and the copper content showed itself equal to the best coming from any of the amygdaloid mines of this section, possibly excepting the Champion and the Ahmeek.

There had been no new developments at the Indiana mine, and the work at the bottom of the shaft had not located the rich No. 2 lode, which was originally opened by the drill cores. At the 600-ft. and at 1150-ft. levels, the showing of copper was good in every respect, and more and more copper ground continued to be opened with each blast. Plans had been made for further shipments of the mass copper taken out at these two places.

Allouez has been in position to increase its output and to maintain the same high grade of rock that had been characterizing its shipments up to the time of the strike. This property had been making substantial earnings, and was in position to announce its first dividend in the near future.

### HANCOCK NEARLY READY TO PRODUCE

The Hancock was about to become a substantial shipper and producer of copper ore. It had been hoisting an average of 150 tons daily. Shipments to the Points Mills plant had, however, been made intermittently after 50 cars accumulated on the siding. This arrangement was necessary by reason of the fact that the rock had been milled at the customs rate, and there had to be a clean-up before and after each lot of Hancock rock was treated.

While no figures are obtainable from the management as to the quality of this rock, and while the shipments have not been considered in the nature of a test of the general run of the mining, it has been stated that the rock has been running better than 20 lb. mineral per ton. This rock has been coming from various openings, and has been taken out in the extension of drifts, preparatory to larger and more regular shipments. As a matter of fact, the Hancock could have pushed its shipments up substantially had not the impending labor trouble already foreshadowed some embarrassment. The mine had plenty of miners, but was short of rock pickers, sorters, trammers and common laborers. Up to this time it had not been troubled by scarcity of labor, because of the fact that it is situated in the city of Hancock. The mine had 80 shipping points underground, and it would have been an easy matter to maintain daily rock shipments of close to 1000 tons. It is interesting in this connection to note that the lower level openings on the Pewabic lode are showing many of the characteristics of the Pewabic formation on the Quincy. The main lode now is paralleled by quite a number of smaller lodes not far from the main lode, which are narrow but rich in mass copper, and with plenty of average stamp rock.

### HANCOCK AND QUINCY NOT TO CONSOLIDATE

In some of the openings, two and even three of these branch lodes run along with the main formation. In the lower openings of the Quincy this condition is becoming more and more pronounced and a more important factor in developments. In fact the branch lodes are now looked upon as fully as important as the main lode. At different times since the organization of the Hancock Consolidated and the commencement of operations, there have been stories to the effect that the Hancock and the Quincy properties eventually would be consolidated into one corporation and managed as one company. That the move would admit of opportunity for economies in operation goes without saying. At the same time all the stories that have been in circulation at different times in the past have proved without foundation. Recently there has been a revival of the rumor. President John D. Cuddihy, of the Hancock Consolidated, when asked regarding this statement, said that there was no truth to the story.

### GRAND PORTAGE LODE AT ISLE ROYALE

The development of the Grand Portage lode at the Isle Royale property continued to be encouraging. This formation first was tapped by long laterals from No. 2 shaft. The character of the ground, from the first, was good and as it was developed it improved. For several months the Grand Portage formation had been regularly furnishing the Isle Royale with a good quantity of stamp rock. In the early days of the old Huron mine this lode was one of the most prolific sources of rich-rock supply. It was, at all times, an eccentric formation; narrow patches of rich ground would alternate with wide stretches of poor rock. Strange though it may seem, in all the later-day openings, the showings have been quite a little above the average of the earlier showings and the grade of rock has been better than the average of the Isle Royale lode.

What was of greater importance was the fact that the explorations had been so extended that the management was considering plans for more extended and more economical mining of this lode. Either the old No. 1 shaft was to have been cleaned and concreted and put into good condition again, or a new shaft sunk. One plan appeared about as economical as the other. No. 1 shaft had been out of commission for many years, ever since it was wrecked by fire. It is, however, well located and could be rehabilitated at a cost which might make it more economical than to start a new shaft in this vicinity. A new shaft would permit extensive openings on the Grand Portage formation.

### OPENINGS ON THE PEWABIC LODE

The Quincy was installing a new hoist at the Mesnard or No. [illegible] shaft, preparatory to raising a greater part of its production through this shaft. At the lower openings of the Mesnard shaft the physical characteristics of the Pewabic lode are unusual. The lode, instead of being wide and broken, is split into two or three and in some places four different veins, each with distinct foot and hanging walls. These little veins average 4 or 5 ft. in width, but are rich in copper. A different system of mining must necessarily be applied here successfully to obtain results, because it is necessary practically to break down the vein rock and the vein rock only.

Franklin had been conducting exploratory operations to open the Allouez conglomerate at a depth of 3200 ft. A crosscut from the Pewabic lode was being driven 500 ft. to intercept the Allouez. This formation formerly was operated to good advantage on the Franklin property, but at a depth of 2300 ft. it petered out and became so thin and lean that it was considered worthless. Now it is believed that the exploration effort would be worth while at this greater depth.

### EVERGREEN A RICH PRODUCER OF MASS COPPER

The Evergreen lode always has been notable for the large amount of mass copper it contains. The Evergreen had lately been turning out more mass copper than ever before, in fact running close to one-third of the total output of the Mass Consolidated company. At the Mohawk the management was bending all energy toward higher underground efficiency in the selection of rock and in the choice of locations for further breaking down of rock. The openings tributary to No. 6 shaft, while not on a par with those of the North Ahmeek, were, nevertheless, showing a grade of rock which is decidedly better than the average of the Mohawk shafts. The construction of the new shaft rockhouse at No. 6 was nearing completion, including all of the machinery installation.

While some Allouez shareholders may have suspected that it was taking a good while to get the property into shape for dividend disbursements, it must be remembered there are one or two features of underground development work as practiced at the Allouez that are likely to have quite an influence on the future of the property which may not now be appreciated. For instance, instead of cutting down stopes right near the shafts, all laterals are driven to the shaft limits and stopes are cut down at the extreme outside drift limits first. This saves time and labor, but it effects a more important saving by the fact that comparatively little timber is needed, as stopes can be abandoned when cleaned out and no heavy pillars of rich rock need be kept standing, nor is extensive timbering necessary. To cut out a mine in this fashion requires, however, much preliminary work.

The stockpile at La Salle had been treated and underground rock was to be sent to the mill. The best stope ever opened in No. 1 shaft is at the twelfth level, where a fairly good grade of commercial rock of the Kearsarge lode has been exposed. There was every reason for the belief that the rock would show better results than those obtained the last time the La Salle shipped mill rock down. At that time the refined copper return was under 14 lb., which included all mass and barrel material.

South Lake had cut the station at the bottom of the shaft depth 500 ft. Opening the Evergreen lode at a depth of 300 ft. was in progress, the formation having been cut in the crosscut. This formation contains good copper at this point. The lode is fully 10 ft. wide and well impregnated with shot copper that looked unusually rich when opened by the shaft on the way down. Some enthusiasts believed that this property was going to repeat the record of Ahmeek and meet expenses from the time the first shipments were made to the Franklin stamp mill. This opinion was not shared by the management, the statement having been given out that the shipment was simply for the purpose of making a test of the vein. These notes, while fragmentary to a degree, are indicative of some of the most interesting work that was going on in the copper country at the time all the mines were closed down by the strike.

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## The Rand Strike

JOHANNESBURG CORRESPONDENCE

The only topic is the strike. In my last letter (cf. ENG. AND MIN. JOURN., July 26, 1913), I explained how the trouble at the New Kleinfontein mine arose. For over a week the company made no effort to work its mine and on June 6 yielded on all important points and offered to reinstate all strikers if they returned to work by June 11. By this time, however, outside agitators had induced the men to demand what was practically an eight-hour "bank-to-bank" working day and they refused to return.

The company then fenced the mine, introduced free labor and started the mill. The strikers became frightened and asked to be allowed to return, but the company refused to discharge the 30 free laborers engaged, although promising to give any strikers the first vacancies or to find them work on neighboring mines. The strikers foolishly refused this offer.

The company rapidly increased its labor force and the strikers determined to spread the strike if possible; on June 19 and 20, they induced the miners of the Van Ryn Estates and the Modderfontein mines to strike in sympathy against the wishes of the majority of the men. These strikers soon became dissatisfied and threatened to go back to work if a general strike was not immediately proclaimed. The local strike leaders saw that their only chance lay in disobeying the instructions of the labor leaders in Johannesburg, who wished to call a proper ballot according to the rules of the unions, because it was well known that any ballot fairly taken would show an enormous majority against any strike. Therefore, on June 30 they gathered a crowd of several hundred strikers and marched through all the East Rand mines, "pulling out" the men by threats and shows of violence. All of this was utterly illegal and though there were enough mounted police available to have dispersed the parade, the strikers were allowed to do practically what they wished and to create an artificial strike.

The engine drivers, who are properly organized, and who have a favorable agreement with the Chamber of Mines, guaranteeing them extra-high wages, were betrayed by their officials and by a few socialistic members and were forced out in most cases also. On June 20, a proclamation was posted in Benoni, forbidding all meetings; yet the authorities on June 29 allowed a large meeting to be held in Benoni, to which miners had been invited to "come armed." Acts of violence against free laborers occurred and the police were unable to protect persons and property. All the imperial forces in South Africa were being hurried to the Rand and special constables were sworn in.

On July 4, practically all the men except staff and reduction workers had ceased work; 80% of them unwillingly, and the trade unionists of most trades were also on strike. All work except pumping and bailing on the mines was stopped and the railway men were being urged to make the strike a general one. All the men on the big power stations, even the Vereeniging, 90 miles away, had also struck. The miners and strikers declared they would hold a demonstration on Market Square and the government forbade it and lined the square with troops and police. A riot followed with some loss of life and a mob in the evening burned a portion of Park State Railway station and of the Star newspaper office and broke into shops, so that the military had again to fire on the mob.

The next day further rioting occurred in an attack on the Rand Club, and, at Benoni, shops and houses were burned. On the same day, the strike leaders were summoned to meet the government at Pretoria, and an agreement was entered into by which the men's leaders agreed to call the strike off, the Kleinfontein strikers being allowed to return on the terms offered June 6; the free laborers were to be found work by the government and the miners were to have the right to lay any other grievances before the government. A certain section of the strikers who had been led to believe that they would gain many other benefits is dissatisfied and accuse their leaders of selling them out. The great bulk of the men have, however, returned to work. Twenty-one persons have already died and there are a number of seriously wounded. Great unrest was caused among the natives of some of the mines in the Central Rand. These natives announced a strike for higher wages and had to be overawed by police and military. There are some 7000 soldiers and police on the Rand.

Of the results of the strike it is somewhat early to speak. The labor forces have gained enormously in solidarity. Their unions have gained recognition from the government and many nonunion workers seem to be joining the unions. They have so far gained no material benefits but are in a better position to gain them later on. The most ominous feature for the future is that they gained their ends by violence and they will be quick to adopt violent measures in future. The mining industry has received a severe setback. Confidence has been destroyed, many small investors ruined and the flow of capital so urgently required to open up new areas has been checked; the fear of future disputes over further demands of the men will hang as a pall over the share market and the business world for a long time.

The capitalists whom the strike was designed to hurt made a few millions on the stock exchange, but will find great difficulty in making further schemes attractive enough to interest European investors.

To those who believe there is too much gold coin in the world, the howl of apprehension that went up from the European financial centers when there appeared a possibility of the supply of gold from the Rand being cut off for a month or two should be instructive.

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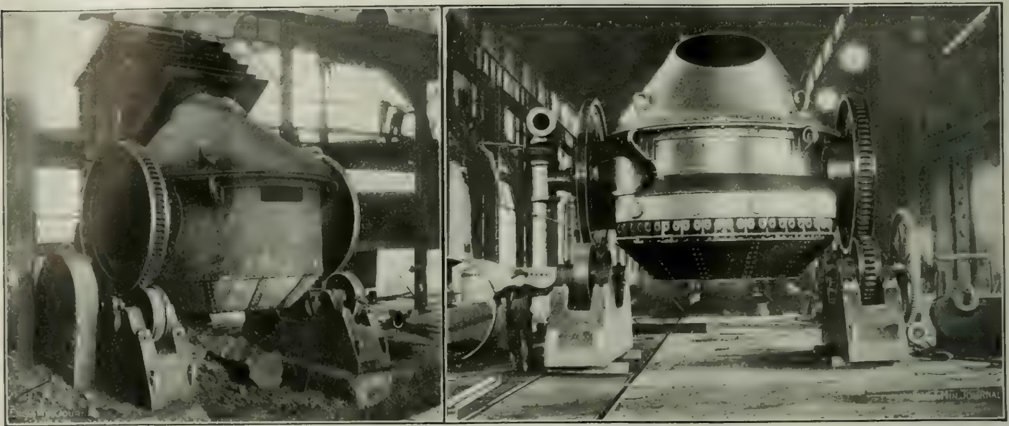
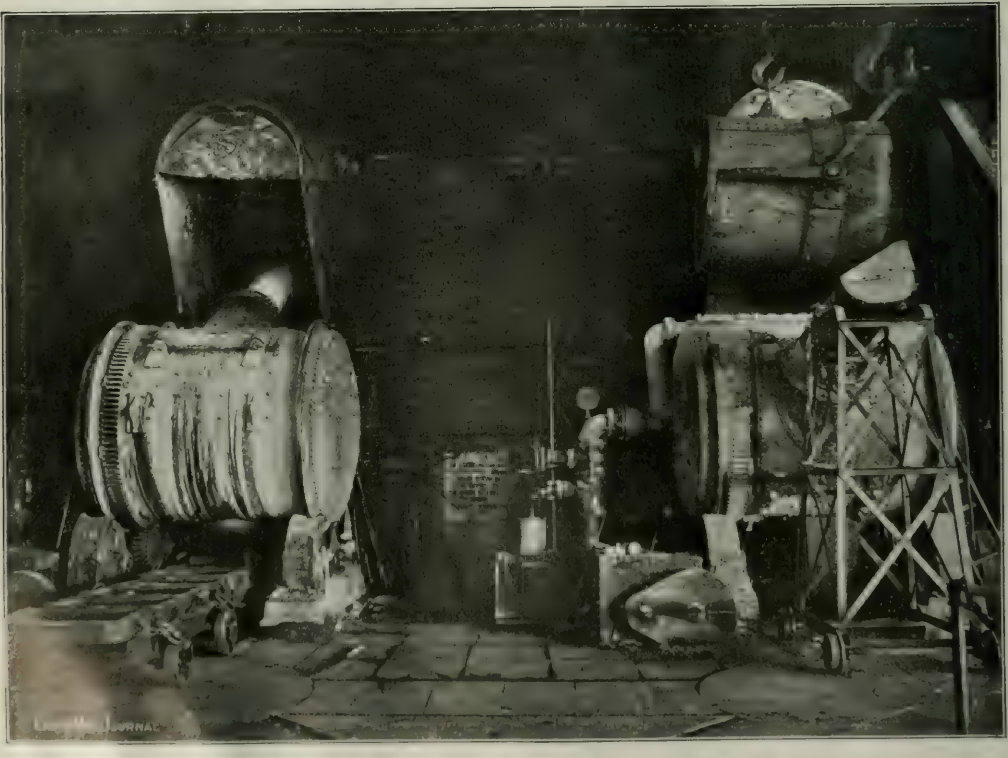
**The Field of the Electric Steel Furnace is rapidly increasing,** says W. Eilender, since apart from its use in the ferro-alloy industry, the electric furnace will soon not only have conquered the whole field of quality steels, but gained a strong footing as regards the production of medium qualities. In this connection Mr. Eilender showed that the cost of producing electrically-refined Thomas steel when large furnace units were used, is quite as low and even lower than that of the Siemens-Martin standard qualities.

# PHOTOGRAPHS FROM THE FIELD



Recently Installed Converters at Greene-Cananea Smelting Plant in Mexico
These converters are probably nowhere equaled in size except perhaps at Butte; note gear box at left pedestal.



Converters at Mt. Morgan Mine, Queensland, Australia
The charging trough frame, encased gears and turntables in front of each stand are features of this converter installation.

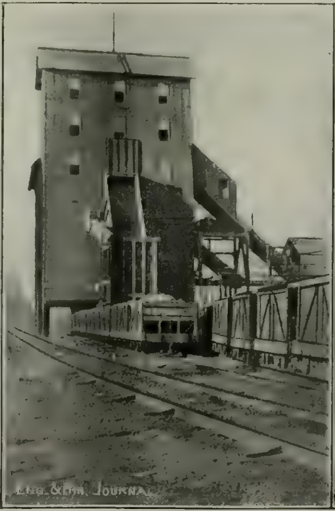
MICHIGAN SHAFT HOUSE WITH CYLINDRICAL ORE BINS

SENECA-SUPERIOR MILL, PETERSEN LAKE, ONTARIO

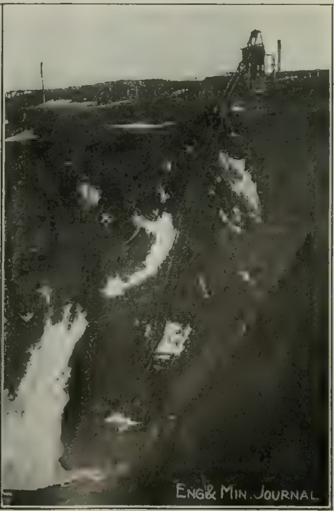
THE DOE RUN NO. 3 MILL, IN SOUTHEASTERN MISSOURI

The picture at the left shows the crusher-feed floor; the one at the right the view through the mill, the lighting court and office on second floor being notable features of this lead-zinc ore mill.

SINKING SHAFT IN QUICKSAND, MARQUETTE, MICH.



MICHIGAN SHAFT HOUSE, WITH ROCK CRUSHER



AN EARLY-DAY REMINDER, MARQUETTE, MICH.

# NEW PUBLICATIONS

THE YENTNA DISTRICT, ALASKA. By Stephen R. Capps. Pp. 79, illus. Bull. 534, U. S. Geological Survey, Washington.

THE KOYUKUK-CHANDALAR REGION, ALASKA. By A. G. Maddren. Pp. 124, illus. Bull. 532, U. S. Geological Survey, Washington, D. C.

A PRELIMINARY REPORT ON THE MINERAL SPRINGS OF GEORGIA. By S. W. McCallie, State Geologist. Pp. 190, illus. Bull. 20, Geological Survey of Georgia, Atlanta.

TESTS OF REINFORCED CONCRETE BUILDINGS UNDER LOAD. By Arthur N. Talbot and Willis A. Slater. 6x9, pp. 104, illus., paper. Bull. No. 64, University of Illinois, Urbana, Ill.

REPORT OF THE STATE GEOLOGIST ON THE MINERAL INDUSTRIES AND GEOLOGY OF VERMONT, 1911-1912. Pp. 269, illus. George H. Perkins, State Geologist, Burlington, Vt.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, VOL. V, 1912. 6x9¼, pp. 284, illus. Published by the Institute and for sale by D. Van Nostrand Co., New York.

GEOLOGY AND ORE DEPOSITS OF THE PHILIPSBURG QUADRANGLE, MONTANA. By William Harvey Emmons and Frank Cathcart Calkins. Pp. 271, illus. Professional Paper 78, U. S. Geological Survey, Washington, D. C.

MITTEILUNGEN AUS DEM EISENHUETTENMAENNISCHEN INSTITUT DER KOENIGL. TECHN. HOCHSCHULE AACHEN. VOL. V. By F. Wüst. 7½x11, pp. 160, illus., paper; 14 marks. Wilhelm Knapp, Halle a. S., Germany.

THE COASTAL PLAIN OF NORTH CAROLINA. By William Bullock Clark, Benjamin L. Miller, L. W. Stephenson, B. L. Johnson and Horatio N. Parker. Pp. 552, illus. Volume III, North Carolina Geological and Economic Survey, Chapel Hill, N. C.

EXTRACTS FROM REPORTS ON THE DISTRICT OF UNGAVA RECENTLY ADDED TO THE PROVINCE OF QUEBEC UNDER THE NAME OF THE TERRITORY OF NEW QUEBEC. Pp. 160, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec, Canada.

COST OF PRODUCTION OF IRON AND STEEL PRODUCTS IN THE UNITED STATES. (Full Report.) Part III of Report of the Commissioner of Corporations on the Steel Industry. By Francis Walker, Acting Commissioner. Pp. 569. May 6, 1913. Government Printing Office, Washington, D. C.

ORGANIZATION, INVESTMENT, PROFITS, AND POSITION OF UNITED STATES STEEL CORPORATION. Part I of Report of the Commissioner of Corporations on the Steel Industry. By Herbert Knox Smith, Commissioner. Pp. 422. July 1, 1911. Government Printing Office, Washington, D. C.

COST OF PRODUCTION OF IRON AND STEEL PRODUCTS IN THE UNITED STATES. (Preliminary Report.) Part II of Report of the Commissioner of Corporations on the Steel Industry. By Herbert Knox Smith, Commissioner. Pp. 144. Jan. 22, 1912. Government Printing Office, Washington, D. C.

THE THEORY OF LOADS ON PIPES IN DITCHES, AND TESTS OF CEMENT AND CLAY DRAIN TILE AND SEWER PIPE. By A. Marston and A. O. Anderson. 6x8¾, pp. 181, illus., paper. Bull. 31, Engineering Experiment Station, Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa.

RECONNAISSANCE OF THE GEOLOGY OF THE RABBIT EARS REGION, ROUTT, GRAND AND JACKSON COUNTIES, COLORADO. By F. F. Grout, P. G. Worcester and Junius Henderson. PERMIAN OR "PERMO-CARBONIFEROUS" OF THE EASTERN FOOTHILLS OF THE ROCKY MOUNTAINS IN COLORADO. By R. M. Butters. Pp. 57 plus 101, illus., Bull. 5, Parts 1 and 2, Colorado Geological Survey, Boulder.

RESUSCITATION. By Charles A. Lauffer, M.D. 4x6½, 47 pp., illus.; 50c. John Wiley & Sons, New York.

This little book, which can be read in a few minutes, and of which the essential facts cover only 10 pages, ought to be studied by every mine foreman, and the knowledge imparted to every mine worker. The prone pressure, or Schaefer, method was originally devised to resuscitate those overcome by electric shock, but the actual cause of the cessation of breathing is the same, and the method for restoring it is equally applicable, whether the asphyxiation occurs through shock, drowning, gases or fumes, anaesthetics or narcotics.

AIR COMPRESSION AND TRANSMISSION. By H. J. Thorkelson. 6¼x9¼, pp. 207, illus.; $2. McGraw-Hill Book Co., New York.

As a text for students of general engineering, this book offers the advantage of brevity and conciseness as compared with the many better known and more elaborate treatises on the same subject, to which the author acknowledges his indebtedness for most of his material. The development of the underlying theory follows the conventional lines, but the interpretation of indicator cards, as a means of correcting defects in valve adjustment, etc., is presented with unusual clearness. The chapter on effect of altitude on compressor efficiency is borrowed directly from Peele's book, and the chapter on the production of low pressure by fans and blowers is a verbatim report of an extended lecture at Columbia by H. deB. Parsons. The chapter on turbo-compressors, an uptodate feature of the book, is compiled from articles by Franz zur Nedden in "Engineering Magazine." The book is not exhaustive, but such ground as it does cover it makes clear, and will well serve its announced purpose as an introductory textbook.

COMMON MINERALS AND ROCKS, THEIR OCCURRENCE AND USES. By R. D. George, State Geologist of Colorado. Pp. 406, illus.; cloth. Colorado State Geological Survey, Boulder, Colo.

This book, issued as Bulletin 6 of the Colorado State Geological Survey, is one of the most pretentious attempts at governmental textbook publishing that has come to our notice. "The main purpose of this bulletin is to describe the commoner minerals and rocks, and furnish the means of recognizing them and knowing their uses. Many valuable geological materials lie unused for want of knowledge of what they are and how they may be used. It is hoped that it will stimulate an interest in, and a search for, valuable geological products."

We venture to predict that this laudable purpose will not be fulfilled by this volume. In the first place, its scientific terminology, its indiscriminate presentation of chemical symbols, its insistence on minute discriminations which would tax the skill of an expert, render the book unavailable for the ordinary prospector, on whom lies the burden of searching for economic minerals. Of what use is it to a Colorado prospector to know that "hardystonite is a calcium-zinc silicate $Ca_2ZnSi_2O_7$, or 2 CaO, ZnO, 2 $SiO_2$, occurring in a limited amount in the North Hill mine at Franklin Furnace, N. J.," or that "humite is similar to chondrodite, but contains five molecules of $MgSiO_4$ instead of three, and is orthorhombic?" On the other hand, the book will be of only superficial use to students, who are already supplied with books covering the same ground in a much more complete and scholarly manner. The author acknowledges his indebtedness to these higher authorities for practically the whole contents of his book; for this reason, there is little fault to find with matters of fact stated therein, but the whole work lacks discrimination and ought never to have been published at state expense.

DIE SCHACHTFOERDERUNG. By H. Bansen and K. Teiwes. 8x9, pp. 333, illus.; 14 marks. Julius Springer, Berlin, Germany.

This is the fourth volume of a series on "Die Bergwerksmaschinen," of which the first three have been noted in previous issues of the "Journal." This volume supplements Vol. III, on "Die Schachtfördermaschinen," and together they cover the theory and practice of hoisting in a most thorough manner. Speaking broadly, Vol. III presented the analytical phase of the problem, while Vol. IV covers the design and construction of the appliances actually used in shafts. The examples are taken almost exclusively from German practice, and in many respects should prove most suggestive and illuminating to American engineers.

Chapter 2 describes the structure of hoisting ropes, rules for their selection, and means for cleaning, oiling, inspecting and testing. Chapter IV, on cages, is typically European, the most noteworthy feature being the multiple-deck cages for hoisting eight cars at once, and the ingenious devices for locking cars in place, and for discharging them automatically. The next chapter, on safety devices, presents numerous effective designs never seen on this side of the Atlantic, both for wooden guides and for rope guides. Analytical methods for ascertaining the stresses produced by stopping a falling cage are presented in this long and valuable chapter. Devices for attaching ropes to cages are the subject of a separate chapter, many of which will appear novel to American readers; in general, they are more elaborate than those employed in this country. On the subject of shaft guides, the most valuable features are those relating to the methods of fastening wooden guides to the steel buntons of circular shafts. Special devices for oiling guides are illustrated. Steel rails, and wire ropes, used for guides require special methods of attachment, which are shown. A long and valuable chapter is devoted to the laying out of tracks at top and bottom of shafts, with a view to assisting the loading and unloading of cages by gravity. Hydraulic elevators and other mechanisms for facilitating the rapid unloading of multiple-deck cages are described. These, likewise, are worthy of careful scrutiny by Americans, as are also the designs for landing chairs, of many ingenious types. The final chapter, on the construction of headframes, presents a typically European practice, involving the use of steel exclusively, with a fertility and unconventionality of ideas probably never thought of, and certainly never put into practice, by American designers.

# Minerals Separation vs. James M. Hyde

The suit of the Minerals Separation, Ltd., vs. James M. Hyde, was decided by Judge Bourquin, in favor of the plaintiff, as told in the JOURNAL of Aug. 2, 1913, p. 229, and Aug. 9, 1913, p. 277. Those portions of the decision bearing on the technical points will probably be of interest to the mining fraternity.

The invention claimed, in general terms, may be said to be the discovery in March, 1905, that if a very small and appropriate quantity of an oily substance, ranging around 0.02% to 0.5% of the weight of the ore be added to a pulp of water and finely pulverized ore (the slimes being helpful and most easily recovered) and the whole vigorously agitated and thereby thoroughly aërated by great and excess quantities of air, the metalliferous particles are oiled and adhere in a complete envelope to or of bubbles of the air and rise to the surface of the mixture on occasion of agitation, forming a strong coherent and stable froth easily removed. The process may be aided by heat to disseminate the oily substance more quickly and effectively through the pulp and bring it into contact with the metalliferous particles, and may also be aided by a mineral acid or salt up to 1% thereof of the weight of the ore to increase the preferential affinity of the oil for metal over gangue, but not sufficient acid to cause chemical action on the metal, nor is it intended to generate gas for flotation. The patent specification is full, complete and clear to those skilled in the art, and describes one well known apparatus of mixing vessels, spitzkasten, etc., and the operation of the process therewith.

The claims are general and particular, all calling for oil and agitation to produce a froth, some defining a range or quantities of oily substance, some likewise of acid, some specifying oily substances alone, some oily substances in various combinations with heat or acid and with both. The main defense of invalidity is lack of novelty and anticipation. In reference thereto it appears from the evidence that the use of oil, air and agitation in ore concentration, separately and in various combinations, and with other ingredients, was well known to the art prior to the discovery of the process in suit. To summarize fully the prior processes, some of them were bulk oil processes, using oil in such large quantities that in taking up the metalliferous particles in the pulp the mass thereof was yet sufficiently buoyant to float to the surface of water, the gangue sinking.

Concentration being more essential for lean ores, economy is the foundation of success, so other of these processes reduced the amount of oil to a degree where it was not sufficient of itself to float the metal, and to aid therein air, steam or gas was injected to render the mass spongy. Another process further reduced the oil and to and around 4% to 6% in weight of the weight of the metalliferous content of the ore, the somewhat novel result being that the metalliferous particles were by the oil agglomerated into granules which sank in the water and were retained in the mixing vessel, while the gangue rose and was carried off by upcast. Some dispensed with oil and employed surface tension or skin flotation by floating off the powdered metalliferous particles on the surface of quietly flowing waters, or by injecting air, steam or gas into the mixture of ore and water, or by generating gas therein, where bubbles attached to said particles and carried them to the surface of the water, in all the gangue sinking. Another process sought the same end by spraying the oiled metalliferous particles through air and on to water, where they remained, the gangue sinking.

In some processes acid was used to generate gas in situ for flotation, while in others it was used solely to render more pronounced the selective attribute of oil for metal over gangue. This last feature was the discovery, so far as ore concentration is concerned, of Carrie J. Everson, of Chicago, to whom a domestic patent, embodying it, issued in 1886. In some heat was used to hasten the action of the oil, and some resorted to agitation.

For anticipation, defendant relies most upon Froment's patents and working description. They date from 1902 to 1903. The process thereof is one wherein the ore is carefully crushed in two operations so as to minimize slime, and is first deslimed, for that the slime is "too fine to be treated," quoting Froment. Thereupon, to a mixture of deslimed ore and water oil and carbonate of lime (which may be limestone) are added proportionate to the weight and richness of the ore, from 1% of oil in weight of the ore, for one containing up to 5% of metal, to 3½% of oil for ore containing 50% of metal, and from about 1% of carbonate of lime in weight of the ore, 2½% in difficult cases, or more, and in like proportions to the oil for richer ore, it requiring more gas. Agitation in mixture containing two stirrers revolving in opposite directions and for a few minutes, or about 10 min. at about 300 r.p.m., the "chief point" being that all metallic particles are brought "into thorough contact with the oil," is described by Froment. The mixture is then discharged into a vat containing a perforated coil through which sulphuric acid is introduced in quantity about 10% of the carbonate of lime, and a vat therein turns slowly and about 10 to 12 r.p.m. to prevent the ore collecting at the bottom in too compact a mass.

Steam may also be injected through said coil to assist the reaction, but it is necessary in only cold countries. The reaction of the acid generates gas, which in bubbles carry the sulphides to the surface, here skimmed or pushed into a hopper. Such thereof as fall back and sink are otherwise recovered. A large proportion of the oil may be recovered from the concentrates in a press. Froment's patents refer to the use of "gas of any kind," that the bubbles will "become covered with an envelope of sulphides" and rising to the surface, "form a kind of metallic magma," and the "formation of these metallic spherules is singularly active if the gas is in a nascent state." Froment's patents, working description and an apparatus therefor, were purchased in 1903 by the patentees of the patent in suit.

It may be noted that prior to said purchase, and continuously since, said patentees were, and now are, associates and metallurgists, chemists, experimenters, inventors and operators in ore reduction in various parts of the world, with headquarters in London. To them, and in their behalf, have been issued patents, domestic and foreign, and they have purchased others. They are of complainants, and much of their work has been for complainants. There is little evidence of practical use of any of these prior processes, and no substantial evidence that any substantial commercial success has accrued to any of them, or that any of them has had any considerable continuous successful operation. Some have operated commercially with some small success, and some are long since abandoned as impracticable, experiments, failures. Froment's process has not been in practical operation.

Complainants' process has, in substance, displaced some of the prior, and has firmly established itself as a new and valuable method of ore reduction. The evidence shows many and large plants thereof, built or building, in widely separated parts of the world. Its successful operations, practically from discovery, have recovered, and largely from waste and tailings, values aggregating near $9,000,000, and at a profit of near $4,000,000, to the patent owner and its licensees. Detailed comment in respect to anticipation is little necessary, save to Froment. Looking to the evidence, and therefrom contrasting the process with complainants', Froment's requires several times the quantity of oil than does this in suit, both by examination of the patents and working description and by tests in evidence. Froment crushes the ore in two operations and deslimes it before treatment, because the slime is too fine to be treated by his process, while the process in suit needs but one crushing operation and finds slime advantageous and most easily recovered. Froment employs carbonate of lime, the process in suit does not. Froment requires acid and in greater quantity and for a different function, than does the process in suit, which latter may or may not use acid. Both may use heat, and both require agitation, Froment, agitation only to disseminate the oil, the process in suit for that purpose and also to aërate. Froment's result is by flotation by gas generated in situ, this in suit is by flotation by air introduced by vigorous agitation. Froment's product is like unto a magma, a spongy, pasty mass of oil and metallic particles, and more or less gas bubbles, while this in suit is a froth of oil and metallic particles and air bubbles. Froment's requires oil in such quantity that he deems it worthy of recovery from the concentrates, so far as it can be, this in suit so little oil, it disappears, is not sensible to sight or touch upon the concentrates, but only to analysis. In Froment's it would seem that the metallic particles are floated like the basket of balloon, while in this, like the very envelope of a balloon. Froment's is costly, while this is cheap. And from the evidence, it would seem that Froment's process would fail in practical operation, while this in suit has succeeded. In Froment's, he oils the metallic particles by agitation, then, when the mixture is quiescent, generates gas therein by quick reaction, followed by immediate and direct rising of the gas bubbles to the surface in which they may come in contact with but few metallic particles. In this in suit, vigorous agitation of the mixture beats great and excess volumes of air therein, likely bringing the ultimate air bubbles into repeated contact with many metallic particles. The action of the gas in Froment's is almost explosive in nature. He speaks of proportion of carbonate of lime to be sought as in his test-tube example, the reaction may be so sudden

**and violent as to project the metallic particles out of the tube.** Froment's gas bubbles, quick formed and quick rising, it may be, arrive at the surface with expansion still in progress. These or [illegible] reasons may account for Froment's magma [illegible] gas bubbles and fragile evanescent froth in so far as the result is like unto froth, and also may **account for the process in suit's strong and lasting froth.**

One of complainants' experts, Dr. Adolph Liebman, of London, [illegible] Froment's product, as not a froth, but a magma, and his process as one involving the principles of skin flotation, assisted by bubbles of carbonic acid. He further testified that in the process in suit is produced a result which was never attained before, that the froth is of a **peculiar character, "consisting of air bubbles which, in their covering film, have the minerals embodied in such manner that they form a complete surface all over the air bubbles,"** that though the very light and easily destructible air bubbles are coated with a heavy mineral, yet the froth is stable **and utterly different, so far as this property is concerned, from any froth known," to him, that "it appears as if the minerals were protecting the tender air bubble like an armor guarding it," that "the froth has a long life," and one is** "tempted to say it is permanent, at least as far as metallurgical operation are concerned"; that he himself had "seen a **froth standing for 24 hours without the least change having** taken place"; that a "very striking difference between the **previous processes and the process of the patent in suit, is the difference between failure and success"; that "the simplicity of the operation as compared with the prior attempts, is startling."**

**The differences hereinbefore set out between Froment's process and this in suit, are so obvious, numerous, radical, and, in many respects, vital, it is clear they constitute different processes.** They are different in ingredients, function **of some thereof, combination, manipulation, principle and result. Their points of resemblance only serve to accentuate their difference. Broadly speaking, a process is a definite** combination of new or old elements, ingredients, operations, **ways or means to produce a new, improved or old result. Any substantial change therein, by omission to the same or better result, or by modification or substitution with different function to the same or better result, is a new and patentable process. New or substantially changed methods whereby the product is bettered, increased, cheapened, may be a new and patentable process.**

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## American Mining Congress Meeting

Manufacturers of mining machinery, rescue and first-aid apparatus and safety appliances are to be given an opportunity to display their wares before the mining men of the country at a great industrial exposition to be held under the auspices of and in conjunction with the American Mining Congress, in Philadelphia, Penn., the week of Oct. 20.

This exposition will be national in scope, the metal mining of the West to be as fully represented as the coal mining of the East. There is a tentative plan to have a gold-mining camp in full operation with a mill crushing the ore. Horticultural hall, the biggest place of its kind in Philadelphia, has been engaged for the occasion.

Many large coal companies that have developed the "Safety-First" movement at their mines are now negotiating for space to show the mining men and the public what they are doing for their men and will send rescue and first-aid crews. The U. S. Bureau of Mines will be represented by one of its safety cars and a picked crew of helmet men. The State of Illinois and a number of the big anthracite companies may send rescue cars for exhibition purposes.

The convention is to be the first get-together affair of all the mining interests of the country, and an attempt will be made to show the need of a stronger national organization that will represent all phases of the industry [illegible] to the placing of the industry in the important [illegible] belongs. Perhaps the leading topic of the convention will be the new system of mine taxation recently put in operation in some states and being discussed in others at the present time. The West can unite with the East upon this proposition, for Colorado and Arizona have new taxation laws for the mines and so have Pennsylvania and Michigan. Colorado mining men are claiming that they are doubly taxed and that their industry will suffer. Arizona is making similar claims and it is understood that Michigan is much dissatisfied. An increase in the price of Pennsylvania coal is threatened by reason of the new tax law in that state.

It is expected that the West will insist upon a definite Alaskan policy by Congress and there will be a demand for quick action. The smeltery-fume problem, which also mainly belongs to the West will be discussed dispassionately with the hope that an amicable adjustment may be reached. California has, at the present time, two commissions delving into this problem and Montana one.

The disposal of the débris from placer mining is another vexed question. It is claimed that the placer-mining industry of California has been nearly wiped out by drastic rules and regulations, some of them imposed by the United States Government. At the present time the débris question is in charge of a commission of United States Army engineers and it is claimed that while they zealously watch the interests of the farmers, they know nothing about the mining problem. A demand may be made for the inclusion of a mining engineer on this board to see that the interests of the mines are protected.

The coal men of the East will be principally interested in the "Safety-First" movement and the conservation of the coal lands adjacent to the great Eastern industrial centers. It is fully realized that Eastern coal fields are being rapidly used and that when they are gone, it will be useless to think of getting coal from the West.

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## Tin in German West Africa

A recent report from German West Africa says that the prospects of finding tin, which would pay to mine on a large scale, have not been realized. Tin occurs over a wide area between Usakos and Okombahe and elsewhere. It is found in the numerous pegmatite veins which pierce the mica schists. Unfortunately, not all the pegmatite contains tin. The nature of the occurrence is so uncertain that some of the companies interested have restricted their attention to working alluvial deposits in order to recover some of the money spent on development work. Tin will be exported in small quantities, but the prospects of a large tin industry are once more regarded as somewhat remote.

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## Gold Dredging in California

In the issue of Aug. 2, 1913, is an article on Natoma No. 7 dredge, crediting Paul E. Morse as the builder. As a matter of fact the Yuba Construction Co. designed and built this dredge. Mr. Morse is the construction foreman in its employ, who had charge of the work.

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**Petroleum and Natural Gas Have Been Discovered in the Vailala District** of British New Guinea, and it is believed that the oil deposits are quite extensive. One well has found oil at a depth of 800 ft., and other wells are being sunk. The oil found is a heavy oil with asphalt base. Prospecting is going on under direction of the government.

# EDITORIALS

## Production of Lead

Our revised statistics of the production of lead in the United States in 1912 are given in the accompanying tables, the first of which is based on reports received by all of the refiners, classified as in previous years, i.e., the lead reported as "desilverized" and "antimonial" is the product of the refiners treating Western and foreign bullion, while the production of the Missouri and Illinois refiners is entered according to the main sources of their ore supply. Some of the Missouri lead is desilverized, but this is not enumerated separately. Many of the refiners treat lead scrap and dross. The amount of refined lead derived from such old material in 1912 was 6589 tons, against 3916 tons in 1911.

PRODUCTION OF LEAD (REFINERY STATISTICS)

(In tons of 2000 lb.)

| Class | 1910 | 1911 | 1912 |
|---|---|---|---|
| Domestic: | | | |
| Desilverized | 217,490 | 211,041 | 236,207 |
| Antimonial | 9,098 | 8,916 | 9,239 |
| S. E. Missouri | 145,387 | 155,008 | 145,336 |
| S. W. Missouri | 20,729 | 25,993 | 19,224 |
| Totals | 392,704 | 400,958 | 410,006 |
| Foreign: | | | |
| Desilverized | 90,473 | 89,487 | 82,715 |
| Antimonial | 4,892 | 4,929 | 5,003 |
| Totals | 95,365 | 94,416 | 87,718 |
| Grand totals | 488,069 | 495,374 | 497,724 |

Our second table, showing the distribution of lead production according to states, is based upon the reports of crude lead, as returned by the smelters rather than the refiners, except in the case of one interest, which is both smelter and refiner. Allowing for the refined lead obtained from scrap, dross, etc., it appears that while the refiners' production was larger than the smelters' in 1910, it was a little smaller both in 1911 and 1912. This is readily explained by the accumulation of base bullion at the Tooele works in Utah.

PRODUCTION OF LEAD (SMELTERS' PRODUCTION)

(In tons of 2000 lb.)

| State | 1910 | 1911 | 1912 |
|---|---|---|---|
| Arizona | 1,399 | 4,392 | 3,201 |
| California | 1,038 | 529 | 1,059 |
| Colorado | 34,711 | 28,730 | 33,196 |
| Idaho | 99,840 | 116,524 | 126,035 |
| Kansas | 1,343 | 2,500 | 162,194 |
| Missouri | 160,642 | 173,787 | |
| Montana | 1,795 | 2,492 | 2.517 |
| Nevada | 2,119 | 1,076 | 5,640 |
| New Mexico | 1,730 | 1,381 | 2,478 |
| Oklahoma | 1,860 | 1,950 | 2,500 |
| Utah | 57,158 | 54,538 | 59,317 |
| Wisconsin (a) | 3,400 | 3,944 | 3,180 |
| Other states | 177 | 912 | 1,690 |
| Undistributed | 1,429 | 1,760 | |
| Zinc smelters | 1,988 | 3,511 | 6,217 |
| Totals | 370,629 | 398,026 | 409,224 |

The smelters' reports are as near as we can come to the mine production, and we use these in recording the lead production of the United States rather than the refinery figures. The latter show how much lead was available to the market, irrespective of source, and commercially are, of course, important.

The dominant lesson of the lead statistics of recent years is the failure of lead production to increase in so large ratio as the production of copper and spelter. This is true not only of the United States, but also of the rest of the world. In other words, lead supply is all the time becoming a little shorter with respect to consumptive requirements. This no doubt is the explanation of increasing strength in the lead market.

Otherwise, the American returns for 1912 do not show anything that is very significant that was not previously known. As in 1910 and 1911, Missouri held the premier place, but its output fell off considerably in 1912. There is a possibility that the mines of the Southeastern district are now at or near their maximum. During the last 10 years they have experienced a wonderful development.

On the other hand, the Coeur d'Alene, which was supposed to have passed its zenith, with one or more of the mines of the largest producer in rather a bad way, has taken a turn upward again. During each of the last three years there has been a noteworthy increase of production.

Perhaps the most interesting feature of the statistics is the more and more lead that the zinc smelters are recovering from their residues. This comes from ore that only a few years ago was unmarketable in this country. A part of this lead is of foreign origin, but there is no way of separating it in the statistics, and consequently it is all credited to the United States.

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## The A. I. M. E. at Butte

The meeting of the American Institute of Mining Engineers, which takes place next week, at Butte, Mont., is the first meeting since the reorganization of the institute, and the officers of the institute have exerted themselves to demonstrate what a technical meeting ought to be. It was an old complaint that the meetings were too often held in New York, Washington and other Eastern cities which were not mining centers; and that the Western members were by their remoteness deprived of participation. We shall not argue the question of New York being a mining center. Undoubtedly it is the greatest mining center of the world. However, we shall readily admit that whenever an A. I. M. E. meeting was scheduled for New York, the majority of the Western members coming to attend it found more of interest in the features of the metropolis than in the stately halls of the Engineering Building, and the sessions in the latter failed to command the interest that was hoped.

However, this is all changed. It used to be said that the institute ought to meet in places where there are mines and smelting works. Now, no one will deny that Butte and Great Falls are precisely such places. If there is any spot in North America where mines of the first order are concentrated that place is Butte Hill. Moreover, these are great mines, the greatest in the world, and they exemplify the best practice in mining, milling, smelting, and almost everything else. Butte is pre-eminently the place for mining and metallurgical engineers to go to see, study and learn. It was a happy idea to nominate Butte as the first meeting place of the rejuvenated institute.

The mining men of Butte, led by the officials of the Anaconda company, have appreciated the honor being done them and have risen grandly to their self-assigned task of making this a red-letter meeting. That it is to be such a one we can see already from the papers that have been printed in the recent bulletins. These fat volumes constitute an up-to-the-minute treatise on mining and metallurgy as practiced at Butte, written by the highest authorities, viz., the men who are practicing it. In inspiring and stimulating these papers the administration of the Anaconda company deserves the highest praise. We think that no other company has ever made so great a contribution to technical literature. May the precedent be frequently followed in the future! Nothing else will be so greatly contributory to advancement in the arts.

A member of the Institute of many years, indeed one of its former presidents, writes us:

> If any justification for the change in policies of the American Institute of Mining Engineers were necessary, certainly the August Bulletin, just published, furnishes that justification. I do not recollect any previous time in the history of the Institute that we had succeeded at one time in obtaining such a collection of papers, which not only numerically, but still more by their high character and the variety of subjects presented cannot fail to impress the reader of this bulletin.
>
> We old members take great pride in our Posepny volume, and our Emmons volume, each treating on one subject only, but we here have before us the making of a monumental Montana volume which covers every phase of geology, mining, metallurgy, mechanical and electrical engineering as actually being practised in that great metallurgical center; a perfect vade mecum and guide to the metal miner of the best practice known to the profession of today.
>
> The papers are all so good that it seems almost invidious to name one more than another, but I cannot refrain from calling special attention to the splendid work and marvelous study of conditions shown in R. H. Sales' paper on the "Ore Deposits of Butte," and to the able description of the results obtained from the study of the Great Falls flue system by Messrs. Goodale and Klepinger. These two papers alone would justify our giving the title of "Montana" to our next volume of "Transactions."
>
> To the officers and members of the Institute by whose efforts such a volume has been made possible, the membership at large should certainly extend their gratitude, and I hope that the technical press throughout the country, by calling attention to this great work being done, will assist the activities and general usefulness of the American Institute of Mining Engineers and the profession at large.

We hope that the Butte meeting of the Institute will be well attended. As to the welcome that visitors will receive and the profit that they will gain we may prophesy with confidence

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## The Advance in Copper

Realization of the truly strong statistical position of copper, produced by an increasing consumption and a production that lately has been about stationary, has brought about a further sharp advance in the price for the metal. The prospective shortage in the supply of Lake copper, owing to the strike, has of course been con[illegible] in creating a sentiment. Anyway, the recent decline to below 14c. undoubtedly went too far and a substantial rally was naturally due.

We see no conditions now that would lead to a 20-25c. price for copper if the world were on the eve of an industrial boom. It is certain, however, that no such development is ahead of us right away. On the contrary, financial conditions the world over are still in a dangerous state and are tending to enforce contraction in business rather than to promote expansion.

For the moment, belated consumers, who overstayed the bear market of a little while ago, are having to pay a trifling premium for copper immediately required. However, there is no serious shortage of metal for that delivery, in spite of the smallness of the reported stock. A large output of cathodes is being drawn from the refineries every day. Recent events have shown in a striking way that the copper business can be run smoothly with a much smaller stock of copper than anybody thought.

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## New Construction

The biggest jobs of mining and metallurgical construction now under way are the United Verde, Calumet & Arizona, Clifton and Hidden Creek copper-smelting works. Important jobs that are less advanced are the zinc smeltery of the American Zinc & Chemical Co., the plant of the Southern Aluminum Co., and the mill of the Inspiration Consolidated Copper Co. In each case, the cost runs into millions. The biggest thing on hand, however, is the installation of the Chile Copper Co., which will come to about $8,000,000. Another big thing is the mill of the Alaska Gold Co. At about the same time, the Alaska-Juneau company will also be doing some big construction.

The current construction work is sufficient evidence that there is no stagnation in the mining industry. Important work is under consideration. It is in the air that Phelps, Dodge & Co. will build a big concentrating mill to treat the low-grade Copper Queen ore in the not very distant future; and it is, furthermore, in the air, that the Inspiration Consolidated will build a smelting works at Miami, Ariz.

The Anaconda Copper Mining Co. is carrying on great construction work all the time. It is now rebuilding the Washoe concentrator, and the Great Falls smelting works.

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## American Mining Machinery Abroad

The Bureau of Manufactures of the Department of Commerce and Labor has issued a special report on "Mining in the Federated Malay States," by D. C. Alexander, Jr., which is out of the ordinary in so far as foreign reports coming through Washington are concerned. Mr. Alexander's article would find acceptance by any technical paper, even the JOURNAL. This is explained by the facts that Mr. Alexander is both an experienced engineer and a fluent, lucid writer.

In reading his account of tin mining in Malaya, we were struck by the extent of the equipment—engines, motors, pumps, etc.—supplied by British manufacturers and the scanty representation of American manufacturers. Among the latter, the Sullivan Machinery Co. is the only one mentioned by Mr. Alexander. We wonder why American manufacturers of mining and metallurgical machinery do not emulate the policy of the U. S. Steel Corporation and attempt to expand their foreign business.

## BY THE WAY

According to a press dispatch of date Aug. 4, the first automobile trip from Fairbanks, in the heart of the interior of Alaska, to the coast, was completed at midnight, when Robert Sheldon drove his five-passenger car into Valdez, having covered the 363 miles in 54 hours, actual running time. Sheldon, with two passengers, left Fairbanks at midnight, Thursday. They were forced to make a long detour because of road conditions.

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Traders in mining stocks of the Curb, who have to skirt between the Scylla of bucket-shops and the Charybdis of promoters effecting distribution, now have to look out for the new rocks of forged certificates. Consequently the lamb who purchases Goldfield Sunflower, Tonopah Midas, etc., no longer knows whether he is getting the real thing, or only a sort of green goods. Even the talent has been hooked. Anyway, we have been reading in the daily papers of some incidents connected with the shares of Tonopah North Star.

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One of our subscribers sends us some criticism of a shaft sunk on a property of which he had charge, made by a man who had charge of an adjacent property. The shaft was sunk on a hillside on a vein the strike of which was nearly parallel to the longitudinal axis of the hill. Behind the shaft the hill rose to a height about 600 or 700 ft. above the collar of the shaft. Upon viewing the shaft for the first time, the critic calmly ignored the situation of the ore, etc., and asked in a rather patronizing tone, "Why, in h——. wasn't that shaft located on top of that hill, where greater depth could have been secured?"

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In the Cloncurry district of Queensland over 1000 men are idle, says the *Australian Mining Standard,* the miners' union having refused to allow its members to continue the system of contract or piece work which has been in operation, under an agreement, for some time. As a rule, upheavals in the industrial world have as their cause the allegation that the workman is not receiving fair remuneration for his toil. Here the position is quite the reverse; it seems as if the men, or some of them, have been earning too much money. In other words, they have been too industrious, and this does not seem to suit the book as drawn up according to the ideas of the union. At Cloncurry the standard wage rate is high, miners and timbermen being paid at the rate of 12s. to 15s. per day, and artisans from 15s. to 23s. By taking contracts, however, as much as 20s. per shift can be, and has been, earned, and this the autocrats of the Trades Hall have decreed must cease.

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"Der Tunnel" is the title of a new book by the German author, Bernhard Kellerman, who has been hailed as succeeding to the laurels of Jules Verne. Kellerman's conception is of a tunnel 3100 miles long under the Atlantic Ocean, connecting America with Germany. We have read a few chapters. The Tunnel City springs up over in the thickly forested section of New Jersey near Toms River. The forest is cleared, and we glean from the book that in a day or two at the most an open cut 600 ft. deep and 12 miles long has been excavated. This hole is at the American entrance of the tunnel, which is to be started at the bottom of the abyss. The laborers, 40,000 of them, go to work when a whistle blows at 4 a.m. Over on Manhattan Isle men discard blue serge for summer suits, the cement-dust from Jersey turning those suits gray in a day. We wonder how many men Kellerman will have at work in the heading; 40,000 at the portal, how many inside? We don't recommend the book to mining engineers. Kellerman hasn't an interesting, but an ignorant imagination. His "Tunnel" reads too much like sundry "reports" that are too familiar to all of us.

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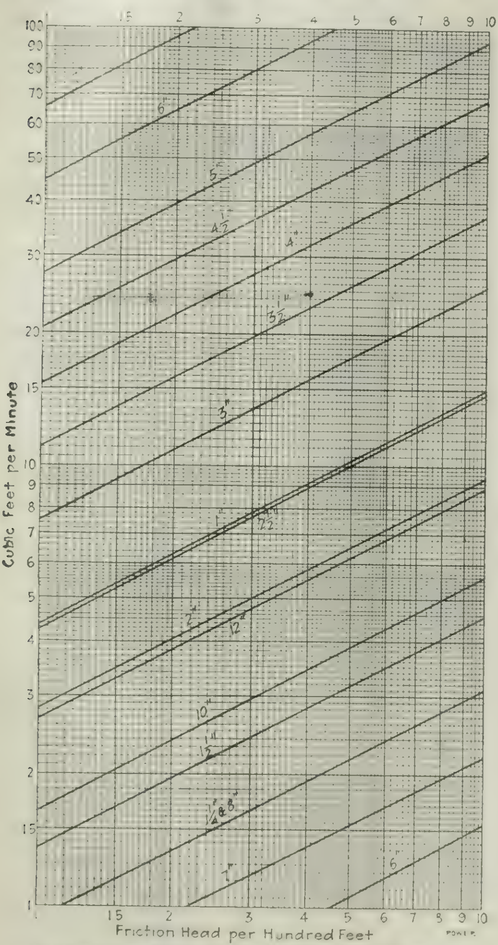
The petition of bankruptcy filed by Albert S. Bigelow in Boston recalls the fact that erroneous judgment relative to values in coppers in the Lake Superior district and in the Butte district was, to a certain degree, responsible for the financial plight in which Bigelow now finds himself. One illustration of this was brought out at the time of the Hyams effort to prevent the Calumet & Hecla from going ahead with its enlarged milling plan. During the progress of the litigation the figures at which the Bigelow interests sold out to the Calumet & Hecla at the conclusion of the litigation for control of the Osceola Consolidated were given in evidence. The Bigelows had a large percentage of Tamarack and Ahmeek stock. In the case of Ahmeek it amounted to half the total capitalization. These two issues, Tamarack and Ahmeek, were sold to Calumet & Hecla at practically the same figure, a little more than $100 a share. As events have proven, the Tamarack was not a good bargain, but the Ahmeek has more than made up for any overpay on the Tamarack or any of the others. The sale of Ahmeek at such a figure, ridiculously low as compared even with the present rock-bottom selling price, is but one instance of Mr. Bigelow's unfortunate parting with valuable securities. When he sold out control of the Boston & Montana to the Amalgamated interests it was only after he had suffered a financial beating in the stock market, which cost him almost a million, according to friends in whom he confided after the incident. His experiences in the Globe district with the refinancing of the Old Dominion are common history, pretty well known to all students of the Boston market conditions. Albert S. Bigelow's father, the late Horatio Bigelow, was largely responsible for the financing of a number of the corporations that were pioneer development propositions and afterward successful mines in this district. Associated with James Clark, he was instrumental in organizing a number of companies. When the gigantic proposition of starting the Tamarack was first suggested it was Mr. Bigelow who had the nerve to go through with it, although it involved millions and was an engineering feat which at that time was looked at askance by conservative mining men; for the Tamarack, it must be remembered, had to sink its shafts to great depth before encountering a pound of the Calumet conglomerate lode that carried commercial copper.

# Flow of Water in Pipes

In problems relating to the flow of water through pipes there are five variables which must be considered, says W. L. Durand, in *Power*, July 1, 1913. These are: Quantity of water, size of pipe, velocity of flow, length of pipe, friction head. The last two may be reduced to one variable "friction head per unit length," such as "per hundred feet." A set of curves showing the relation between quantity of water, friction head and size of pipe, are presented in the accompanying chart.



For 1-Inch Pipe Divide the Vertical Scale by 10. For Pipes 6 to 12-Inches in Diameter Multiply the Vertical Scale by 100

Quantity of Water, Friction Head and Size of Pipe

Any equation of the form $y = bx^n$ may be plotted as a straight line on logarithmic paper, and *vice versa* any straight line on logarithmic paper may be reduced to the form $y = bx^n$. It is also possible to reduce a set of curves between three variables, which are straight lines on logarithmic paper, to the form $y = bx^n z^m$.

Without going into the method employed, the accompanying curves reduce to

$$V = 0.4\, d^{2.64} h^{0.53}$$

From this formula the following formulas may be derived, by the use of which any one of the four variables mentioned above may be found if any other two are known.

$$V = 0.327\, d^2 v$$

$$v = 1.22\, d^{0.64} h^{0.53} = 3.06 \frac{V}{d^2}$$

$$h = \frac{5.6\, V^{1.89}}{d^5} = \frac{0.69\, v^{1.89}}{d^{1.21}}$$

$$d = \frac{1.42\, V^{0.38}}{h^{0.2}} = \frac{0.73\, v^{1.56}}{h^{0.83}}$$

in which,

$V$ = Cubic feet per minute;
$v$ = Velocity in feet per second;
$h$ = Friction head in feet per 100 ft.;
$d$ = Actual internal diameter of pipe in inches.

From the first formula it is also possible to make an equalization table similar to that in use for steam pipes. In using such a table the quantity of water and friction head per unit length are constants and the diameter is the only variable. If, then, in the formula

$$V = 0.4\, d^{2.64} h^{0.53}$$

$V$ and $h$ are taken as constants, and $d$ as a variable, all that is necessary to make this table is to take the actual diameters and raise them to the 2.64 power. This table is as follows:

EQUALIZATION FACTORS FOR PIPES

| Diameter, In | Equalization Factor |
|---|---|
| 1 | 1.13 |
| 1¼ | 2.34 |
| 1½ | 3.52 |
| 2 | 6.80 |
| 2½ | 10.86 |
| 3 | 19.3 |
| 3½ | 28.3 |
| 4 | 39.5 |
| 4½ | 53.3 |
| 5 | 71.7 |
| 6 | 116 |
| 7 | 172 |
| 8 | 240 |
| 10 | 440 |
| 12 | 700 |

By the use of this table the size of pipe equal to several smaller pipes may be determined so that the friction loss per unit length will be the same in all.

What size pipe should be used to feed four 3½-in. pipes? From the table, 28.3 is given as the equalization factor for 3½-in. pipe. Then

$$4 \times 28.3 = 113.2$$

The nearest size pipe to this factor is 6 in., which will feed four 3½-in. pipes with the same friction loss in all.

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# Great Britain Adopts Metric Carat

The Standards Department of the British Board of Trade has decided to adopt the metric carat of 200 mg. as the standard for all transactions in precious stones and jewelry. An official order to that effect will soon be issued. The metric carat is less by 0.00017 troy oz. than the British carat heretofore in use. The Jewelers' Association in New York has already adopted the metric carat as the standard, as noted in the Journal of Nov. 16, 1912, so that it will now be generally in use among all commercial nations.

## PERSONALS

J. Parke Channing arrived in New York this week.

Charles Hollister, formerly of Ray, Ariz., is now at Cananea, Sonora, Mexico.

T. W. H. Shanahan has been appointed superintendent of the San Francisco Mint.

W. B. Chidester is with the Globe Consolidated Mining Co., at Dedrick, California.

Robert H. Chapman is with the United States Geological Survey at Yerington, Nevada.

Robert B. Stewart is at Saskatoon preparing for an exploration trip in northern Alberta.

George E. Farish is in Nelson, B. C., and expects to stay in that part of British Columbia until winter sets in.

Felix MacDonald has assumed charge of the Inspiration Consolidated mine at Miami, Ariz., succeeding T. R. Drummond.

William H. Green, formerly of the Toronto University staff in mineralogy, is now at Ironwood on the Gogebic Iron Range, Michigan.

C. H. Palmer, Jr., is in Goldfield, Nev., making some examinations for Eastern interests, and expects to remain there about two weeks.

Harrison Souder, general superintendent Cornwall Ore Bank Co., Cornwall, Penn., sailed for Europe Aug. 2 and will be absent about a month.

Thomas C. Wear, formerly superintendent of the Colorado Mining Co., Arroroy, Măsbate, Phillipine Islands, is now at Cananea, Sonora, Mexico.

Thomas Pearce is mine foreman for the Sterling Iron & Ry. Co. at Sterlington, N. Y. He was formerly at the Crown Reef mine in the Transvaal.

E. R. Eaton is making magnetic surveys of several extensive iron tracts in the Port Henry section of the Lake Champlain district in New York.

J. P. Hutchins has just been examining platinum mines in the Urals. According to last news from him he was on his way to the Lena River region.

C. Vey Holman, of Maine, inspected some gold-mining properties in Nova Scotia before leaving for Toronto, to attend the Geological Congress.

F. M. Simonds, of the firm of Simonds & Burns, New York, is in Cuba on professional business and will not return until some time in November.

H. Whittingham, recently associated with G. H. Garrey on mine-examination work at Sierra Mojada, Coahuila, Mexico, left New York Aug. 7 for London.

M. F. Perry, resident director of Butters Divisadero Co. and Butters Salvador Mines, Ltd., Salvador, will be in Whitney's Point, N. Y., during August and September.

James Humes, for several years connected with mining properties on Vancouver Island, B. C., is now superintendent for the Silver King Consolidated, at Park City, Utah.

C. R. Wilfley has removed to Denver, Colo., where he will have his residence and office as non-resident manager of the Barstow mine at Ouray; also, taking up consulting work.

S. H. Knox, president Marine National Bank, Buffalo, N. Y., has been elected a director of the Rogers-Brown Iron Co. to fill the vacancy caused by the death of S. M. Clement.

Dr. W. R. Crane, professor of mining in the Pennsylvania State College, has just returned from Alaska, where he has spent a year investigating the coal resources of the territory.

W. L. Saunders, chairman of the executive committee of the Ingersoll-Rand Co., has gone to Butte, Mont., to attend the meeting of the American Institute of Mining Engineers.

Frank M. Wallace, vice-president of the Pittsburgh Coal Co., and interested in several steel plants, has been appointed a member of the new Public Service Commission of Pennsylvania.

James F. Kemp was given the degree of doctor of laws by McGill University at a special convocation on Aug. 2 on the occasion of the visit of the International Geological Congress to Canada.

W. N. Crafts, president of the Crucible Steel Co., Cleveland, returned from Europe Aug. 2. Mr. Crafts has been abroad for several months, studying the operations of electric steel furnaces.

H. A. Morrison has resigned as mine superintendent with the Uwarra Mining Co. and has accepted a position under Wallace MacGregor, manager of the Globe Mine in California, beginning Aug. 10 at his new post.

Prof. Albert Sauveur, of Harvard University, Cambridge, Mass., has been awarded the Elliott Cresson gold medal by the Franklin Institute of Philadelphia, in recognition of his important contributions to the science of metallography.

John O. Pew, formerly vice-president of the Youngstown Iron & Steel Co., has been elected president to fill the vacancy caused by the death of Lucius E. Cochran. Mr. Pew remains general manager. P. W. Heedy has been elected vice-president and secretary.

David Bowen, having resigned his appointment as head of the mining department of the University of Leeds, England, has opened offices in Leeds as a consulting, mining and civil engineer. Mr. Bowen has had a long and wide experience in both coal and metal mining, in addition to geological work of a varied nature.

A dispatch from Seoul, Chosen, dated Aug. 11, says: "Mr. Mason, the American manager of the gold mine at Un-San in northern Korea, was sentenced today to 18 months' penal servitude on a charge of manslaughter for killing a Chinese mine employee, who, in the absence of Mr. and Mrs. Mason, committed a criminal assault on their 12-year old daughter. When Mason returned home and learned of the occurrence, he went out and killed the Chinaman. In his defense, Mason pleaded the 'unwritten law,' but was condemned. An appeal against the sentence was entered at once."

J. E. Johnson, Jr., has opened an office as consulting engineer and metallurgist in association with Sanderson & Porter, at 52 William St., N. Y. Mr. Johnson intends to do work for iron and steel plants and iron mines, both in engineering and advising as to operation, also investigations as to methods, quality of product, etc. The investigation upon which Mr. Johnson has been engaged for the last three years, while manager of the Ashland plant of the Lake Superior Iron & Chemical Co., covering the general subject of the quality of cast iron, was completed before he left there, and it is expected that the results will be published soon by the American Institute of Mining Engineers. Those who are familiar with these results are of the opinion that they will be of great industrial and commercial importance.

## OBITUARY

Frederick H. Seymour, one of the organizers of the Detroit Copper & Brass Rolling Mills, died at Detroit, Mich., July 25, aged 63 years. He was widely known as an inventor and author and took a prominent part in public life.

Harvey D. Chess died in Pittsburgh, Aug. 10, aged 70 years. He was born in Pittsburgh, and after serving in the Civil War, became associated in business with his father, who was a manufacturer of nails, and upon the death of the latter, in 1877, he became a partner in the business with two brothers, Walter and Henry Chess. Later, this partnership became the Consolidated Expanded Metal Co., with its plant in Braddock. Mr. Chess was vice-president of that company until his retirement in 1907. He spent more than 40 years in the study of special machinery for his own lines of manufacture and so became a machine designer and engineer of national reputation.

John Milne died at Newport, Isle of Wight, England, July 31, aged 63 years. He was born in Liverpool and was educated as a mining engineer at the Royal School of Mines, London. He worked at his profession in Newfoundland and Labrador for Cyrus Field, Sir James Anderson and others. Later he was geologist to Doctor Beke's expedition into Arabia before taking up his work for Japan. He was well known all over the world, having traveled extensively in the United States, Australasia, China, Japan, the Southern Seas and Europe. For 20 years he was employed by the Japanese Government, for which he established a chain of nearly 1000 earthquake-recording stations. He also completed a seismic survey of the world for the British Association. He was the designer of seismographs and of instruments to record vibrations on railways. Among his publications are "The Miners' Handbook," "Earthquakes" and "Crystallography."

Alf. A. Tregidgo died at his home in San Francisco, Aug. 1, aged 55 years. He was one of the best known mining engineers on the Pacific Coast. He was born in Bath, England, July 13, 1858, and was a student of Oxford University. He went to Vallejo, Calif., in his earlier years and was superintendent of St. John's quicksilver mine at that place.

He married Miss [illegible] Russell, a graduate of Napa Seminary, by whom he had three children, Don A., Eugene de Sabla and Mabel E. Tregidgo. His mining operations extended over the whole Pacific Coast, but his most notable achievement was the damming of the Yuba River for the creation of electric power, in which he was associated with Eugene de Sabla and which was the beginning of the Pacific Gas & Electric enterprise, which has come to be one of the most powerful corporations of the West. Up to the time of his last illness, Tregidgo was superintendent of the St. John's mine at Vallejo, and was also president of El Dorado & Placer Counties Gold Mining & Power Co.'s dredging property on the Middle Fork of the American River. Besides being a man of keen intellect and sound mining judgment, he was possessed of great executive ability. He was probably the most popular president the California Miners' Association ever chose, and it can be said of him that he rarely made a failure in judgment in any mining proposition. If he did not get rich himself he had the faculty of making others rich. He was one of the most genial and companionable of men and his loss will be mourned by all of the old-time Californians.

## SOCIETIES

**Colorado School of Mines**—The thirty-ninth year of the Colorado School of Mines opens on Sept. 2. The graduation in May of 70 students illustrates the extent to which in recent years admission to advanced standing serves to augment the numbers in the upper classes. Revision of the working schedules has simplified the courses without radically altering their scope. The requirements for admission are not changed. The prospects for the coming year indicate a decided increase in admission. Harry J. Wolf, who acted as professor of mining during much of the past year, has been appointed as permanent incumbent of that position. No changes have been made in the headships of any of the other departments. The summer school, whose session runs during July and August, has had its largest attendance this season. It serves both former students of the "Mines" and new applicants, the former for the removal of conditions, the latter to secure admission to regular standing.

## INDUSTRIAL NEWS

The New Equitable Life Insurance Building, in New York, 38 stories high, will contain approximately 36,000 tons of structural steel, the inspection of which, both mill and shop, has been intrusted to Robert W. Hunt & Co.

The Braden Copper Co. has placed its fourth consecutive order, for 12 of the largest size Hardinge mills. When shipped this will make a total of 36 of these mills for its Chilean plant. The Cuba Copper Co., of Santiago, Cuba, has placed an order for four of the largest size Hardinge mills for grinding, in connection with a flotation process to be installed at its plant.

The National Tube Co. announces that commencing Aug. 1, 1913, it will enter the electrical-conduit field. It has contracted with the National Metal Molding Co. and the Safety-Armorite Conduit Co., both of Pittsburgh, Penn., to manufacture and sell this product for it as its agents, under their various brands. It has also decided to sell this product on the Pittsburgh-basing-discount plan in the same manner as all wrought pipe has been sold for the last 13 years.

Manning, Maxwell & Moore, Inc., of New York, and their subsidiary companies, will move their general offices about Oct. 1, from 85-89 Liberty St. to the new Lewisohn Building, 113-119 West 40th St. They will occupy the twentieth and twenty-first floors of the above building, which will give them 28,000 sq.ft. of space. This space will be exclusively for offices and is almost double that at present occupied for offices on Liberty St. This change is being made to meet the demand for a more convenient and central location, as well as greater space to handle material increases in their various lines which cover electric traveling cranes, machine tools, engineering specialties, railway, machinists', engineers', factory and contractors' supplies. A large portion of this product is manufactured by their constituent companies—the Shaw Electric Crane Co., the Ashcroft Manufacturing Co., the Consolidated Safety Valve Co., the Hayden & Derby Mfg. Co. and the Hancock Inspirator Company.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

MINER'S LAMP. Carl G. Sallander, Galveston, Tex. (U. S. No. 1,068,533; July 29, 1913.)

CRUSHING MACHINE. Edgar B. Symons, Milwaukee, Wis. (U. S. No. 1,069,496; Aug. 5, 1913.)

CONCENTRATING APPARATUS. Delbert Deverell, Woodstock, Ore. (U. S. No. 1,068,633; July 29, 1913.)

ORE CRUSHER and Pulverizer. George A. Stanton, Placerville, Calif. (U. S. No. 1,068,539; July 29, 1913.)

ZINC—Process of Recovering Zinc. Charles J. Reed, Philadelphia, Penn. (U. S. No. 1,069,178; Aug. 5, 1913.)

SMELTING FURNACE (Electric). Oscar S. Emberg and Oscar J. D. Emberg, Chicago, Ill. (U. S. No. 1,069,326; Aug. 5, 1913.)

LEACHING—Treatment of Copper Liquors. John Herbert Thwaites, Peterborough, England. (U. S. No. 1,069,205; Aug. 5, 1913.)

TIN—Improvements in or Relating to the Treatment of Tin Ores. J. W. Clenhall, Totnes, Devonshire, Eng. (Brit. No. 1181 of 1913.)

ROASTING—Improvements in Funaces for Roasting Ores. Soc. Min. et Met. de Penarroya, Paris, France. (Brit. No. 3142 of 1913.)

REFINING—Process for Electrolytically Refining Copper. George D. Van Arsdale, East Orange, N. J. (U. S. No. 1,069,305; Aug. 5, 1913.)

BARYTES—Method of Separating Barytes from Ores. Charles Jason Greenstreet, Webster Groves, Mo. (U. S. No. 1,069,545; Aug. 5, 1913.)

ZINC—Process of Roasting Ores and Recovering Zinc Therefrom. Charles J. Reed, Philadelphia, Penn. (U. S. No. 1,069,179; Aug. 5, 1913.)

DRILLS—Fluid Compressor. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,069,287; Aug. 5, 1913.)

SEPARATOR—Improvements in Electromagnetic Separators. Maschinenbau-Anstalt Humboldt, Coln-Kalk, Germany. (Brit. No. 24,643 of 1912.)

MAGNETIC SEPARATOR. Lewis G. Rowand, East Orange, N. J., assignor to Wetherill Separating Co., New York, N. Y. (U. S. No. 1,068,453; July 29, 1913.)

FURNACE LININGS—Process of Forming Furnace Linings. Archer E. Wheeler and Milo W. Krejci, Great Falls, Mont. (U. S. No. 1,068,470; July 29, 1913.)

ZINC—Process of Treating Ores and Metallurgical Products. Wilhelm Troeller, Frankfort-on-the-Main, Germany. (U. S. No. 1,068,611; July 29, 1913.)

ZINC—Improvements in the Removal of Zinc from the Ore, Particularly Zinc-Lead Ore. H. C. Woltereck and J. Moeller, London. (Brit. No. 16,218 of 1912.)

ELECTRIC FURNACE and Process of Operating the Same. Ezechiel Weintraub, Lynn, Mass., assignor to General Electric Co. (U. S. No. 1,068,615; July 29, 1913.)

CONCENTRATION—Improvements in or Relating to Ore Concentration. G. A. Chapman and S. Tucker and Minerals Separation, Ltd., London, Eng. (Brit. No. 14,273 of 1912.)

ROASTING—Rabble-Arm for Roasting Furnaces. Utley Wedge, Ardmore, Penn., assignor to the Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,068,955; July 29, 1913.)

BRIQUETTING—Improved Process for Briquetting Fine Ores and More Particularly Iron Ore. Maschinenbau-Anstalt Humboldt, Coln-Kalk, Germany. (Brit. No. 14,896 of 1912.)

DRILLS—Fluid-Feeding Attachment for Hollow Drill Steels. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,069,288; Aug. 5, 1913.)

VANADIUM—Process of Extracting Values from Ores. Warren F. Bleecker, Canonsburg, Penn., assignor to the Standard Chemical Co., Pittsburgh, Penn. (U. S. No. 1,068,730; July 29, 1913.)

ZINC—Process of Treating Sulphide Ores. Court C. Titus and William J. Barenscheer, Helena, Mont., assignors to New England Electro-Chemical Metals Co., Boston, Mass. (U. S. No. 1,069,498; Aug. 5, 1913.)

SMELTER FUMES—Method of Discharge of Electricity into Gases. Frederick Gardner Cottrell, Berkeley, Calif., assignor to International Precipitation Co., Los Angeles, Calif. (U. S. No. 1,067,974, July 22, 1913.)

ROASTING—Rabble Shaft, Arms, and Plows for Roasting Furnaces. Thomas Daniells Merton, Grove Mill, Watford, England, assignor of one-half to Harry MacKenzie Ridge, London, England. (U. S. No. 1,068,518, July 29, 1913.)

CYANIDING—An Improved Process and Apparatus for the Separating of a Solution Containing Gold or Other Metals or Material from Finely Crushed Insoluble Substances. D. W. Stacey, Bulawayo, Rhodesia. (Brit. No. 23,165 of 1912.)

MELTING FURNACES—Improvements in Liquid-Fuel Furnaces for Melting Metals and Their Alloys and for Other Metallurgical Operations. A. Etienne, L. Canet, L. Mercier and H. Mercier, Somme, France. (Brit. No. 15,252 of 1912.)

CANDLESTICK—Folding Candlestick. Harry D. Pelham and Charles P. Kaba, Colorado Springs, Colo., assignors, by mesne assignments, of one-half to Addie G. Slater, Colorado Springs, Colo., and one-half to said Charles P. Kaba. (U. S. No. 1,069,170; Aug. 5, 1913.)

ORE TREATMENT—Process for the Recovery of Gold and Silver from Antimonial, Arsenical, and other Gold-Bearing Ores. James Gitsham, Moonee Ponds, Victoria, Australia, assignor to Gitsham Gold Extraction Co., Ltd., Melbourne, Australia. (U. S. No. 1,068,646, July 29, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Aug. 7

**A Railroad to Eureka** in Humboldt County will be opened for traffic early in the spring of 1914. For several years this road, the Northwestern Pacific, has been operated between San Francisco and Willits and Sherwood in Mendocino County. This is about half the distance between San Francisco and Eureka. The road now extends as far north as Dos Rios and as far south from Eureka as Fort Seward, a distance of 68 miles. This leaves a gap of less than 50 miles to fill in before the road is completed, but this part of the right-of-way is mountainous and the construction work is exceptionally difficult. There will be liability to blockade on account of snowslides and rockslides in the operation of the road, but it is believed that these difficulties will be soon eliminated. It is stated by railroad men that the rate of cost of construction on this line for a distance of 39 miles between Willits and Shively has been greater than for any other railroad so far known. About 50 miles have been built in the last three years, but the construction was delayed by boring the Island Mountain tunnel, which is 4337 ft. long and reduces the length of the railroad about five miles. There are 47 tunnels. Frequently it was necessary to haul rails and supplies by wagons over rough mountain roads in the construction of tunnels. The completion of this railroad will be of great commercial advantage to the mining districts in Humboldt County. There are large deposits of copper ore in the southwest and in the central and northeasterly portions of the county. There are some gold mines, principally gravel deposits, but the development of quartz mines, like the development of the copper mines, has been retarded by the lack of railroad transportation. There are also deposits of coal still undeveloped in the southern and central portions of the county. The exploration of these coal deposits has not been sufficient to prove them of great commercial value, but the possibility of exploration and development will be increased by the completion of railroad facilities. Humboldt County was one of the first in the state to produce petroleum, and the oil is of a light gravity. Humboldt County has been known chiefly for its production of lumber, the commercial value of which has not depended upon railroad transportation.

### DENVER—Aug. 9

**The Option on the Golden Cycle** will probably not be taken up, for the merger of the Golden Cycle Mining Co., of Cripple Creek, with the El Paso Consolidated is not likely to be effected according to John T. Milliken, president of the former company. He gave President Allen Burris, of the El Paso company, an option several months ago on fourteen-fifteenths of the stock, and Burris went to Europe to float the deal, but so far is said to have been unsuccessful, and his option expires Sept. 1, and will not be renewed, Mr. Milliken says, for while he is willing to sell outright, the mine is in splendid condition, the mill working full capacity, the production being about 6000 tons per month.

### BUTTE—Aug. 7

**The Three Forks to Radersburg, R.R.** has been a disappointment to mining men of Broadwater County, and of Radersburg in particular, because an announcement has been made that construction work on the partially completed railroad will not be resumed this year as was intended. Construction upon the road was begun more than one year ago, but work was stopped after a few miles of grading had been done, owing to financial trouble. A short time ago, however, the promotors gave notice to those interested, that funds had been raised for resumption of the work, debts were paid, and apparently everything pointed to a speedy completion of the line.

**The Pay of Miners in July** was at the rate of $3.50 per day. During the month the price of copper averaged 14.37c. per lb. This rate of pay is in accordance with the agreement between the company and the Butte miners, entered into some time ago, whereby wages of underground workers are to be paid at the rate of $3.50 per day when the price of copper during the month averages less than 15c. per lb.; $3.75 with the price over 15c. and under 17c. per lb.; and $4 when over 17c. The output of the Anaconda company's smelting plants at Anaconda and Great Falls, was about 22,100,000 lb. and of the East Butte smeltery, 1,250,000 lb. of copper, making the total output of the Butte district 23,350,000 lb. The Anaconda company had on its payroll about 9000 men; the North Butte company 850, the East Butte company 450, and others, including the Butte & Superior, Tuolumne, Elm Orlu, Butte-Alex Scott, Rainbow Lode Development Co., Butte & Duluth, Butte & Zenith City, and Butte & Great Falls companies, a total of 1700, bringing the total to about 12,000 men employed during the month.

### HOUGHTON—Aug. 12

**The Copper Country Strike is Broken.** It may be months before the Federation calls the strike off and it will be at least six months and probably one year before the mines of the Michigan copper country resume normal outputs of copper and recoup working forces to normal strength, but the situation now indicates that the strike has failed, just like every other strike which the Western Federation of Miners has incited. While none of the shafts are as yet hoisting copper rock they will be within a week. The actual working forces now employed at the mines total more than 3500, half of which are employed at the Calumet & Hecla properties. Comparatively few are working underground. The companies are doing a lot of necessary repair work on surface and about the plants. All shop and office forces are working. Pumps are going everywhere. The strike seems to have accentuated the internal dissensions among the officers of the Western Federation of Miners. Representatives of President Moyer, who are here, do not hesitate to say that they disapprove of the strike and of the actions of Vice-president Mahoney. They say the strike never would have been called if Moyer had not gone to Europe, leaving Mahoney in charge. Charges of a rather serious nature, growing out of this and other strikes, are likely to be made against some of the officials of the Federation before the national assemblage of that organization the next time it meets. The strike now has degenerated into a socialistic political propaganda. The meetings last Saturday and Sunday were socialistic. The parades comprised mostly Finn socialists of whom there are hundreds here. The paraders include all kinds of socialists, miners, servants in houses, farmers and others. The meetings have turned into socialistic harangues and the attendance has dwindled to a point where it now includes practically none but the Finn socialists who cannot understand what the English speakers say. The Federation will come to a critical and crucial point inside of another week, when the strikers will demand their strike dues. The agitators promised them $1 per day while they were on strike. They also promised that President Woodrow Wilson would come to the copper country and that the Government would take over control of the mines if they remained idle long enough and a lot of other rot that the socialistic element swallowed whole. Now there is a demand for the strike benefits and the leaders do not seem able to explain satisfactorily when the money will be paid nor where. Likewise, they claim that 90% of the men of the district have joined the union. If this is true the organization must have received a fund totaling $50,000 at a very conservative estimate of $3 per man. Nobody is quite sure what has become of that money. The mining companies are content to resume operations in a limited way and without hurry. They are taking back the good men as they want them and getting things in readiness for copper production on a limited scale. They are certainly exercising the greatest care and judgment in the men who are taken on. When the strike is over the Lake Superior mines will have the highest class of labor to be found anywhere. Not one of the agitators nor any of the men concerned in the violence or in the campaign leading up to the rioting or the strong-arm movement will get his position back again, under any circumstances. It is going to be a "white man's camp" is the talk that is heard everywhere. Thousands of Cornishmen and Scotchmen are preparing to return to the copper district. They saw what was coming months ago and they took the occasion for a journey back to the "Old Country" to avoid the trouble. They are coming back satisfied that the Western Federation never will be able to obtain a foothold again in this district. Hundreds of the better class of workmen in Butte are coming back to the Lake Superior district, disgusted with conditions in Butte and the domination of the camp by the Federation crowd of socialists. At best, however, it is going to take a long time for this district to recover from the effects of the strike and to again show a normal copper production.

### SALT LAKE CITY—Aug. 9

**Gold in Bull Valley** is drawing attention to a new district in Washington County, south from Modena. A sack of 94 lb. of high-grade ore was recently received here from the Bull Valley Gold Mining Co.; it brought $4500, or about $47 per lb. This material consisted of picked ore or specimens, carrying leaf gold, taken in the last few days from the company's upper tunnel. The tunnel is in 350 ft., and rich gold ore has been cut at four places, while the greater part of the work on the vein is in ore. This renews interest in Bull Valley, which first came into notice one year ago.

### DULUTH—Aug. 9

**The Situation at the Allouez Docks** has changed, and the strikers, whom everyone thought were ready to return to work, voted to stay out. The Industrial Workers of the World have taken a hand and it is said that William H. Haywood and Joseph J. Ettor have been invited to Duluth, where they will, no doubt, stir up the usual rumpus and delay or defeat all efforts to conciliate the men. After the strikers voted to stay out, it was expected that new men would take their places, but the men who were imported as strikebreakers quit in a body when they found they were mixed up in a strike. The strikers had signified a willingness to go back to work; the dock officials had made all the concessions the strikers demanded and had agreed to give the men an increase of 15c. per day in pay, the demand for higher wages being a later issue brought up by the men, but just then a leader of the Industrial Workers of the World succeeded in stopping the move for conciliation. An inquest was held Aug. 5 over the two men who were killed in the accident that precipitated the strike. The coroner's jury decided that the men met death under the cars and cited as the cause the custom of the railroad of allowing switchmen to ride on the sides of the cars instead of the tops. On Aug. 8 the first blood of the strike was shed on the main street when Cannon, an I. W. W. leader, and one of his leading aids clashed with Oliver Mining company policemen, following a controversy regarding an open-air meeting. The aid suffered a deep scalp wound and Cannon was bruised. Sixty men, augmented by 105 during the night, loaded 15,000 tons of ore. Nine ore boats were anchored in the bay. Business men of Duluth condemned the Industrial Workers of the World and its methods in a set of resolutions. The Great Northern R.R. is fortifying itself for prolonged hostilities by beginning the construction of a large number of portable shacks in which to house strikebreakers. A sufficient number will be erected to accommodate 400 strikebreakers. A heavy guard will be maintained at the camp night and day. The Great Northern now has 100 deputies, 60 at night and 40 on day duty. They are paid $4 and board. The committee of citizens, which was refused admittance, has abandoned all efforts at intervening, having been discouraged by the unreceptive mood of the men. The committee will disband. The strikers were unable to prevent the steamer Pope, laden with ore, clearing from the dock the morning of Aug. 9; three other steamers were loaded before the end of the day and it was thought that four could be loaded the day following. Duluth vessel agents are holding their boats in the lower lakes. H. V. Brown, local agent for the Pittsburgh Steamship Co., operating 101 carriers, said: "Our company is sending a few boats to Escanaba, Two Harbors, and Ashland, but has taken all boats away from the Duluth and Superior docks. We will keep the remainder of the fleet at Lake Erie ports until the trouble blows over." The Interlake Steamship Co. operating 39 vessels, has done likewise. It is understood that each day a carrier lies idle it costs the company $600. The Great Northern road is carrying out its promise to reduce the element of risk by covering the openings under inside tracks with planks.

### WALLACE—Aug. 7

**A Three-Mile, Double-Track Tunnel** is being planned by men interested in the Nine Mile Creek and Sunset Peak region. They have submitted to the Northern Pacific Ry. Co. a proposal that promises to solve the transportation problem in the district and assurance has been given that the matter will receive careful consideration. The plan contemplates the construction of a double-track mining tunnel 3 miles long by the railway company from the lowest practical site on [illegible] Miles northeast to the different mines to be served, [illegible] easy connection with the Rex, Tamarack and Custer, [illegible]ted, Interstate-Callahan, Sunset, Nipsic and several others less developed and bringing many of the Sunset [illegible] reach by short extensions. Such a tunnel would tap the veins in W. A. Clark's Sunset at an approximate vertical depth of 3000 ft., and would open nearly every vein in the Sunset district with which it could be connected and all of them on the Nine Mile at the lowest possible level from any direction. To build a railway line into the district would cost not less than $350,000, and its operation in the winter time, because of the deep snow and steep grades, would be a constant heavy expense. A 3-mile mining tunnel, such as is proposed, would cost not more than $200,000, it is estimated, and the operation of electric trains through it would be a matter of easy accomplishment at all seasons. Individual mining companies in the Cœur d'Alenes now have in operation tunnels practically as long. The Morning mine main working tunnel is now in over 2 miles, the Hercules is driving one nearly as long from the Trade-Dollar ground and the Bunker Hill & Sullivan Kellogg tunnel is approximately 3 miles long.

### FLAT RIVER—Aug. 6

**A vote to Strike** was polled in the southeastern lead-producing district of Missouri Aug. 6, 95% of the 4000 men employed at the mines in Flat River, Bonne Terre, Herculaneum, Leadwood, Elvins and Desloge voting to go out on strike. They demand an increase in wage of 50c. per day and recognition of the union. The executive committee of the Western Federation of Miners was to meet the night of Aug. 6 to decide when the order should become effective. The lead companies have begun preparations to close the mines. The superintendent of one mine said that the mines would be allowed to fill with water. The trouble between the operators and miners began in 1907, when wages were reduced from 20 to 25%. Several requests for a new scale have been made in the last few years, and a strike was threatened two years ago, but it did not materialize. The answer of the operators was that the price of lead had gone down and that they could better afford to shut down than to operate under the conditions demanded. Coupled with the present labor difficulty, the lead mine owners are facing a reduction in the tariff. The pioneers in the district were the St. Joseph and Doe Run Lead companies, which are controlled by virtually the same stockholders. Other companies operating in the district are the Desloge Consolidated Lead Co., the Federal Lead Co. and the St. Louis Smelting & Refining Co. The Federal Lead Co. is owned by the Guggenheims and recently erected, in Flat River, what is said to be one of the largest lead mills in the world. The St. Louis Smelting & Refining Co. is a subsidiary of the National Lead Co. Labor difficulties in St. Francois County in 1903, witnessed the closing down of mines owned by the Central Lead Co. Rather than yield to the demands of the miners, the shafts were allowed to fill with water. The company passed out of existence and the land later passed into the hands of the Federal Lead Co. when the Guggenheims decided to enter the field. The stand of the Central Lead Co. chilled the ardor of the unionists. The locals passed out of existence and were not revived until the 1907 wage cut. Residents of the district own only their home buildings, the title to all the land having been retained by the companies and the land has been leased. Approximately 20,000 are dependent on the mines.

### CORDOVA, ALASKA—July 31

**The Sushanna Gold Strike** is causing almost as much excitement as was aroused by reports of the Klondike discovery in 1897. The recent find of rich gold-bearing gravel on the Sushanna River was made near the head of the White River, which with the Nabesna is near the headwaters of the Tanana. As a result, a stampede to the new gold field is now on in the Copper River Valley. Men from all walks of life have already joined the stampede or are preparing to join in the rush to the new diggings. From the information available, it appears that there are two creeks, Bonanza and Eldorado, upon which good pay has been struck. There are many other creeks in the district which have not yet been prospected. Some exceptionally rich strikes are reported, and while some of these may be exaggerated, those returning from the Sushanna state that prospecting has revealed wonderfully rich gravel. Although the confirmation of the strike was received from McCarthy but a few days ago, there has been a great exodus to the interior. Cables from Seattle state that more than 500 have embarked for this city. As the trail from McCarthy, along the lines of the Copper River & Northwestern Ry., is the nearest and most feasible route to the Sushanna, all of the travel to the new strike will be via Cordova. It is 50 miles from McCarthy to White River and about the same distance from White River to the diggings. Men from the States who join the stampede can come to Cordova by steamer, go to McCarthy over a broad-gage railroad and "mush" from there to Sushanna in five or six days.

# THE MINING NEWS

## ALABAMA

### Jefferson County

STANDARD STEEL CO. (Oxmoor)—The properties of the Self Fluxing Ore & Iron Co., including 1600 acres of ore land, have been purchased by the Standard at a price said to exceed $1,000,000.

## ALASKA

ALASKA GOLD MINES (Juneau)—Two 1750-kv.-a. alternating-current generators with a 50-kw. motor-generator set, a 540-kv.-a. induction motor with 22-kw. exciter, six 600-kv.-a. water-cooled transformers, switchboard panels and accessories are being supplied by the General Electric Co. for immediate installation.

McGILLIVRAY & TREML (Fairbanks)—Colin McGillivray and Joseph Treml, lessees on the Wild Rose claim of the Reliance Mining Co., have their working shaft down 50 ft., where sinking has ceased for a time on account of water. A small station has been cut, and it is planned to crosscut to the vein, which dipped into the hanging wall at a depth of 26 ft. in the shaft. If developments on the 50-ft. level prove satisfactory, the shaft will be continued to the 100-ft. level, where a larger station will be cut.

## ARIZONA

### Gila County

OLD DOMINION (Globe)—Ore will be raised through the Kingdon shaft while "A" shaft is being prepared for skip hoisting. Work on the concentrator is progressing rapidly.

MIAMI COPPER (Miami)—In July, underground development amounted to 5600 ft., exclusive of the work of reopening the ground in the northwest section of the orebody. That section is again in good working condition and the scale of mining will be increased in the near future. During July, 93,423 tons of ore were milled. At present the concentrator is treating about 3100 tons daily. Work of enlarging and timbering the Captain shaft down to the tramming level is proceeding rapidly. At the mill the crusher section of the building is being enlarged to make room for two sets of heavy Miami-type Traylor rolls. In the sixth unit a new type of Deister table, a quadruple-deck sand table is being installed. It is to receive a thorough test during the next few weeks. On the foundations of what would be the mill's seventh section an experimental plant is being built for leaching tests of New Keystone ores. Launders to the flat southeast of the Miami mill are being built to carry away the tailings.

INSPIRATION CONSOLIDATED (Miami)—At the millsite the first concrete was poured into the forms on Monday, Aug. 11. The concrete mixers at the millsite are set upon platforms and the sand, cement and crushed rock are carried to them already mixed by conveyor belts, the mixers merely mix the materials with water and discharge the concrete into long wooden troughs, which will convey the concrete downward to the successive walls as they are built one below the other. The concrete now being poured at the orebin foundations near the hoisting shafts in Webster Gulch is being supplied from a flat car, upon which the mixer is mounted. Launders leading out from each side of the car make it possible to fill forms on each side as the car moves along the track. The quarry west of the millsite is supplying about 80 cu.yd. of rock daily for the orebin and about an equal amount for the beginning of the mill building. As work at the latter progresses, the quarry will be opened and its output increased. Cement is arriving at the rate of one carload per day. This rate will keep the construction force supplied. It is possible that the transmission line from Roosevelt dam will be finished to Miami by November.

### Mohave County

GOLCONDA (Golconda)—Timbering of the shaft is practically completed and it is expected that mining will be resumed within a few days.

TELLURIDE MINING, MILLING & DEVELOPMENT CO. (Oatman)—A 40-hp. gas engine, blower, hoist and other machinery have been installed. The main shaft is 200 ft. deep. At this depth a crosscut has cut good milling ore. It is said that near this shaft, two veins form junctions with the Tom Reed vein.

GOLD ROAD (Gold Road)—A bar of bullion valued at $17,000, the cleanest bar of bullion ever sent from this district was shipped recently. A change has been made in the personnel of the staff by Manager D. R. Muir, several of the heads of departments, including the mine and mill superintendents having left the employ of the company.

KINGMAN COPPER CO. (Mineral Park)—Upon arrival of the larger drilling rig, an attempt was made to deepen a 300-ft. hole drilled with the lighter outfit, but it was found that the hole had been filled with scrap iron for 60 or 70 ft. A new hole was started near the plugged hole, and has now reached a depth of 350 ft. Some copper ore has already been encountered.

ARIZONA VENTURE CORPORATION (Kingman)—H. R. Collins recently took charge. A small Buick runabout with a delivery body for light haulage between Kingman and the mine has been purchased, and a large shipment of supplies has been sent out to the mine. This property was at one time known as the Great Republic and produced some rich silver ore. Good copper ore has also been found in recent development work. It is understood that considerable development work is planned and that a mill may be built.

## CALIFORNIA

### Amador County

ZEILA (Jackson)—A large quantity of old cables and machinery long in disuse is being shipped to San Francisco. The mine and mill are in operation.

SOUTH EUREKA (Sutter Creek)—Ten stamps of the old Oneida mill have been overhauled and are now dropping on ore from the drift connecting the South Eureka and Oneida mines. All the 80 stamps of the South Eureka are also dropping on good ore.

MOORE (Jackson)—Application has been made to the Board of Equalization for a reduction of taxes from $30,000 to $8960. The mine has not been operated for several years, though it is said to be one of the best of the properties developed by Capt. W. A. Neville, now deceased. The Central Land & Trust Co., of San Francisco, made the application, which was denied.

### Modoc County

SUNSHINE (Highgrade)—Jack Miller is sinking a winze from the main tunnel. It is believed that the work is being done below the main vein originally uncovered at the surface. The William Vinson lease on ground north of the main tunnel on block No. 8 was reported to have yielded satisfactory results.

LUCKY DUTCHMAN LEASE (Highgrade)—It is reported that the oreshoot has been opened up for a length of 100 ft. The ore will be sorted and a carload shipped to the Salt Lake sampling works. This lease is on the Sunshine, but that part of the mine is commonly known as the Lucky Dutchman. Fred Schrott is lessee.

MODOC MINES CO. (Highgrade)—The shaft is deeper than 200 ft.; it is equipped with a steam hoist. Difficulty with water has been experienced during the last month. The shaft will be deepened to 500 ft., and the stations will be cut and drifts driven at the 100-, 200-, 300- and 400-ft. levels. J. F. Cutler is superintendent.

### Placer County

YUKON GOLD MINING CO. (Auburn)—A dredge-building camp has been established at Mammoth Bar. The lumber for the bunkhouse, cookhouse, and the stocks for launching the boat has been hauled in. Lumber and other materials were transported over the railroad operated by the Pacific Portland Cement Co. It is understood that a 7-cu.ft. bucket dredge will be built, and that a large part of its machinery will be taken from one of the boats out of commission in the Oroville field. The exploration of adjoining bars and the construction of the dredge are under the general supervision of O. B. Perry, of Oroville. The geological work is under the direction of F. R. Short, of San Francisco. Hoyt Perren is general superintendent and Mr. Munro is field superintendent. The field of exploration work includes the bars on which the Poverty Bar dredge is being built.

### Sacramento County

UNION DREDGING CO. (Folsom)—It is reported that negotiations are being made by the Ashburton Mining Co. for the purchase of the Union's dredge and dredging lands in Blue Ravine. The Ashburton has a comparatively small acreage left to be dredged in its field, and the Union property has a large area.

### Sierra County

PRIMROSE—This quartz property, in Hog cañon, is being thoroughly prospected by T. E. Winrod, of Downieville, who has bonded the property from A. Siebricht, owner.

SIERRA DEL ORO—An old 200-ft. tunnel is being opened and retimbered. It will be extended 300 ft. to tap the rich pay-shoot 100 ft. below the workings now open.

BANNER—This quartz property, at the head of Jim Crow cañon, has been bonded by the Harris estate to A. C. Copp, of Alameda, who will begin prospecting work at once.

KINSELBACH (Alleghany)—Development work has been resumed on this quartz property, on Kanaka Creek, by the owners, who recently came from Pasadena to take personal charge.

RED LEDGE—At this mine, on Scott's Flat, recent development work has disclosed a vein carrying free-gold ore, with sulphides assaying high in both gold and silver. A 4-stamp mill is being built and will soon be in operation.

KATE HARDY (Forest)—A raise for ventilation is being cut from the lower to the upper tunnel, with good prospects of high-grade ore being encountered in the course of the work. Ore from the upper dumps is now supplying the mill.

### Yuba County

TARR MINING CO. (Marysville)—The mine at Blue Point near Smartsville, has been closed down. Large sums of money have been spent in building a plant for treating the gravel, including a dredging machine operated like a bucket-elevator dredge, but requiring no flotation pond. A report to the stockholders a few days ago stated that the superintendent, A. J. Poser, had reported that the grade of the gravel in the property was not sufficient to warrant further development or the closing of the deal with the New Blue Point Mining Co., which held the title to the ground. The contract expired June 23. At that time the final payment of $132,000 was due. A trust deed for $55,381 was also due. The failure to secure a court judgment or the amount of water required is said to have crippled the mine to some extent. It is reported also that an additional sum of $4500 remains unpaid.

## COLORADO

### Clear Creek County

HONEST JOHN TUNNEL (Idaho Springs)—The owners of this Chicago Creek property plan to spend $25,000 for development work. The crosscut tunnel, which is now 2100 ft. long, is to be advanced to intersect veins owned by the company. The work will be let to contractors, and for the present will be done by hand. The advisability of installing a compressor plant is being considered.

STANLEY (Idaho Springs)—During July the fifth level west heading was advanced 110 ft. to a total length of 2467 ft. The drift intersected a prominent fault, which also crosses the east drift from the third level winze. This fault has drained the water from the winze workings. A raise will soon be started from the fifth level to connect with the bottom of the winze from the third level. This connection will make the ore in this ground available through the fifth level at lower cost than heretofore, due to the elimination of the expense of raising and hoisting from the winze.

### Eagle County

THE EXTENSION OF THE LADY BELLE is claimed to have been opened by Sheriff Henry, of Eagle County, lessee of the New Dakota Claim. He has struck ore assaying from 7 to 95 oz. silver and some copper. It is 1000 ft. south of the Lady Belle and in the same formation, Dakota sandstone.

### Gilpin County

NOTAWAY (Central City)—A Leyner compressor, together with the necessary auxiliary equipment, has been installed and shaft sinking will be continued with air drills. The purchasing of machine drills for drifting and stoping is being considered. The east and west headings on the new 750-ft. level are being advanced in pay ore.

WAR DANCE (Idaho Springs)—To eliminate undesirable features of the leasing system, the operators will try the system of leasing recently adopted in Cripple Creek. The company will furnish power and supplies, the lessees will furnish the labor, and the net profits from the operations will be divided equally between lessor and lessee.

### San Juan Region

. ORE SHIPMENTS FROM TELLURIDE for July totalled 99 cars of concentrates, or more than three cars per day.

THE LEDGE MILL is now running steadily on custom ores. The new bins are filled and a large quantity of ore is expected in the future, from the Red Mountain district; the Silver Doctor at Animas Forks is also a large contributor.

KING (Silverton)—This mine, on Sultan Mountain, which has been idle for a few years, is once more producing. The first shipment was two cars of high-grade ore sent to the American Smelting & Refining Co. plant at Durango.

BALLARD (Telluride)—Ground is being broken in Bear Creek Gulch for a new 20-stamp mill to treat the ores from this property on Mount Ballard. The ore will be transported by a wire-rope tramway. For the last year a large vein of low-grade, free-milling gold ore has been developed.

SAN BERNARDO—This property near Ophir Loop is now being operated by lessees. The mill was recently placed in operation and it is reported that the results are gratifying. A sufficient ore reserve is blocked out in the mine to keep the mill supplied for several months and development work is opening up new ore.

JUNTA (Telluride)—Work on the new mill in Bear Creek Gulch is progressing rapidly. Five carloads of machinery were hauled to the mill last week. The company is making every effort to place the mill in operation before the beginning of winter. It is stated that ample reserves of milling ore are blocked out in the Jim Crow, Wasatch and Orion properties, in La Junta Basin, to keep the mill supplied with 300 tons per day as soon as the plant is ready to receive it.

### Summit County

WELLINGTON MINES C. (Breckenridge)—A large vein has been cut in driving the crosscut on the fourth level, toward the old Oro shaft. The vein contains blende, pyrite and some lead. It seems probable that drifting in the vein will disclose a shoot of pay ore. The dry or magnetic separator mill is kept running full time on the middlings saved from the former operation of the wet mill and makes a good shipping grade of zinc concentrate.

### Teller County

HOMESTAKE MILL (Cripple Creek)—Custom operations will be started by Thomas Kavanagh some time in August, when ore in 100-ton lots will be accepted. The ore will be purchased outright, a charge of $3 being made for treatment, which will be the minimum. The ore must be delivered to the mill. At present ore assaying $1 per ton is being milled. In July about 500 tons were treated. It came from the tunnel and was used only to try out the machinery. As soon as the custom ore is taken and as soon as it is determined that it can be treated there is every reason to believe that a scale of rates will be arranged.

## IDAHO

### Cœur d'Alene District

SONORA (Burke)—An assessment of 2 mills per share indicates that this company will resume operations. Its mine has been left idle for several years. The stock was formerly active on the Spokane market, and prospects of developing the mine were considered good. Much development work was done prior to the suspension.

[illegible]CKFORD—Contractors have begun work on an extension of the lower tunnel of this property on Big Creek. The extension will start from the 600-ft. station and will continue [illegible] ft. At this point it is thought the vein will be [illegible] ore exposed, the 1600 ft. of tunnel along the upper workings developed ore of good grade but not in shipping quantities.

NATIONAL (Wallace)—The General Engineering Co., of Salt Lake City, has completed exhaustive tests of the National ores and has been engaged to design and erect a 500-ton plant. J. M. Callow is at the millsite with a corps of draftsmen. Construction work, under Karl Bernson, of the engineering company, will be started immediately, and the mill is expected to be under cover before snow falls.

### Custer County

RED BIRD SMELTING CO. (Mackay)—A smelting plant of 100 tons capacity has been ordered from a Denver firm, and it is expected that the plant will be in operation by Oct. 1. In addition to building the reduction works the following groups of mining claims have been purchased: Red Bird, Skylark, Silver Rule, Ella and Hood. The company will be in the market for custom ores in addition to its own product.

### Idaho County

MAJESTIC—(Dixie)—The milling plant of the Idaho-Champion company, about 10 miles away, has been purchased for this mine, and is now being moved. Ten stamps, vanners, leaching tanks, pumps and piping are included in the sale. The Majestic company has a power plant developed and a millsite, on which the new equipment will be placed. Sufficient ore has been developed to assure steady running of the mill.

MT. MARSHALL MINES, LTD. (Burlington)—This company, operating mines in the Marshall Lake district, was formerly known as the Rapid River Reducing Co. A tunnel has been driven for a length of 800 ft. and has cut two veins. Drifting on these veins will be started at once and the tunnel will be driven farther into the hill in the hope of cutting more veins, the existence of which is indicated by outcrops on the surface. The ore contains $36 per ton in gold and silver; $27 per ton was recovered in a recently made mill test. Development work consists of a 100-ft. shaft from which a drift 260 ft. long has been driven on one of the veins, the total length of the workings in the properties being 1734 ft. Ore is taken from several open cuts on the veins. A 6-stamp mill of 30 tons daily capacity has been built and equipped with amalgamation plates, two Wilfley tables and two Frue vanners.

## MINNESOTA

### Cuyuna Range

ADAMS (Oreland)—Drifting the orebody is under way. The management expects to make shipments before the close of the season.

ROGERS, BROWN ORE CO. (Crosby)—The Armour No. 1 mine has been closed down, throwing 225 men out of work. The stockpile of 35,000 tons will be shipped this season. This is an underground mine, but it is the intention of the management to change to stripping next season.

CUYUNA-SULTANA IRON CO.—An option on a manganese property on the Cuyuna range will be exercised. The acquisition of this property will make the company second in importance to the Cuyuna-Mille Lacs company as controlling valuable manganese property.

DULUTH-BRAINERD IRON CO. (Crosby)—This company will start sinking a shaft within the next 30 days. The Northern Pacific Ry. is surveying an extension from its Cuyuna-Mille Lacs mine spur to the Duluth-Brainerd property in Sec. 32, 47-29. The company has 1,500,000 tons of manganiferous iron ore shown up by drilling.

BRAINERD-CUYUNA MINING CO. (Brainerd)—At a recent stockholders meeting it was decided immediately to commence sinking a shaft on the property, inside the city limits of Brainerd. The shaft will be about 200 ft. deep, and an orebody of considerable size has been proved by drilling, although the iron content is somewhat lower than the Cuyuna range properties now shipping.

CUYUNA-MILLE LACS (Crosby)—Within the next week the manager expects to be hoisting and shipping 700 tons per day; it is expected that it will be possible to ship approximately 75,000 tons this season. This is the richest ore that is shipped out of the State of Minnesota, containing more than 20% manganese and 30% or more iron. The manganese content, however, is extremely variable.

BARROWS (Barrows)—One 3600-gal. triple-expansion pump operating at less than half capacity is raising all the water from this shaft. A station is now being cut for an additional pump of similar capacity. From 40 to 50 tons of ore per day are being hoisted, and vessel space has been reserved for at least 15,000 tons this season. The property is operated by the Virginia Ore Mining Co., a subsidiary of M. A. Hanna & Co.

PITTSBURGH STEEL ORE CO. (Riverton)—Plans are being made for building a concentrator. A considerable portion of the ore carries free quartz, which will be removed by concentrating. According to present plans, a first and second grade of concentrates will be made, the latter carrying probably 12% or more silica. A shaft is now being sunk to some of the leaner ore to obtain a sufficient supply for experimental purposes. This portion of the orebody is at a considerable distance from the hydraulic stripping operations now being carried on by this company.

### Vermilion Range

NORTH AMERICAN (Tower)—It is expected that ore will be encountered at any day now. A drift is being driven on the 400 level to ore located by diamond drills.

CONSOLIDATED VERMILION & EXTENSION CO. (Tower)—The exploratory shaft on East Extension ground, which was started in ore from the surface, is still in clean hematite, running 62 to 68% iron, at a depth of 50 ft. This shaft will be known as Vermilion No. 2. The Vermilion No. 1 shaft is producing and putting ore on the stockpile.

LUCKY BOY-ANDERSON (Ely)—At this property of the Vermilion & Mesabi Iron Co. a drift is being driven at a depth of 210 ft. It is now in ore. A considerable flow of water attended entering the ore at this depth, and caused delay for a week. The orebody was 14 ft. wide at a depth of 90 ft. and 20 ft. wide at 140 ft. It is expected that the deposit will be still wider at 210 ft., and plans are being made to open up this level for production.

## MISSOURI

### Joplin District

PORTER LAND (Carthage)—A Carthage company has just drained the old Porter tract. Three shafts are now being reopened and within a month production will be resumed.

MacDONALD & DERISAL (Aurora)—Silicate is being produced profitably. Recent turn-ins assayed 46.80% zinc. For some time the weekly production from the mine has averaged about 4 tons.

PEACOCK-GALENA (Galena)—Five shafts have been sunk on the lease and the company is hoisting from each. Virtually the same run of ore is being worked, and the mill is in constant operation.

FORTUNE TELLER (Granby)—Three Joplin operators, F. Kincannon, Frank Sitler and John Painter, have leased this mine and also are sinking a new shaft on the property, hoping to strike a vain of zinc ore that produced well from the old shaft.

DUNCAN & CO. (Joplin)—Cuttings from three drill holes sunk on the ground of the Missouri Lead & Zinc Co. showed the presence of both lead and zinc ore at depths of 90 to 120 ft. The company intends to sink several other drill holes before sinking a shaft.

VINEGAR HILL MINING CO. (Neck City)—A 200-ton concentrator has just been purchased in Joplin for removal to a newly-developed lease at Neck City. A promising deposit has been opened on a lease of the Reliance land in the very heart of the old camp.

RUBY B. (Bellville)—Exceptionally rich ore is being taken out of a new shaft at a depth of 40 ft. Only zinc is found. Some of the dirt taken out last week assayed 40% ore. A new company is developing the tract, R. O. Spears and A. J. Hamilton, of Joplin, being interested.

WHIRLWIND MINING CO. (Carl Junction)—New steam equipment has been installed at the lease on the Budd M. Robinson land. Some good ore was developed at 60 ft., but in sinking deeper still richer dirt was found and the 94-ft. level shows exceptionally good ore.

PUSSAFISS (Joplin)—This mine has been sold to a company of Joplin and Carthage operators. Several good turn-ins have been made, although only a hand-jig outfit has been used. The new company plans to open new drifts and carry out a general campaign of development work. The mine is situated near the Seven mine, which has been in the producing column of the Joplin camp every week for several months.

EMMA GORDON (Miami)—This mine, one of the first opened up in the Miami camp, is operating again after a shutdown of several weeks, when the mill was overhauled and placed in condition for continuous operation. The land is owned by a Cherokee Indian woman. Ore was found accidentally, the strike being made while drilling for water for agricultural purposes. Since then 6 mills have been erected on the land and the Indian woman's royalty from the land has exceeded $125 per day.

SLEEPY HOLLOW MINING CO. (Joplin)—This company's tract is the latest addition to the Joplin camp. It is situated southeast of the city and consists of 80 acres. Six drill holes and three shafts have shown zince ore. Drifts have been extended from the main shaft, and from them a large quantity of ore has been taken out and placed in the bins. Both lead and zinc ore are found. Operations are being conducted from the 100-ft. and 120-ft. levels. A mill is to be built within a short time, according to Charles Wells, of Joplin, superintendent of the company, and the ore from the three shafts will be treated.

## MONTANA

### Butte District

ALEX-SCOTT (Butte)—Shipments are made daily of 250 tons of ore to the East Butte smeltery works and it is expected that an increase to 300 tons will be made soon. During the year recently ended the company mined 50,700 tons of ore of a gross value of $8.94 per ton. Mining and transportation charges amounted to $214,338; reduction charges to $157,555, at the rate of $3.107 per ton. The company is doing much development work and is blocking out some fine ore.

PILOT-BUTTE (Butte)—This property appears to be developing into a great mine. Three veins carrying good ore have been cut on the 2000, the lowest level opened, and two have been opened on the 1800. The first of these veins carris 9 ft. of 27% zinc ore. The second is a large copper-bearing vein which for a width of 20 ft. assays high in copper. The third vein, which has been cut on the 2200 but has not yet been reached on the 1800, is a silver- lead- and zinc-ore vein. The crosscuts are being continued to cut another known vein farther north.

TUOLUMNE (Butte)—It is stated that there is no idea at present of taking in the Colusa-Leonard in the proposed merger, on which the Tuolumne and Main Range stockholders will vote Aug. 18. The Main Range stockholders think the Tuolumne is getting the best of the proposed merger. The Tuolumne mine has for a few years been a great disappointment. On the 1800, 2000 and 2200 levels the vein is almost barren, although on the 2200 it is as strong as any vein in the district, but the ore is lean. At the crosscut, as on the 2000 and 1800 levels 20% copper ore was cut and the officers thought they had a bonanza, but the ore petered out within 20 ft. Preparations are now being made for sinking several hundred feet more.

ANACONDA (Butte)—A new steel and concrete orebin, capable of holding 5000 tons of ore, is being erected at the Belmont mine, in the southern part of the district. This orebin is 200 yd. east of the shaft, on the Butte, Anaconda & Pacific R.R. A tramway is being built from the cellar of the shaft to the bins; it is equipped for electric haulage. The Belmont shaft will be used to hosit ore from the Belmont mine, and in addition, from some of the south veins of the Anaconda mine, to which it is connected by a long crosscut. A report has been circulated for some time that practically all of the ore from the Anaconda company's mines will be hoisted through the Belmont shaft in the near future, but there is no truth in the report.

EAST BUTTE (Butte)—During the last few months a larger force of men has been working on the lower levels. It has been demonstrated that richer and more extensive bodies of ore exist on these levels than on the 800-ft. level and others above, and within the last few months more ore has been blocked out than was hoisted during the year. Work upon the enlargement of the smelting plant, which has been reported as about to be commenced many times during the last two years, is still being deferred. This is accounted for by the management as having been deemed advisable in order to liquidate the company's indebtedness as rapidly as possible. An official of the company recently stated, however, that the work will be commenced this autumn.

### Broadwater County

LITTLE GIANT (Townsend)—Recently in drifting west on a vein opened by a croscut on the 600-ft. level a shoot of high-grade gold ore was encountered; the shoot is widening as progress is made. P. W. Risque, owner of a claim adjoining the Little Giant, has just shipped a carload of ore which it is believed will run about the same as a carload shipped by him a short time ago, and which netted $164 per ton.

### Fergus County

KENDALL (Kendall)—If investigations now being made show its advisability, this mine and mill will be operated again. Work was suspended about one year ago.

### Granite County

AMERICAN FLAG (Philipsburg)—The company operating this mine has opened the vein to a depth of 200 ft., developing good copper ore. As the long wagon haul makes the cost of transporting ore prohibitive, the company is planning the erection of a concentrator.

## NEVADA

### Comstock Lode

CROWN POINT (Virginia City)—The first carload of drain pipe to be utilized in carrying the water 3000 ft. from the joint incline shaft to the Sutro tunnel, is now being installed, and will be complete for use upon the installation of the pumps in the early autumn. The hot water pumped from the levels below the 1400, will be conveyed for six miles in a conduit to the mouth of the Sutro tunnel, the point of discharge.

### Douglas County

A GOLD STRIKE is reported to have been made two or three miles west of Buckskin. The property is already under bond and lease, and development has been begun.

OREGON KEYSTONE MINING CO. (Dothan)—Application has been made to the state engineer for the waters of the east fork of Cow Creek for hydraulic mining. If granted, extensive development work will be done in the way of building flumes and a dam.

### Lyon County

DEWITT MINE (Silver City)—A discovery of good-grade ore was recently made in this mine, and the force will be increased.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the Thompson smelting plant for the week ended July 31, 1913, were as follows: From Mason Valley mine, 1890 tons; from Nevada-Douglas, 1292 tons; from other mines, 712 tons; total, 3894, or a daily average of 556 tons. During the same week five cars of matte were shipped.

NEVADA-DOUGLAS (Ludwig)—Ore assaying 12 to 15% copper has been taken out in development on the 750-ft. level. The oreshoot here appears to be as extensive as on the level above. On the sixth level the continuation of the ore in 605 stope has been found. This is 4 ft. wide and assays 19% copper. The new oreshoot discovered between the third and fourth levels in the drift from the 417 raise assays 6% copper; 4½% ore has been discovered in the drift under the Maybe stope on Douglas Hill. On the tunnel level 6% ore has been opened from which shipments are now being made. Results of the development in the Casting Copper ground are satisfactory.

### Mineral County

WAGNER AZURITE COPPER CO. (Luning)—This is commonly known as the Luning group and consists of 14 claims, situated three miles southeast of Luning. The area covered is traversed by six veins of carbonate ore in a shattered garnet-lime formation. All but one of the claims have been prospected by opencuts, and the minerals exposed are hydrous copper carbonates, red and black oxides of copper, and at a depth of 20 ft., pyrite and chalcopyrite. In the southern part of the property a shaft is now down 70 ft. This will be used for more extensive development and eventually for a main working shaft. The first car of ore, which averaged 4% copper, has been shipped. A small mill and leaching plant have been purchased. Frank Everett is manager.

### Nye County

TONOPAH MINING CO. (Tonopah)—The grade of ore is now showing great improvement over that mined during the last two months, the total output for those months averaged between $14 and $15 per ton, but during July the ore milled averaged nearly $20 per ton.

NORTH STAR (Tonopah)—The east drift on the 1060-ft. level has now been extended 230 ft. in ore without a fault. The vein ranges from 4½ to 10 ft. of good shipping ore. The property is now shipping 100 tons of ore daily, but a new compressor is being installed and shipments will be increased to 150 tons.

### Washoe County

BELLE ISLE—The island in the Truckee River, which is Reno's amusement park, was recently staked as a placer claim. Those staking the ground claimed there was a defect in the old title.

## NORTH CARROLINA

### Montgomery County

UWARRA MINING CO. (Candor)—Underground conditions led to the conclusion that the Iola company, operating adjoining property, was trespassing on Uwarra ground. Rumors of such trespassing had been current for several months, but as there was no law in the state under which a survey of the Iola workings could be ordered, Percy E. Barbour, the manager for the Uwarra company, drew up such a law modelling it upon such laws as are in force in the mining states of the West, but with the more drastic provisions of the Western laws eliminated. Despite the efforts of the Iola company early last March Barbour succeeded in getting the legislature to enact the law he had framed. The Uwarra company immediately filed a complaint and request for a survey. A date was set for a hearing and the Iola company was ordered to show cause why the order for survey should not be granted. The Iola then proposed an amicable survey. An agreement was drawn up in the form of an order of Court and was signed by the judge, but when one of the court surveyors started to make the survey he met with resistance. The Uwarra then cited the Iola for contempt whereupon the judge ordered a survey to be permitted by Uwarra engineers according to Uwarra contentions, at the same time, of course, giving the Iola the right to survey according to that company's contentions. The Iola company at this point also brought up the question of boundaries. The Iola is now under a suspended judgment in the contempt proceedings and is operating their mine under a restraining order granted to Uwarra when it first filed complaint. The framework of the Uwarra mill building is nearly all erected and placing the corrugated covering has been started. Several carloads of the mill machinery have arrived and have been unloaded. The new boilers are in place, bricked up and are ready for the stacks and piping. The new Sullivan compressor is already on its foundation. Underground, the main shaft has been sunk 53 ft. below the 300-ft. level and sinking is progressing steadily. A small hoist has been installed in the 300-ft. station, and is used for sinking and hoisting through the manway so that the cage may run without interruption to the 300-ft. level, enabling continuation of lateral development on that level. The Montgomery vein on the 150 level has been faulted and lost, for a long time, but has just been picked up. The vein in the 300 Montgomery south has just been cut off by a dike, which is the third dike in the mine. Judging from the other two it is expected that the vein will be found beyond this dike without any difficulty.

## UTAH

### Juab County

IRON BLOSSOM (Eureka)—The recent strike made in a fissure paralleling the main fissure about 75 ft. above the 500 has been found to extend to that level, and it is stated that preparations for stoping are being made. In July 58 cars of ore were shipped.

EAGLE & BLUE BELL (Eureka)—The recent strike of high-grade ore on the 700 appears to be of importance. The winze from the 1350-ft. level begun close to the main orebody is down 90 ft., the last 40 ft. being in ore. Stoping is being done on the 1350. During July 71 cars of ore were shipped.

YANKEE (Knightsville)—The night shift has been withdrawn from the deeper levels, although work will be continued there as heretofore. Especial attention is being given to the 200-ft. level, where prospecting was recently begun for a continuation of the Beck Tunnel ores. There are 2000 ft. of unprospected ground here on the trend of the Beck Tunnel mineral zone. Two cars of zinc ore were shipped in July.

VICTORIA (Eureka)—Drifting on the main fissure for some time in progress on the 1000- and 1200-ft. levels has resulted in the discovery of a small deposit of ore on the 1200, running well in gold, which it is thought may open into a larger oreshoot. One car of ore has been shipped from the new find. A raise from the 1200 has been completed to the 1000, improving ventilation and affording a better outlet for ore. July production amounted to 20 cars.

### Salt Lake County

BINGHAM METAL (Bingham)—Drifting to the west is under way on a fissure 4 ft. wide, carrying a good grade of silver-lead ore. A raise is being lifted through mineralized ground toward the limestone above. It is stated that a contract for furnishing water is to be made with the Bingham-New Haven.

UTAH COPPER (Bingham)—A contract was recently made with the Utah Metal Co. for water from the Pine Cañon supply of the latter company, and for a new tunnel between Carr Fork and the Tooele side. A 6-in. pipeline is being laid through the tunnel to Bingham. The pipeline will be nearly four miles long, that portion of it in the tunnel measuring about two miles.

## CANADA

### British Columbia

THE KETTLE RIVER VALLEY RY. will be completed in about one year and will give transportation between the [illegible] cities of British Columbia and the southern interior [illegible] districts of the province. In present construction [illegible] men are engaged.

A [illegible] STRIKE OF COPPER ORE is reported from Fif[illegible] Creek, a tributary of the Coquihalla River. The [illegible] by Urbin Hicks, who located three claims on a [illegible] having a width of from 8 to 14 ft. He will commence operations on the property early in September.

[illegible] (Hazelton)—R. J. McDonell, one of the principal owners of this claim on Hudson Bay Mountain, is pre[illegible] development on a large scale, owing to the [illegible] of the Grand Trunk Pacific Ry.

BRITISH COLUMBIA COPPER CO. (Greenwood)— A six months extension of the bond on the L. H. mine, near Silverton, has been secured.

TOGO (Greenwood)—On this claim, J. D. Graham has struck a small streak of high-grade ore that assays over $400 per ton in silver and gold. The rich ore is 20 ft. from the surface in a shaft that is being sunk on the vein.

YANKEE GIRL (Ymir)—Approximately 1000 tons of ore had been shipped to the British Columbia Copper Co. plant at Greenwood before shipments were switched to Trail, on account of the percentage of lead in the ore making it unsuitable for the British Columbia company's furnaces.

BIG MISSOURI—A small crew of men is at work on this group in the Portland Canal mining division, continuing a crosscut tunnel to strike one of the veins. The owners have exposed one shoot of ore by means of open cuts. It is 110 ft. wide and assays from $10 to $12 per ton in gold, silver, copper and lead.

AUFEAS (Hope)—The vein was struck in the tunnel, July 26, at a distance of 385 ft. from the portal, and at a depth of 450 ft. The vein is 3 ft. wide where cut, and shows a higher percentage of copper than the surface. An aërial tram is to be installed and shipments to the Tacoma smelter will be started. The ore resembles that of the Nickel Plate mine in the Similkameen, except that the arsenic content is higher.

INDIAN MINE—A strike of 6 ft. of silver-lead ore has recently been made at this property on Salmon River in the Portland Canal district. A tunnel was run to get under a massive surface showing of blende and galena, and at 230 ft. in from the portal the downward extension of this orebody was met with, at a vertical depth of 150 ft. Three feet of the six is clean ore; the rest will require concentration.

### Ontario

BURNSIDES (Swastika)—Arrangements are being made to form a stock company and put the stock on the market.

DANE COPPER CO. (Dane)—Work has been stopped at No. 2 shaft on account of the low grade of the ore in the bottom levels.

ERNHOUS (Swastika)—It is understood that the option on this property held by E. P. Earle and David Fasken, will not be exercised.

DOME LAKE (Porcupine)—A report states that this company is having trouble with its mill, and is not obtaining the extraction which was expected.

McINTYRE (Schumacher))—A meeting of shareholders has been called to ratify a bond issue of $250,000, of which the directors propose to sell $200,000 to pay off indebtedness and provide for development work and the enlargement of the mill.

STERLING (Elk Lake)—This property, which was recently sold at auction under a judicial order for $300,000, is again on the market, owing to the purchaser having made default in the payment of the required deposit. A resale has been ordered.

LUCKY CROSS (Swastika)—Just before the closing down of this mine while alterations are being made to the mill, a strike was made in drifting on No. 9 vein, at the 100-ft. level, where a rich oreshoot 3 ft. wide in the face of the drift was encountered. It shows a large amount of free gold, and tests have disclosed the presence of tellurium.

TOUGH-OAKES (Kirkland Lake)—These properties, also known as the Foster-Tough, have been taken over by a company incorporated under the name of the Tough-Oakes Gold Mines, Ltd., with an authorized capital of $3,000,000 in $5 shares. The officers are: Clement A. Foster, president and managing director; Harry Oakes, vice-president, and Edwin W. Kearney, secretary-treasurer. Of the 600,000 shares, 450,000 have been issued as consideration for the properties, and of the remainder, 50,000 shares will be offered to the public at $4 per share to finance the erection of a mill.

## MEXICO

### San Luis Potosi

TIRO GENERAL (Charcas)—It appears quite possible that the American Smelting & Refining Co. will have to suspend operations here, due to the difficulty of doing any work under existing circumstances. Suspension of work seems most unfortunate as a large amount of construction work has just been completed, which would make this the most important, or one of the most important properties in Mexico owned by the company. The mine has been held up twice for forced loans, visited once with a little shooting between rebels and federals, and the traffic on the railroad has been cut several times since June. Of late, however, the rebels have not molested the men personally, other than to make demands for money. In February there was a fight in which 20 men were engaged, most of whom were miners who had become intoxicated. All of the women and children got out of camp safely.

### Sonora

EXPORTS OF ORE FROM AGUA PRIETA for July, were as follows: Nacozari, 13,200 tons, El Tigre, 403; Churunababi, 492; Batuc, 55; Monte Cristo, 20; Rivera, 15; Agua Buena, 23; La Sonora, 38; Vaquero, 108; San Francisco, 2, Archipelago, 70; Matilde, 20, El Gallo, 298; Estrella, 32, Santa Margarita, 53; total, 15,329 tons.

HOHMAN (Nacozari)—An examination for Pittsburgh men has just been completed and the result is satisfactory. Work will be commenced immediately as the country around Nacozari is quiet and all the mines are working unmolested.

## AFRICA

### Transvaal

Gold production in the Transvaal in July was 655,389 oz., which is 91,688 oz. less than in June and 110,949 oz. less than in July, 1912. For the seven months ended July 31 the total output was 5,309,245 oz. in 1912, and 5,295,810 oz.—or $109,464,393—in 1913; a decrease of 13,435 oz. this year. A further

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Aug. 13

The metal markets have been marked chiefly by an advance in prices, which seems to be based partly on some increase in demand, but partly on a general impression as to scarcity of supplies.

MONTHLY INDEX NUMBERS

| Month | 1912 | 1913 | Month | 1912 | 1913 | Month | 1912 | 1913 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 111 | 126 | May | 118 | 126 | Sept. | 127 | ... |
| Feb. | 109 | 125 | June | 117 | 117 | Oct. | 133 | .. |
| March | 111 | 125 | July | 114 | 110 | Nov. | 129 | ... |
| April | 115 | 124 | Aug. | 120 | . | Dec. | 129 | ... |

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115

Numbers for each month and year calculated on approximate sales of pig ron, copper, tin, lead, zinc and aluminum.

## Copper, Tin, Lead and Zinc

**Copper**—The market throughout the week has displayed considerable strength and a good quantity of electrolytic copper has been sold at steadily advancing prices. There has been little or no making of concessions by any of the agencies. Producers are now well booked ahead. Electrolytic copper for spot and August delivery is becoming scarce and there has been some talk of premiums in cases where buyers needed immediate supplies, but we have heard of none actually paid so far.

The business in Lake copper has been naturally very limited, as all of the mines are closed this week and the smelters have used up nearly lal the material they had on hand. A few small lots have been sold but prices of this variety must be considered entirely nominal. The strike at the Lake continues, and, although there are some of the strikers who show a disposition to give way, there is no doubt that production will not be resumed on any large scale for some time and in all probability the rest of the year will show operations on rather a reduced scale.

The Lake copper on hand continues to be held for higher prices, and at the close the market is quoted nominally at 15⅞@16c., while electrolytic copper in cakes, wirebars and ingots closes at 15.50@15.60c. Casting copper is quoted at 15@15¼c. as an average for the week.

The London market for standard copper on Aug. 7 was £68 2s. 6d. for both spot and three months. It advanced over £1 on Aug. 8 to £69 3s. 9d. for both positions. On Aug. 11 and 12 it fluctuated around £69, and on Aug. 13 was again stronger, and closes at £69 12s. 6d. for both spot and three months.

There have been considerable realizations of speculative holdings, which have been well absorbed, and leave the market in even a stronger position than before.

Base price of copper sheets was advanced 1c. on Aug. 7, and is now 21c. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16¼@16½c., carload lots at mill.

Exports of copper from New York for the week were 8085 long tons. Our special correspondent gives the exports from Baltimore at 1287 tons for the week.

Visible stocks of copper in Europe July 31, are reported as follows: Great Britain, 18,037; France, 3132; Rotterdam, 4000; Hamburg, 1584; Bremen, 1699; other European ports, 1200; total, 29,652 long tons, or 66,420,480 lb.; a decrease of 1996 tons from the July 15 report. In addition to the stocks given above 2175 tons are reported afloat from Chile and 5000 tons from Australia; making a total of 36,827 tons. Stocks in other European ports have not heretofore been reported.

**Brass Prices**—Base prices of brass goods, dating Aug. 8, are: Sheets, high brass, 16¼c. net per lb.; low brass, 18⅛c. Wire, high brass, 16c.; low brass, 18⅛c. Rods, high brass, 16c.; low brass, 18⅞c. Tubes, brazed, 20¾c.; open seam, 20¾c. Brass angles and channels, 20¾c. Scrap allowances, 10¾c. net per lb. for high brass; 12¾c. for low brass.

**Tin**—The market retained its strength mainly on the good support which it obtained from this side. There was heavy buying during last week, both by consumers and dealers, and, consequently, large orders were placed in London. Spot material in this market seems to be concentrated in a few hands and is commanding a premium of from ⅜ to ½c. over the import price. Early this week American buyers withdrew and immediately the London market became weaker. The market closes easier at £188 for spot, and £189 for three months, and at about 41½c. for August tin here.

**Lead**—The market is quiet and without special feature. St. Louis is quoted at 4.37½@4.40c., and New York at 4.45@4.50 cents.

The miners' strike in the southeast Missouri lead district has not yet materialized. The miners in the Flat River district voted to strike, but so far have not carried the threat into effect.

The London market is somewhat easier, Spanish lead having declined to £20 15s. and English to £21 5s. per ton.

**Spelter**—The position in spelter seems to be a little stronger and there is no pressure to sell while there is a fair demand, and business has been done at somewhat higher prices. At the close St. Louis is quoted at 5.45@5.50c., and New York at 5.60@5.65 cents.

DAILY PRICES OF METALS

NEW YORK

| Aug. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 4.8645 | 59⅛ | 15⅞<br>@16 | 15.10<br>@15.20 | 41⅜ | 4.45<br>@4.50 | 4.37½<br>@4.40 | 5.55<br>@5.60 | 5.40<br>@5.45 |
| 8 | 4.8665 | 59 | 15⅞<br>@16 | 15.20<br>@15.30 | 41½ | 4.45<br>@4.50 | 4.37½<br>@4.40 | 5.55<br>@5.60 | 5.40<br>@5.45 |
| 9 | 4.8659 | 59 | 15⅞<br>@16 | 15.30<br>@15.40 | 41¼ | 4.45<br>@4.50 | 4.37½<br>@4.40 | 5.55<br>@5.60 | 5.40<br>@5.45 |
| 11 | 4.8655 | 59¼ | 15⅞<br>@16 | 15.40<br>@15.50 | 42⅛ | 4.45<br>@4.50 | 4.37½<br>@4.40 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 12 | 4.8655 | 59¼ | 15⅞<br>@16 | 15.40<br>@15.50 | 41¼ | 4.45<br>@4.50 | 4.37½<br>@4.40 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 13 | 4.8635 | 59⅛ | 15⅞<br>@16 | 15.50<br>@15.60 | 41½ | 4.45<br>@4.50 | 4.37½<br>@4.40 | 5.60<br>@5.65 | 5.45<br>@5.50 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Aug. | Silver | Copper: Spot | Copper: 3 Mos | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| 7 | 27¼ | 68⅛ | 68⅛ | 73½ | 186¼ | 186½ | 20¾ | 20½ |
| 8 | $27\frac{3}{16}$ | $69\frac{3}{16}$ | $69\frac{3}{16}$ | 74¼ | 187¼ | 187¼ | 20¼ | 20⅝ |
| 9 | $27\frac{3}{16}$ | .. | ... | . |  | .. | . | .... |
| 11 | $27\frac{5}{16}$ | 68⅞ | $68\frac{13}{16}$ | 74 | 189⅞ | 189⅝ | 20¾ | 20⅞ |
| 12 | $27\frac{5}{16}$ | 69 | 69 | 74¼ | 188½ | 187¾ | 20¾ | 20¾ |
| 13 | 27¼ | 69⅝ | 69⅝ | 74 | 188 | 189 | 20¾ | 20⅜ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c Variations, £1 = 0.21¾c.

At London good ordinaries close at £20 7s. 6d. and specials 5s. higher.

Base price of zinc sheets is now $7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

## Other Metals

**Aluminum**—The market is rather dull, and very little business has been transacted. The uncertainty as to the tariff still holds back business and sales have been only of metal required for immediate use. Current quotations are a little lower, 2[illegible]@23¼c. per lb. being asked for No. 1 ingots, New York delivery. Imported metal is quoted at 18½@19c. in bond. The foreign market is rather firm at last quotations.

**Antimony**—The market has been dull and weak, with sales only of a [illegible] order. Cookson's is quoted at 8.35@8.40c. per lb.; Hallett's at 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business is fair and prices remain unchanged. New York quotations are $40 per flask of 75 lb. San Francisco, $39.50 for domestic orders, and $37 for copper. The London price is £7 5s. per flask, with £7 quoted from second hands.

## Gold, Silver and Platinum

**Gold**—Gold on the open market in London was unchanged, the quotations being 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. There was no special demand.

Imports of gold at New York week ended Aug. 9, were $370,668, chiefly from Mexico; exports were $47,000, all to Cuba.

Imports of gold in France five months ended May 31, were 257,611,000 fr.; exports, 26,889,000 fr.; excess of imports, 230,722,000 fr., against 97,641,000 fr. last year.

Gold in the United States Aug. 1 is estimated by the Treasury Department as follows: In treasury current balance, $174,725,676; in banks and circulation, $606,015,613; held in treasury against gold certificates outstanding, $1,092,252,169; total, $1,872,993,458, an increase of $4,202,598 during July.

**Iridium**—There is no change in the position of this metal. Demand is rather quiet, but quotations remain about $85 per oz., New York.

**Platinum**—The situation remains unchanged both here and abroad. The Russian export tax is not yet settled, and it will probably be some time before it goes into effect. Meantime trade is inclined to be quiet, with prices unchanged. Dealers ask $45@46 per oz. for refined platinum, and $49@52 per oz. for hard metal.

**Silver**—The market has ruled firm and steady the past week, advancing to 27$\frac{5}{16}$d. in London on buying by China Banks. A good deal of the strength of the market in China arises from the poor condition of the import trade. The buying for Indian Bazaars also continues good, so that prices are likely to continue steady for the present.

Exports of silver from London to the East, Jan. 1 to July 31, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| India | £4,240,200 | £4,251,500 | I. | £11,300 |
| China | 933,500 | 462,000 | D. | 471,500 |
| **Total** | £5,173,700 | £4,713,500 | D. | £460,200 |

Imports of silver at New York, week ended Aug. 9, were $452,184, chiefly from Mexico and South America. Exports were $1,208,420, nearly all to London.

Imports of silver in France, five months ended May 31, were 135,361,000 fr.; exports, 151,706,000 fr.; excess of exports, 16,345,000 fr., against an excess of imports of 13,131,000 fr. last year.

Coined silver in the United States, Aug. 1, is estimated by the Treasury Department as follows: Standard dollars, $565,633,020; subsidiary coins, $175,582,664; total, $711,215,684. Of the dollars $483,869,000 are held in the Treasury against outstanding silver certificates.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Aug. 9

The base price paid this week for 60% zinc ore was $44@[illegible] ton. The base price paid for 80% lead ore was $53@55 per ton.

SHIPMENTS WEEK ENDED AUG. 9

| | Zinc ore, lb | Lead ore lb | Sulphur ore, lb. |
|---|---|---|---|
| [illegible] | 3,208,190 | 331,800 | 877,940 |
| [illegible] | 8[illegible],498,530 | 1,505,990 | 37,380,500 |

Shipped during week to separating plant, 1,876,430 lb. zinc

### JOPLIN, MO.—Aug. 9

The high price of zinc blende is $48, the base per ton of 60% zinc ranging from $44 to $46.50 for choicest grades, with $48@50 base paid for blende carrying in excess of 8% iron. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades is $43.46 per ton. Lead sold at $54@55 per ton of 80% metal contents, with the average of all grades $53.38 per ton.

SHIPMENTS WEEK ENDED AUG. 9

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week | 9,962,750 | 1,016,040 | 2,189,150 | $285,438 |
| Totals 32 weeks | 343,720,290 | 25,235,420 | 57,212,420 | 9,502,519 |

| | | | |
|---|---|---|---|
| Blende value, the week | $216,522 | 32 weeks | $7,678,538 |
| Calamine value, the week | 10,484 | 32 weeks | 319,700 |
| Lead value, the week | 58,432 | 32 weeks | 1,504,281 |

# IRON TRADE REVIEW

### NEW YORK—Aug. 13

Perhaps the most notable feature of the iron and steel trades is the more confident tone and the belief in future demand and continued activity.

New orders are increasing, though they are generally for moderate quantities. In this connection, however, it is well to consider that there is not the same inducement to contract far ahead that existed last year. The trade has been pretty well gaged, and there is no fear of any scarcity of material.

Pig iron is more in demand and is firmer. Concessions are little heard of; in fact, small advances are beginning to be the rule, especially with basic iron.

Sentiment in the steel trade continues to improve, in the direction that a buying movement cannot be far off, but there is less assurance that current prices will be maintained. The declines in sheet prices during the past few months, with declines in wire products amounting with this week's decline to $3 a ton, and the reduction of $2 a ton in steel pipe, are admitted as a suggestion that probably the majority of finished steel prices will have declined somewhat before buyers begin taking hold for forward delivery. Current buying is chiefly for quick shipment, which large mills are much better able to effect than a couple of months ago.

The International Harvester Co. has placed its contracts for steel bars for the season. They amount to about 100,000 tons and are divided between the Carnegie and the Jones & Laughlin companies.

**The United States Steel Corporation** reports unfilled orders on the books on July 31 at 5,399,356 tons of all kinds of material. This is a decrease of 407,961 tons from June 30; of 2,532,808 tons from Dec. 31, 1912; and of 557,723 tons from July 31 of last year.

**Pig-Iron Production**—The reports of the blast furnaces, as collected and published by the "Iron Age," show that on Aug. 1 there were 266 coke and anthracite stacks in blast, having a total daily capacity of 81,700 tons; a decrease of 6300 tons from July 31. Making allowance for the charcoal furnaces the estimated production of pig iron in the United States in July was 2,595,500 tons; adding the report for the first half-year, this makes a total for the seven months ended July 31 of 19,084,100 tons. Of this total 13,309,500 tons, or 70%, were made by the steel-works furnaces.

### PITTSBURGH, PENN.—Aug. 12

The Steel Corporation's loss in unfilled tonnage in July, 407,961 tons, compares with a June loss of 517,005 tons and a May loss of 654,440 tons. There was a slight decrease in shipments from June to July, but even making allowance for this there is shown a material increase in books, even though they remained much below shipments. It is understood that bookings late in July were heavier than early in the month, thus promising a still better showing for August.

Additional shading of wire products by independents has caused the American Steel & Wire Co. to make another reduction in prices, and today it has notified the trade that contracts made Aug. 1 are to be reduced $1 a ton, making a general basis which it is hoped will become the turning point in prices. This basis is $1.65 for nails, $1 a ton below open prices of a fortnight ago, and $3 a ton below the market of earlier in the year.

Butt-weld sizes of steel pipe have been reduced one point, or $2 a ton. In some quarters predictions are made that bars, plates and shapes will decline about $2 a ton and it is represented that this would complete a fairly general reduction in steel prices, sufficient to inaugurate a fresh buying movement.

**Pig Iron**—Though the furnaces have for weeks claimed that the basic iron market was $14.25, Valley, each succeeding sale proves to have been at about $14, the latest involving a round tonnage taken by the American Steel Foundries for Alliance and Sharon delivery, at $14.50, delivered. The recently reported purchase of Jones & Laughlin Steel Co. and Youngstown Sheet & Tube Co. were at about $14, Valley furnace, though reported in the trade at the time at $14.25. We now quote basic at $14, Valley, though it might be more difficult to buy at this figure than it was when the market was openly quoted at the higher figure. Bessemer is nominally quoted at $14.50, Valley, although buyers are unwilling to take hold at the figure. Foundry iron appears definitely firmer, the $13.75 Valley quotation being probably a thing of the past. Buying on the whole is rather light. We quote: Bessemer, $14.50; basic, $14@14.25; malleable, $14.25; No. 2 foundry, $14; forge, $13.50@13.75, at Valley furnace, 90c. higher delivered Pittsburgh.

**Ferromanganese**—Perhaps in recognition of shading of the reduced price of $58.50 recently made, English producers have made another reduction of $2.50, and the market for both prompt and forward is now quoted at $56, Baltimore, with $2.16 freight to Pittsburgh.

**Steel**—Rumors are heard of possible concessions in billets and sheet bars from prices recently quoted of $26.50 for billets and $27.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown. There is little demand and the strength of the market is not being tested. Rods are quotable at $28, Pittsburgh.

### IRON ORE

Shipments from the Lake Superior iron-ore district in July were 8,204,416 tons, the heaviest ever reported in one month. For the season to Aug. 1 the total shipments by ports were, in long tons:

| Port | 1912 | 1913 | Change |
|---|---|---|---|
| Escanaba | 2,478,294 | 2,659 299 | I. 181,005 |
| Marquette | 1,430,814 | 1,556,501 | I. 125,687 |
| Ashland | 2,103,858 | 2,264,031 | I. 160,173 |
| Superior | 6,668,655 | 7,073,413 | I. 404,758 |
| Duluth | 4,385,802 | 5,934,664 | I. 1,548,862 |
| Two Harbors | 4,223,481 | 4,841,552 | I. 618,071 |
| Totals | 21,290,904 | 24,329,460 | I. 3,038,556 |

The increase this year is coming from the eastern Mesabi; the gain from the Hill leases is comparatively small.

**Imports of iron ore into Germany**, six months ended June 30, were 6,843,646 metric tons; exports, 1,374,982 tons. Imports of manganese ore were 378,493 tons; exports, 4337 tons.

### COKE

Connellsville coke prices continue steady at $2.50 per ton for contract furnace coke. Production and shipments were about at the usual level.

**Anthracite Shipments** in July were 5,487,852 long tons, a decrease of 797,301 tons as compared with July, 1912. For the seven months ended July 31 the total shipments were 32,382,132 tons in 1912, and 40,339,706 tons in 1913; an increase of 7,957,574 tons, or 24.6% this year.

**Coal Passing Sault Ste. Marie** canals season to Aug. 1, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 505,225 | 1,425,554 | I. 920,329 |
| Bituminous | 5,981,229 | 7,986,881 | I. 2,005,652 |
| Total | 6,486,454 | 9,412,435 | I. 2,925,981 |

Anthracite shipments were light last year, owing to the suspension of mining in April and May.

## CHEMICALS

### NEW YORK—Aug. 13

The general market is still quiet with the usual midsummer dullness quite apparent.

**Arsenic**—Business is slow, with sales on a moderate scale. Quotations are $3.12½@3.25 per 100 lb., but are nominal in the absence of large business.

**Copper Sulphate**—Sales continue fair and prices are unchanged at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

**Nitrate of Soda**—There is not much business doing. Quotations remain about the same, at 2.32½c. for both spot and futures up to December.

Advices from Chile report that interests representing over two-thirds of the total production have agreed to join in the new combination to restrict production.

### OTHER ORE MARKETS

**Manganese Ores**—The schedule of prices adopted by the Carnegie Steel Co. is as follows, for deliveries in the Pittsburgh district or at South Chicago: Ore containing 49% or over metallic manganese, 25c. per unit; 46 to 49%, 24c.; 43 to 46%, 23c.; 40 to 43%, 22c. These prices are based on ores containing not more than 8% silica or 0.20% phosphorus. Deductions will be made of 15c. per ton for each 1% of silica in excess of 8%; of 2c. per unit of manganese for each 0.02% of phosphorus in excess of 0.20%. Ores containing less than 40% manganese, more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at buyer's option. These prices are for domestic ores; the greater part of the ores used are imported, and are bought abroad at current market prices.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | March | April | May | June | July |
|---|---|---|---|---|---|
| Alaska shipments | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 |
| Anaconda | 22,900,000 | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 |
| Arizona, Ltd. | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 | |
| Copper Queen | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 |
| Calumet & Ariz. | 4,250,000 | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 |
| Chino | 4,464,723 | 3,925,409 | 3,883,611 | 3,682,706 | 4,686,250 |
| Detroit | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 | 1,519,224 |
| East Butte | 1,400,000 | 1,400,000 | 1,268,595 | 1,055,646 | |
| Mammoth | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 |
| Giroux* | 625,000 | 600,000 | 625,000 | 610,000 | |
| Mason Valley | 1,608,492 | 1,264,304 | 1,186,560 | 1,097,014 | 990,000 |
| Miami | | | 1,943,900 | 2,612,000 | |
| Nevada Con. | 5,555,320 | 5,650,000 | 5,933,275 | 6,344,863 | |
| Ohio | 591,651 | 690,001 | 650,071 | | |
| Old Dominion | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 |
| Ray | 4,287,000 | 4,379,128 | 4,384,400 | | |
| Shannon | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 | 880,000 |
| Sonth, Utah | 62,224 | 132,267 | 200,000 | | |
| Tennessee | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 | |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 2,900,000 | |
| Utah Copper Co. | 8,248,880 | 9,539,847 | 10,003,227 | 11,637,949 | |
| Lake Superior* | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 | |
| Non-rep. mines* | 6,203,606 | 6,000,000 | 6,300,000 | 6,000,000 | |
| Total prod. | 102,619,054 | 104,224,079 | 109,824,500 | | |
| Imports, bars, etc. | 24,215,480 | 25,578,297 | 22,205,942 | | |
| Total blister | 126,834,534 | 129,802,376 | 132,039,442 | | |
| Imp. ore & matte | 11,911,041 | 7,177,363 | 10,528,562 | | |
| Total Amer. | 138,745,575 | 136,989,739 | 142,559,004 | | |
| Miami† | 3,102,200 | 2,312,900 | | | 2,890,000 |
| Shattuck-Arizona | 1,234,450 | 1,158,326 | 1,026,170 | 1,059,625 | |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 844,735 | 794,000 | | | |
| Granby | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 | |
| Mexican Cos.: | | | | | |
| Boleo† | 2,204,720 | 2,811,200 | 2,424,800 | 1,984,640 | |
| Cananea | 4,772,000 | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 |
| Moctezuma | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 |
| Cape Cop., S. Af. | 732,480 | 586,880 | 387,520 | 414,400 | |
| Kyshtim, Russia | 1,478,400 | 2,544,640 | 1,490,000 | | |
| Spassky, Russia | 974,400 | 974,400 | 721,280 | 835,520 | |
| Exports from | | | | | |
| Chile | 7,840,000 | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 |
| Australia | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 |
| Arrivals—Europe† | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VII, '12 | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123 198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,452,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,904,606 | 71,904,000 | 124,808,606 |
| VIII | | | | 52,904,606 | 66,420,480 | 119,325,086 |

Note—From Jan. 1. 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Andes, Nev | July 27 | Aug. 19 | $0.02 |
| Belcher, Calif | July 21 | Aug. 14 | 0.10 |
| Blue Bell, Ida | July 15 | Aug. 20 | 0.002 |
| Blue Bull, Nev | July 14 | Aug. 18 | 0.02 |
| Carbonate, Ida | July 25 | Aug. 25 | 0.001 |
| Central Eureka, Calif. | ........ | ........ | 0.025 |
| Comstock, Ida | July 24 | Aug. 23 | 0.001 |
| Eagle Mountain, Ida | July 19 | Aug. 16 | 0.0005 |
| Eastern Star, Ida | July 25 | Aug. 25 | 0.002 |
| Emerald, Utah [illegible] | ...... | Sept. 13 | 0.005 |
| Galena King, Utah | July 21 | Aug. 11 | 0.02 |
| Independence [illegible], Ida | July 5 | Aug. 29 | 0.002¼ |
| Iron Mask, Ida | July 11 | Aug. 11 | 0.002 |
| Morning Star, Utah | Aug. 8 | Sept. 1 | 0.0025 |
| North Bunker Hill, Ida | July 15 | Aug. 16 | 0.002 |
| O.K., Utah | July 26 | Aug. 12 | 0.005 |
| Overman, Calif | July 24 | Aug. 13 | 0.05 |
| Rescue Eula, Nev | July 6 | Aug. 11 | 0.01 |
| Saltese, Ida | July 20 | Aug. 20 | 0.002 |
| Syndicate [illegible], Ida | July 23 | Aug. 23 | 0.003 |
| Tar Baby, Utah | Aug. 1 | Aug. 27 | 0.0025 |
| Temple, Ida | July 19 | Aug. 23 | 0.002 |
| Tintic Delmar, Utah | July 16 | Aug. 16 | 0.001 |
| Tuscumbia, Ida | Aug. 1 | Aug. 23 | 0.005 |
| Umatilla, Nev | July 14 | Aug. 18 | 0.013 |
| Utah-United, Utah | July 19 | Aug. 11 | 0.01 |
| Wilbert, Utah | Aug. 1 | Aug. 23 | 0.02 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | NEW YORK | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | ...... | 17.644 | ...... | 78.670 | ...... |
| September | 17.508 | ...... | 17.698 | ...... | 78.762 | ...... |
| October | 17.314 | ...... | 17.661 | ...... | 76.389 | ...... |
| November | 17.326 | ...... | 17.617 | ...... | 76.890 | ...... |
| December | 17.376 | ...... | 17.600 | ...... | 75.516 | ...... |
| Year | 16.341 | ...... | 16.560 | ...... | 72.942 | ...... |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | ..... | 208.351 | ..... |
| September | 49.135 | ..... | 223.762 | ..... |
| October | 50.077 | ..... | 228.353 | ..... |
| November | 49.891 | ..... | 227.619 | ..... |
| December | 49.815 | | 226.875 | |
| Year | 46.096 | | 209.322 | . |

New York, cents per pound. London in pounds sterling per long ton.

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | ...... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | ...... | 4.924 | ...... | 22.292 | ...... |
| October | 5.071 | ...... | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | ...... | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | ...... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ...... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | ...... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ..... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | .... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ...... |
| Year | $16.01 | ..... | $14.93 | ...... | $15.28 | ...... |

## STOCK QUOTATIONS

**COLO. SPRINGS** Aug. 12

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02½ |
| Cripple Cr'k Con. | .01½ |
| C. K. & N. | .10 |
| Doctor Jack Pot | .05½ |
| Elkton Con | .56½ |
| El Paso | 2.00 |
| Findlay | .02½ |
| Gold Dollar | .05 |
| Gold Sovereign | .02½ |
| Isabella | .11¾ |
| Jack Pot | .04 |
| Jennie Sample | .05 |
| Lexington | .02 |
| Moon Anchor | .01 |
| Old Gold | .01½ |
| Mary McKinney | .56 |
| Pharmacist | .01 |
| Portland | .95 |
| Vindicator | .84 |
| Work | ‡.005 |

**SALT LAKE** Aug. 12

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .05 |
| Black Jack | .06 |
| Cedar Talisman | .01 |
| Colorado Mining | .14 |
| Columbus Con. | ‡.07 |
| Crown Point | ‡.01½ |
| Daly-Judge | 6.35 |
| Grand Central | .50 |
| Iron Blossom | 1.25 |
| Little Bell | ‡.10 |
| Lower Mammoth | .01¼ |
| Mason Valley | ‡6.00 |
| May Day | .05¼ |
| Nevada Hills | .81 |
| New York | ‡.02 |
| Prince Con | .28 |
| Silver King Coal'n | 3.20 |
| Sioux Con | .02 |
| Uncle Sam | .02 |
| Yankee | ‡.08 |

**TORONTO** Aug. 11

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .07 | Foley O'Brien | .20 |
| Coniagas | 7.05 | Hollinger | 15.25 |
| T. & Hudson Bay | ‡65.00 | Imperial | ‡.01 |
| Timiskaming | .28 | Jupiter | .24 |
| Wettlaufer-Lor. | .11 | Pearl Lake | .32 |
| Apex | ‡.005 | Porcu. Gold | .08 |
| Crown Chartered | ‡.00¼ | Preston E. D. | .02 |
| Doble | .25 | Rea | .15 |
| Dome | 14.00 | Swastika | .03 |
| Dome Exten. | .06 | West Dome | .10 |

**SAN FRANCISCO** Aug. 12

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .04 | Belmont | 6.65 |
| Belcher | .24 | Jim Butler | .66 |
| Best & Belcher | .06 | MacNamara | .12 |
| Caledonia | 1.10 | Midway | .47 |
| Challenge Con | .06 | Mont.-Tonopah | 1.02½ |
| Chollar | .01 | North Star | .86 |
| Confidence | .15 | West End Con. | 1.17½ |
| Con. Virginia | .09 | Atlanta | .14 |
| Crown Point | .20 | Booth | .01 |
| Gould & Curry | .03 | C.O.D. Con | .03 |
| Hale & Norcross | .18 | Comb. Frac | .03 |
| Mexican | 1.00 | Jumbo Extension | .11 |
| Occidental | .70 | Pitts.-Silver Peak | .46 |
| Ophir | 18 | Round Mountain | .51 |
| Overman | ‡.50 | Silver Pick | .02 |
| Potosi | .01 | Tramp Con | ‡.01 |
| Savage | .11 | Argonaut | 2.00 |
| Sierra Nevada | .05 | Bunker Hill | 1.50 |
| Union Con | .09 | Central Eureka | .10 |
| Yellow Jacket | .17 | So. Eureka | 2.62 |

**N. Y. EXCH.** Aug. 12

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 74¾ |
| Am. Agri. Chem. | 46½ |
| Am.Sm.&Ref.,com | 67¼ |
| Am. Sm. & Ref., pf. | 102 |
| Am. Sm. Sec., pf. B | 81¾ |
| Anaconda | 37⅛ |
| Batopilas Min | 1¼ |
| BethlehemSteelpf | 74 |
| Chino | 40⅜ |
| Federal M. & S., pf. | 39 |
| GreatNor., ore., ctf. | 36⅛ |
| Guggen. Exp | 46 |
| Homestake | 103 |
| Inspiration Con. | 15⅜ |
| Miami Copper | 22¼ |
| Nat'nalLead,com | 49¼ |
| National Lead, pf. | 105½ |
| Nev. Consol | 16¼ |
| Phelps Dodge | 192½ |
| Pittsburg Coal, pf. | 84⅞ |
| Quicksilver, pf. | 3⅝ |
| Ray Con | 19⅝ |
| RepublicI&S,com. | 25½ |
| Republic I & S, pf. | 89 |
| SlossSheffi'd,com. | 29 |
| Sloss Sheffield, pf. | 85 |
| Tennessee Copper | 31⅞ |
| Utah Copper | 50⅞ |
| U. S. Steel, com | 65¼ |
| U. S. Steel, pf. | 108⅝ |
| Va.Car.Chem., pf. | 96 |

**N. Y. CURB** Aug. 12

| Name of Comp. | Clg. |
|---|---|
| Barnes King | 1.73 |
| Beaver Con | .30 |
| Big Four | .38 |
| Braden Copper | 6⅞ |
| B. C. Copper | 2⅜ |
| Buffalo Mines | 2⅜ |
| Can. G. & S. | .24 |
| Con. Ariz. Sm. | ¼ |
| Davis-Daly | 2⅛ |
| Diam'field-Daisy | .02 |
| Ely Con | .08 |
| Florence | .27 |
| Giroux | 1 5/16 |
| Gold Hill Con. | ‡¼ |
| Goldfield Con. | 1 9/16 |
| Greene Cananea | 34 |
| Greenwater | .05 |
| Internat. S. & R. | ‡109 |
| Kerr Lake | 3 7/16 |
| Keystone | ‡2 |
| La Rose | 2¼ |
| McKinley-Dar-Sa | 1¼ |
| Min. Co. of A. new | 2½ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 9 |
| Ohio Copper | ½ |
| Pacific Sm. & M. | ⅛ |
| Puebla S. & R. | 2 3/16 |
| South Live Oak | ‡2 |
| South Utah M. & S. | ⅜ |
| Stand'd Oil of N.J. | 372 |
| Stewart | 1 11/16 |
| Tonopah | 4 5/16 |
| Tonopah Ex. | 1 1/16 |
| Tonopah Merger | .71 |
| Tri-Bullion | ⅛ |
| Tularosa | ⅜ |
| Union Mines | ⅛ |
| United Cop., pfd. | 2½ |
| Yukon Gold | 2½ |

**LONDON** Aug. 2

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 15s 0d |
| El Oro | 0 14 3 |
| Esperanza | 1 1 3 |
| Mexico Mines | 5 5 0 |
| Oroville | 0 5 6 |
| Santa Gert'dis | 0 16 3 |
| Stratton's | 0 1 9 |
| Tomboy | 1 6 3 |

**BOSTON EXCH.** Aug. 12

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1¼ |
| Ahmeek | 275 |
| Alaska Gold M. | 19¼ |
| Algomah | 1⅛ |
| Allouez | 36 |
| Am. Zinc | 21½ |
| Ariz. Com., ctfs. | 3 1/16 |
| Bonanza | .32 |
| Boston & Corbin | 1 |
| Butte & Balak | 1½ |
| Calumet & Ariz | 64½ |
| Calumet & Hecla | 420 |
| Centennial | 13 |
| Cliff | 1½ |
| Copper Range | 40¾ |
| Daly West | 2¼ |
| East Butte | 12¾ |
| Franklin | 4⅝ |
| Granby | 62¼ |
| Hancock | 17½ |
| Hedley Gold | ‡30 |
| Helvetia | .35 |
| Indiana | 5½ |
| Island Cr'k, com. | 52 |
| Island Cr'k, pfd. | 83 |
| Isle Royale | 18¾ |
| Keweenaw | 1 |
| Lake | 8 |
| La Salle | 3¼ |
| Mass | 3 |
| Michigan | ¾ |
| Mohawk | 43¾ |
| New Arcadian | 1¼ |
| New Idria Quick. | ‡3⅞ |
| North Butte | 28½ |
| North Lake | 1⅛ |
| Ojibway | ¼ |
| Old Dominion | 49½ |
| Osceola | 80½ |
| Quincy | 60½ |
| Shannon | 7 |
| Shattuck-Ariz. | 25 |
| Superior | 25¾ |
| Superior & Bost. | 2½ |
| Tamarack | 29 |
| Trinity | 4¾ |
| Tuolumne | 1 |
| U. S. Smelting | 37¼ |
| U. S. Smelt'g, pf. | 48 |
| Utah Apex | 1¾ |
| Utah Con | 9¼ |
| Victoria | 1⅛ |
| Winona | 1¼ |
| Wolverine | 45 |
| Wyandot | ¾ |

**BOSTON CURB** Aug. 12

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 4 |
| Boston Ely | .54 |
| Butte & Lon'nDev. | .27 |
| Butte Central | .06 |
| Cactus | .02 |
| Calaveras | 2¼ |
| Chief Cons | 1¾ |
| Corbin | .97 |
| Cortez | .20 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | .95 |
| First Nat. Cop. | 2¼ |
| Houghton Copper | 3¼ |
| Majestic | .35 |
| Mexican Metals | .53 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 1¼ |
| New Baltic | .70 |
| Oneco | .80 |
| Raven Copper | .15 |
| Rhode Island Coal | .01 |
| Smokey Dev. | 1 |
| S. W. Miami | ‡1¼ |
| South Lake | 4¼ |
| Tretheway | ¼ |
| United Verde Ext. | .61 |

‡Last quotation.

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# Developments on Michigan Iron Ranges

By P. B. McDonald*

*SYNOPSIS—A sketch of the history of iron-ore shipments from Michigan ranges, followed by a description of the principal features of the important districts. Concentration of low-grade ore is now being attempted, and if successful, will appreciably increase the available iron-ore reserves.*

⁂

Attention has recently been directed to the Michigan iron ranges by the mining boom, which has been taking place in the Iron River field, and also by the extensive exploration and improvement work being carried on by progressive companies in both the old and new districts. The record-breaking shipment of over 48,000,000 tons of iron ore from the Lake Superior region, in 1912, has aided in attracting attention. New mining corporations have lately acquired footholds in the Michigan districts; furnace interests from Ohio and New York, as well as local mining men from Michigan and Minnesota, and a steady expansion is in progress.

South Jackson Open-Cut Mine of the Cleveland-Cliffs Iron Co.

### Shipments Date from 1856

Shipment of Lake Superior iron ore to lower Lake ports substantially began in 1856, at the completion of the ship canal along St. Mary's River connecting Lake Superior with Lake Huron, when 6343 tons were shipped, and has increased to such proportions that the enormous quantity of 50,000,000 tons is predicted for 1913. In 1860, the tonnage moved was 114,401, all from the Marquette range, as was also the case in 1870, when 830,934 tons were shipped. In 1880, the amount was 1,976,096 tons, which came from the Marquette and Menominee ranges, and in 1890, 9,003,725 tons came from Marquette, Menominee, Gogebic and the Vermillion ranges in Minnesota. In 1909, 19,080,379 tons were shipped from Marquette, Menominee, Gogebic, Vermillion and Mesabi ranges (the last contributing 7,809,535 tons), and in 1910, 43,442,397 tons were shipped from the same ranges, of which the Mesabi contributed 29,201,760 tons.

Since 1900 the Michigan ranges have been somewhat overshadowed by the huge shipments made from the Mesabi range in Minnesota, but nevertheless have been growing and expanding steadily, and it is believed that the deeper deposits of Michigan are assured of a much longer life than the flat orebodies of the Mesabi.

### Iron River District Early Overlooked

The Iron River district, on the western Menominee range, was, for a long time, a minor producer of medium-grade, non-bessemer ores, suitable for pig iron and open-hearth steel. On account of the non-bessemer grade of the ore and the scarcity of outcrops, the field was rather overlooked by the large steel organizations and its mines became controlled by small, aggressive companies which, several years ago, began an active exploratory campaign, the successful results of which attracted others. Much of the land was held in small parcels by settlers, making a diversity of ownerships. It had formerly been believed that the ore formation was confined to a northwest-southeast belt between Palatka and Iron River, but drill holes sunk promiscuously beyond these limits disclosed three or four other strong ore-zones, striking in various directions, and it is now recognized that the iron occurs in irregular, discontinuous lenses in the slates so that a lot more drilling will be necessary before it can definitely be indicated where the ore is not. J. R. Finlay credits the district with containing what is probably the second largest ore reserve in Michigan, and R. C. Allen, the state geologist, has predicted that Iron River will be producing iron ore years hence. Following the successful diamond drilling undertaken during the past five years, the district has been experiencing a mild mining boom.

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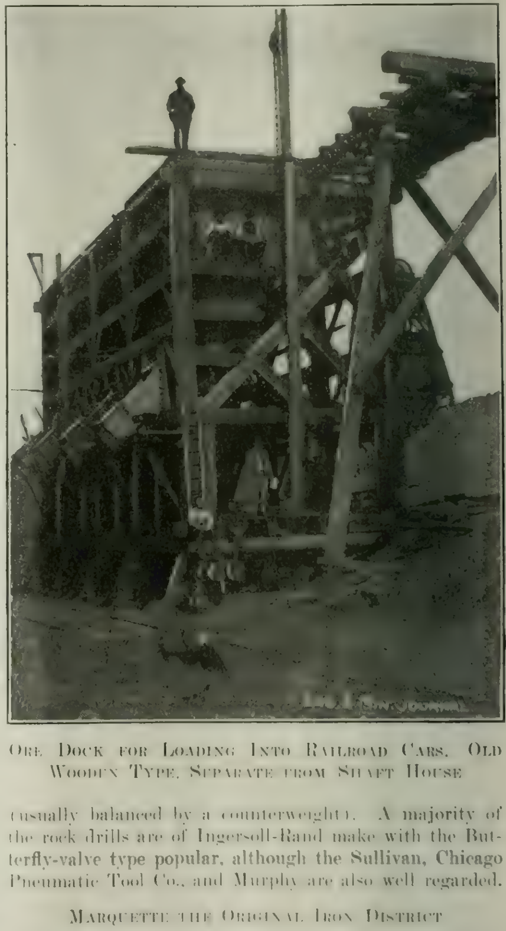
*Mining engineer, Gouverneur, N. Y.

At present, most of the favorable land has been taken up by the score of active companies on the ground, and in general the district is in the development stage. Shafts are being sunk, orebodies blocked out by drifts and raises, and surface equipments are being installed. In 1912, the tonnage shipped from the district was 1,750,000, and this figure will be greatly exceeded when the mines now developing begin to produce in earnst. The Bengal, Rogers, Tully and Forbes, all in process of development, have large proven orebodies, as has the Sherwood property of the Republic Iron & Steel Co., as yet in the exploration stage. In addition to these, a number of mines are developing deposits, which are not determined in extent.

The overburden in the Iron River district, consisting of glacial sand and boulders, is generally thick, and may be as much as 250 ft. The orebodies occur in steeply pitching, tabular lenses, surrounded by black or gray slates. Both the sub-level and caving systems of mining are used. The mines are as yet comparatively shallow, varying up to 800 ft. in depth. Shafts are practically all vertical, and due to the thick overburden and water troubles, the tendency is toward few shafts and permanent installations. Steel shaft houses have been erected at the James, the Forbes, the Rogers, and the Zimmerman mines. Surface buildings are of steel and brick, or frame covered with corrugated iron. Electric power is purchased from the Peninsula Power Co., of Iron Mountain, at about 1c. per kilowatt-hour. The following mines have installed electrically driven air compressors: Cortland, Wickwire, Virgil, Davidson, Bengal and Bates. The type of electric compressor purchased is Ingersoll-Rand, class P E, direct connected, with air supply adjusted by the "clearance-control" device. Several of the mines also purchase power for pumping and underground haulage, but hoisting is practically all done by steam or compressed air.

Installations and equipment are of various types. Thus the Rogers mine used a reinforced-concrete drop shaft, sunk by the caisson method to pierce 140 ft. of overburden, while at the Tully and Bates mines, where similar trouble was anticipated from quicksand and water, timber shafts were put down. At the Forbes mine, the steel headframe is of the two-post type, with hoisting taking place along the outside of the structure. At the Rogers mine, contrary to the usual practice in the district, the gyratory crusher is placed high enough in the steel shaft house to permit crushed ore to drop into the ore bins ready for loading, thus obviating secondary hoisting. Several of the larger mines have erected well equipped machine, forge and wood working shops in a single long building, separated by partitions, an economical construction which permits work being readily transferred from one shop to another.

The Rogers and the Dober mines have installed water-tube boilers, contrary to custom at most of the iron mines. Concrete is extensively used for foundations for buildings, crushers, and shaft houses and for floors. A number of Leyner drill sharpeners have lately been purchased and the usual types of compressors installed include Ingersoll-Rand, Chicago Pneumatic Tool Co., Sullivan and Nordberg. Hoists include the Sullivan, Wellman-Seaver-Morgan, Lake Shore Engine Works, Nordberg, and Allis-Chalmers designs. It is becoming customary to install a first-motion hoist for lifting ore in balance and a smaller geared hoist for raising the man and timber cage (usually balanced by a counterweight). A majority of the rock drills are of Ingersoll-Rand make with the Butterfly-valve type popular, although the Sullivan, Chicago Pneumatic Tool Co., and Murphy are also well regarded.



ORE DOCK FOR LOADING INTO RAILROAD CARS. OLD WOODEN TYPE, SEPARATE FROM SHAFT HOUSE

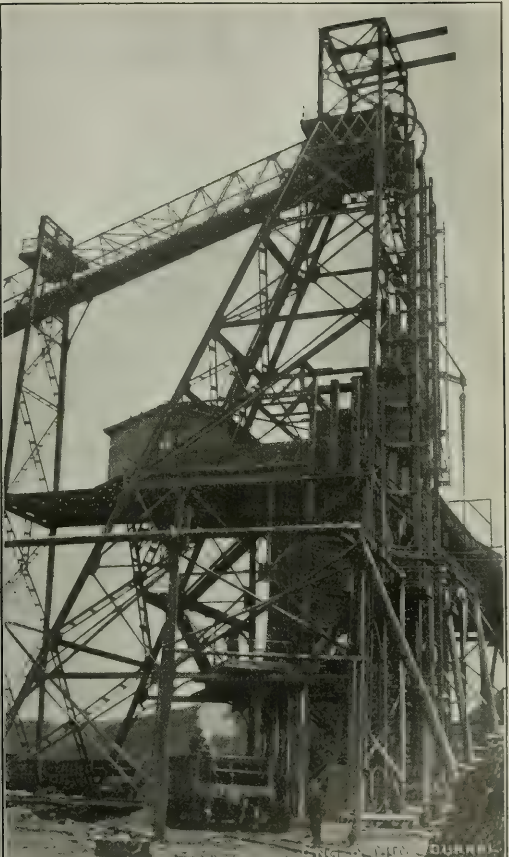
### MARQUETTE THE ORIGINAL IRON DISTRICT

The Marquette range was the first discovered, and for 20 years was the only producer. It will likely be one of the last to become exhausted, as the deep deposits of the Negaunee basin are counted as the greatest ore reserve in Michigan.

Important developments have been recently made by the Cleveland-Cliffs Iron Co., the Breitung-Kaufman companies, M. A. Hanna & Co., and the Cascade Mining

Co. The Cleveland-Cliffs Iron Co., the largest shipper on the range, is developing the Morris, Lloyd and Chase mines, situated near North Lake, four miles west of Ishpeming. Development work at new properties is carried on by the different departments of the company, according to standard designs carefully prepared. Two large hoisting shafts are usually sunk, and equipped with standard steel headframes. Concrete-lined shafts, sunk by the caisson method, are used when necessary, and steel and brick buildings are erected. Electrically operated compressors, hoists and pumps are now being substituted for steam machinery, the power furnished from the company's hydro-electric plant on the Carp River, near Marquette. An electrically driven Ingersoll-Rand compressor, in use at North Lake, was one of the first installed in the Lake Superior district. The electric equipment recently completed at the company's Negaunee mine, including a costly motor-generator set, direct-connected skip-hoist, and geared cage-hoist, is probably the finest on the iron ranges. The electric pumps being installed underground in the company's mines are of both plunger and centrifugal types; the plunger style is preferred for its higher efficiency.

Steel Headframe of Volunteer Mine of Volunteer Ore Co.



Headframe at Prince of Wales Mine of Oliver Iron Mining Co.

The company's active mines on the Marquette range include the Imperial, at Michigamme; Chase, Morris and Lloyd, at North Lake; Cliffs Shafts, Lake and Salisbury, at Ishpeming; Negaunee, Maas, Lucy and South Jackson, at Negaunee. In addition, there are several mines producing and developing in the Gwinn or Swanzy district, a subsidiary of the Marquette range, lying 15 miles to the southeast, where the company's model town of Gwinn has been built. Here, as in the North Lake district, the ore has been traced by extensive diamond-drilling under the direction of the company's efficient geological department. The ore at North Lake lay unknown for years, only a few feet under the soil, until someone pointed out that the strike of the ore formation was in that direction.

The Cleveland-Cliffs Iron Co. is noted for the care shown in looking after the welfare of its employees, a special department being maintained for that purpose. Company dwelling houses and other buildings are well constructed and maintained, prizes are given for attractive gardens [illegible], and a night-school to train miners into [illegible] recently started, with a Michigan College of M[illegible]ate in charge. A safety department is [illegible] for inspection of all dangerous machinery [illegible] and mine-rescue crews are trained and supplied with apparatus. Frequent meetings of foremen and [illegible] heads are arranged. The company plans [illegible],000 tons of ore in 1913.

The Breitung-Kaufman companies, operating the Mary Charlotte, Breitung-Hematite and Milwaukee-Davis mines, at Negaunee, and the Barron mine, at Humboldt, and developing the Lucky Star mine, at Negaunee, have only recently become important in the iron-ore business. They shipped about 500,000 tons in 1911, and the same in 1912. Their ores at Negaunee are soft and of good grade. These companies, controlled by E. N. Breitung, of Marquette, have the advantage of owning their Negaunee mines outright and thus have to pay no royalties.

M. A. Hanna & Co., of Cleveland, is one of the largest of the "independent" companies. Its Marquette range mines are the American, west of Ishpeming, and the Richmond, in the Cascade district, the latter a low-grade proposition. The American is an old mine that was supposed to be worked out. However, with J. R. Thompson as manager, the mine has found ore, both high grade and low grade, and is also developing extensive lands lying to the west, explored with the diamond drill by George Maas, of Negaunee. The interest of mining men has been aroused by the thorough attempt being made to concentrate the low-grade ore of the American mine. A large concentrating mill, equipped with Richards pulsator jigs and Deister tables, is now operated, and although minor difficulties are being encountered, it is expected to concentrate commercially a 40-45% to a 60-65% material. Many mining men predict that concentration of iron ore will soon become more important than at present, and several far-sighted companies are inserting in their leases of ore lands a clause giving "the right to concentrate."

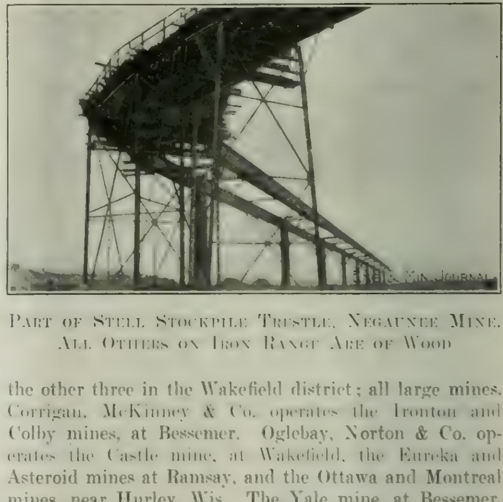
The Cascade Mining Co., a new corporation organized by the Pillsbury-Bennett-Longyear interests, of Minneapolis, is developing a large mine in the Cascade district of the Marquette range. This section was supposed to contain only low-grade, siliceous ores, of which it has hundreds of millions of tons, until the Volunteer Ore Co. and the Cascade Mining Co. began operations on high-grade deposits. Developments are being watched with interest.

The Oliver Iron Mining Co., the iron-mining department of the U. S. Steel Corporation, has not been especially active on the Marquette range during recent years, as it owns most of its properties there and attention is being directed to leased mines elsewhere. The Republic Iron & Steel Co., and Jones & Laughlin operate several mines in the district, but have been conservative about expansion, although the latter company has lately been increasing its exploration facilities.

### GOGEBIC RANGE A HEAVY PRODUCER

Iron ore was not produced on the Gogebic range until [illegible] when 1022 tons were shipped. It has, however, been a heavy producer during late years, as its mines are [illegible] deep and are nearly all well developed. The mines are the deepest on the iron ranges, their depths ranging up to [illegible] ft., which is the distance reached in the Newport. The iron-bearing formation was traced out early in the history of the range, being consistent and easily followed. Little diamond drilling has been done, although this method of exploration has been gaining in favor recently. The operating companies have devoted themselves to mining, and much of the exploration has been to determine the depths of the orebodies. Lately there has been some exploration in the Wakefield section by M. A. Hanna & Co., R. S. Rose, of Marquette, and others. On the extreme eastern end of the range, near Marinesco, the Presque Isle Iron Co., composed of R. J. Whiteside, W. G. LaRue and W. H. Cole, of Duluth, is developing the Copps property.

The Cleveland-Cliffs Iron Co. lately abandoned Gogebic range operations by relinquishing the Ashland mine. The Oliver Iron Mining operates the Atlantic, near Hurley, Wis.; Tilden, at Bessemer, Mich.; and the Pabst, Aurora, Norrie, Davis, Geneva and Puritan, at Ironwood, Mich. The Newport Mining Co. operates the big Newport mine, and also the Anvil and Palms mines, where a new deep shaft is being sunk. The Newport mine ranks in magnificence of equipment with the Negaunee mine of the Cleveland-Cliffs Iron Co., on the Marquette range. Pickands, Mather & Co. operates the Cary, Mikado, Brotherton and Sunday Lake mines, the first at Hurley, Wis., the other three in the Wakefield district; all large mines. Corrigan, McKinney & Co. operates the Ironton and Colby mines, at Bessemer. Oglebay, Norton & Co. operates the Castle mine, at Wakefield, the Eureka and Asteroid mines at Ramsay, and the Ottawa and Montreal mines, near Hurley, Wis. The Yale mine, at Bessemer, is now controlled by the Lake Superior Iron & Chemical Co., which uses the ore in its charcoal-furnace plants in Michigan and Wisconsin. The Norrie group of the Oliver Iron Mining Co. (including the Norrie, Aurora and Pabst mines), together with the Newport mine, owned by Ferdinand Schlessinger, of Milwaukee, have shipped 60% of the entire output of the range, and are credited with 80% of the ore reserves.



PART OF STEEL STOCKPILE TRESTLE, NEGAUNEE MINE. ALL OTHERS ON IRON RANGE ARE OF WOOD

The eastern portion of the Menominee range, with mines centering around Iron Mountain and Norway, is much like the Gogebic range, in that a number of large, established mines are operating, with comparatively little exploration and new development taking place. The Oliver Iron Mining Co. is the largest producer at Iron Mountain, where its famous Chapin mine is situated, and the Penn Iron Mining Co. is the dominant interest at Norway, where the Aragon mine of the Oliver Iron

Mining Co. is also situated. J. R. Finlay states that this district is the least promising in Michigan for the future.

The Crystal Falls district of the Menominee range resembles its neighbor, the Iron River district, in many respects, and is starting on a period of expansion. For many years it was a medium producer of non-bessemer ores, with Corrigan, McKinney & Co. the dominant interest. Recently M. A. Hanna & Co. and the Longyear interests have made large finds on lands previously overlooked or discredited. The new Carpenter mine, being developed by M. A. Hanna & Co., is to be a good-sized producer, and the big Mastodon find of the Longyear interests is now recognized as one of the largest orebodies on the Menominee range, with probably 10,000,000 tons of ore. A number of diamond drills are at work in the Crystal Falls district, including those of the Oliver Iron Mining Co., Cleveland-Cliffs Iron Co., Florence Iron Co., and Nevada Land Co., the latter a Longyear subsidiary.

Many additions to the known iron formation are being made, and large stretches of country are recognized as favorable for exploration, which is, however, expensive, due to the thick overburden and irregular geological structure.

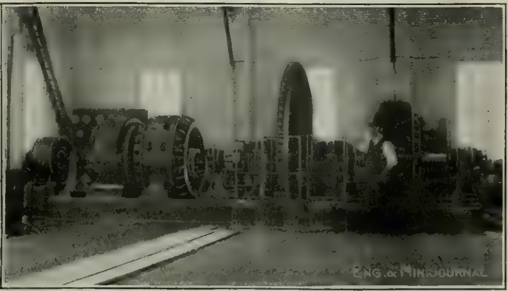
### Many Nations Represented in Laboring Class

The iron mines are practically all operated by close corporations, most of which are affiliated with furnace interests from Cleveland, Pittsburgh, Buffalo or Chicago. The iron-ore business is a moderately profitable one, due to the large scale of the operations and the general good practice prevalent. There are few blast furnaces and only a few concentrating mills in the Lake Superior iron region, and mining is the chief industry. Miners include Cornishmen, Finns, Austrians, Poles, Italians and Balkans.

The Cornish are the best miners and are usually found as foremen or "mining captains;" the Finns are numerous and have a large tendency toward socialism. Austrians, Poles and some of the Italians make good miners. The old Cornish type of Michigan iron miner, such as is seen to best advantage on the Marquette range, has always been in demand by mining companies elsewhere throughout the country, and a great many of the mining men in the southwest, at Butte, and in Canada were originally from the Lake Superior region.

Because the iron-ore deposits are large, irregular, oxidized and usually wet and soft, mining methods of nearly all kinds have been necessary. The caving and sub-level systems have reached a high state of perfection. The question of equipment and machinery has of late years undergone radical changes, as it is recognized that innovations such as hydro-electric power, steel headframes, underground electrical tramming systems, machine shops, drill sharpeners, concrete shafts, etc., are economical installations where the orebody is of good size.

Installing Electric Cage-Hoist with Wuest Gears, Negaunee Mine



Motor-Generator Set for Negaunee Mine

PRINCIPAL MINING COMPANIES IN IRON RIVER DISTRICT

| Company | Operating name | Mines shipping ore | Tons of ore shipped 1912 | Mines developing | Orebodies proven |
|---|---|---|---|---|---|
| Pickands, Mather & Co | Verona Mining Co. | Baltic | 100,736 | Bengal |  |
|  |  | Caspian | 306,913 |  |  |
|  |  | Fogarty | 84,074 |  |  |
|  |  |  | 491,723 total |  |  |
| Rogers, Brown Iron Co. | Munro Iron Mining Co. | Hiawatha | 220,106 | Rogers |  |
|  |  | Chicagon | 149,619 |  |  |
|  |  |  | 369,725 total |  |  |
| Oglebay, Norton & Co. | Brule Mining Co. | Chatham | 134,079 |  |  |
|  |  | Berkshire | 33,419 |  |  |
|  |  |  | 167,498 total |  |  |
| U. S. Steel Corporation | Oliver Iron Mining Co | Dober (including Isabella) | 177,496 |  |  |
| Corrigan, McKinney & Co. |  |  |  | Tully | Blair-Michaels |
|  |  |  |  | Baker |  |
| Wickwire Steel Co | Wickwire Mining Co | Wickwire | 40,417 |  |  |
|  |  | Cortland | 17,498 |  |  |
|  |  | Virgil | 2,996 |  |  |
|  |  |  | 60,911 total |  |  |
|  | Buffalo Iron Mining Co. |  |  | Homer |  |
| McGreevy Steel Co. |  |  |  | Purcell |  |
|  |  |  |  | Sheridan |  |
| Spring Valley Iron Co. |  | Zimmerman | 189,482 |  |  |
| Huron Iron Mining Co. |  | Youngs | 83,528 |  |  |
| Mineral Mining Co |  | James Konwinski | 75,702 |  |  |
| Jones & Laughlin |  |  |  | Forbes |  |
| New York State Steel Co. | Davidson Ore Mining Co | Davidson | 126,207 |  |  |
| Ladenburg, Thalmann & Co. | Bates Iron Co. |  |  | Bates |  |
| Cleveland-Cliffs Iron Co. |  |  |  |  | Erickson |
| Republic Iron & Steel Co. |  |  |  |  | Sherwood |

# Repairing a California Gold Dredge

By L. H. Eddy

Natoma No. 6 dredge, operated in the Natoma field of American River district by the Natomas Consolidated of California, has been overhauled and a new hull constructed. Some important improvements have been added and some of the machinery parts renewed. The boat had been in operation from March, 1908, to May, 1913. This is not a long life for a wooden-hull dredge, but the repairing was begun before that period of deterioration when the boat would be entirely useless. There had been no serious direct damage done to the hull, nor to any of the machinery parts, but a general wearing out of the hull and of some of the machinery. The boat was digging in fairly good order at the time it was taken out of commission to be placed in the dry-dock. The repairs were completed and the dredge resumed digging on July 31, working as smoothly as an old boat and digging with the capacity of a new one.

This dredge is equipped with 86 close-connected 9-cu.ft. buckets and was designed to dig 60 ft. below the water line. It was built by the Western Engineering & Construction Co. for the Folsom Development Co. in 1907-8. The boat was taken over with others of the Folsom Development Co. by the Natomas Consolidated in 1909. It was built and initially operated under the supervision of R. G. Hanford, who directed construction and operation of all except one dredging company (the Eldorado Gold Dredging Co.) in the American River field for 10 years prior to the organization of the Natomas Consolidated. The buckets and machinery are of the Bucyrus type. The hull is 120 ft. long, 46 ft. 7 in. wide, 10 ft. 3 in. deep, and 6 ft. 10 in. draft. The digging ladder is of the plate-girder type. The stacker is of the lattice-girder type, 142 ft. centers, equipped with a 38-in. belt 292 ft. long. The revolving screen is 36 ft. 9½ in. long, 7 ft. diameter. The steel spud is 75 ft. long, 34x54-in. section, and weighs 76,000 lb. The wooden spud is 78 ft. long, 35x54-in. section, and was one of the largest single sticks of timber handled on the Pacific Coast up to that time. The upper tumbler weighs 20,000 lb., the lower tumbler 16,000 lb. The digging ladder weighs 144,000 lb., and the revolving screen 46,410 lb. The total weight of the machinery is 1,275,700 lb., and the total weight of the lumber in the hull and deck and the superstructure is about 1,142,000 lb., or a total weight of about 1100 tons.

The motor equipment has a rated capacity of 790 hp. The average power consumed in full operation is 572 hp., or 428.3 kw. Westinghouse motors are used. Electric power is furnished by the Western States Gas & Electric Co. The old wood in the hull of No. 6 was, at the time of its dismantling, rotten from bow to stern. The side walls were made new the full length of the boat. The well hole was made new two-thirds of the way back from the bow end. The outside walls of the hull are made of 4x12-in. planks; the well hole of 6x12-in. planks. New verticals were placed in both outside walls one-fourth of the length of the boat from the bow end toward the [illegible], and new verticals in the well hole from the bow end to the well hole bulkhead. The deck beams to starboard are all new the entire length of the boat. To the port side the deck beams are all new one-third of the length of the boat from the bow end. There are also new deck beams under the tables over the middle well hole. About one-half of the main deck was made new with 4x6-in. planks. The deck was rotted on both bows, and badly rotted under the main operating winch. All of the bow gantry posts and stern gantry posts were spliced from above the deck down. The auxiliary posts from the main gantry were spliced and new foundations put in. The main truss athwartship at the main gantry beam and the auxiliary braces running over from the main gantry were spliced. Four posts from the main truss chord running through the deck into the hull on each side of the well hole were also spliced. A new foundation was placed under the main operating winch. There were numerous other timbers replaced because of rot.

The new machinery parts installed are: One new shaft at the ladder winch, a new speed shaft on the main drive of the upper tumbler, new bull-wheel wheels and pinions, and new dump-chute at the hopper. The revolving screen was repaired and some of the old plates replaced with new. The gold-saving tables were increased in area to 5000 sq.ft., and there were some repairs on the distributing box.

There were four new features added in the reconstruction: An extensive save-all was installed; the old brackets supporting the deck overhang were displaced by beams; a bucket idler was installed; a set of fire-protection boxes for the main transformer and automatic switches, were especially designed and installed by the electrical department of the Natomas Consolidated.

The dredge was especially built for digging in tightly cemented gravel on Sulkey flat, and was equipped with two monitors which were operated singly or together and supplied from 150-ft. head, centrifugal, direct-connected pumps driven by 150-hp. motors.

In its present condition of reconstruction the dredge is practically as good as a new boat. In fact, close inspection of the repairs and new construction warrant the belief that the present hull and machinery may be continued in operation a longer period than the original boat was operated. But, considering the conditions and available material and machinery for dredge construction in 1907 and in 1913, the old hull had a reasonably long life. There are other wooden hulls that have had longer life than this one by two or three years, but in most cases the digging has not been as tight as in Sulky flat.

The repairing of No. 6 dredge was in charge of W. R. Bean, a construction superintendent, who has had experience in construction and reconstruction of dredges in various parts of the world. The work was done by the Natomas Consolidated in the shops at Natoma, under L. D. Hopfield, general superintendent.

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# Metallic Glucinum

Metallic glucinum has been obtained by Fichter and K. Jablczynski (*Ber.*, p. 1604, 1913), by the electrolysis of a fused mixture of the fluorides of glucinum and sodium (2 mols. : 1 mol.). The product was purified from adherent oxides by centrifuging the fine powder in a mixture of ethylene bromide and alcohol of 1.95 sp.gr. It was then compressed into cylinders and fused. The metal after fusion is of 1.842 sp.gr., melts at 1280° C., and does not volatilize at 1900° C. Its electric conductivity at 20° C. is $5.41 \times 10^4$ reciprocal microhms per c.c., and its hardness 6—7 on Mohs' scale. Its apparent inertness toward water is due to a film of oxide.

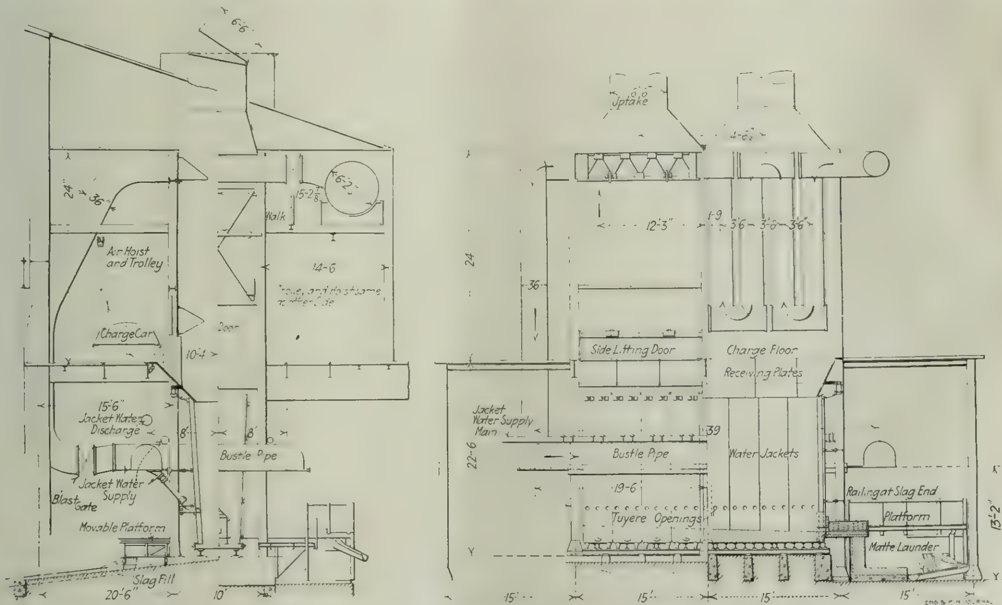
# New Smeltery of United Verde Copper Co.—II

By Richard H. Vail

*SYNOPSIS—Some of the details of the old smelting and converting plant of the United Verde company, and some of the ingenious devices in use at the old works. What is being done in the mines to get ready for the new large-scale production, including working in the fire zone.*

⁂

The plant now comprises four blast furnaces and four stands of converters using basic lining. Three of the furnaces are 48x240 in. and one is 56x180 in. Three furnaces are kept in blast, the smelting capacity on this basis is from 1000 to 1200 tons per day. All the furnaces have Giroux hot-blast tops that heat the blast to about 200° F.; the blast is supplied to the furnaces at from 26- to 28-oz. pressure. The larger furnaces have 40 five-inch tuyeres and each receives about 33,000 cu.ft. of air per minute. A rectangular cast-iron spout is lined with magnesite brick, "discards" from basic-converter repairs being largely used; the spout is sufficiently filled with clay to trap the blast eight inches, the clay requiring renewal about twice per shift. The use of water-jacketed spouts was discontinued owing to the smeltery water containing much lime.



Design of Blast Furnaces, United Verde Plant

The furnaces have cast-iron crucibles, supported on a steel framework. For the large furnaces, 16-ft. circular settlers are used, with a solid-copper tapping block. The tap block has an untapered 2-in. hole, and is held in position by plates or bars clamping against it at the sides and bolting to the settler shell. Between taps a spray of water is kept on the block, the water being run off through an opening in the side of the launder; the top and bottom of the block are cemented to keep water from entering the settler. In making the tap block, a short-headed end of a bar is cast in the upper portion of the block and allowed to project a few inches; when it is desired to change the block, a chain block is attached to this projection, which permits the ready removal of the block. Frozen settler holes are opened by means of an air-hammer drill using a cross bit; little trouble, however, is experienced from this cause.

### Little Flux Required

The regular furnace charge consists of: (1) Oxide (surface) ore; (2) heavy iron sulphide; (3) more-siliceous sulphide ore; (4) lime rock. About 40% of the charge is fine—under ½ in. No weighing is done, the ores being sufficiently regular in composition to enable the superintendent or furnace foremen to regulate the furnaces. Only a small amount of lime rock is required on the charge, the ores being nearly self-fluxing. It is stated that about 6½ to 7% of Segundo coke is used.

The furnace charges are dumped on inclined plates, except in the case of the coke, which is shoveled in, being wheeled to the charge plates from small service bins beside each furnace. The charges are brought to the furnaces by electric locomotives in Anaconda-type charge cars, holding four tons each, and are tilted by compressed-air cylinders. Twelve-ton charges are used, three cars being dumped to a charge. The gates of the mine-storage bins are all operated by compressed air so that the gathering of the charges is much facilitated at the bins, though the entrance to and exit from the feed floor is restricted to a single track.

A typical weekly slag analysis shows the following composition for the furnace slag: Cu, 0.3%; $SiO_2$, 36.9; FeO, 46.8; $Al_2O_3$, 6.3; CaO, 3.2; MgO, 1.2%. The slag is removed in side-dumping pots by electric locomotives. A furnace crew consists of a feeder and two helpers, a furnaceman and helper, and a man to keep the settler slag spout open.

### Four Stands of Basic-Lined Converters

The matte runs from 21 to 26% copper and is converted in four stands of basic-lined converters, 96x138 in., electrically operated. Since the adoption of basic lining for the converters, experiments with a Knudsen furnace have been abandoned as the basic converters will handle low-grade mattes satisfactorily and, in combination with blast furnaces, with vastly greater expedition. The converters here were first lined with magnesite brick in 1894; at the beginning silica was tamped in over the basic lining, but this was later discontinued, silica being fed as at present. For fluxing the converters, siliceous company and custom ore is used, drying being unnecessary on account of the climatic conditions. The monthly copper production is usually from 3,000,000 to 3,250,000 lb., the yearly output averaging about 36,000,000 pounds.

### Some Ingenious Devices

The old works contains several ingenious devices developed by Supt. Thomas Taylor, an old Swansea smelter of long practical experience in this country. For example, the floor of the furnace building is here practically free of shovelers cleaning up accumulations of old slag "chips" and breaking slag skulls. These men have been dispensed with by dumping all slag skulls from the converter ladles into a large heavily built steel trough or "boat." After dumping the slag skulls on this boat, the craneman then drops an iron ball on the slag shell, breaking same but keeping all the particles within the boat, which is then tilted so that the contents empty directly into the foul-slag skip. This delivers the product to a steel bin convenient to the charge trains. The skip has an automatic-switch arrangement permitting one man to operate the skip by a knife switch, this attendant also looking after any spilling that may take place. Thus in place of two to four shovelers usually seen on the floor of furnace buildings of this size, one man only is employed.

Another interesting device developed by Mr. Taylor is a hook for pulling converter collars, this operation requiring only three to five minutes. The device consists of a heavy cast-iron hook having a steel tool projecting therefrom to "bite" into the converter incrustation. This hook was made at the company's shops; its efficiency is dependent upon the improved bite obtained by the 4-in. square steel tool protruding from the cast-iron hook and upon the use of a sufficient amount of cast iron so that the metal does not become heated and lose its strength. Most of the early forms of converter-collar hooks failed when a particularly obdurate collar was encountered and the hook kept in the converter mouth until it became red hot, straightening out if used further.

### Diesel Engines Used

At the old works, the company has had in use for several years a number of interesting power units, one being a Diesel-engine installation. This comprises two three-cylinder, 16x24-in., Busch-Sulzer, Diesel engines, mounted as a double unit and driving by rope transmission a No. 11 Roots blower. This unit has given excellent service and delivers by actual test a brake horsepower on 0.6 lb. of oil; during two years' service the total cost has been about one cent per brake horsepower. Another interesting machine in one of the power houses is a Rateau-Smoot turbo-blower furnishing converter air at 16-lb. pressure; it operates at 2500 r.p.m. and supplies 25,000 cu.ft. of free air per minute.

On account of the company's comparative isolation, it has a complete equipment of mechanical shops, all repairs for the United Verde & Pacific Ry. being made here. The Jerome terminus of this narrow-gage road is being removed from the United Verde mine to a point around the mountain about 2000 ft. to the north. Hereafter on entering the district by this road, the visitor alighting at the station will neither see the town of Jerome nor the United Verde mine, over the workings of which he was formerly landed.

### Preparing the Mine for the New Smeltery

While all the details of preparing the mine for the increased output that will be required by the new smelting plant have not yet been settled, it will be of interest to note in a general way the plans for doubling the mine tonnage. When the new smelting plant is in operation all ore will leave the mine at the 1000-ft. level, where the main haulage adit will be established. The present Hopewell tunnel, an adit 6593 ft. long, connecting with this level, will be extended 1500 ft. into the mine, with a section approximately 9x10 ft. This adit will have a standard-gage track on which the ore will be delivered by electric haulage to storage bins at the mouth of the adit, where a sorting belt will also be established.

When these plans have matured, all ore from the upper levels will be dumped into chutes and gravitate to four storage bins at the 1000-ft. level, while ore from the lower levels will be raised in two 6-ton skips operated by an underground hoist. This hoist, having a capacity of 3000 tons in 16 hr. from 1500 ft., will be stationed at a suitable place on the 1000-ft. level and a three-compartment shaft will be raised from the 1500-ft. level, the lowest working of the mine, to a point near the 900-ft. level, thus giving sufficient height for the establishment of two storage bins and short raises leading to the skip dumping pockets. From the top of the other four storage bins raises will be extended to the levels above but will be slightly offset at each level. The top of the raises will have a grizzly to control the size of the rock fed at that level, and at the bottom a gate will permit the ore to gravitate slowly to the bin below. All this work will be done in carefully selected ground so that difficulties from caving will be avoided. Each of the six mine storage bins will have a capacity of 500 tons or more.

### Lenticular Orebodies

The orebodies occur in lenticular masses of various sizes and grades. The strike is approximately N.30°W. The dip is about 20° from the vertical but varies in direction in different parts of the mine. The footwall is usually well defined, but the limits of mining in the east wall have to be determined by sampling. All of the ore carries gold and silver in varying proportions. The United Verde mine contains three different types of sulphide orebodies, the most important of which consists of a chalcopyrite ore in pyrite. This pyrite is in the form of a large lens with its commercial orebodies along the line of contact with porphyry and schist and along the water courses and faults. The other sulphide orebodies also contain the copper in the form of chalcopyrite, but in a schist gangue, and in a quartz and quartz-porphyry gangue. The capping over the pyrite lens consists of an oxidized ore containing gold and silver, most of the copper having been leached out. The capping of the chalcopyrite ores, occurring in the quartz and quartz-porphyry gangue, is a quartz containing gold and silver in commercial quantities. The schist ores, as a rule, extend to the surface.

The mine has numerous openings, the most important of which are No. 3 and No. 4 shafts and three adits at the 300-, 500- and 1000-ft. levels. The latter are at present the main haulage levels, but a new motor-haulage equipment is also being installed on the 1200 level. The 300 and 500 levels were originally driven for "roast grades" as well as for drainage and ventilation, heap roasting having been practised until about five years ago. The 1000-ft. adit was driven since the new reduction works have been in contemplation and was made larger than the others so that if it should be found desirable the smeltery ore trains might be run directly into this to the mine-storage bins situated along the adit. If timbered, it will have clear dimensions as follows: Height, 7½ ft.; width at top, 6½ ft.; width at bottom, 8½ feet.

### Ore Now Hoisted through Two Shafts

The principal hoisting for the mine is done through No. 3 shaft, which is a vertical three-compartment shaft extending to the 1500-ft. level. It is equipped with a steel headframe and a 20x48-in. Webster, Camp & Lane double-reel engine hoists ore in double-deck cages in two compartments of the shaft; in the third, men and tools are hoisted by a 16x30-in. Webster, Camp & Lane engine. The No. 4 shaft has two compartments and is used for hoisting oxidized ore, and ore from the "fire country." The shaft is now down 500 ft. and will be deepened by raising from the 1000-ft. level. It is a vertical shaft and is not likely to be sunk deeper as the orebodies pitch away from this shaft to the north. No. 4 shaft is equipped with a steel headframe and hoisting is done with double-deck cages by an E. P. Allis 20x48-in. double-reel engine.

Looking East toward Clarkdale from the United Verde Mine and Works

No. 1 shaft was abandoned 10 to 15 years ago. No. 2 has been practically discontinued as a hoisting shaft, but is now used above the 500 level for ventilation; below that point, the [illegible] has been removed and the shaft is utilized as a waste-storage chute, connection being made to mill holes where waste may be economically mined.

Four classifications are now made of the ore hoisted from the mine. These comprise: (1) An oxidized gold ore, mined partly by open cut and partly by mill holes; (2) "fire ore," a heavy iron-sulphide ore carrying chalcopyrite and about 38% S, 42% Fe, and 5 to 10% $SiO_2$; (3) a sulphide ore, but with less iron and more silica than the preceding; (4) a siliceous ore, used for converter flux.

### SQUARE SETTING SUPERSEDED BY BOTTOM SLICING WHERE THE GROUND PERMITS

The mine is opened to the 1500-ft. level, but no stoping is being done below the 1200, though the 1350- and 1500-ft. levels are being prepared for extraction. The level intervals vary from 100 to 200 ft., but in the lower levels 150 ft. has now been adopted as the standard level interval. The orebodies were formerly mined by the square-set method exclusively. This method is at present used only in the older portions of the mine—in the fire zone or where ground is unusually heavy. The oxidized ore is mined principally by open cutting and by milling—the milling system will probably be extended when the smelting operations and the United Verde & Pacific Railway station now over the mine have been removed. In the newer workings and in some of the older parts of the mine where the character of the ground will permit, bottom slicing has been introduced by Mine Supt. Robert E. Tally, and about 60% of the ore is now won in this way. This method or the shrinkage system will be used exclusively in the lower levels of the mine. Timber is only used along the drifts and for the manways and raises down which the ore is sent. These raises have timber cribbing and a 4-in. lining made up of 2-in. plank, the inside plank taking the wear and being replaced when worn. These ore chutes are placed at about every fourth set and much of the ore can be shoveled directly into the chutes. As fast as the ore and flooring are removed from the stope, waste is drawn from a chute at the side and the stope filled to within about 7 ft. of the back, when another slice is started. Except for an occasional stull, there is no timbering to be seen in these stopes. It is now the practice to keep all stopes filled with waste as fast as the ore is removed. Waste for filling is obtained from development work and also from surface gloryholes.

### THE FIRE ZONE

Portions of the mine extending from the 700 level to the surface have been on fire for the last 15 years or more. The fire is not confined to the sulphide zone, but extends into the old timbered stopes of the oxidized ore. The fire, however, is now kept under control by the pressure system, maintaining a slight positive pressure to hold the fire and gases in check and blowing in a sufficient volume of air to make agreeable working condition.

With the numerous improvements and precautions that have been taken, the "fire stopes" are almost as comfortable to work in as the other parts of the mine. The mean temperature in the newer portion of the mine is about 70°, while in the "fire stopes" the temperature averages about 78°. This is only possible by the complete system of ventilation and ventilation control that has been established in this part of the mine. The above mentioned temperature is maintained only in the working stopes of the fire country; the openings not in actual use merely receive a volume of air sufficient to prevent fire.

### VENTILATING A "FIRE STOPE"

In working a fire stope, the first step is to segregate that particular section and to arrange the ventilation control. The system of ventilation consists in bringing the air in at one end of the stope, passing it over the entire working and outletting it at the opposite end, thus making conditions good where required. To control the air satisfactorily doors and curtains are necessary at various places in the stope. In ventilating the fire stopes, it is of prime importance to have an outlet in solid ground so that if a fire should take place the smoke and heat therefrom would not burn the timber of the outlet and cause the caving of that opening. These outlets must be controlled with doors to keep the pressure in balance. If too large a volume of air be sent through the fire district a suction of the gases from different points is caused and a fire results.

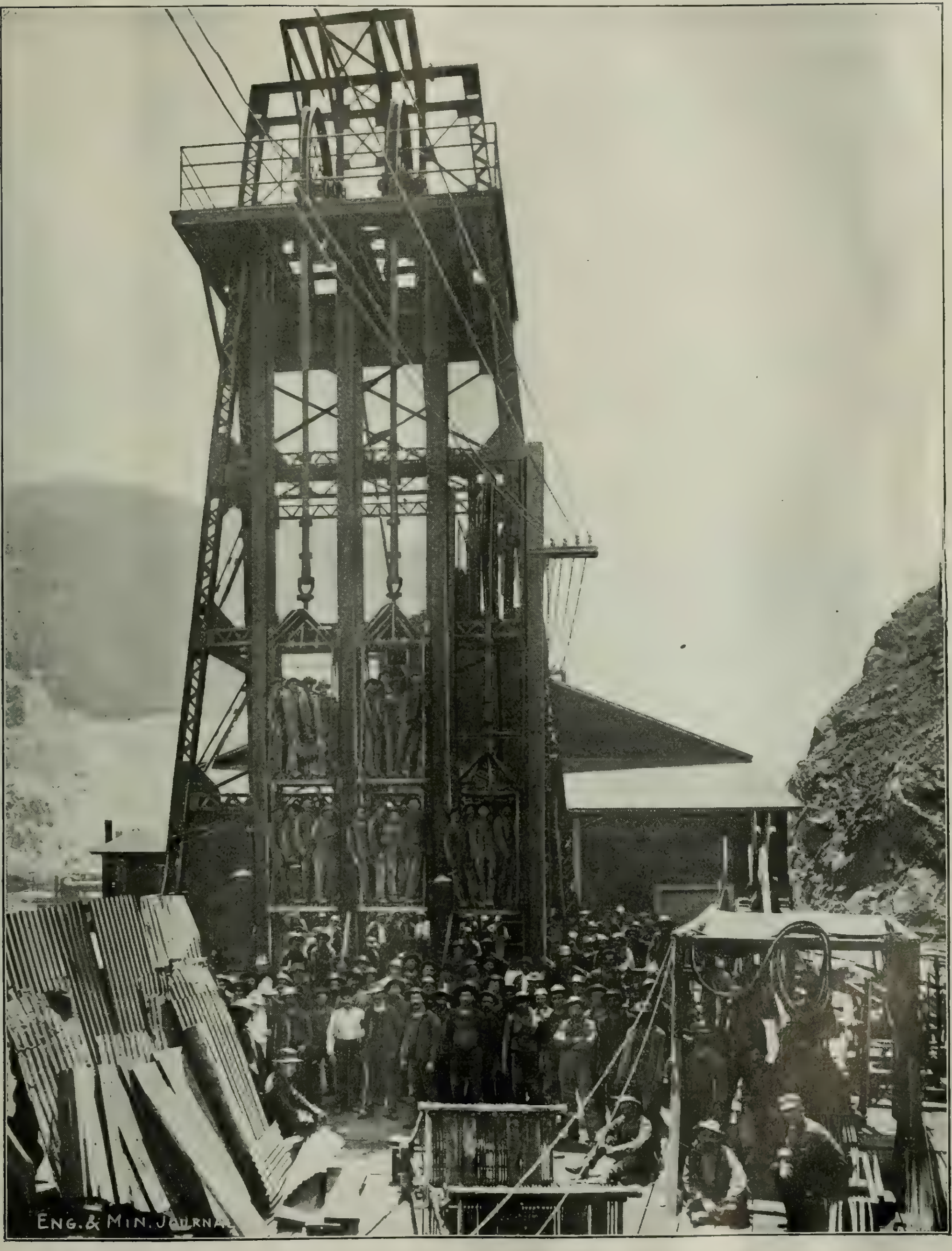
When it is found too expensive to maintain gangways and raises for ventilation of a certain section and the burning of such an area would not interfere with other workings, the openings are sometimes bulkheaded with concrete and a limited amount of air fed, thus permitting it to burn slowly with a single outlet to the surface for the gases.

To prepare for subsequent working of fire areas now bulkheaded off, a lateral is driven outside the orebody and from this lateral, crosscuts to the fire area. The lateral connects with an outlet raise and the exhaust air from other workings is forced through this fire district; after the combustion of any inflammable material, the area is gradually cooled.

### FIGHTING THE FIRE

An outbreak of fire in this section of the mine is not the serious matter that it is in mines where the ventilation system is not under such close control. Careful inspection is maintained, however, and if a fire is found at any point, a minimum quantity of water or of a chemical solution is forced upon the fire and the ventilation so arranged as to have the least interference from smoke. Little difficulty is experienced in keeping sulphide-ore fires in check, timber fires being the most difficult to extinguish.

In fighting bad fires, Draeger oxygen helmets and Anaconda hoods are used and each shift boss has six men trained in the use of the helmets. The fire signal consists of nine bells, which are indicated in the engine room on the level annunciator. The engineer, on receiving these bells, signals nine flashes of the electric lights through the entire mine three times, and then flashes the signal of the level from which the fire was reported. Blue-and-white enameled signs, posted in the various workings, instruct the carmen and others to notify those working in the stopes and other places where there are



No. 3. HOISTING SHAFT, UNITED VERDE COMPANY

Note flat hoisting cable and multiple-deck cages.

no lights. The regular firemen take charge of the fire fighting. The [illegible] specifically remind the miners that "the first consideration will be for the safety of the men, then for the extinguishing of the fire and protection of property."

### Mine Work Done by Contract, Except in the Fire Zone

The fire section of the mine is operated practically as a separate department having its own foremen and shift bosses. Most of the work in this section of the mine is on day's pay. Three shifts are worked, and the painstaking and important nature of the work makes it impractical under present conditions to contract the work, as is done in the rest of the mine. The ground in the fire district is badly broken and heavy. At present it is worked by the overhand square-set system, the filling being kept up to the back. It is the intention after the removal of smelting operations, to work these stopes by a modification of the top-slicing, or underhand, system, which will be more economical.

Two shifts are worked in the mine, except in the fire district, and so far as possible all work is done by the contract system; the basis of pay in development work is for footage, and in stoping, for the cubic feet extracted. The stope contractors pay all regular charges as well as for timbering, filling and tramming. The mining costs are not as high as generally supposed. While expenses in the fire zone are heavy, the total mine operating costs, exclusive of taxes, general expenses, etc., in 1912 were $3.245 per ton of ore. There are six shift bosses, three on each shift, distributed in the upper, the middle and the lower levels. Some of the ground is extremely hard; water Leyner drills are employed, air being supplied at 100-lb. pressure at the machines; for raising, a wide variety of stoping drills are used. In blasting 40% dynamite is regularly used, though 60% is employed occasionally for blockholing. Maple City and Baldwin acetylene mine lamps have superseded candles to a large extent, though a few candles of Perry and of Standard Oil make are used.

The mine makes comparatively little water, but more water is coming in at depth. An Aldrich quintuplex pump having a capacity of 500 gal. per min. against a head of 1000 ft. is now being installed on the 1500 level to raise the water to the 1000-ft. adit, after which the pump on the 1200-ft. level will be removed. All the mine water is precipitated, the principal precipitating flumes being at the mouth of the 500- and 1000-ft. adits. The water at the 500 level is much richer in copper than at the 1000, the former carrying from 100 to 150 grains per gallon while the heads at the lower flume carry only 11 to 12 grains. The precipitation is efficient, the tails running from a trace to 1.4 grains per gallon. About 2500 lb. of precipitate is recovered per day.

One is impressed by the great care that is being taken in this mine both in the matter of comfortable working conditions and in the safety of the men. Notwithstanding the fire in the mine, there are few mines of this size [illegible] that are more comfortable, by reason of the [illegible] ventilation and the absence of water and dust. Not only in the fire district, but throughout the mine fire doors consisting of concrete frames and iron doors are placed near stations and at other places which it is of importance to protect. A new modern change house with overhead chain "lockers" of the Continental type is about to be constructed at the mouth of the 50-ft. adit, which will eventually become the main entrance for the miners. Accommodations will be provided in the new change house for 800 miners.

About 1500 men are now on the United Verde payroll in the different departments, which include the mine, smeltery, railroad, mechanical shops, new works and townsite and a number of ranches in the Verde Valley north and south of Clarkdale. The various United Verde operations are under the general management of Charles W. Clark, and Will L. Clark is manager at the property.

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## Arizona Mine Taxes

Arizona mine taxes are levied on the basis of an assessed valuation of one-eighth of the gross output plus four times the net profit, plus the value of improvements. The following is the official list of mine valuations as computed for tax-assessment purposes, as furnished by Secretary Jesse L. Bryce, of the Arizona State Tax Commission.

VALUATIONS OF ARIZONA MINING CLAIMS, OR GROUPS OF CLAIMS, FOR 1913

| | |
|---|---|
| COCHISE COUNTY | |
| Bonanza Belt Copper Co | $19,762.17 |
| Calumet & Arizona Mining Co | 5,209,878 48 |
| Superior & Pittsburg Copper Co | 15,837,256 61 |
| Copper Queen Con Mining Co (Group A) | 28,505,865 37 |
| Copper Queen Con. Mining Co. (Group B) | 23,508 33 |
| Great Western Copper Co | 695,515.31 |
| Leonard Copper Co, Owner—Shannon Copper Co, Lessee | 164,261 82 |
| Shattuck Arizona Copper Co | 671,888 77 |
| Tombstone Con. Mines Co, Ltd (Bankrupt) | 113,953 04 |
| Wolverine & Arizona Mining Co | 33,334 35 |
| Total | $51,275,224 25 |
| GILA COUNTY | |
| Miami Copper Co. | $8,992,636 84 |
| Old Dominion Copper M & S Co | 3,618,882 37 |
| United Globe Mines Co | 2,122,553 53 |
| Total | $14,734,072 74 |
| GREENLEE COUNTY | |
| Arizona Copper Co, Ltd | $9,908,711 75 |
| Coronado Mining Co. | 3,268 83 |
| Detroit Copper Mining Co of Arizona | 8,197,962 98 |
| Shannon Copper Co. | 3,082,778 96 |
| Total | $21,192,722 52 |
| MARICOPA COUNTY | |
| Red Rover Copper Co | $22,466 99 |
| Total | $22,466 96 |
| MOHAVE COUNTY | |
| Frisco Gold Mines Co. | $105,899 17 |
| Gold Road Mines Co. | 419,023 35 |
| Grand Gulch Mining Co | 29,198 54 |
| The Needles M & S Co | 31,553 79 |
| Tom Reed Gold Mines Co | 3,032,518.94 |
| Union Basin Mining Co. | 449,736 03 |
| Total | $4,067,929 82 |
| PIMA COUNTY | |
| Pioneer Smelting Co | $56,230 25 |
| Twin Buttes M & S Co | 167,873 69 |
| Total | $224,103 94 |
| PINAL COUNTY | |
| Magma Copper Co | $74,443 24 |
| Ray Con Copper Co | 8,403,567 04 |
| Total | $8,478,010 28 |
| SANTA CRUZ COUNTY | |
| Duquesne Mining & Reduction Co | $66,223 45 |
| R. R. Richardson & A. E. Crepin, Owners,<br>N. L. Amster, Operator under Option | 127,855 25 |
| Total | $194,078 70 |
| YAVAPAI COUNTY | |
| Commercial Mining Co | $51,362 56 |
| John Lawler & Ed Wells | 20,063 70 |
| Swastika Development Co | 45,030 92 |
| Yavapai Consolidated Co—Gold-Silver Copper Co | 21,898 45 |
| United Verde Copper Co | 13,386,188 70 |
| Total | $13,524,544 33 |
| Total for state | $113,713,153 57 |

# Internal Combustion Mine Locomotives

By John Tyssowski*

*SYNOPSIS—Describes features of construction of principal American-made gasoline locomotives. Self-contained transportation units suitable and economic for mining purposes. Gasoline consumption 0.1 gal. per horsepower-hour. Haulage costs in many operations average less than 2c. per ton moved.*

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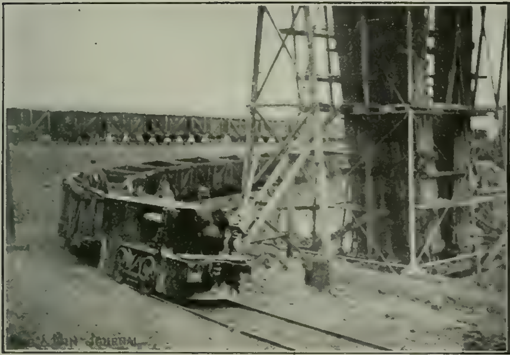
Development of industrial locomotives, propelled by internal-combustion motors, is in keeping with the continued improvement and universal use of automobiles and trucks. The operating conditions about mines impose the severest possible test upon the haulage equipment, and for this reason it is only now that the gasoline motor has reached a high state of perfection that its use is becoming a factor in solving the problems of mining transportation.

The conditions of mine haulage are peculiar and severe. A large and constant output must be transported from the workings with ease and dispatch, and the system must be economical, reliable, safe and flexible. This in many instances, in regions where water is scarce or the cost of coal prohibitive. The advantages of the internal-combustion locomotives over those propelled by steam, electricity or compressed air, particularly in isolated regions, are patent. Each gasoline locomotive is a self-contained transportation unit, the radius of operation being only limited by the capacity of the fuel tank. This means the elimination of expensive power-house installations, overhead wiring, and special tracks. Furthermore, no fuel is consumed while the engine is idle. Finally, gasoline locomotives of approved design are practically fool-proof, or at least can be safely operated by men of ordinary intelligence. It is also claimed that they may be used with security in safety-lamp mines, where sparks from steam engines or from electric wires might be dangerous. In any case, however, the selection of the most desirable haulage systems must involve a consideration of the operating requirements and a full knowledge of the particular conditions to be met.

The chief manufacturers of internal-combustion locomotives in the United States are: Milwaukee Locomotive Manufacturing Co., Milwaukee, Wis.; George D. Whitcomb Co., Rochelle, Ill.; the Baldwin Locomotive Works, Philadelphia, Penn.; Vulcan Iron Works, Wilkes-Barre, Penn., and Jeffrey Manufacturing Co., Columbus, Ohio.

The essential points in the design and construction of the gasoline locomotive for mining purposes are in general as here noted: (1) A heavy, rugged, medium-speed engine, simple in construction, giving maximum power from minimum space and having no exposed flywheels or moving parts; (2) a simple transmission system that can be operated by inexperienced men of ordinary intelligence without danger to fellow workmen or machinery in slipping gears, etc.; (3) forward and reverse motion instantly available, preferably two speeds forward; (4) drive on all four wheels to secure maximum traction; (5) efficient cooling system; (6) safe system for handling gasoline. How the various manufacturers meet the requirements, is best brought out by noting the essential points of the several designs.


Moving Cars on Sharp Curve

Hauling 6-Ton Load Up 12½% Grade

### Scotch Yoke Side Rods Used on Baldwin Locomotives

The Baldwin gasoline locomotive is manufactured under the patents of A. H. Ehle, in four standard sizes, 3½, 5, 7 and 9 tons, respectively. A vertical four-cylinder, four-cycle engine drives a small bevel-pinion construction, which meshes with two large bevel gears on an intermediate countershaft. When the engine flywheel is engaged by a friction clutch, the large bevels run in opposite directions. The large bevels run loose on the intermediate shaft, except when one or the other is engaged by the forward or reverse jaw clutch, located midway between the bevel gears.

Two spur gears of different diameters are keyed fast on the intermediate shaft and constantly meshed with corresponding high- and low-speed gears on the jack or driving shaft, which run loose except when one or the other is engaged by a high- and low-speed jaw clutch, placed centrally on the jackshaft. Two driving cranks, set 90° apart on the jackshaft, are connected with both pairs of driving wheels by Scotch-yoke side rods, one on each side. This method of drive in the Baldwin gasoline locomotive is the logical development of well established steam-locomotive practice and is worthy of especial note as it is [illegible], yet allows free vertical motion for the driving wheels and complete spring suspension of the entire locomotive. Driving chains are eliminated from this design.

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*Mining engineer, Home Life Building, Washington, D. C.

All parts of the Baldwin locomotive are ruggedly constructed of the most suitable material and gears are accurately machined with wide faces. Transmission parts are inclosed in oil-tight cast-steel housing. The main friction clutch is of the multiple-disk type. The main frames are of the cast-steel bar type, and in general similar to those used in steam-locomotive practice.

### Motors Rated on High-Gear Draw-Bar Pull

The performance, rating and dimensions of the four standard sizes of Baldwin gasoline locomotives are given in the accompanying table. The locomotives are rated on the draw-bar pull obtained with high gear, which, under normal conditions, is only about half that developed by the low gear. The average resistance of rolling stock on industrial railways varies from 7 to 60 lb. per ton and averages about 30 lb. This resistance, multiplied by the number of tons to be hauled, gives the draw-bar pull on level track. For each per cent. of grade there is an additional resistance of 20 lb. per ton, and on curves of short radius a further increase. Running under normal or rated load, the gasoline consumption is stated to be about 0.1 gal. per horsepower-hour, and for most requirements the fuel consumption may be figured on an average development of one-half the rated horsepower of the engine throughout the working day.

PERFORMANCE, RATING AND DIMENSIONS OF BALDWIN GASOLINE LOCOMOTIVES

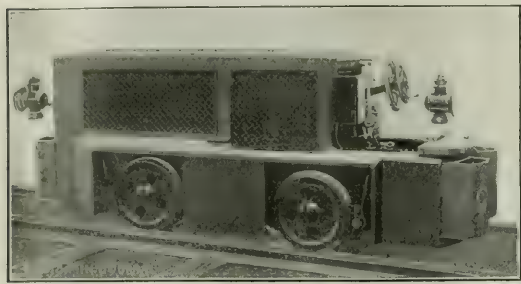
| Weight of Locomotive in Pounds | Hp | No. of Cylinders | Diameter of Cylinders in Inches | Stroke in Inches | Draw-bar Pull in Pounds with High Gear on Level Track | Low-Gear Speed in Miles per Hour | High-Gear Speed in Miles per Hour | Diameter of Driving Wheels in Inches | Wheelbase Ft | Wheelbase In | Height without Cab or Canopy Ft | Height without Cab or Canopy In | Height over Cab or Canopy Ft | Height over Cab or Canopy In | Length over Frames Ft | Length over Frames In | For Over-all Width add to Gauge in Inches | Minimum Gauge in Inches |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7,000 | 25 | 4 | 4¼ | 5½ | 750 | 5 | 10 | 24 | 3 | 0 | 4 | 2 | 6 | 10 | 9 | 5 | 14 | 30 |
| 10,000 | 35 | 4 | 5 | 6 | 900 | 5 | 10 | 26 | 3 | 6 | 4 | 1 | 7 | 0 | 10 | 5 | 16 | 36 |
| 14,000 | 50 | 4 | 6 | 6 | 1300 | 5 | 10 | 30 | 4 | 0 | 5 | 0 | 7 | 6 | 12 | 2 | 18 | 36 |
| 18,000 | 65 | 4 | 6½ | 8 | 1700 | [illegible] | 10 | 36 | 4 | 6 | 5 | 6 | 8 | 0 | 13 | 2 | 20 | 36 |

### Vulcan Motor Has Horizontal Cylinders

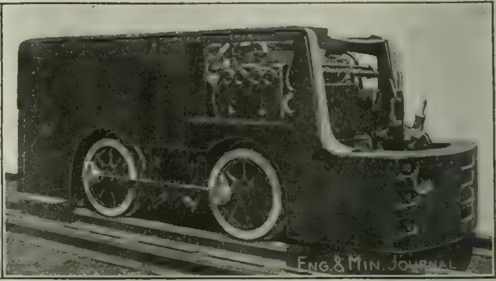
The gasoline locomotive, built by the Vulcan Iron Works, has four horizontal cylinders, placed two on each side of the crank shaft. Transmission is effected through two large multiple-disk clutches on the engine shaft to bevel gear on the jackshaft. Drive from the jackshaft to the axle is through a series of heavy spur gears running in oil.

Exhaust gases enter a large muffler and pass through a series of baffle plates and screens over a body of water. The locomotives are built in five sizes from four to 12 tons in weight.

Two types of gasoline motor-driven locomotives for mine and industrial service are built by the Milwaukee Locomotive Manufacturing Co. Type M, having vertical cylinders, is built in 4½-, 5-, 7- and 9½-ton models. Type E, designed to meet the demand for a locomotive of limited height, differs from Type M in general construction only in having cylinders placed horizontally. It is only built in the 4-ton size. Measured from top of rail to the top of locomotive frame, it is only 34 in. high, which makes it especially adapted for gathering cars from mine rooms of restricted area, and in low workings.



Milwaukee Locomotive



Vulcan Locomotive

### Governor to Prevent Racing of Engine Provided On Milwaukee Motors

The Milwaukee mining-type locomotive is a powerful, compact unit of simple design and rugged construction, not only in the side and end sills, but also in the engine, transmission gears, chains and sprockets. All engines are designed to be run at low speeds to insure long life and low maintenance cost. Furthermore, a governor is provided with each engine, which makes it impossible for the operator to race his engine when running the locomotive by releasing the clutch.

The transmission gears are inclosed and run in oil, speed changes being effected by jaw clutches with all gears in mesh. A lever engages the clutches, thus securing either high- or low-gear speed. The reversing mechanism is of standard design as used in automobile and marine practice.

### Deodorizing Tanks on Motors for Underground Use

In examining the fuel-supply system, it should be noted that the gasoline tanks are removable and are provided with stop safety valves, which seal the tanks when the locomotive is not in use. The locomotives intended for underground work are equipped with deodorizing tanks in which the exhaust from the engine is forced through a series of parallel perforated pipes, which pass through the solution in the tanks. Other locomotives are supplied with mufflers. Wheels are provided with removable steel tires, shrunk on cast-iron centers. The axles are made of steel and according to standard construction. Journal boxes of the M. C. B. type are made of open-hearth steel.

General dimensions of the Type M locomotives are: Gage, 18-56½ in.; length, 113-150 in.; width, 42-70 in.; height, 46-61 in.; wheel base, 29-48 in., and wheels 18-24 in. diameter. These locomotives are built in 1½-ton, 20-hp.; 5-ton, 25-hp.; 7-ton, 35-hp., and 9½-ton, 50-hp. sizes. The Type E, 4-ton, 20-hp. locomotives are built according to the following specifications: Gage, 18-48 in.; length, 134, 130 and 127 in.; width, 46 and 50 in.; height, 34 in.; wheel base, 34 in.; wheel diameter, 16 inches.

Gasoline Locomotive with String of Cars

It is stated that brake tests indicate the fuel consumption of these locomotives as not to exceed 0.1 gal. gasoline per horsepower hour, or 0.125 gal. when alcohol, naphtha, kerosene or California distillate is used. The average daily fuel consumption is given as 8 to 10 gal. for a 25-hp. and 16 to 20 gal. for a 50-hp. locomotive.

The Geo. D. Whitcomb Co. builds a complete line of gasoline motors, including 10 sizes and 17 models, ranging from 4 to 16 tons in weight. This company, as is true of the others, has made a specialty of coal-mining work, but has also supplied a number of locomotives to metal mines.

### Two-Speed Forward and Reverse on Whitcomb Motors

The Whitcomb gasoline mine motor has the approved large and heavy crankshaft, connecting rods, camshafts and sturdy frame. The engines are provided with two speeds forward and reverse, change of direction and speed being effected by clutches instead of shifting gears.

The system of control by clutches is of especial interest. One set of friction clutches controls the forward and reverse motions, while clutches of the jaw type are so provided for shifting from low to high speed. There is an interlocking system between the two sets of clutches, so that the jaw clutches cannot be thrown from one speed to another, except when the forward and reverse clutches are both disengaged. Two straight levers provide control of the clutches, which operate within the transmission case and are kept flooded with oil by an oil-circulating pump.

### Chain Drive to All Four Wheels

The drive from the high- and low-speed shaft to the front axle is by means of a double chain drive and from the front axle to the rear axle by a single chain drive. All of the weight of the motor rests on the four wheels.

Two detachable fuel tanks are used on each motor. These are connected to the main frame by large swivel nuts. After the tanks are connected, a valve in the tank is opened, admitting fuel to the engine. Check valves are also provided in the pipe system between each tank and the engine.

### Operating Data from Mines Instructive

Some data relative to the operation of Whitcomb mine motors, although incomplete, will indicate the possibilities of their use. At the mines of the Roane Iron Co., Rockwood, Tenn., cars weighing 1400 lb. empty, 3640 lb. loaded, are hauled 1½ miles over a 1½% grade. An average of ten 20-car trips are made each day. The haulage cost with mules was 4.95c. per ton, as against 2.48c. with the motor. Daily costs of operating motor are given: Motorman, $2.05; coupler, $1.65; 13 gal. gasoline at 11c., $1.43; 2 lb. carbide at 4c., $0.08; ½ gal. oil, $0.12; 1 gal. transmission-case oil, $0.24; total, $5.57. The Southern Coal & Coke Co., Gatliff, Tenn., with a 5-ton motor, hauls 500 tons, or about 354 cars, in 9 hours. Cars are hauled from sidetracks an average distance of 2500 ft. on grades up to 1½%, against and 3½% in favor of the loads. The daily saving in using motor, as against the use of mules, is figured as $10.52. Operating costs on motors for one year are given as: Labor (including $51.34 for tearing down wheels), $129.60; cost of material used in repairs,

$120.51; motor [illegible], $581.20; oil, gas and carbide, $591.19; total, $[illegible]50. In the period under review, 115,484 tons were handled an average distance of 3000 feet.

Maintenance costs on two 6-ton locomotives operated at No. 40 mine of the Pennsylvania Coal & Coke Corporation, at [illegible], Penn., are given for a period of one year as follows: Repair parts, $103.47; gasoline and oils, $1515.10; labor for repairs, $120; labor overhauling, $137.76; total, $1876.33. The two motors handled about 400 tons each a distance of over a mile. The haulage cost per ton is 1.07c. Data from the Shilch mine, of the Southern Coal & Mining Co., show that two 6-ton motors handled an average of 1680 tons per day, the daily run of the two machines being approximately 53 miles. The haulage cost per ton is given: Labor, 1.05c.; lubricating oil, 0.07c.; gasoline, 0.23c.; repairs, 0.07c.; total, 1.42c. Information received from a number of other operations show daily fuel consumption for 5-ton locomotives as about 15 gal. The amount of oil used varies from one to three gallons.

Little information is at hand regarding the construction or operation of the gasoline locomotive manufactured by the Jeffrey Manufacturing Co. This company has, however, recently perfected a 7-ton gasoline locomotive, which is claimed to develop a draw-bar pull of 3500 lb. at three or six miles per hour. The working parts of the locomotive are inclosed and it is designed so as to be easy to operate and maintain.

⁂

## Electric Furnace for Brass Melting

One kilowatt-hour in the form of heat derived from various sources, costs, as stated by G. H. Clamer and Carl Hering in a paper before the American Institute of Metals, as follows:

| | |
|---|---|
| Electric power at 1c. per horsepower-hour | 1.34c. |
| Water power at $20 per kilowatt-year (Niagara Falls) | 0.228c. |
| Water power at $6 per kilowatt-year (Norway) | 0.0670c. |
| Wood at $4 per cord | 0.0525c. |
| Coke at $4 per long ton | 0.0479c. |
| Crude oil at 2c. per gal | 0.0457c. |
| Coal at $3 per ton | 0.0292c. |

With such differences in original cost, it is evident that electricity must have important advantages to overbalance its cost, in order to be used. These differences are the great stack losses in heating by coal or other fuel. Other objections to fuel heating are: Oxidation, volatilization of the zinc and absorption of sulphur, although these do not begin to make themselves apparent until a fairly high temperature is reached. Preheating with fuel and developing higher temperatures with electric energy will probably be economical procedure when electric energy is expensive.

One of the most important advantages of electricity is that in a good electric furnace nearly all of the energy is converted into useful heat in the metal, while in fuel furnaces by far the greater part, probably about 90%, goes up the chimney as waste. In some electric furnaces nearly all of the heat goes into the metal directly, being generated in it, no matter whether the temperature is high or low; hence the efficiency of this part of the operation is nearly perfect.

The accompanying data deduced from presumably reliable sources for the specific and latent heats, gives the energy required to melt and superheat (about 10%) 100 lb. of the corresponding metal, assuming there are no losses of heat. This should be accepted only as an approximation.

| Metal | Kilowatt-hour per 100 lb. |
|---|---|
| Aluminum | 13.9 |
| Nickel | 12.0 |
| Copper | 8.7 |
| Brass, 80 : 20 | 8.2 |
| Brass, 2 : 1 | 6.9 |
| Bronze | 6.9 |
| Platinum | 5.6 |
| Zinc | 4.1 |
| Tin | 1.6 |
| Lead | 0.91 |

The apparently large discrepancy between aluminum and platinum is due to the fact that the former is a light metal and the latter a heavy one. Although no precision is claimed for these figures, yet they are believed to be sufficiently accurate that any claims made for melting with appreciably less than these theoretical minimums may safely be taken as impossibilities. Such claims have been published to advertise furnaces.

Electric furnaces may be divided into two general classes, arc and resistance. In the former the heat is generated in an electric arc formed in a short space between an electrode, usually of carbon or graphite, and either the metal, the slag, or another electrode. The heat is generated mostly in the arc itself and only partly at the electrode; hence the heating is entirely from the top and must therefore flow down into the liquid metal by conduction, which takes time. It may be said that heat does not like to flow down in liquids. Moreover, the heating is mostly by radiation from the arc or by contact of vapors from the arc, hence the transmission of heat to the metal is limited and cannot be forced. The roof of the hearth is also subjected to these very high temperatures, which will increase the amount spent in furnace repairs. The temperature of the electric arc is extremely high, over 3000° C. or 5432° F., which is excessive and the metals ought not to be directly subjected to it.

In a type of resistance furnace with which the writers have been experimenting, small portions of the liquid metal are heated with great rapidity in cylindrical holes in the bottom of the hearth, and are then immediately ejected with considerable force into the main body of the molten liquid, fresh metal being continuously sucked into these holes. This ejecting is produced by a peculiar recently discovered electromagnetic force called the "pinch effect."

All the heat in the furnace is therefore generated directly in the metal itself, exactly where it is wanted, hence with no initial loss at all, that is, with perfect efficiency. It therefore reaches the metal instantaneously instead of by the slow process of conduction and radiation. The highest temperature is moreover in the liquid metal itself where it is wanted, as distinguished from being above it or in the slag. Heating is done at the bottom of the liquid, which is the more rational place as heated metal always rises. The only losses occur after the heat has been in the metal, being those through the walls and the top surface. There should be no loss of furnace heat through the electrodes, although there will be some loss of electrical energy.

Electric melting may be done in a nonoxidizing atmosphere, or even a reducing atmosphere, if charcoal is added to the furnace. Crucibles and their consequent expense are avoided when the electric furnace is used.

# DETAILS OF PRACTICAL MINING

## Churn Drill Holes for Blasting

The results of using Keystone churn drills in breaking down the face of a quarry are described by F. L. Jorgensen in the *Keystone Drill Magazine*, July, 1913. When the quarry was first begun, the face was so near the river that small blasts were necessary and tripod air- or steam-drills were used to put down 1½-in. holes 12 or 14 ft. deep. Leaving the river, the height of the bank increased 65 ft., and it became necessary to take it in benches. Besides the high cost of labor, due to using two men for each tripod drill, the mucking of the broken material off the benches was a source of great expense. It was therefore decided to install a Keystone well-drill, of a size suitable for 6-in. holes, and equipped with an electric motor.

The motor was connected to the electric conductors at three different poles on which the power line was strung, and the motor wire was rolled on a drum. An ordinary day laborer was taught how to run the machine by a man sent out by the manufacturer. He is paid 9c. per foot drilled and is able to make from 50 to 100% more than when working at his ordinary $2 per day job. The quarry sharpens the drills for him and since the holes are relatively shallow, lost tools are merely left in the hole and blasted out later. It is stated that the total cost for drilling averages less than 15c. per ft., including repairs, oils, power, drillers, etc. The overburden is stripped and the actual drilling is through about 25% of slate and 75% of hard limestone. No trouble has been experienced with the machine. The actual reduction in the quarry pay roll is between $12,000 and $15,000 per year, equivalent to about 8c. per ton on the daily production of 650 tons. About $2000 is saved in drilling costs and $10,000 to $13,000 is saved by avoidance of bench cleaning, track moving, etc. In addition there is the saving due to decreased labor troubles on account of using fewer men. The consumption of explosives remains the same, about 500 lb. of 40% Red Cross dynamite per hole.

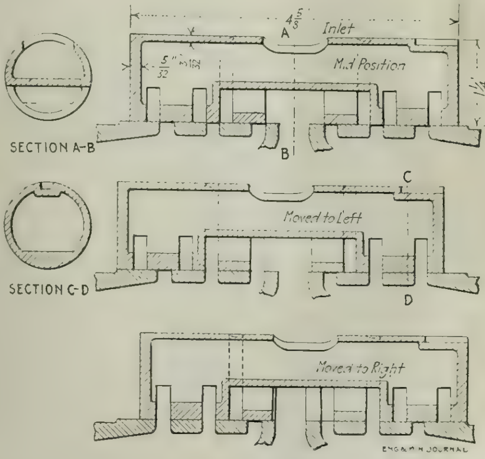
With the tripod drills the 1½-in. holes were put down 6 ft. apart, 16 ft. back from the face, and 12 ft. deep; the 6-in. churn-drill holes are put down 20 ft. apart, 20 ft. back in the face, and, at present, 65 ft. deep. The rock is broken as satisfactorily as before. The chance of accident is greatly decreased. It is found that the machine has to work only one-half the time, so that the drilling is all done during the summer months.

Albert B. Blakeslee, in the same publication, gives some examples of the application of churn drills to cut blasting. In one case on the Catskill aqueduct a cut about 12 ft. deep and 20 ft. wide, consisting of 6 ft. of earth on 6 ft. of slaty rock, was broken with two holes across the face 12 ft. apart. A 6-in. iron pipe was used to case the 6 ft. of soil and about 35 ft. of drilling was done in an 8-hr. shift. The ability of the churn drill to operate in the soil, thus saving stripping expense, is a noteworthy point. In another case, a rock cut for a three-track railroad averaging 40 ft. in depth and running up to 60 ft. for a maximum, was broken with five or six churn-drill holes abreast across the face, extending about 5 ft. below grade. From 1000 to 2000 yd. of rock were broken at a blast. For this work in slaty formation one box of dynamite was used in the bottom of the wet holes and from one to two cans of black powder when the holes were dry. In the deepest, 65-ft. holes, 50 lb. of dynamite and 50 lb. of black powder were employed. The machines averaged 45 ft. per 10-hr. day.

⁂

## Hollow, Double-Ported Spool Valve

In the hammers of the drill-sharpening machines at the Champion and Trimountain mines, Michigan, a special spool valve is used, illustrated in the accompanying drawing. The valve is hollow, being machined from a casting till its walls are 3/32 in. thick. The ports are double, so that a maximum port opening is obtained with the relatively small travel of 11/32 in. There is a large wearing surface and after 30 months of continuous use tool marks are still visible. The interior of the valve serves to collect scale and dirt that might otherwise clog the ports. The ratio of the area of the inlet opening on the top to the area of the ports is such that the valve is practically balanced, but is kept to its seat by a slight pressure. The circumferential groove in the exterior of the valve is for the purpose of taking care of any air leakage, and of conveying it to the exhaust, thus preventing the danger of its being imprisoned in the chest beyond the valve. In order to prevent the valves from breaking by striking the ends of the valve chest, the plugs in the latter are capped with a resilient material which acts as a cushion. This buffer lasts from six to



UNUSUAL ROCK DRILL SPOOL VALVE

30 months. In about three years' run on the sharpeners, only one valve out of 10 had to be replaced. They have also been used for [illegible] months with good results on hammer and piston drills underground. The valve is patented by Ernest Penberthy, of Painesdale, Michigan.

⁂

## Shaking Chute Motors

By E. M. Weston*

The simple shaking chute is still largely used underground on the Rand. Motors driven by compressed air, however, are now being introduced to obviate manual labor in reciprocating the chutes. Fig. 1 shows one manufactured by Head, Wrightson & Co., Ltd. It is similar to a rock drill, and is light and simple. The machine runs 35 to 40 strokes per min. and has a low air consumption; the length of stroke can be varied up to 18 in. on a slope of 15° to 20°.

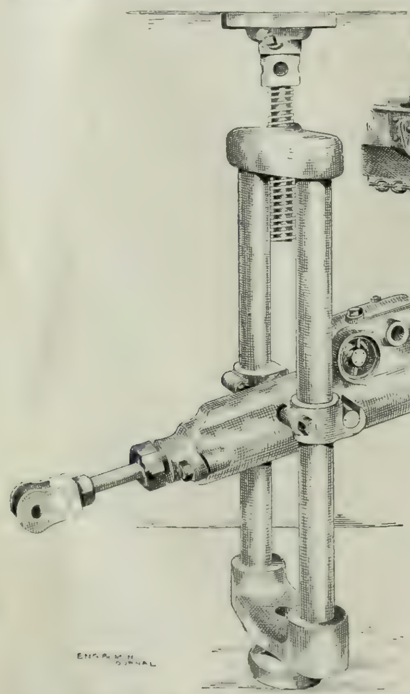


Fig. 1. Motor of Rock-Drill Type

The Flottmann Engineering Co. has introduced an entirely new style of shaking conveyor for underground work. This has its air-actuated motor, as shown in Fig. 2, beneath the chute and attached anywhere in its length. The chute may be swung on chains, as shown, or in low stopes may be pushed up and down over special shoes on the foot wall. The motor consists of a cylinder A open at both ends, in which move two pistons which act by means of two connecting rods on two pairs of toggle levers *B*. One end of each toggle is fixed to the chute and the other to a slide plate *C* attached to a chain anchored in the stope. The air enters between the pistons when the toggle levers are straight; the outward movement bends the levers and pulls the chute upward; the advancing piston opens an exhaust port which throws over the valve and allows the chute to fall back. The toggles give a mechanical advantage with a small motor which will, when working a chute 240 ft. long, on perfectly flat ground, transport ore at a rate of 12 to 14 ft. per minute.

The chute is trapezoidal in section, 20 in. at the top, 16 in. at the bottom, and 5 in. high, made of steel plate. The sections are fastened by flanges connected, as shown at *D*, by a patent bolt and wedge which are self-tightening and can be taken apart with a hammer. The motor costs about $250 and the chute about $2.50 per running foot.

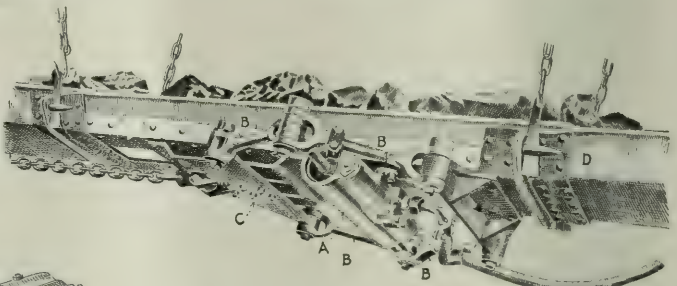


Fig. 2. Toggle-Action Motor

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## Track Work in a Minnesota Mine

By E. W. R. Butcher*

The accompanying illustrations show some details of underground track work and one of the motor turns used in the mines of the Republic Iron & Steel Co., on the Mesabi range. Figs. 1 and 2 show a right and left turn. As a rule, the location of a turn is determined before the drift is driven and the necessary sets are put in place to make the turn when required. Props are placed under the ends of the two caps resting on the opening set until that turn is to be driven. A 9-ft. by 6-in. post is used under both of these caps and on either side the posts of each set are shortened six inches until an 8-ft. post is reached, which is the length of post used in motor drifts. When the opening set is placed in position, a point is placed on the set and on the 10-ft. by 9-in. set and with this line the rest of the turn is put in with the aid of the other dimensions shown.

Figs. 3, 4 and 5 show the track layout and frog details used in connection with a 25-ft. radius timber turn. The frog is designed so that it can be used for either a right or a left turn. The stub switch has given better satisfaction for underground work than the point switch. The latter caused considerable trouble by dirt getting between the wing rail and track, which interfered with its closing. Figs. 6 to 10, inclusive, showing details of switch stand and tie-rod connections, are self-explanatory.

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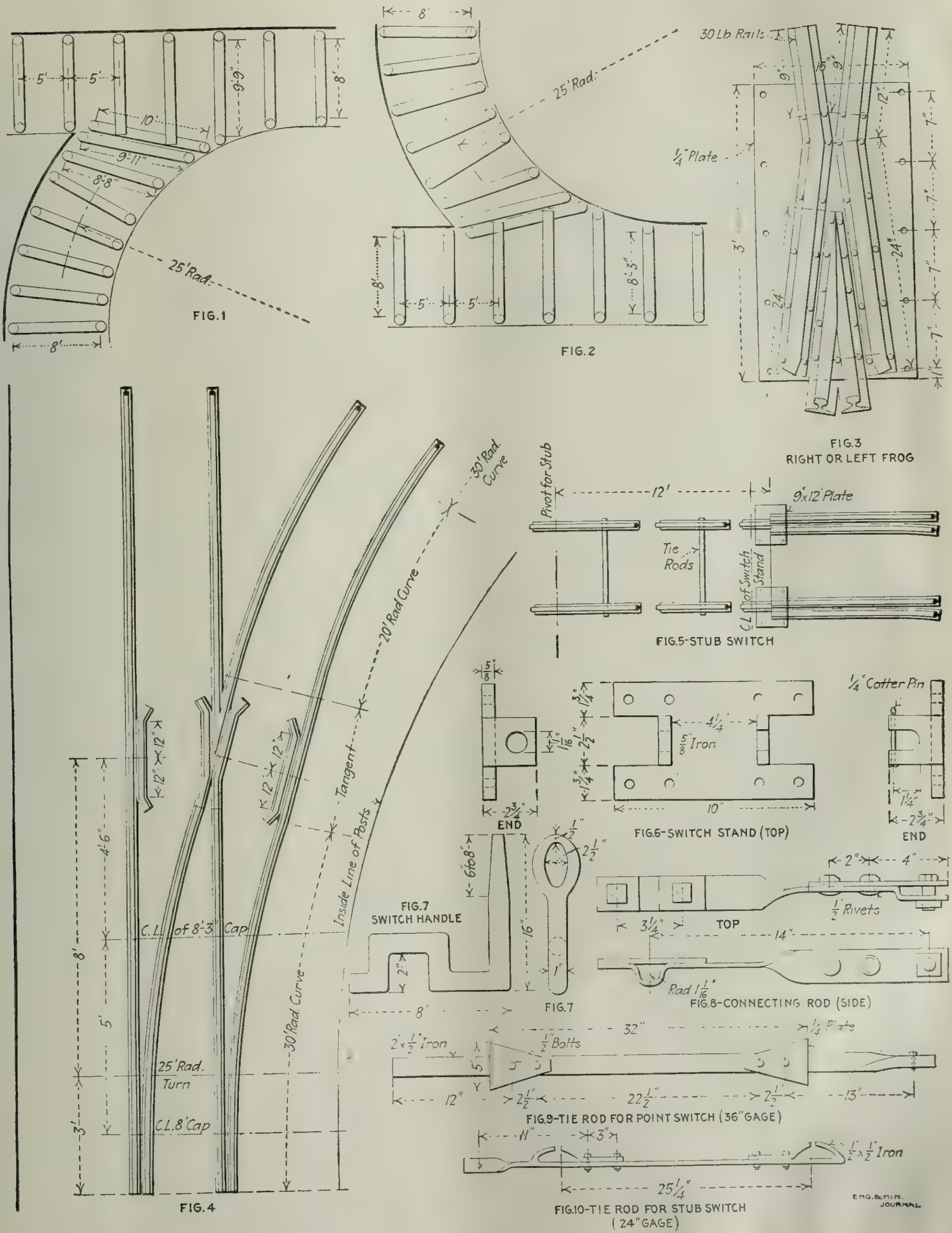
*Union Club, Johannesburg, South Africa.

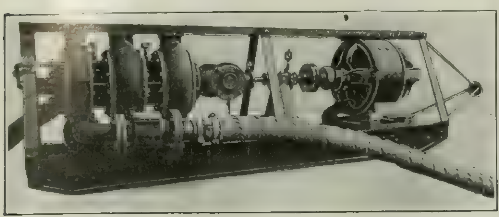
*Gilbert, Minn.



Turnouts Used in a Mesabi Range Mine

## Centrifugal Pump Set for Incline

The accompanying illustration shows a centrifugal pump and motor arranged for operating in an inclined working [illegible] from the horizontal. The pump is a 4-in., [illegible] centrifugal machine operating on heads up to [illegible] ft. The motor has a capacity of 30 hp. The two machines are held together in the steel framework with an eye at one end capable of attachment to the cable or rope for lowering or hoisting the set. The lower part of the framework acts as a skid. Special arrangements are made for oiling, the lubricating device for the lower bearing, visible between the coupling and the bearing housing, being fed with oil from the upper end.



Pump and Motor on Skid Frame

The pump was made by the United Iron Works, of San Francisco, and the motor is a Westinghouse machine. Several sets of this type are said to be in successful operation.

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## Electricity Underground in Relation to Safety

The principal dangers resulting from the use of electricity in mines are shocks, fires and explosions. Bare trolley wires are the most fruitful source of electrical shock underground. There is in addition the danger due to the charging of parts of equipment not supposed to carry current. For instance, if a locomotive loses its round by oversanding, while motor or lights are in operation, the frame becomes charged to the potential of the trolley wire, and is capable of giving a severe shock. Danger from fires arises from defective installation, careless upkeep, or injuries due to falls of rock. Short-circuits, the blowing of open fuses, and incandescent lamps are capable of igniting adjacent combustible material. Explosions in metal mines are limited to the ignition of explosives, which may be due to contact with electrical circuits during handling and transporting, or may be incidental to detonation by electricity. Explosives may be brought into contact with an electric circuit, so as to carry the current and be exploded without any spark or outside ignition. For instance, explosives in metallic packages on cars drawn by electric motors may accidentally form part of a circuit, due to inefficient grounding, and be thus detonated. Accidents from electric firing are due either to the accidental discharge of detonators in the vicinity of explosives, or to the premature ignition of charged holes. Premature ignition is more likely if the detonating circuit includes an earth return; because if the other side of the circuit be accidentally grounded, differences of potential existing in the earth may be sufficient to cause detonation.

Electrical installations underground are made in the face of adverse conditions, such as dampness, dust, acid water and possible falls of rock. Cramped quarters and the lack of sufficient illumination operate to prevent suitable installations and also are likely to cause accidental contact later. The temporary nature of mining operations renders it inadvisable to expend a great amount on the first cost of an installation.

It is probable that the dangers of electricity would be more largely guarded against if electrical accidents did not form so small a percentage of the accidents underground. For instance, during the first eight months of 1912 only 3% of the men killed in and about United States coal mines, met their death from electrical causes. The electrical danger is thus overshadowed by those sources of accident which are responsible for a larger loss of life.

### Advisable Precautions

Abundant electrical light underground should be provided in dangerous places, thus making the current protect itself. Electricity is dangerous only when it breaks from its proper channels, and it should be kept in these channels by proper insulation. The argument that insulated coverings are a source of danger, because they deteriorate and appear efficient when actually not so, is not universally applicable, as it depends upon the kind of insulation and the conditions of service. When bare conductors are necessary, they should be protected and well supported mechanically. Proper selection, in the first place, and suitable protection for electrical machinery, result both in increased safety and decreased cost of upkeep. Inflammable material should not be allowed where it may be affected by heat or fire due to electrical causes. The dead metallic parts of electrical apparatus should be grounded, and the bodies of men working upon such apparatus properly insulated. Efficient inspection by the mine electrician is the best means of obtaining a high factor of safety.

It should be noted that electricity, while a source of danger underground, can also be made use of to promote safety. Its most important application in such respects is the telephone. In addition there is the portable electric lamp and the firing of shots by electrical means. The use of storage-battery locomotives is advantageous from the point of safety, and has also other advantages, such as the elimination of cable-reel locomotives; the possibility of satisfactory voltage regulation with less copper, and the elimination of trolley wires and rail bondings.

[To the list of means by which electricity may be utilized to promote safety, we can add the use of electric light as affording better illumination and protection against many sources of accident underground, and the use of electric signals, both flash and bell, as promoting more efficient hoisting. The advantages of electric firing in blasting operations, from the point of view of safety, are still questionable. It seems as if the storage-battery electric locomotive would eventually offer so many advantages, in spite of increased cost of operation, as to become the accepted type.—Editor.]

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Note—Abstract of a paper by H. H. Clark, presented at the Pittsburgh meeting of the American Institute of Electrical Engineers, Apr. 18-19, 1913.

# DETAILS OF METALLURGICAL PRACTICE

## Iron Castings to Resist Corrosion

Some practical rules laid down by the American Foundrymen's Association for obtaining castings resistant to corrosion are as follows (*Canadian Eng.*, July 17, 1913): (1) Use white iron if possible (white irons are especially useful where any acidity is to be encountered); (2) if not practicable to use white-iron castings, chill those surfaces which are to be in contact with corrosive conditions; (3) if grey iron must be used, get dense, close-grained castings through the use of steel scrap or otherwise; (4) avoid oxidized metal; use pig irons of good quality, together with good cupola practice. If possible, use deoxidizing agents, such as titanium or vanadium; (5) keep the sulphur as low as possible.

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## Weighing Light Material on Ordinary Scales

It is often desirable to weigh with some accuracy articles or material of light weight when only the ordinary platform scale, used for heavy weights, is at hand. In such cases a method devised by W. B. Crowe (*Met. and Chem. Eng.*, June, 1913) is available and is a great convenience.

The method is based on the relation of the beam weight to the platform weight. In many ordinary scales this proportion is 1 : 100, 1 lb. on the beam balancing 100 lb. on the platform, and this proportion can be used as an example, any other proportion being treatable in the same way. To find the weight of an article too light for weighing in the usual way on the platform, it is attached instead of the beam weight and a convenient material placed on the platform until equilibrium is reached. Then the article is detached and the material is weighed as usual. The weight of the material used, divided by 100, equals the weight of the light article hung for the beam weight. With scales accurate to 0.25 lb. on the platform, the sensibility to objects on the beam would be 0.04 oz., or 1.133 grams. This ingenious expedient should be of use in metallurgical plants, as by it small amounts of precipitate, bullion, flux, etc., can be weighed with sufficient accuracy for ordinary purposes.

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## Safety Rules—Boiler Erection*

(1) Boilers shall be numbered at both ends and on top. The number should be placed so as to designate the boiler to which it applies and should be large enough to be plainly seen. Numbers perforated in steel plates are recommended.

(2) Seamless tubing should be used in all boilers.

(3) Guards should be provided for water-gage glasses.

(4) Relief (safety pop) valves of ample capacity should be provided and piped through the roof or outside of building. No stop valve should be placed between the safety valve and the boiler.

(5) To relieve pressure in the blowoff line, for each battery of eight boilers, or fraction thereof, a vertical pipe should be connected with the blowoff line and run up through the roof, or outside of building.

(6) Two stop valves should be provided in the blowoff connection.

(7) Two valves should be placed in feed-water connections of each boiler, one on each side of check valve.

(8) To avoid untrue indication of water level, and possibly an explosion, no valves should be placed in connections between water columns and boilers, or if valves are so placed they should be locked open when not in use.

(9) One of the two valves in the connection between the boiler and the steam header should be a nonreturn valve.

(10) Suitable drains should be provided where necessary on all steam lines.

(11) Walks on platforms, equipped with suitable stairs or ladders, should be provided, wherever possible, on boilers, steam header and other places where men have to work.

(12) When boilers are not equipped with nonreturn valves, a guard provided with a lock, designed to lock the steam-valve wheel, should be provided and used when men are working in the boilers, to prevent anyone from turning in steam.

(13) Plank covering over exhaust pits should be frequently inspected and kept in good repair.

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## Care of Rubber Belts

Methods of handling and splicing rubber belts are of interest to the mining industry. Some valuable kinks are given by Robert Moore in *Power*, July 22, 1913. Care must be taken in putting on a new belt to stretch it as much as possible before splicing.

In placing a 36-in. eight-ply rubber belt on pulleys 50 ft. between centers, allow ⅛ in. per running foot for stretch. Put on the clamps, as shown in Fig. 2, and draw them tight. Do not be afraid of breaking the belt, as even a five-ply 10-in. belt will stand a strain of 10,000 lb. and larger ones in proportion; the pulley will collapse first. Take all the tension the bearings will stand, then turn the shaft slowly back and forth until the clamps touch the pulleys; taking up the slack as it is recovered from the upper half. Neglect to do this will stretch only one-half of the belt, and is apt to cause it to run out of line.

After thoroughly stretching, proceed with the lap, which in this case should be 15 in. long. It should always point in the direction of travel over the pulley, as in Fig. 1. Thus any slip of the pulley will have a tendency to smooth down the lap. Place a board on the clamp rods on which to rest the splice and draw a line squarely across the belt 45 in. from the end. Lay the section off in 2-in. squares, starting 1 in. from the outer edge, as in Fig. 2. Punch ¼-in. holes where the lines cross. As there are five plies, there will be three cuts or scarfs. Cut a line just the depth of two plies at the 45-in. line and peel off these two thicknesses; do the same at the 15- and 30-in. lines.

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*From Inland Steel Co.'s book of rules.

Scarf the other end, place the halves together and punch holes in the lower half, inserting the punch in the holes in the upper half. By so doing, the holes will be directly opposite each other. Cleanse the surfaces with naphtha and apply a liberal coating of the best rubber cement. Allow this to dry until it will not stick to the fingers, then place the laps together, starting at the edge and rolling the upper one out as it is being cemented, so that air may not be entrapped between the surfaces. Sew the outer edges, using the shoemaker's stitch, shown in Fig. 3. Alternately roll and pound the joint until it is perfectly flat, then sew each row of holes as was done with the outer ones.

Cut filling strips of duck the width of the space between lacings (most belt companies sell this duck all prepared) and give them several coats of rubber cement on each side. Clean the face of the belt between the laces with naphtha and give it a liberal coating of cement. When each surface is dry, that is, when the finger placed lightly to the surface will not adhere, place the strips between the lacing and roll them down. Now take a piece of duck, the width of the splice, but 4 in. longer, and cement this to the face of the belt, covering the joint. By so doing the lacings are protected and, except for the occasional renewal of the outer covering the joint is as durable as the belt itself. The manner of this is shown in Fig. 5.

For lacing, tip the laces like a shoe string by bending a V-shaped piece of tin around the ends, as illustrated, or use the eyed awl shown, to pull the lace through.

Belts smaller than 10 in. are butted and have a butt strap on the outer surface; this is known as the "back splice." Belts on grindstones, saws, rattlers, etc., where shippers are used will wear on the corners where they are butted, and the outer lace hole will soon tear away, if this form of joint is not used. Shippers for belts of this kind should always be of the roller type. In joining canvas belts always stagger the holes and do not have them less than 1¼ in. apart as the fabric is apt to crack across in cold weather.

Another form of joint, known as the "diamond splice," is used on generators with small pulleys, as there is less shock when the lap passes over the pulley, eliminating all flicker of the lamps. The diamond splice is made in much the same manner as the lap splice except that the scarfs are divided into three equal parts and cut as shown in Fig. 3; it is not so strong a joint as the lap splice, but is more flexible and, therefore, better adapted to small pulleys.

Increasing the diameter of the pulley lengthens the life of a belt, as the stretch and compression are less per foot. As the thickness of the belt increases, so should the diameter of the pulley increase. For instance, the arc of a belt ¼ in. thick on a 2-ft. pulley would measure 37.69 in. next the pulley face, while the outer edge would measure 38.48 in., a total distortion of 0.79 in. If the belt were ½ in. thick the outer edge would measure 39.27 in., giving a total distortion of 1.58, just twice as much (Fig. 4). When more power is wanted and it is not advisable to increase the size of the pulley, better results are obtained by widening the belt and pulley face than by increasing the thickness of the belt. To increase the diameter of the pulley to 48 in. would give a total distortion of 1.58 in. when using a ½-in. belt, but as the arc would measure 75.4 in., the distortion for each lineal foot would be halved.

Animal fats and grease should never be used on rubber belts. Boiled linseed oil is good; also equal parts of black lead, red lead, French yellow, litharge and enough japan dryer to make it dry quickly. This will give a smooth polished surface.

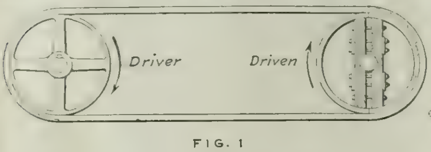

FIG. 1

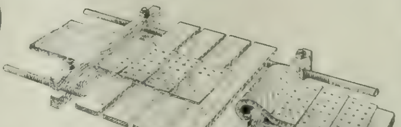

FIG. 2

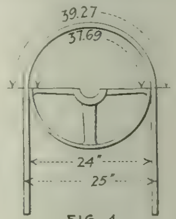

FIG. 4

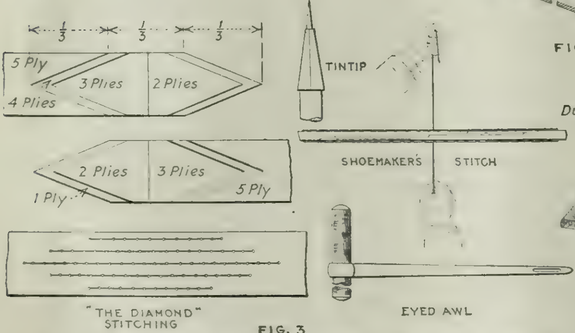

FIG. 3

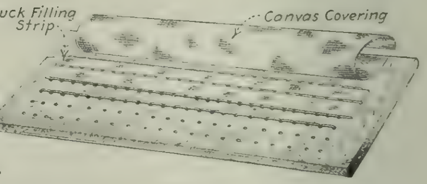

FIG. 5

Stitchings, Splices and Tools Used in Repairing Rubber Belts

# COMPANY REPORTS

## Isle Royale Copper Co.

In the year ended Dec. 31, 1912, the Isle Royale Copper Co., Houghton, Mich., produced 8,186,957 lb. of refined copper for 11.89c. per lb. The costs given in the report were as shown in the following table:

| | Per ton ore stamped | Per lb. copper produced, c. |
|---|---|---|
| Running expenses at mine and mill | $1.54 | 10.01 |
| Construction | 0.034 | 0.20 |
| No. 7 shaft | 0.023 | 0.15 |
| Explorations | 0.008 | 0.05 |
| Unwatering Huron mine | 0.013 | 0.08 |
| Smelting, freight, commissions, eastern office, etc. | 0.202 | 1.31 |
| Interest paid | 0.015 | 0.09 |
| Totals | $1.835 | 11.89 |

The total tonnage treated was 531,105, secured from 622,485 tons of rock hoisted, 14.7% of which was discarded as waste of sorting. The average yield was 15.4 lb. of refined copper per ton. The ratio of concentration at the mill was about 93 tons of ore into one ton of mineral which yielded 71.43% of fine copper. There was a net increase of $419,767 in assets during the year, making a net balance of $557,743 on hand at Dec. 31, 1912. Development work consisted of 941 ft. of shaft sinking and 19,106 ft. of drifting, drift-stoping and crosscutting. Total depth of shafts at Dec. 31 follows: No. 2 shaft, 3162 ft. from surface; No. 4, 1939.5 ft.; No. 5, 1206 ft.; No. 6, 1553.5 ft. and shaft A, 972 ft. below surface.

⁂

## Nevada Consolidated

The Nevada Consolidated Copper Co., of Ely, Nev., submits a statement for the second quarter of the fiscal year ended June 30, 1913. The production of copper was 17,928,746 lb., divided thus: April, 5,650,608 lb.; May, 5,933,275 lb., and June, 6,344,863 lb. The Nevada Consolidated ore milled during the quarter was 762,880 tons, of which 91% was supplied from the pits and 9% from the underground workings of the Veteran mine.

The grade of ore treated averaged 1.76%, which is in excess of the mine average of 1.67%. This is due to the fact that 70% of the steam-shovel tonnage came from the Eureka pit, where it was possible to mine the higher-grade ore. During the balance of the year the pit tonnage will be almost equally divided between the Eureka and Liberty-Hecla areas. The cost per pound of copper produced, including Steptoe plant, depreciation and all charges except ore extinguishment, was 8.95c. The overburden stripped during the quarter was 701,807 cu.yd., costing $290,484, of which $126,824 was charged to operating costs, balance deferred.

The net credit to undivided profits for the quarter was $98,422, after payment of the fifteenth quarterly dividend, and the further payment to the Steptoe company of $131,653 for depreciation, and the charging off of $126,916 for ore extinguishment. This net credit was reduced because the unsold excess copper was written down to 14c. per lb. from the 15c. at which it had been carried. The normal tonnage on hand unsold is carried at 12¼c. per lb. as heretofore.

The copper on hand and in transit (sold and unsold) at the end of the quarter was 22,439,864 lb., inventoried at 13.313c. per lb. The earnings for the quarter are computed on the basis of 14.392c. per lb.

The Nevada Northern Railway Co. during the quarter, purchased from the Nevada Consolidated, for the investment of its sinking fund, $500,000 par value of railway bonds held by the copper company, and the investment account is correspondingly decreased. In connection with the contract between the Steptoe Valley S. & M. Co. and the Giroux Consolidated Mines Co., for the treatment of the ores of the latter, which contract was made for a 5-year period, subject to cancellation on one year's notice, the Giroux company has given notice of the cancellation of the contract, which will become effective early in June, 1914.

⁂

## Copper Range Consolidated

The Copper Range Consolidated Co., Houghton, Mich., operates the Baltic, Champion, Tri-Mountain and the Atlantic mines, also the Copper Range Railroad. The combined production of the operating companies for 1912 was as follows: 37,584,647 lb. of refined copper sold at an average price of 16.16c. per lb. The net income from all sources was $1,692,566 out of which $788,429 in dividends were paid, not including $625,810, being one-half of profit from operating the Champion mine which is paid over to the St. Mary's Mineral Land Co. All income amounted to $6,228,364 and disbursements, $5,324,225, leaving a surplus of $904,138 for the year. The income was derived from the following sources: Sale of copper, $6,071,095; interest receipts, $13,107; net earnings from Copper Range Railroad, $103,775; and net receipts from Atlantic Mining Co., $40,385. The disbursements were made up of: Net mining, smelting, freight, marketing, etc., after deducting sundry credits, $3,661,837; Houghton County taxes, $164,157; taxes and general expenses of Copper Range Consolidated Co., $83,992; St. Mary's Mineral Land Co.'s share of Champion mine earnings, $625,810; and dividends, $788,429. The total dividends of the company amount to $12,902,249 at Dec. 31, 1912.

There were 1,784,402 tons stamped in 1912, an increase of 5330 tons over 1911. The average yield was 21.07 lb. of fine copper per ton, an increase of 0.20 lb. per ton over the previous year. The profit from the Atlantic Mining Co. came mostly from operating its stamp mill on custom work. A statement of available quick assets shows $1,094,262 on hand in the form of cash, copper and first-mortgage bonds of the Copper Range R.R. Co., after deducting all liabilities.

At the Baltic considerable progress has been made in carrying out modifications of the underground practice. Over 1700 ft. of raises were put up to facilitate the handling of filling material and to permit the use of old fill over again. As the old stopes near the surface have been filled as [illegible] practicable with the waste rock hoisted and [illegible] underground dumps have been installed so that waste [illegible] new openings can be used where wanted. The [illegible] system is being carried out at the other mines. Improved drilling machines have also been introduced at the mines. The old mill of the Atlantic company is to be closed down after cleaning up all accumulations of copper rock and mineral.

PRODUCTION AND COSTS
BALTIC, CHAMPION AND TRIMOUNTAIN MINES, 1912

| | Baltic Mine | Champion Mine | Trimountain Mine |
|---|---|---|---|
| Tons rock [illegible] | 705,281 | 804,994 | 403,089 |
| Rock sort[illegible] | 7.49% | 4.9% | 9% |
| Tons rock [illegible] | 652,433 | 765,306 | 366,663 |
| Pounds [illegible] produced | 22,444,810 | 28,460,500 | 12,417,575 |
| Ratio of [illegible] mineral | 58.2 to 1 | 54 to 1 | 59 to 1 |
| Pounds refined copper | 13,373,961 | 17,225,508 | 6,980,713 |
| Yield in copper per ton.. | 20.50 lb | 22.508 lb | 19.04 lb |
| Costs | | Per ton of ore | |
| Mining | | | |
| Superintendence and labor | $1.0500 | $0.900 | $0.961 |
| Rock house expense | 0.0535 | 0.057 | 0.053 |
| Hoisting expense | 0.0755 | 0.052 | 0.088 |
| Power drills... | 0.0770 | 0.081 | 0.143 |
| Powder and supplies | 0.1660 | 0.153 | 0.175 |
| Total mine costs | $1.422 | $1.24 | $1.42 |
| Surface: | | | |
| Superintendence and labor | 0.072 | 0.0595 | 0.158 |
| Supplies | 0.112 | 0.0591 | 0.077 |
| Teaming | ... | 0.0018 | |
| Insurance | 0.004 | 0.0045 | 0.006 |
| Electric lights and telephones... | .. | 0.0012 | 0 |
| Purchasing department | 0.005 | 0.0058 | 0.006 |
| Library maintenance. | ... | 0.0023 | |
| Legal and general.................... | 0.012 | 0.0068 | 0.004 |
| Transporting ore to mill. | 0.136 | 0.1370 | 0.112 |
| Stamping | 0.214 | 0.2020 | 0.187 |
| Total mine and surface | $1.98 | $1.72 | $1.97 |
| Less rents received | 0.01 | 0.02 | 0.02 |
| Net mine and surface cost | $1.97 | $1.70 | $1.95 |
| Taxes.. | 0.097 | 0.081 | 0.11 |
| Smelting, refining, selling, etc......... | 0.197 | 0.219 | 0.19 |
| Total all charges. | $2.264 | $2.000 | $2.25 |
| Less interest received | 0.007 | 0.004 | 0.01 |
| Net cost per ton .. | $2.25 | $1.996 | $2.24 |
| Development Work Performed | | | |
| Feet sinking . . . . | 464 | 429 | 263 |
| Feet drifting................. | 10,547 | 9,343 | 7,746 |
| Feet crosscutting.................... | 679 | 1,209 | 401 |
| Feet raises .... | 1,172 | 1,740 | 1,770 |
| Total development work, feet. | 13,462 | 12,721 | 10,180 |
| Net cost per lb. copper. ... | 10.94c. | 8.88c. | 11.73c. |

⁂

## Kyshtim Corporation

The Kyshtim Corporation, London, owns and operates the Kyshtim Mining Works Co., Kyshtim, Perm, Russia. The lands of this corporation approximate 2198 square miles of 1,406,700 acres, including iron mines, copper mines and gold deposits. However, a large part of this acreage consists of forests and grazing lands. The company smelts copper and iron ores, operates an iron works and a copper refinery. Its annual report for year ended Jan. 13, 1913, shows an operating profit of $2,276,428 before allowing for depreciation and income tax. After allowing for these charges apparently only $1,440,000 of the profit, as stated, was applicable to dividends. In addition to these costs, the expenses of the Kyshtim Corporation have to be deducted before its net profit can be [illegible]ened. The affairs of the concern are complicated [illegible] is hard to check its costs. The figures reported are [illegible] extremely low that it is doubtful if they represent all [illegible].

The production amounted to 7547 tons of electrolytic copper, 11,298 tons of sheet iron, 4763 tons of cast iron and 15 tons of art castings. The company also sold 19,577 tons of barren pyrites for sulphuric-acid manufacture. The output of copper in 1913 is expected to reach 8000 tons. The three mines operated produced 347,850 long tons of ore, averaging 3% Cu, 0.10 oz. Au, and 1.1 oz. Ag, of which 18% came from development work. Of the total tonnage mined, the Koniukhoff mine produced 39.6%; the Smirnoff, 43.7% and the Tissoff, 16.7%. The Tissoff also produced 21,000 tons of barren pyrites. The development work consisted of 4653 ft. of drifts, 2843 ft. of raises, 1397 ft. of crosscuts and 458 ft. of main shafts; total, 9351 ft., or about one foot for every 37 tons of ore mined.

At the Karabash smeltery, the heightening of the main stack was carried on to 75 ft., making the total height from the foundation 200 ft. and from feed floor 250 ft. There is now under construction a 19x100-ft. regenerative gas-fired reverberatory furnace with suitable calciners. This has been made imperative by the accumulation of fine ore, which is being produced in quantities considerably in excess of the capacity of the Martin furnaces at Kyshtim. It is hoped this plant will be in operation by the middle of 1914, at which time it is estimated that the stock of fines will total 100,000 tons. The reverberatory furnaces at Kyshtim continued normal operations, producing 5 to 6% matte for treatment at Karabash; it has been decided, however, to install three mechanical calciners to allow the production of higher-grade matte. Further tank-house capacity is being provided at the refinery, for the present only four series of tanks will be added, bringing the annual capacity up to 10,000 tons. The ultimate capacity will be 13,000 tons of copper per annum. At the Karabash works during 797 furnace days the following charge was run:

| | Long tons in charge | Per Cent. Copper | Oz. Gold per ton | Oz. Silver per ton |
|---|---|---|---|---|
| Ore to blast furnaces | 300,100 | 3 | 0.10 | 1.1 |
| Kyshtim matte.... | 21,599 | 5.52 | 0.23 | 2.1 |
| Kyshtim cleanings.. .. | 759 | 3 | 0.12 | 1.2 |
| Refinery slags..... | 568 | 28 | 0.84 | 7.9 |
| Flue dust recovered... | 27,007 | 3.08 | 0.12 | 1.2 |
| Quartz charged........ | 77,090 | | . | . |
| Limestone.. . .. | 29,603 | | | . |
| Gross blister copper . | 7,180.7 | 98.98 | 3.79 | 33.1 |
| Less copper in refinery slag already reported as blister . .. | 150.7 | | ... | . |
| Net blister produced..... | 7,030 | | ... | ... |

The recovery on metals charged to blast furnaces was: 75.2% copper, 81% gold, 69.80% silver.

The summarized operating costs are given in the following table:

| | Per ton Ore | Per L. ton Blister |
|---|---|---|
| Mining . | $1.46 | $66.39 |
| Smelting | 1.94 | 86.46 |
| Transporting | 0.13 | 5.10 |
| Overhead expense | 0.19 | 8.15 |
| Total .. . | $3.72 | $166.10 |

As compared with 1911, the cost per ton is slightly higher, but per ton of blister, lower, due to the high ratio of recovery in smelting. The refinery cost, when reduced to terms of blister, was about $19.70, and transport from Karabash to the refinery about $1.22, bringing the total cost to approximately $187 per long ton of blister. Reducing this to terms of refined copper delivered on the railway, it becomes 8.5c. per lb.; by crediting the copper with the gold and silver produced the cost appears to be 4.8c. per lb. of refined copper.

The ore reserves at May 1, 1913, were estimated to contain 2,069,000 long tons of ore, assured by development and bore holes, and 496,000 long tons, estimated in extensions beyond limits of exploration, total of both estimates, 2,565,000 tons. There is an additional reserve of 380,000 tons, blocked out and available for immediate stoping.

# Historical Note on Copper Smelting

*SYNOPSIS—A review of copper smelting from its appearance among the Egyptians, about 6500 years ago, to the time of Agricola.*

⁂

The discoverer of the reduction of copper by fusion, and his method, like the discoverer of tin and iron, will never be known, because he lived long before humanity began to make records of its discoveries and doings. Moreover, as different races passed independently and at different times through the so called "Bronze Age," there may have been several independent discoverers. Upon the metallurgy of prehistoric man we have some evidence in the many "founders' hoards" or "smelters' hoards" of the Bronze Age which have been found, and they indicate a simple shallow pit in the ground into which the ore was placed, underlaid with charcoal. Rude round copper cakes eight to 10 in. in diameter resulted from the cooling of the metal in the bottom of the pit.

Analyses of such Bronze Age copper by Professor Gowland and others show a small percentage of sulphur, and this is possible only by smelting oxidized ores. Copper objects appear in the prehistoric remains in Egypt, are common throughout the first three dynasties, and bronze articles have been found as early as the IV Dynasty (from 3800 to 4700 B.C., according to the authority adopted). The question of the origin of this bronze, whether from ores containing copper and tin or by alloying the two metals, is one of wide difference of opinion, and we further discuss the question under "Tin." It is also interesting to note that the crucible is the emblem of copper in the hieroglyphics. The earliest source of Egyptian copper was probably the Sinai Peninsula, where there are reliefs as early as Seneferu (about 3700 B.C.), indicating that he worked the copper mines. Various other evidences exist of active copper mining prior to 2500 B.C. (Petrie, "Researches in Sinai," London, 1906, p. 51, etc.). The finding of crucibles here would indicate some form of refining. Our knowledge of Egyptian copper metallurgy is limited to deductions from their products, to a few pictures of crude furnaces and bellows, and to the minor remains on the Sinai Peninsula; none of the pictures were, so far as we are aware, prior to 2300 B.C., but they indicate a considerable advance over the crude hearth, for they depict small furnaces with forced draught—first a blow-pipe, and in the XVIII Dynasty (about 1500 B.C.) the bellows appear. Many copper articles have been found scattered over the Eastern Mediterranean and Asia Minor of pre-Mycenæan Age, some probably as early as 3000 B.C.

This metal is mentioned in the "Tribute of Yü" in the Shoo King (2500 B.C.?); but even less is known of early Chinese metallurgy than of the Egyptian. The remains of Mycenæan, Phœnician, Babylonian, and Assyrian civilizations, stretching over the period from 1800 to 500 B.C., have yielded endless copper and bronze objects, the former of considerable purity, and the latter a fairly constant proportion of from 10% to 14% tin. The copper supply of the pre-Roman world seems to have come largely, first from Sinai, and later from Cyprus, and from the latter comes our word copper, by way of the Romans shortening *aes cyprium* (Cyprian copper) to *cuprum*. Research in this island shows that it produced copper from 3000 B.C., and largely because of its copper it passed successively under the domination of the Egyptians, Assyrians, Phœnicians, Greeks, Persians, and Romans. The bronze objects found in Cyprus show 2% to 10% of tin, although tin does not, so far as modern research goes, occur on that island. There can be no doubt that the Greeks obtained their metallurgy from the Egyptians, either direct or second-hand—possibly through Mycenæ or Phœnicia. Their metallurgical gods and the tradition of Cadmus indicate this much.

By way of literary evidences, the lines from Homer (Iliad, xviii) have interest as being the first preserved description in any language of a metallurgical works, when Thetis came to Hephæstus to secure a shield for Achilles. Even if we place the siege of Troy at any of the various dates from 1350 to 1100 B.C., it does not follow that the epic received its final form for many centuries later, probably 900-800 B.C.; and the experience of the race in metallurgy at a much later period than Troy may have been drawn upon to fill in details. It is possible to fill a volume with indirect allusion to metallurgical facts and to the origins of the art, from Greek mythology, from Greek poetry, from the works of the grammarians, and from the Bible. But they are of no more technical value than the metaphors from our own tongue.

Greek literature in general is singularly lacking in metallurgical description of technical value, and it is not until Dioscorides (1st Century A.D.) that anything of much importance can be adduced. Aristotle, however, does make an interesting reference to what may be brass, and there can be no doubt that if we had the lost work of Aristotle's successor, Theophrastus (372-288 B.C.), on metals, we should be in possession of the first adequate work on metallurgy. As it is, we find the green and blue copper minerals from Cyprus mentioned in his "Stones." And this is the first mention of any particular copper ore. He also mentions (xix) pyrites "which melt," but whether it was a copper variety cannot be determined. Theophrastus further describes the making of verdigris.

From Dioscorides we get a good deal of light on copper treatment, but as his objective was to describe medicinal preparations, the information is very indirect. He states (v, 100) that "pyrites is a stone from which copper is made." He mentions *chalcitis* (copper sulphide), while his *misy, sory, melanteria, caeruleum*, and *chrysocolla* were all oxidation copper or iron minerals. In giving a method of securing *pompholyx* (zinc oxide), "the soot flies up when the copper refiners sprinkle powdered *cadmia* over the molten metal," he indirectly gives us the first definite indication of making brass, and further gives some details as to the furnaces there employed, which embraced bellows and dust chambers. In describing the making of flowers of copper he states that in refining copper, when the "molten metal flows through its tube into a receptacle, the workmen pour cold water

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Note—This is one of the historical notes from Hoovers' translation of Book IX of Agricola. That on lead smelting is given in the "Journal" of July 26, 1913.

on it, the copper spits and throws off the flowers." He gives the first description of vitriol, and describes the pieces as "shaped like dice which stick together in bunches like grapes." Altogether, from Dioscorides we learn for the first time of copper made from sulphide ores, and of the recovery of zinc oxides from furnace fumes; and he gives us the first certain description of making brass, and finally the first notice of blue vitriol.

The next author we have who gives any technical detail of copper work is Pliny (23-79 A.D.), and while his statements carry us a little further than Dioscorides, they are not so complete as the same number of words could have afforded had he ever had practical contact with the subject, and one is driven to the conclusion that he was not himself much of a metallurgist. Pliny indicates that copper ores were obtained from veins by underground mining. He gives the same minerals as Dioscorides, but is a good deal confused over *chrysocolla* and *chalcitis*. He gives no description of the shapes of furnaces, but frequently mentions the bellows, and speaks of the *cadmia* and *pompholyx* which adhered to the walls and arches of the furnaces. He has nothing to say as to whether fluxes are used or not. As to fuel, he says (xxxiii, 30) that "for smelting copper and iron, pine wood is the best." The following (xxxiv, 20) is of the greatest interest on the subject:

> Cyprian copper is known as coronarium and regulare; both are ductile. . . . In other mines are made that known as regulare and caldarium. These differ, because the caldarium is only melted, and is brittle to the hammer; whereas the regulare is malleable or ductile. All Cyprian copper is this latter kind. But in other mines with care the difference can be eliminated from caldarium, the impurities being carefully purged away by smelting with fire, it is made into regulare. Among the remaining kinds of copper the best is that of Campania, which is most esteemed for vessels and utensils. This kind is made in several ways. At Capua it is melted with wood, not with charcoal, after which it is sprinkled with water and washed through an oak sieve. After it is melted a number of times Spanish plumbum argentum (probably pewter) is added to it in proportion of 10 lb. of the lead to 100 lb. of copper, and thereby it is made pliable and assumes that pleasing color which in other kinds of copper is effected by oil and the sun. In many parts of the Italian provinces they make a similar kind of metal; but there they add 8 lb. of lead, and it is remelted over charcoal because of the scarcity of wood. Very different is the method carried on in Gaul, particularly where the ore is smelted between red hot stones, for this burns the metal and renders it black and brittle. Moreover, it is remelted only a single time, whereas the oftener this operation is repeated the better the quality becomes. It is well to remark that all copper fuses best when the weather is intensely cold.

The red-hot stones in Gaul were probably as much figments of imagination as was the assumption of one commentator that they were a reverberatory furnace. Apart from the above, Pliny says nothing very direct on refining copper. It is obvious that more than one melting was practiced, but that anything was known of the nature of oxidation by a blast and reduction by poling is uncertain. We produce the three following statements in connection with some byproducts used for medicinal purposes, which at least indicate operations subsequent to the original melting. As to whether they represent the stages of refining or not, we leave it to the metallurgical profession (xxxiv, 24):

> The flakes of copper are used in medicine, they are made by fusing copper and moving it to another furnace, where the rapid blast separates it into a thousand particles, which are called flowers. These scales are also made when the copper cakes are cooled in water (xxxiv, 35). Smega is produced in the copper works, when the metal is melted and thoroughly smelted charcoal is added to it and gradually kindled; after this, being blown upon by a powerful bellows, it spits out, as it were, copper chaff (xxxiv, 37). There is another product of these works easily distinguished from smega, which the Greeks call diphrygum. This substance has three different origins. . . . A third way of making it is from the residues which fall to the bottom in copper furnaces. The difference between the different substances (in the furnace) is that the copper itself flows into a receiver; the slag makes its escape from the furnace; the flowers float on the top (of the copper?), and the diphrygum remains behind. Some say that in the furnace there are certain masses of stone which, being smelted, become soldered together, and that the copper fuses around it, the mass not becoming liquid unless it is transferred to another furnace. It thus forms a sort of knot, as it were, in the metal.

Pliny is a good deal confused over the copper alloys, failing to recognize *aurichalcum* as the same product as that made by mixing *cadmia* and molten copper. Further, there is always the difficulty in translation arising from the fact that the Latin *aes* was indiscriminately copper, brass, and bronze. He does not, except in one instance (xxxiv, 2) directly describe the mixture of *cadmia* and copper. "Next to Livian (copper) this kind (*corduban*, from Spain) most readily absorbs *cadmia*, and becomes almost as excellent as *aurichalcum* for making *sesterces*." As to bronze, there is no very definite statement; but the *argentatium* given in the quotation above from xxxiv, 20, is stated in xxxiv, 48, to be a mixture of tin and lead. The Romans carried on most extensive copper mining in various parts of their empire; these activities extended from Egypt through Cyprus, Central Europe, the Spanish Peninsula, and Britain. The activity of such works is abundantly evidenced in the mines, but little remains upon the surface to indicate the equipment; thus, while mining methods are clear enough, the metallurgy receives little help from these sources. At Rio Tinto there still remain enormous slag heaps from the Romans, and the Phœnician miners before them. Professor W. A. Carlyle informs us that the ore worked must have been almost exclusively sulphides, as only negligible quantities of carbonates exist in the deposits; they probably mixed basic and siliceous ores. There is some evidence of roasting, and the slags run from 0.2 to 0.6%. They must have run down mattes, but as to how they ultimately arrived at metallic copper there is no evidence to show.

The special processes for separating other metals from copper by liquidation and matting, or of refining by poling, etc., are none of them clearly indicated in records or remains until we reach the 12th century. Here we find very adequate descriptions of copper smelting and refining by the monk Theophilus. We reproduce two paragraphs of interest from Hendrie's excellent translation (pp. 305 and 313):

> Copper is engendered in the earth. When a vein of which is found, it is acquired with the greatest labor by digging and breaking. It is a stone of a green color and most hard, and naturally mixed with lead. This stone, dug up in abundance, is placed upon a pile and burned after the manner of chalk, nor does it change color, but yet loses its hardness, so that it can be broken up. Then, being bruised small, it is placed in the furnace, coals and the bellows being applied, it is incessantly forged by day and night. This should be done carefully and with caution, that is, at first coals are placed in, then small pieces of stone are distributed over them, and again coals, and then stone anew, and it is thus arranged until it is sufficient for the size of the furnace. And when the stone has commenced to liquefy, the lead flows out through some small cavities, and the copper remains within. (313) Of the purification of copper. Take an iron dish of the size you wish, and line it inside and out with clay strongly beaten and mixed, and it is carefully dried. Then place it before a forge upon the coals, so that when the bellows act upon it the wind may issue partly within and partly above

it, and not below it. And very small coals being placed round it, place copper in it equally, and add over it a heap of coals. When, by blowing a long time, this has become melted, uncover it and cast immediately fine ashes of coals over it, and stir it with a thin and dry piece of wood as if mixing it, and you will directly see the burnt lead adhere to these ashes like a glue. Which being cast out again superpose coal, and blowing for a long time, as at first, again uncover it, and then do as you did before. You do this until at length, by cooking it, you can withdraw the lead entirely. Then pour it over the mold which you have prepared for this, and you will thus prove if it be pure. Hold it with pincers, glowing as it is, before it has become cold, and strike it with a large hammer strongly over the anvil, and if it be broken or split you must liquefy it anew as before.

The next writer of importance was Biringuccio, who was contemporaneous with Agricola, but whose book precedes *De Re Metallica* by 15 years. That author (iii, 2) is the first to describe particularly the furnace used in Saxony and the roasting prior to smelting, and the first to mention fluxes in detail. He, however, describes nothing of matte smelting; in copper refining he gives the whole process of poling, but omits the pole. It is not until we reach *De Re Metallica* that we find adequate descriptions of the copper minerals, roasting, matte smelting, liquation, and refining, with a wealth of detail which eliminates the necessity for a large amount of conjecture regarding technical methods of the time.

## Hoisting Accident in the Coeur d'Alenes

A hoisting accident in which two men were scalded to death, occurred July 27 in an underground hoisting station of the Green Hill mine, Mace, Idaho, according to the *Press Times*, of Wallace. The exact cause of the accident is not yet known, but it appears that a heavy skip of ore being hoisted from the 1400' level got away from the engineer. It seems likely that either the clutch broke or the reel became unclutched. At all events, the skip started back down the shaft and the efforts of the engineer to stop it with the brakes were of no avail. The reel attained such speed that it burst and its pieces, together with pieces of the brake posts, were scattered about the hoisting room with terrific force. Although the engineer's platform, on which were August Storjohn and Arthur Schultze, hoisting engineer and oiler, respectively, was twisted out of shape, the men were apparently not injured until the 10-in. steam pipe between the boilers was broken by a flying piece and the steam liberated. The men made their way out of the hoist room into the tunnel, but died within a few hours after being taken to the hospital. Although hoisting was done in balance, the descending skip was brought to rest and did not fall in the shaft. The damage to the shaft has not as yet been ascertained, but is probably extensive, as the skip fell, according to report, about 2200 ft. The hoist was a Fraser & Chalmers, 20x60-in. first-motion machine.

Several points of similarity will be noticed in the accident to the one occurring at the Leonard mine in Butte, April 23[1]. In both cases a shaft conveyance got away and spun the reel so fast that it burst and wrecked the hoisting room. In both cases also loss of life occurred from the flying parts of the broken reel. At the Leonard, however, the heaviest loss of life occurred in the shaft. Two other accidents recently, one at the Ellison shaft of the Homestake company in the Black Hills[2], and one reported from Mexico[3], makes a total of four attributable to the same cause, namely, the impossibility of stopping by brakes or safety catches a descending cage or skip that has attained a high speed. Such a succession of accidents gives strong point to the editorial recommendation of the JOURNAL, and to Mr. Bromly's suggestion[4], that there be added to the safety equipment of the hoisting apparatus, a governor to stop automatically all motion as soon as a certain speed is exceeded by the conveyance in either compartment.

## New Nickel and Chrome Works in New Caledonia

According to a report of the United States Consul at Noumea, an important hydro-electric plant being erected by a French company in the south of New Caledonia for the production of ferronickel and ferrochrome involves the construction of two generating stations at different levels on the Yate River. For the lower station, which is being built first, the water will be diverted from the river by a dam 13 ft. high to a tunnel 9500 ft. long, which will deliver 34,000 cu.ft. per minute, with a head of 350 ft., to the turbines. Electric smelting works will be erected in close proximity to the generating station. A similar quantity of water, with a head of 157 ft., is available for the higher plant, which will generate 7600 hp. to be converted to high-tension current for transmission to various points. A reservoir is also being constructed by means of a dam 52 ft. high. It is expected that the lower plant will be completed in about two years, and that then the other installation will be started and will take three years to complete.

## The Chuquicamata Pictures

Through the courtesy of Pope Yeatman, a series of pictures of the Chuquicamata copper mines is reproduced in the pages, "Photographs From the Field." This great deposit, on which many mines were operated on a small scale, has been acquired by the Guggenheims, who have organized the Chile Exploration Co. to develop and operate what will be one of their greatest copper producers.

The view of the seaport of Tocotillo shows shipping conditions prevalent on the west coast of South America; ships cannot come in to docks, but anchor opposite moles or piers that run from the water's edge to deeper water beyond the surf. From the moles the freight is carried to and from the ships in lighters.

The Chuquicamata railroad station is about 4 km. from the mines. The cart in the background of the picture is used to haul water to the mines. The tank car shown just ahead of the passenger coach is used to haul water from Calama, where it is drawn from pipe lines taking supply at San Pedro. These pipe lines furnish all the water for Antofagasta, the distance from Antofagasta to San Pedro being 300 km. The Chile Exploration Co. will develop water power and obtain a supply from various sources out some distance from Chuquicamata. The other views are self-explanatory.

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[1] "Eng. and Min. Journ.," May 3, 1913, p. 922.

[2] Ibid; Apr. 19, 1913; p. 824.

[3] Ibid; June 7, 1913; p. 1159.

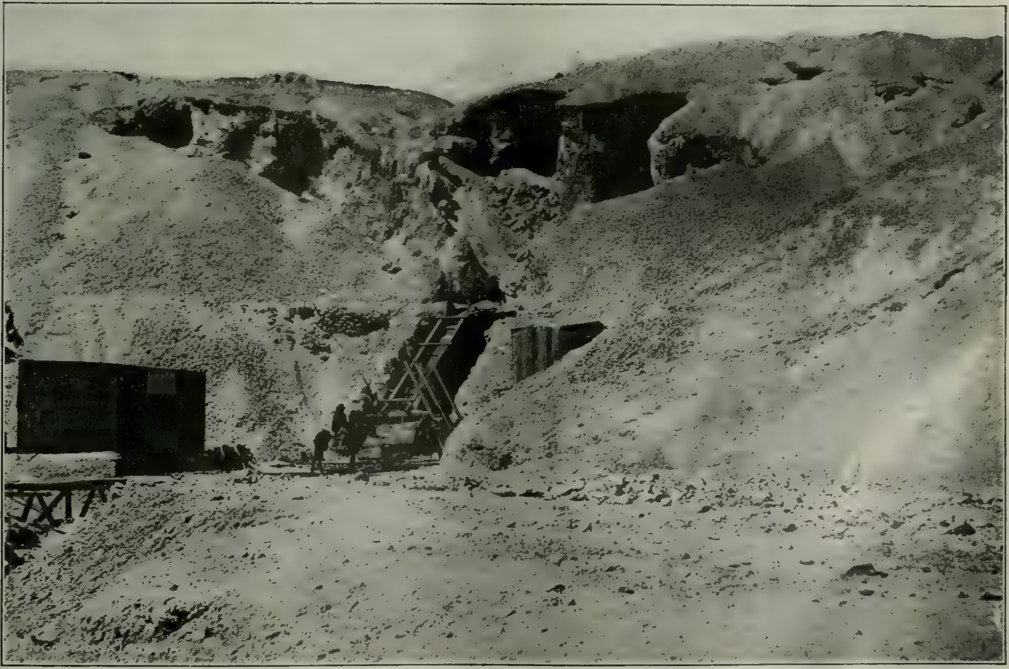
[4] Ibid; May 31, 1913; p. 1111.

# PHOTOGRAPHS FROM THE FIELD

Tocotillo, a Chilean Seaport from Which Chuquicamata Copper May Be Shipped

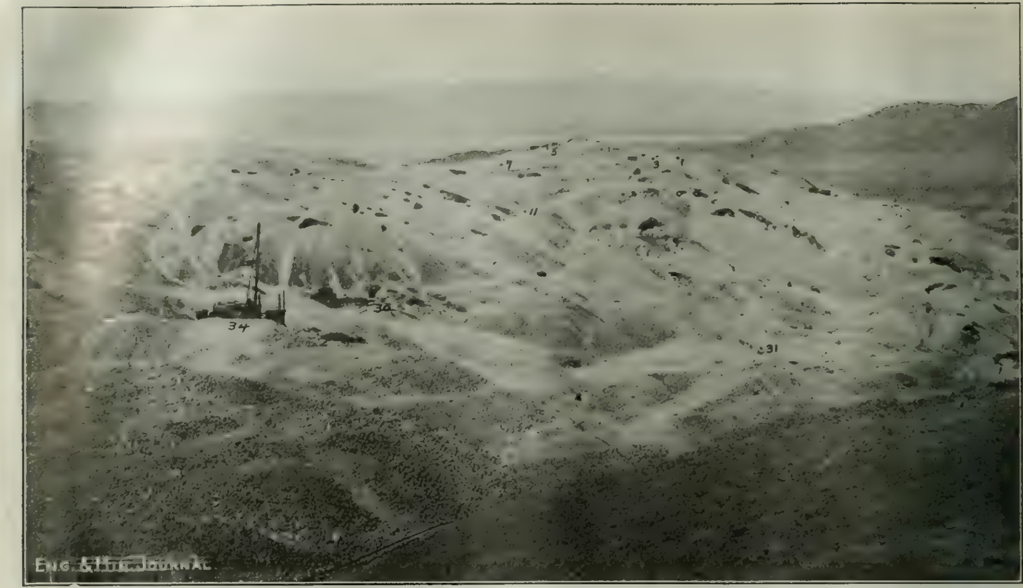
Chuquicamata Railway Station Near the Copper Mines

THE MILLSITE FROM THE MINE, TWO MILES AWAY



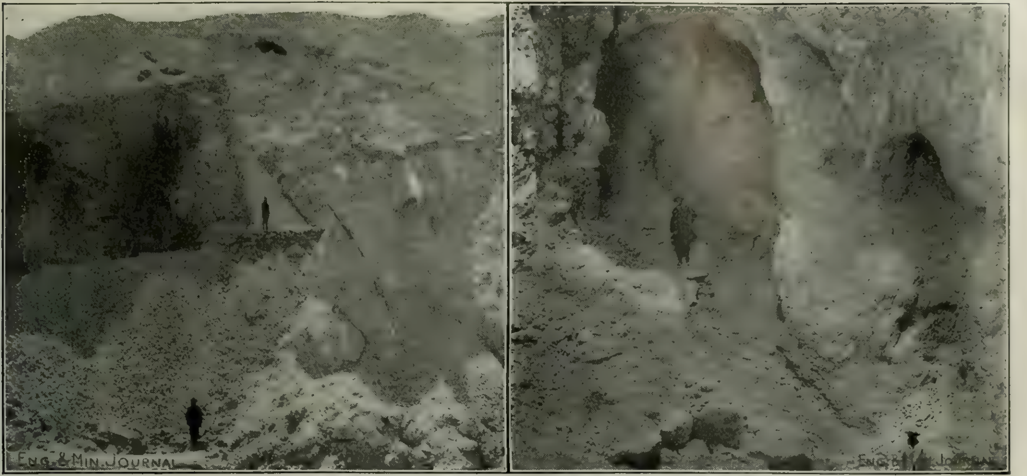
THE CONSTANCIA OPENCUT AND OLD SCREENING PLANT

The Chuquicamata mines are being developed by the Chile Exploration Co., a Guggenheim company.



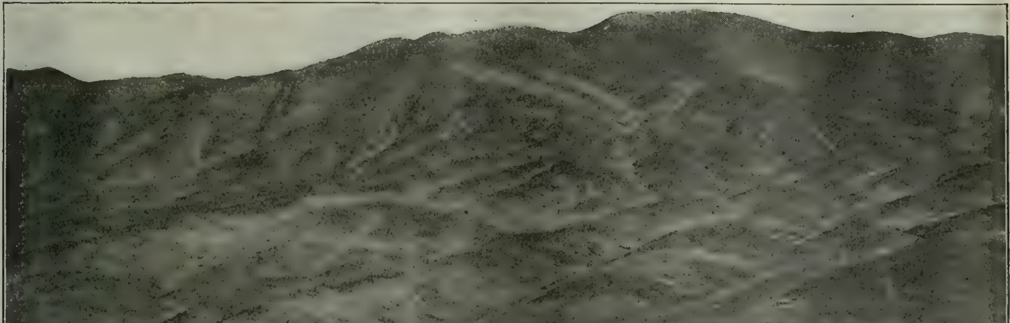
The Mine with Position of Drill Holes Designated

The Espanola Opencut and Old Screening Plant



Interior of Two of the Opencuts

These views give an idea of the size of the "holes" shown in the opposite illustration.



The Old Camp at the Mine, Now Being Rebuilt

# CORRESPONDENCE AND DISCUSSION

## Motor Trucks in Mining

In considering the use of motor trucks in mining work, such [illegible] described in the JOURNAL of June 14, 1913, I have found the essential questions are the character of roads over which the truck will operate, the truck's capacity and its speed.

Gasoline consumption and approximate cost of upkeep, including repairs and replacements, are incidentals on which figures are of no practical value to anyone and might be misleading to an intending purchaser of a truck. One case will not apply to another. Each must be tried out in practice on its own ground. As an illustration, the consumption of gasoline in our case varies, depending on the road and engine conditions, from 7 to 11 gal. per trip, with one truck, and from 9 to 14 with another, and, singular as it may seem, the smaller truck will average the greater consumption of gasoline.

It is not the purpose of this letter nor the desire of the writer to advertise any particular make of gasoline truck or tire. It is important, however, to warn an intending purchaser against using anything but rubber tires on a motor truck. The rubber-tire cost is a fixed charge. A set of six tires costs $600 with a 10,000-mile guarantee, which makes the cost 6c. per mile, or in our case, $2 per trip of 33 miles. This is the best we can expect to do.

I am writing this opinion from actual experience on the ordinary roads in the foot hills of California, which link the Pocahontas Copper Mining Co.'s mines with the railroad. The work of the truck on improved highways and city streets is not considered. In the particular case in question, the road is 16.5 miles long, making the round trip 33 miles. Starting from Le Grand, Merced County, on the Santa Fé at an elevation of 280 ft., it meanders through the hills and reaches an elevation of 1050 ft. at the mine. Of this 770-ft. raise, 80% is made in the eight miles nearest the mine. The first seven miles of the road is in Merced County, is run on section lines and is graded and graveled, but has no summer care, such as oiling or sprinkling. The other 9.5 miles is in Mariposa County, where little attention is given to placing the road in the best natural position to avoid bad grades and to receive proper drainage. In this section, little or no road building is done except plowing on the side of the road where there is soil. The soil is scraped to cover the exposed rocks, and is usually blown away in dust during the hot summer months or washed away as mud during the winter. The road has no summer care. Over this road the best speed that our trucks have maintained for any length of time is five hours per round trip, including loading and unloading. We load from a double-door bin by gravity; the unloading device is simple and rapid, the front of the bed being hoisted to give a rear dump. The time consumed in loading and unloading does not exceed [illegible] minutes.

We commenced operation in August, 1912, with one 5-ton and one 6-ton truck. During the winter months of December, January and February, we hauled 1132 tons of ore. In all, we have delivered over 4000 tons of ore in Le Grand and have hauled to the mine about 100 tons of supplies.

Our hauling is by contract and is 40% cheaper than the best team rate we could get at the time we commenced operation.

Last winter, being a dry season, was particularly favorable for operation of motor trucks, so that we ran steadily all winter, being laid off only a few days after each rain. The period of stoppage was less as the season advanced and the road became more packed and harder after each storm.

It would be well for an intending purchaser to buy nothing but a high-grade machine, for the best will give trouble enough. If such a first-class machine is purchased, it should be taken at the lowest possible net cash price, discounting every guarantee. In this way money will be saved. A settlement of the usual guarantee is a source of trouble and disappointment. Purchasing a machine, for instance, on a 30-day demonstration and a guarantee, is to be avoided; because the purchaser pays for this and is usually left heir to all kinds of engine trouble.

A man trained as a truck driver makes a better operator than an automobile driver. The trained truck driver usually does not have the speed mania and there are several other things that he does not have to unlearn. Driving and maintaining an auto truck is a man's job. It takes persistence, energy, care and great patience to gain a success. This is work that should not be saddled on the superintendent; for the reason that it will interfere greatly with the main issue, which is mining. There are many reasons why I advise that the hauling be done by contract, even if the mine must own the machine, and the most important is that the contract system relieves the management of the details of the operation, leaving so much more time to be devoted to mining. For economical operation, I advise the avoidance of night work, as two hours of daylight is worth three hours of darkness in average running and when it comes to road repairs, one hour of light is worth four hours of darkness.

To those contemplating the purchase of a truck, I advise the purchase of an extra engine also. This may seem an added and perhaps an unnecessary expense at the time, but it will soon prove to be a wise expenditure. The type of engine used at the present in motor trucks should be taken out and overhauled at least every 30 days. This work in the country takes from five to eight days, including removal, overhauling, repairing and re-assembling, so that it can readily be seen that the extra engine will soon pay for itself in preventing delays with the truck. The truck most suitable for this work and our character of roads is one with the load well balanced between the front and rear wheels, thus avoiding undue strain on the engine and driving chains, and distributing the weight of the load over the road surface. We have demonstrated that a 6-ton truck with load, is about the limit that the average road will hold up under, and it seems to be about as economical as the 5-ton truck, as regards the operating expense. The construction of the bed is an important factor in the running and upkeep of a truck. It should be down as near as possible on the chassis, and should not extend far beyond the rear wheels; thus avoiding an excessive load on the rear axle. A wide bed will cause a swaying motion when loaded and traveling that will give untold tire trouble; compare a wagon in motion loaded with hay and one loaded with with sand.

The auto truck, as constructed at present, is far from being perfect. The type of engine in use can best be compared to a race horse doing the work of a draft horse. It shows that the makers are not familiar with the ordinary field conditions, and it would seem that they never have taken into consideration the character of roads. The construction of the running gear is wrong, in that the rear wheels, which are double tired, are wider than the widest wagon gages. The result is excessive wear on the outer border, only avoidable by much road work; there is no apparent reason for such a wide wheel-base. The front wheels also do not track with either set of rear tires, thus causing extra friction on soft on sandy roads.

The use of the automobile engine in truck construction is a serious mistake. The work is different and requires an engine with larger and longer bearings, stronger in every part, and in every way more accessible and more flexible, if I may use the word. Flexibility is also required in the radiator for protection against vibration; as at present installed the radiator is a great cause of trouble and delay. The springs are another source of endless trouble; they need a different construction, different temper and protection against shock.

In spite of the faults which I have enumerated in all kindness, the auto truck is by far the best equipment with which I have had experience for this work.

DAVID ROSS.

Lewis, Calif., June 23, 1913.

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## The Beatty-Guggenheim Case

In the JOURNAL of Aug. 2, 1913, in my communication with reference to the Beatty-Guggenheim case, there are a number of typographical errors, some of which are important enough to justify my asking you to print a correction thereof.

On p. 225, the article as printed, reads:

> As I understand it, Justice Gerard held, as a matter of law, that even if the officers of the company knew that Beatty was interested with Perry and assented to it, the company would not be bound unless those officers knew the exact amount of Perry's interest, that is, that it is not enough for an agent to say to his principal, "I have a personal interest in a transaction, are you willing to deal with me on that basis?" but that he must say, "I have a 9% or a 13% interest."

My letter to you reads:

> As I understand it, Justice Gerard held, as a matter of law, that even if the officers of the company knew that Beatty was interested with Perry and assented to it, the company would not be bound unless those officers knew the exact amount of Beatty's interest, etc.

On the same page, the article reads:

> As already stated, the contracts between the Guggenheim company and Treadgold and Perry were made in December, 1905.

and then, quoting from the testimony of Daniel Guggenheim, it reads:

> A—Mr. Hammond told me something in 1906. I think the end of the year, that Mr. Beatty had advanced some money in order, etc.

My letter to you, quoting from the stenographer's minutes of the trial, read:

> A—Mr. Hammond told me something in 1905. I think the end of the year, that Mr. Beatty had advanced some money in order, etc.

On the previous page, referring to Perry's contract of 1904 with the Guggenheim company, the article reads:

> In one finding the court finds that it was under this contract that Perry examined the Yukon properties in 1906. In another finding the court finds the contrary.

My letter to you contained the correct date of Perry's examination of the properties, which was 1905.

The importance of the dates lies in the fact that, on Mr. Beatty's behalf, we insist that Daniel Guggenheim in 1905, before the final contracts were entered into on Dec. 5, 1905, knew of Mr. Beatty's personal interest in the transaction.

HENRY WOLLMAN.

New York, Aug. 12, 1913.

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## Michigan Miners' Houses

I wish to call attention to the pictures shown in the JOURNAL of Aug. 9, 1913, in "Photographs from the field," particularly the views showing "Types of Houses Provided for Miners" and "A Miner's Family." The first two pictures were taken during the summer of 1901 and are a part of a series of six views taken from the Lake Superior stand pipe, showing a panoramic view of the Calumet & Hecla mine.

The Calumet & Hecla Mining Co. has a total of 764 houses, and out of this total there are only 34 log houses; so you can see the percentage is rather small. The company has over $980,000 invested in houses, and the appraisal value placed on the log houses is only $100 each.

The other picture, "A Miner's Family," I wish to call particular attention to, as these houses are situated in the village of Red Jacket and are owned, together with the land on which they stand, by a socialist of the excessively enthusiastic type, who receives the greater part of his income from real-estate rentals. This picture was taken, I understand, expressly for the purpose it conveys.

C. L. C. FICHTEL.

Calumet, Mich., Aug. 16, 1913.

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## Montana Mining Co., Ltd.

In the JOURNAL, July 26, 1913, p. 174, under the caption "Montana Mining Co., Ltd.," the inference given is that by the payment of £8250, the Montana Mining Co., Ltd., became possessed of all its former holdings in Montana. This is an error. The above mentioned amount was in settlement of a deficiency judgment, sent over and collected in London, England. All known property in Montana belonging to said company, both real and mixed, embracing more than 400 acres of lode claims and mill sites, and more than 600 acres of placer ground, was sold by the U. S. marshall under execution, issued by the Federal Court of this district, to the St. Louis Mining & Milling Co. of Montana, on Mar. 7, 1910. No redemption having been made, the St. Louis Mining & Milling Co. took possession on Mar. 8, 1911, and has been in full possession and operating the property since that date.

WILLIAM MAYGER.

Helena, Mont., Aug. 4, 1913.

## The Lead Schedule

WASHINGTON CORRESPONDENCE

The final action of the Senate in practically adopting the metal schedule of the tariff bill and leaving the duty on lead upon what amounts to practically a ¾c. per lb. basis, is an unsatisfactory one, and in the opinion of many Senators makes it certain that there will have to be a revision and rewriting of the paragraph in conference committee after the bill has been finally acted upon by the Senate. It is now regarded as undoubted that nothing more can be done during the further discussion to obtain a revision of the rates, the present agreement being practically the outcome of a barter between lead and zinc interests in various parts of the country whose votes are essential to the adoption of this bill. The debate produced further gloomy predictions of the effect of the reduction in duty upon the Western mining industry, these being offered particularly by Senators Smoot and Sutherland, of Utah, who contended that 1½c. per lb. is the lowest rate with which the industry can survive. Senator Thomas, of Colorado, unexpectedly answered the Utah Senators and in rebutting their contentions, told the Senate that:

> The closing of the mines of the Rocky Mountain region in the early '90s was not due to the lowering of the tariff upon lead or to any legislative measure other than the act which repealed the purchasing clause of the Sherman law. The mints of India were closed to the coinage of silver on July 19, 1893, and within 30 days after that time practically every lead-producing mine in my state, and, I think, in the states adjoining mine, were closed down. That was caused by the sudden drop in the price of silver from 90c. to about 60c., in consequence of which the various smelters were too much alarmed about existing and future conditions to invest money in the purchase of argentiferous ores.
>
> So I may say that, although there may be some exceptions, all the lead-producing mines of the Rocky Mountain region, and particularly those in the state which I in part represent here, are mines which are worked for their other metallic contents, the lead being in the nature of a byproduct, or wherever they are worked for lead as a principal product, the existence of byproducts, such as silver and gold, makes it possible to work them at a profit.
>
> I may say also at this juncture that lead ores are an essential to the reduction of the gold and silver ores, particularly when they are refractory, silver ores perhaps more generally than gold, and that without lead ores as a flux, their treatment would be largely curtailed, if not diminished practically to zero.
>
> These mines did not resume work immediately after the crushing blow which was delivered to the silver industry in 1893, but they gradually opened up here and there, until in the course of time practically all of them which produced sufficient, either directly or as a byproduct of other metals, to make it an object for them to do so. Of course, a great many other mines, so called, were being operated in the hope of profit, which sometimes was and sometimes was not disappointed.
>
> Now, there was not so much lead produced from argentiferous ores during the existence and operation of the Wilson Act as before or since that time. But it is a fact, Mr. President, that the average annual production of lead in this country continued uninterruptedly during the period of that law. . . . . If it be true that the mines in the Rocky Mountain region are largely worked with lead as a byproduct, then it must necessarily follow that any change in tariff regulations will only incidentally, if at all, affect that industry. . . . There is no danger that the wage rate will fall in the mines of this country, . . . . because they are kept up by the men themselves and not by any protection whatsoever. . . . . The American Smelting & Refining Co. . . . . practically dominates the lead industry . . . . Every plant the company has could be duplicated for less than 50% of the capitalization of the concern. . . . . This company is fortunately circumstanced in that it not only buys from the producer but it sells to the consumer, practically controlling the market in both directions. Therefore, in my judgment, it is able to fix the market price, or at least largely to control the market price as its interests may direct. This is apparent from the nature of its more recent contracts.

The criticism upon the rate of even ¾c. per lb. has been increased in vigor, and it is now very generally conceded that a serious reconsideration will be necessary after the bill has passed the Upper Chamber.

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## Institute of Mining Engineers' Meeting at Butte

SPECIAL CORRESPONDENCE

The meeting of the American Institute of Mining Engineers opened at Great Falls, Mont., Aug. 16. In the morning the party examined the Missouri River power development and in the afternoon visited the smelting works. A technical session was held in the evening.

On Sunday morning the party proceeded to Helena, where it was entertained at luncheon and visited the smelting plant of the American Smelting & Refining Co. All returned to Butte the same evening. Headquarters of the institute in Butte have been established at the Silver Bow Club.

Monday was occupied by a technical session at Butte and visits to the contiguous mines, Wednesday spent in Butte, and on Thursday a visit to the Southern Cross mine, followed by a banquet in the evening. The meeting was highly successful, being attended by about 140 members. The management of affairs by the local committees, under the leadership of Charles W. Goodale, was superb.

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## Spelter Production in 1913

The U. S. Geological Survey has published figures collected by C. E. Siebenthal, purporting to give the production of spelter in the United States in the first half of 1913. In the table below, these figures are given, in comparison with those for the first half of 1912; they are in short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Stocks, Jan. 1 | 9,081 | 4,522 | D. 4,559 |
| Production | 166,496 | 180,213 | I. 13,717 |
| Imports | 3,053 | 5,533 | I. 2,480 |
| Total supply | 178,630 | 190,268 | I. 11,638 |
| Exports | 13,170 | 15,339 | I. 2,169 |
| Estimated consumption | 159,046 | 153,073 | D. 5,973 |
| Total deliveries | 172,216 | 168,412 | D. 3,804 |
| Stocks, July 1 | 6,414 | 21,856 | I. 15,442 |

Of the production reported this year, 171,135 tons were from domestic and 9078 tons from foreign ore. The spelter made in Illinois was 53,524; in Kansas, 42,645; in Oklahoma, 43,253; in other states, 40,791 tons. Imports of zinc ore for the half year were 19,994 tons, the zinc contents being 9204. Exports of zinc ore were 9745 tons.

For the second half of 1912, the total production was 172,310 tons and imports 8062 tons. Exports were 938 tons, and estimated consumption, 181,326 tons. Stocks at the end of the year were 4522 tons. If these figures are correct, the stocks held by smelters increased 17,334 tons during the half year.

This change in stocks was more apparent than real. It was practically only a shifting, as there was at the same time a decrease in the quantities held by consumers.

# EDITORIALS

## Iron Capacity and Prospects

The production in the United States of 16,488,602 tons of pig iron in first half of 1913, as officially reported, and the implied output of an equivalent quantity of steel indicates that we are not only consuming an enormous quantity of material, but also that we are working up rather closely toward our present limits of production. It has been assumed that the existence of a number of idle blast furnaces implies the possibility of a great increase in the make of iron at any time, but a closer consideration of the facts will show that this is not the case. A number of the furnaces carried on the list are of antiquated construction and could not be seriously considered as ironmakers without reconstruction and repairs, which would involve much time and expense. Others among the older stacks are not commercially possible, owing to their situation and relation to supplies of raw material. They could be operated at a profit only under extreme conditions of demand, which are not now likely to arise. Apart from this and taking the more modern and well placed furnaces only, it must be remembered that at the most active times not far from 10% of them must be out of blast for repairs and relining at any given time. It is quite evident, therefore, that the first half of the current year showed a production that cannot be much expanded until new construction has added to capacity.

As to supplies of raw material there is no doubt that iron ore can be furnished in quantities as great as needed, with very little difficulty. The chief obstacle would be in the supply of coke, which is now in demand very nearly up to present productive capacity. A solution to this difficulty is being found in the construction of byproduct ovens, which extend considerably the range of coking coals. This work is rather slow and expensive, but is extending sufficiently to warrant a belief that the fuel will be ready when needed.

Pig iron has been taken as the base of the industry, and the remarks as to present production and its relations to actual capacity will apply to steel also in a large degree. The production of finished material cannot be greatly expanded beyond its present limit without an increase in new construction, which is for the time being on rather a moderate scale. For the rest of the year, at least, not much increase in make can be expected.

Will there be a reaction and the falling off in trade which Wall Street and some other people seem to anticipate? That is a question which seems to trouble many people more than it does the steelmakers. They are apparently quite confident that there will be no serious falling off in the trade. There has been no apparent accumulation of unsold stocks, as there was two or three years ago, and the trade is in fairly good condition. Buyers are less inclined to make contracts far ahead, perhaps, but that seems to be mainly because they do not anticipate any rush which will force prices up as in 1906-7. Nevertheless they are taking material readily in a way which indicates their belief in continued demand. Unless there is more crop damage than has so far appeared, our old friend, the ultimate consumer, promises to be able and willing to take iron and steel wares in sufficient quantity to keep the trade on a satisfactory basis.

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## Boiler Capacity at Altitude

The influence of high altitudes in reducing the capacity of air compressors and to a less extent their efficiency is well recognized. A similar effect in the case of internal-combustion engines is now also pretty generally known. The phenomenon in both cases, of course, is attributable to the same cause, namely, that the atmosphere being under less pressure is more highly rarefied and that in a given space less material is therefore contained. Thus for the compressors to furnish a certain amount of compressed air at a specified gage-pressure requires that more of the lighter material be taken in, and in the case of the internal-combustion engine the latent power in the explosive mixture varies as the amount of oxygen in the air, which of course becomes less as the air becomes lighter. The same influence operates to reduce the capacity of steam boilers, and though this fact is recognized and allowed for by boiler designers and manufacturers, it is not always so well understood by purchasers and operators.

This reduction in boiler capacity is of peculiar interest to the mining fraternity, since the boiler plants found operating at high altitudes are more likely to be mining installations than any other. The typical mining boiler plant uses chimney draft. The capacity of a boiler depends on the amount of fuel which can be burned, which in turn depends on the amount of oxygen passing through the furnace, and this again is determined by the draft pressure. This pressure is due to the difference in weight between the warm column of air in the chimney and the cold air outside. This absolute difference in weight will be less at high altitudes. But since the product to be passed through the boiler is lighter, the volume passed through will be the same. Hence the mere reduction in draft does not reduce the boiler capacity. However, while the volume of air is the same, it does not contain the same amount of oxygen and consequently is not capable of burning the same amount of fuel. To maintain capacity, therefore, it is necessary to use more air, either by increasing the grate area of the boiler or by increasing the velocity at which the air passes.

It is usual to obtain an increase in velocity by increasing the height of the stack. There is some difference of opinion as to how great this increase must be. It is maintained by some that it is sufficient to make it vary inversely as the barometric pressures. That is to say, the stack height is increased at the same rate as the rarefaction of the air proceeds. Others specify an increase of the stack height inversely as the square of the barometric ratios, that is, considerably faster than the rate of rarefaction of the atmosphere. Probably the best practice lies somewhere between these two figures. Along with the increase of stack height, the diameter of the stack must be increased in order to overcome the increased friction due to the increased length of friction surface. This increased [illegible] is usually specified to take place inversely as the [illegible] power of the barometric pressure, so as to maintain the same friction loss at altitude as at sea level.

For very high altitudes the increase in stack height necessary is often such as to make the relation of height to diameter impracticable. In such localities it is ordinary practice to increase the grate area of the boilers and in this way maintain their capacity without an increase in draft.

It should be noted, however, that this discussion applies wholly to boilers using chimney drafts. In many cases, instead of increasing the height and diameter of the chimney, it is advisable to supplement the natural chimney draft with forced draft. When crude oil is used, as is often the case in mining practice, the operation of firing itself is more or less of a forced draft.

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## Measurement of Crushing Efficiency

For crushing and grinding machines of many types, noisy claims for superiority are made. The loudest note seems to make the most impression. This situation can not be otherwise than prejudicial to the best interests of the mill operators who desire to obtain a certain definite product in the most economical way. Search for the reasons governing the existing condition of counter-claims and confusion, reveals the fact that there is no unit for measuring the effective work done in such machines. Certainly it is hopeless to expect to find the best appliance for any use without a measure for its efficiency. In no other department of milling does such a complete lack of harmony exist. It is true that energetic workers have been trying to devise some satisfactory system, but different methods produce different results and there is nothing universally applicable. The classic work of Stadler outlined a method which has served as a basis for enlightening experiment, but it has not been universally accepted as representing the truth in all cases. Del Mar has advocated a classification differing somewhat from that of Stadler, and more recently A. O. Gates published in the JOURNAL an exhaustive study advancing another basis for calculation. The noteworthy circumstance in connection with the publication of all these studies is the exceedingly restricted amount of discussion that has followed. It is a complicated and difficult subject, no doubt, and active operators rarely are able to apply the necessary time to the mastery of so abstruse a subject. We might, however, expect the scientist to undertake the task. It is to be hoped that even now the subject is receiving serious attention and that a measure unit of universal application will be forthcoming.

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## Civil Service Appointments

We have heretofore commented on some unsatisfactory Civil Service examination features. We publish in our By-the-Way column this week a notice of examination for electrometallurgist which seems to call for further criticism. The three years' experience in electric-furnace work required, and the fact that if a thesis is presented, it must bear upon electric-furnace work, seem to throw undue emphasis upon this subject.

We respectfully submit that it is barely possible that two years with the electric furnace and 15 years, say, in wet electrometallurgy, might equip a man almost as well as would three years' work with the electric furnace. We also submit that a man might work five years with an electric furnace and have an absolute vacuum where his ideas of electrodeposition ought to be, and fall far short of being the man the Bureau of Mines should have. Again, just why a knowledge of metal mining should be any great aid to the ore treatment is not easy to see, but this much we will take on trust.

The wide spread of the salary limits is also a peculiar matter. Doesn't the Commission know what salary it wishes to pay, or the grade of man desired? If not, it ought to be the duty of someone to sit down for 10 minutes worth of quiet thought and decide whether an $1800 or a $3000 man is desired. On the other hand, the advertised arrangement affords room for petty politics; we do not say that it is intended to use it thus; but it is obvious that if any one presented unusual qualifications for the place, and took unquestionably higher rank than friends of those having the appointive power, it would be possible to eliminate him by offering him the place at $1800, and let him decline it. The next man could be offered more.

There are persons unkind enough to say that such specifications as we publish this week are drawn to allow some certain candidate to land a job. We do not say so; we are of an absolutely unsuspicious nature. We expect later to have evil-minded persons tell us, "Well, didn't I say * * * * * * would get that?" Of course, however, this will be a coincidence. But in regard to some of these Civil Service advertisements, we wish to address the Civil Service Commission in Jeff's often repeated request to Mutt, "For the love of Mike, be reasonable."

⁂

The strike fever seems to be active and highly contagious at the present time. We have the Lake Superior copper strike, that in the lead mines of Missouri, on the Lake Superior ore docks, the electricians at Butte, and no end of minor troubles at various points. And now the United Mine Workers threaten a general strike in the coal mines of the Rocky Mountain region. From a mine-operator's point of view, this is a stormy season.

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The situation in Mexico is sufficiently grave, but it is hoped that the present crisis will pass without any serious trouble, and without forcing any hostile action on the part of either the United States or Mexico. Apparently open rupture, with all its consequences, can be avoided if the hotheads on either side are kept out—and if others will remember that most of these aggressives are actuated by self-interest.

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A landmark in New York, familiar to many mining men, is about to be torn down. This is the old building which has housed the New York Assay Office from its first organization, and which dates back many years before that time, having been the home of the United States Bank 90 years ago. One-half of the new Assay Office was completed some time ago and is now in use. Work on the remaining half will be begun as soon as the old building is removed.

## BY THE WAY

In the JOURNAL of July 19, 1913, we mentioned the new publication of the Furukawa Mining Co., the *Miners' Friend*, as being, so far as we knew, without an American rival. Less than two weeks later the "Employees Magazine" of the Lehigh Valley Coal Co. appeared, with similar objects and purposes, after having been in preparation for some months previous. The tables of contents of the two magazines' initial numbers are also much alike.

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It appears from recent Geological Survey publications that the "semiprecious" metals are copper, lead and zinc. Where quicksilver and tin get off on this classification we are not informed. Aluminum also sometimes sells higher than the three first mentioned, and antimony for more than lead and zinc. These are probably the quasi-precious metals. When we were younger the metals were classed as precious and common, we believe—now probably iron is alone in the "common" category. What is the use, anyway—if there are no privates in an army what is the joy in being a corporal, and why "semiprecious" if there is going to be only iron besides?

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According to a press dispatch, a bolt of lightning traveled through nearly a mile of tunnel in the Copper Reef mine at Globe, Ariz., on Aug. 5, jumped 300 ft. down a winze and nearly tore a leg off of one miner and shocked more than a score of others. The bolt was conducted through the tunnel by the steel rails. Accidents underground resulting from lightning are not without precedent. We believe there is a well authenticated case in southeastern Missouri of a headframe being struck by lightning and the current passing down pipe lines in the shaft and prematurely setting off an electric firing system in one of the stopes, the last happening in some unexplained way. If the story that comes from the Copper Reef mine is true, the rails in the tunnel must have been extraordinarily well insulated.

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An accident from powder gas recently occurred in the New York aqueduct workings. The published accounts in the daily press, written by reporters apparently unfamiliar with subterranean affairs, sound amusing to the initiated, and illustrate the difference in popular and technical nomenclature. In the *Evening Post*, for example, we read that immediately after the blast "the bellows were set in motion." It appears that the new shift descended too soon. "They had advanced but a short distance from the bottom of the shaft when they detected the pungent odor of glycerin. 'Back, back,' was the cry." This "glycerin," possibly, obtained its "pungent odor" by mixture with rosewater. "The charge used in the blast," it is said, "consisted of 60% du Pont gelatin black powder." This is a new brand on us. We shall be interested to observe the results of crossing gelatin with black powder. "The trip up in the elevator was made in the shortest possible time." Some class to the aqueduct shafts, elevators and all the latest conveniences! Of the 16 men overcome by the gas, 15 revived and one died. " 'This is the first time I ever heard of, witnessed or saw such a thing,' said Dr. Loomis, an ambulance surgeon. 'I don't know what happened or why it happened.' " We are somewhat in the same state of mind.

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The dowsing myth will not down in Cornwall. One T. Fiddick has lately published a pamphlet on the subject. In his preface he says: " 'Dowsing' or 'rhabdomancy,' is as old as the hills. In the past, owing to the atmosphere of magic and mystery surrounding it, and also to the trickery of charlatans, dowsing as a real and practical function has often been repudiated by scientists, and ascribed by them to the ignorance and superstitions of its votaries, and this apparently without any serious attempt to discover whether it had a basis of fact or not. But in consequence of its persistence, and the remarkable achievements accomplished by its aid, and perhaps also to the increased desire in the present day to find the true inwardness of things, divining has of late been receiving more attention from the scientific world. Although manifestly presenting many difficulties, the mists enveloping it are being vigorously attacked, and not without some success. Although we cannot say with certainty what the 'force' really is, our ignorance in this respect ought not to prevent our utilizing the 'power' in the public interest." Mr. Fiddick is himself under the impression that the force is strongly allied to electricity, as it is apparently governed by similar laws. Before serious consideration of this subject we should like to have evidence respecting (1) the present absence of charlatanry, (2) the remarkable achievements accomplished by its aid, and (3) the existence of any "force" or "power."

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The U. S. Civil Service Commission announces an examination for electrometallurgist to fill a vacancy in the Bureau of Mines, at a salary from $1800 to $3000 per year. His duties will be to conduct investigations into metallurgical problems, the investigation of ores with reference to their constitution and treatment, both mechanical and chemical, including smelting operations, and especially the investigation of ores with reference to the feasibility of their treatment by electrometallurgical processes. Competitors will be rated as follows: (1) General education and scientific training, 40; (2) practical experience and fitness, 40; (3) publications or thesis, 20. An educational training equivalent to graduation from a college or university of recognized standing, such training to include courses in geology, chemistry, physics, and metallurgy, and not less than three years' actual experience in electric-furnace work, are prerequisites for consideration for this position. If a thesis is submitted under Subject 3 it must present the results of original investigation in electric-furnace work. Applicants possessing a thorough knowledge of metal mining and metallurgical work, including smelting operations, will receive additional credit under Subject 2. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons desiring this examination should at once apply for Form 304, Electrometallurgist, male, No. 903, and special form to the United States Civil Service Commission, Washington, D. C.

# International Geological Congress

The Twelfth International Geological Congress was held in the Convocation Hall of Toronto University, Aug. 7-14, about 500 delegates from all parts of the world being in attendance. Many of the delegates arrived in Canada some time before the convention to avail themselves of the numerous excursions to points of geological interest, arranged in connection with the gathering. The formal opening of the convention took place at noon, on Aug. 7, when Sir Charles Fitzpatrick, administrator of the Canadian government, during the absence of the Duke of Connaught, extended a welcome to the delegates on behalf of the government. Addresses of welcome were also given by Hon. W. H. Hearst, representing the Ontario government, President Falconer, of the University of Toronto, and Controller Church, of the city of Toronto. Dr. Emil Tietze, of Austria, expressed the thanks of the delegates for the cordial welcome extended to them. R. W. Brock, of the Canadian Geological Survey, Secretary of the Congress, outlined the arrangements made for a series of excursions before, during and after the gathering, covering in all a distance of 20,000 miles, which would enable them to get an idea of the vast geological resources of the country.

At the afternoon meeting, Secretary Brock presented to the Congress the monograph on the "Coal Resources of the World," in three large volumes, and an atlas, which has been specially prepared under the direction of the Executive Committee as a companion work to "Iron Ore Resources of the World," published under the auspices of the Eleventh Congress. Its preparation was undertaken by a committee, including G. G. S. Lindsey, convener; Dr. F. D. Adams, R. W. Brock, D. B. Dowling, Charles Fergie, James McEvoy, J. B. Pater and William McInnes, the actual editing being done by William McInnes, D. B. Dowling and W. W. Leach. The main body of this monograph has reports on 64 countries.

The total coal resources of the world, as compiled from the reports received, amounted to 7,397,533,000,000 tons. Of this total, nearly 4,000,000,000,000 tons are bituminous, nearly 3,000,000,000,000 brown coals of various grades and nearly 500,000,000,000 anthracite. Of the anthracite, Asia with the great Chinese fields has by far the largest supply of any of the great continental divisions, furnishing 407,637,000,000 tons. In bituminous, America leads by a wide margin with 271,080,000,000,000 tons, and is also first in the various grades of brown coals. The world's production for the year 1910 was about 1145 million tons. Making due allowances for loss in mining and for areas that cannot be economically worked, it will be many hundred years before the exhaustion of the supply may be looked for, though taking individual countries the end is in sight in more than one case. The presentation of the monograph was followed by a discussion on the classification of coals.

In the evening a lecture was delivered by Emanuel de Margerie, of France, on "The Geological Map of the World," reviewing the principal maps in use and pointing out their merits and defects. The best geological map in his opinion is that of North America, prepared under the direction of Bayley Willis, director of the U. S. Geological Survey. He suggested that this map should be taken as a model and a complete map covering the other continents secured by a coöperative system.

On Friday, Aug. 8, a large number of papers were read and several commissions met for the consideration of practical questions referred to them by the Congress. In the afternoon the Congress divided into sections for readings and discussions. Magmatic differentiation was the leading topic in Section one and glaciers and glaciation in Section three. Among those who presented papers on the latter subject were G. W. Lamplugh, of England; Dr. A. P. Coleman, Toronto; N. O. Holst, Sweden; W. Wolff, Germany, and Warren Upham and William C. Alden, United States.

Among the numerous papers presented on Saturday was one of special economic interest by Dr. C. N. Gould, of Oklahoma City, on the "Occurrence of Petroleum and Natural Gas in the Mid-Continent Field." He stated that the capacity of the gas wells of that field varied up to 50,000,000 cu.ft. per day. A well recently drilled to a depth of less than 700 ft. in the field of Loco, Stephens Co., in southwestern Oklahoma, produces 25,000,000 cu.ft. of gas daily. M. F. Connor, chemist of the Canadian Mines branch, dealt with the determination of iron by the sulphuretted hydrogen method. A number of the delegates took advantage of week-end trips to Muskoka and other outside points.

On Monday, Aug. 11, the Congress considered the claims of contestants for the honor of entertaining the organization in 1916. The Argentine Republic was anxious that the gathering should be held there, but it was thought that two successive meetings should not be held in America, and Brussells, Belgium, was unanimously selected as the next place of meeting. The Spendiaroff prize awarded each Congress for the best monograph on a geological subject, was given to Emile Argant, of Paris, who dealt with rock formations in the western Alps. A discussion took place on "The Influence of Depth on the Character of Metalliferous Deposits." In the evening a civic reception in honor of the visiting geologists was held at the City Hall, the guests being received by Mayor and Mrs. Hocken. Dr. Frank D. Adams, president of the Congress, entertained a number of the delegates at dinner.

On Tuesday, the 12th inst., no session of the Congress was held, the day being devoted to excursions. A party of 60 under the guidance of Prof. A. P. Coleman, inspected the clay deposits of the Don Valley and visited Scarborough Heights. A party conducted by Dr. Parks, of Toronto University, went to the Credit River to inspect the fossils of rock formation, and others went to Niagara Falls.

"The Sub-Division, Correlation and Terminology of the Pre-Cambrian Period" was the main topic discussed at the session of Aug. 13. Dr. A. C. Lawson, of the University of California, objected to the term "Laurentian"; Dr. Coleman thought it should be retained for the granites intruded throughout the Sudbury series. Dr. Leith, of Wisconsin, was not inclined to accept the Couchiching series as necessarily older than the Keewatin. Other speakers were Dr. Sederholm, of Finland; Dr. Barlow, McGill University; Sir T. H. Golland, of the Asiatic Society of Bengal; Prof. G. A. J. Cole, Dr. Horne, Scotland, and L. Fermor, India. In the evening a banquet was held at the Armories. Dr. F. D. Adams, who presided, alluded to the liberal manner in which the Canadian government and the governments of several of the provinces had contributed to the success of the gathering, and referred in enthusiastic terms to the resources of Canada, which rendered it "the very paradise of geologists." Among the speakers were Hon. Charles Devlin, Minister of Mines for Quebec; Hon. W. H. Hearst, Minister of Mines for Ontario; Dr. Steinman, of Germany; Dr. Tietze, of Austria; Dr. Termier, of France; and Dr. A. Strahan, of Great Britain.

At the meeting of the Council of the Congress on Aug. 14, Secretary Brock introduced a resolution that an International Committee be appointed, consisting of eight members who have had experience on the Executive Committees of the various sessions of the Congress, to consider the question of a permanent constitution and bylaws, and if possible submit a proposal thereon at the next session. The resolution was adopted. Hitherto the Congress has had no permanent organization, members joining only for the session they attend. In the afternoon, the University of Toronto conferred the degree of LL.D. upon seven of the delegates, Dr. R. Beck, of Freiberg, Germany; Dr. T. C. Chamberlain, of the United States; Dr. Willet G. Miller, provincial geologist of Ontario; J. J. Sederholm, of Finland; Dr. A. Strahan, of England; Pierre Termier, of France, and Dr. T. Tschernyschew, of Russia. The proceedings were closed with a garden party, at which the guests were received by Sir William Meredith, Chancellor of the University, and President Falconer.

In the evening, 115 of the delegates left on an extended trip to Western Canada, the leader of the party being President F. D. Adams, with J. B. Tyrrell as associate leader.

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## Finished Steel Production in 1912

The latest issue of the Bureau of Statistics of the American Iron & Steel Association goes with much detail into the production of various forms of finished iron and steel in the United States in 1912. Statistics have been collected from all the manufacturers.

During 1912, or a portion of the year, 565 rolling mills and steel works were in active operation. At the close of 1912 there were 661 plants in existence, of which 96 were idle, most of these being old plants which are hardly in position to operate except under special conditions. There were 19 rolling mills abandoned and 29 new mills completed during the year; while 11 more were under construction. The active mills are situated in 33 states, and the list includes one in the Panama Canal Zone.

The production of iron and steel in rolled forms for the year was as follows, in long tons, all important articles being specified separately:

| Articles | Iron | Steel | Total |
|---|---|---|---|
| Rails | ..... | 3,327,915 | 3,327,915 |
| Plates and sheets | 75,044 | 5,800,036 | 5,875,080 |
| Nail and spike plate | 8,673 | 36,658 | 45,331 |
| Wire rods | 1,289 | 2,652,264 | 2,653,553 |
| Structural shapes | 5,517 | 2,840,970 | 2,846,487 |
| Merchant bars | 944,790 | 2,752,324 | 3,697,114 |
| Bars for reinforced concrete | 2,500 | 271,832 | 274,332 |
| Skelp, flue, etc | 327,012 | 2,119,804 | 2,446,816 |
| Long angle splice bars, etc | 51,567 | 520,115 | 571,772 |
| Hoops | ...... | 270,007 | 270,007 |
| Bands and cotton-ties | ...... | 587,395 | 587,395 |
| Sheet piling | ...... | 22,276 | 22,276 |
| Railroad ties | . | 41,396 | 41,396 |
| All other finished rolled products | 220,797 | 966,311 | 1,187,108 |
| Rolled forging blooms and billets | 303 | 462,173 | 462,476 |
| Exports of blooms, etc | .. | 347,783 | 347,783 |
| Total for 1912 | 1,637,582 | 23,019,259 | 24,656,841 |
| Total for 1911 | 1,460,615 | 17,578,556 | 19,039,171 |
| Total for 1910 | 1,740,156 | 19,881,123 | 21,621,279 |

Blooms, billets, sheet bars and other half-finished articles are not included, with the exception of those exported in that form.

### MISCELLANEOUS PRODUCTS

Miscellaneous products reported included the following, various stated, as compared with similar production in the previous year:

| | 1911 | 1912 | | Changes |
|---|---|---|---|---|
| Tin and terneplates, lb | 1,756,070,000 | 2,157,055,000 | I | 400,985,000 |
| Finished angle splices, etc.,ton | . | 502,771 | | .......... |
| Cut nails, kegs of 100 lb | 967,636 | 978,415 | I | 10.779 |
| Wire nails, kegs of 100 lb. | 13,437,778 | 14,659,700 | I | 1,221,922 |
| Hammered charcoal blooms | 64,616 | 65,807 | I | 1,191 |

Finished angle splices were not reported separately in 1911. Of the production of hammered blooms, billets, etc., by charcoal bloomeries last year, 65,557 tons were manufactured into other forms by the makers, only 250 tons being sold as blooms or billets.

### FORGINGS

The production of forged axles, shafting, anchors, armorplate and other hammered forms in 1912 was 392,520 long tons, of which 383,265 tons were of steel and 9155 tons of iron. The total shows an increase of 174,284 tons over 1911, and of 72,658 tons over 1910.

The following table is a general statement of the production of the United States for two years. All products have been reduced to long tons for purposes of comparison:

| | 1911 | 1912 | | Cnanges |
|---|---|---|---|---|
| Pig iron | 23,649,547 | 29,726,937 | I | 6,077,390 |
| Steel ingots | 23,676,106 | 31,251,303 | I | 7,575,107 |
| Finished rolled steel | 19,039,171 | 24,656,841 | I | 5,617,671 |
| Miscellaneous products | 1,491,675 | 2,229,679 | I | 738,004 |
| Forgings | 218,236 | 392,520 | I | 174,284 |

Details of the pig-iron and steel-ingot production have heretofore been published so that it not necessary to repeat them here. The gain in pig-iron production was 25.6%, and in steel 31.9% over the previous year.

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## California Oil Dividends

The aggregate oil dividends paid during July by the Mexican and California companies reached nearly $1,500,000, says the *San Francisco Chronicle,* Aug. 11, 1913. They are shown by the following table:

| | Rate | |
|---|---|---|
| Amalgamated (a) | $1.25 | $62,500 |
| Amer. Pet. pfd (a) | 0.50 | 8,755 |
| do common (a) | 0.39⅓ | 39,607 |
| Central | 0.02 | 21,793 |
| Columbia | 0.015 | 51,283 |
| Fullerton | 0.05 | 30,000 |
| Home (Coalinga) | 0.01 | 1,000 |
| Maricopa Queen | 0.01 | 9,925 |
| Mount Diablo | 0.01 | 4,675 |
| Pinal-Dome | 0.01 | 9,000 |
| Prod. Tras | 1.50 | 105,000 |
| Record | .... | 5,000 |
| Rice Ranch | 0.01 | 3,000 |
| S. F. and McKittrick | 0.05 | 4,995 |
| Sauer Dough | 0.01 | 2,992 |
| Section 25 | 0.25 | 10,000 |
| State Con | 0.005 | 2,512 |
| Union Oil (a) | 0.60 | 187,757 |
| United Petroleum (a) | 0.60 | 48,551 |
| Union Prov. (a) | 0.60 | 93,518 |
| West Coast (a) | 1.50 | 15,612 |
| Western Union (a) | 0.75 | 7,500 |
| W. K. Oil | .... | 10,000 |
| Total California companies | | $734,771 |
| Mex. Pet. Ltd. pfd. (a) | 2.00 | 240,000 |
| do preferred | 1 50 | 480,000 |
| Total Mex. Pet. Ltd | | $720,000 |
| Grand total | | $1,454,771 |

(a) $100 par value; others $1.

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**The Panama-Pacific Exposition** will show copper smelting, gold milling, and niter manufacturing by full-sized working-exhibits.

## PERSONALS

The [illegible] Zinc Co. has removed the offices of its mining [illegible] Galena, Ill.

R[illegible] of Toronto, Ont., is in Nevada, on professional work [illegible] there until the end of September.

M[illegible]ott has resigned his position as manager of the [illegible] Lake Mining & Smelting Co., Ltd., Porcupine, Ontario.

[illegible] Fisher and F. H. Morris, of London, England, passed through New York recently on their way to study the Oklahoma oilfields.

[illegible] A. Cuenot has been appointed head of the boiler, locomotive and scales branches of the Pennsylvania Steel Co., at Steelton, Pennsylvania.

Richard H. Vail, assistant editor of the "Engineering and Mining Journal" has returned to New York from an extended trip through the Southwest.

Earl E. Hunner, who has been chief engineer, has been appointed general superintendent of the Hill iron-ore properties on the Mesabi range in Minnesota.

Thomas M. Kekich, formerly of the Teziutlan and Cerro de Pasco mining companies, is now assistant superintendent of the Great Western Smelting & Refining Co.'s plant in Chicago.

William Smith has been appointed general master mechanic of the Pennsylvania Steel Co. plant at Steelton, Penn. He has been with the Jones & Laughlin Steel Co. for a number of years.

Raymond A. Linton, of Buenos Aires, who has been engaged in mining and other engineering work in Ecuador, Colombia and Argentina, was married Aug. 11 to Miss Lulu Morley Sanborn, of Stevensville, Montana.

P. Eyermann, of Witkowitz, Austria, has returned to Europe after spending several weeks in the United States and Canada, visiting steel plants and coke works and gathering data as to construction and practice in operation.

Frederick G. Clapp, managing geologist of the Associated Geological Engineers of Pittsburgh, and Alton S. Miller, of Humphreys & Miller, New York, are examining the gasfields of Hungary in company with Prof. Hugo Bockh, of that country.

T. Hagio, manager of the Sunitomo Steel Co., Osaka, Japan, and T. Yamada, an associate, are in this country inspecting iron and steel plants. Mr. Hagio is a graduate of Tokio University and took a post-graduate course at Purdue University, Lafayette, Indiana.

James D. Robertson, formerly sales manager for the Pittsburgh Valve, Foundry & Construction Co., has again assumed charge of the sales of this company, returning as second vice-president after two years' absence. Mr. Robertson in the meantime has successfully completed the organization, plant and launching in business of the Warren Tool & Forge Co., of Warren, Ohio.

Dr. L. L. Hubbard, for many years general manager of the Winona property on the Lake Superior district, has tendered his resignation with both that property and the Houghton Copper Co. He will probably be succeeded by R. R. Seeber, the present superintendent, and A. L. Dickerman, consulting engineer for Mayflower and Old Colony, will probably act in the same capacity for Winona and Houghton.

## OBITUARY

Jacob K. Dimmick, once widely known as a cast-iron pipe maker and later prominent in the iron, coal and coke trades died at the residence of his son in Wynnewood, Penn., Aug. 9, aged 67 years. He was born in Philipsburg, N. J. After serving in the Civil War he became associated with the Addyston Pipe & Steel Co., Cincinnati, Ohio, and was connected with that concern nearly 25 years, a large part of the time [illegible] general manager. In 1889 he built the plant of the [illegible]d Pipe & Foundry Co., Radford, Va., and served as [illegible] manager of the company for two years. He then became associated as vice-president and general manager with [illegible] Pipe & Foundry Co., Anniston, Ala., building [illegible] plant. On the formation of the American Pipe & Foundry Co. he became its vice-president. In 1900 he severed that connection and organized the firm of J. K. Dimmick & Co., Philadelphia, for the sale of iron, steel, coal and coke, which business was continued until some six months ago.

J. Stephen Jeans died in London, England, July 31, aged 67 years. He was for many years editor and part proprietor of the "Iron and Coal Trades Review," of London. He was born in Scotland and his early training was in newspaper work in that country and in the coal and iron country of the north of England. In 1877 he was appointed secretary to the Iron and Steel Institute, an office which he held until he resigned it in 1893. Early in his connection therewith Mr. Jeans assumed also the secretaryship of the British Iron Trade Association, an appointment which he continued to fill until 1908. Notwithstanding the large demands upon his time which attention to the duties of these offices entailed, Mr. Jeans found opportunity to compile and publish a number of works dealing with the iron and steel and allied industries. Prominent among these is his well known book on "Steel: Its History, Manufacture and Uses," published in 1880; "England's Supremacy" (1884), "Railway Problems" (1886), "Waterways and Water Transport" (1888), "Rings, Trusts and Corners" (1893), "Industrial Conciliation" (1894), and "Canada's Resources and Possibilities" (1904). In addition Mr. Jeans organized meetings of the Iron & Steel Institute in various foreign countries, including the United States, Canada, France, Germany, Austria and Hungary. He also initiated several commissions in connection with the industry, notably one to inquire into Continental iron-making conditions in 1895 and another to inquire into American industrial conditions in 1902, and the reports of both these were mainly compiled by him. He also prepared and conducted the case of the British iron trade before the commission appointed in 1888 to inquire into the Railway and Canal Traffic Act, and before the Tariff Commission in 1904. He also read a number of papers before different societies. Mr. Jeans was well known in this country through his travels here and his valuable report on the American iron industry 10 years ago.

## SOCIETIES

**Iron and Steel Institute**—In accordance with previous announcements the autumn meeting will be held at the Palais des Académies, Brussels, Belgium, Sept. 1 to 4. The following is the list of papers that are expected to be submitted:

1. Armand Baar, Liége: "Reinforced Pile Foundations for Blast-Furnaces."
2. Prof. E. D. Campbell and F. D. Haskins, University of Michigan: "Some Experiments on the Effect of Heat Treatment on the Colorimetric Test for Carbon in a 0.32-Carbon Steel."
3. Prof. A. Campion and J. M. Ferguson, Glasgow: "A Method of Preparing Sections of Fractures of Steel for Microscopic Examination."
4. Baron E. Coppée, Brussels: "The Manufacture of Coke in Belgium."
5. Gen. L. Cubillo, Madrid: "The Manufacture of Armor-Piercing Projectiles."
6. Otto Frick, Beckenham, Kent: "The Electric Refining of Steel in an Induction Furnace of Special Type."
7. Emil Gathmann, Baltimore: "Commercial Production of Sound Steel Ingots."
8. Gevers-Orban, Liége: "The Distillation of Tar in Metallurgical Practice."
9. E. Houbaer, Liége: "The Use of Coke-Oven and Blast-Furnace Gases in Metallurgy."
10. Prof. H. Hubert, University of Liége: "Present Methods of Testing, with Special Reference to the Work of the International Association for Testing Materials."
11. Baron E. De Laveleye, Brussels: "A Historical Survey of the Metallurgy of Iron in Belgium."
12. F. Rogers, Sheffield: "So-Called 'Crystallisation through Fatigue.'"
13. Prof. A. Sauveur, Harvard University: "The Allotropic Transformations of Iron."
14. Dr. J. E. Stead, Middlesbrough: "A New Method for the Determination of the Critical Points $Ac_1$ and $Ar_1$."
15. Dr. J. E. Stead, Middlesbrough, and Prof. H. C. H. Carpenter, Manchester: "The Crystallising Properties of Electro-Deposited Iron."
16. Benjamin Talbot, Middlesbrough: "Modern Open-Hearth Steel Furnaces."
17. Gustave Trasenster, Ougrée, Belgium: "The Use of Oxygen in Blast Furnaces."
18. C. Vattier, Valparaiso: "Note on the Principal Deposits of Iron Ore in Chile."

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Aug. 14

**Protection of North Star Shareholders** in the East was the object of certain steps taken by Herman Zadig, president of the Tonopah-North Star. Though he still refuses to establish a transfer office in New York it is reported that he has declared his intention to appoint the Security Transfer & Register Co., 66 Broadway, as agent to authenticate certificates presented by shareholders in names other than their own. Mr. Zadig stated that only six forged certificates have been discovered and he is of the opinion that no more have been sold. W. C. Ralston has offered to attend to the transferring of all certificates sent from the East either to his own name or the name of any person designated, thus placing the certificates beyond suspicion of forgery and provide for instant delivery without question. Shareholders are advised, however, to postpone transfers until Sept. 15, on which date the company will be prepared to exchange old lithographed certificates for new ones which are engraved. For one month the company will make these exchanges free of cost to the shareholders. The shareholders have been advised to transfer their shares in their own names, as it is probable that a dividend will be declared before the end of the year, and can be sent to the addresses already on the ledger thus avoiding delay and annoyance to the shareholders. Since the Pinkertons have failed to apprehend the forger the directors are considering the advisability of offering a reward in cash for his apprehension.

**Gold and Copper Production** estimates for California for the first half of 1913, indicate a large inceease over 1912. The gold production is estimated at $11,000,000; the copper production is estimated at 18,000,000 lb. The increase in gold is largely due to an increase in the number of gold dredges in operation and to the advancement of quartz mining in the Mother Lode counties, including Tuolumne, Calaveras, Amador and Eldorado, also to a large production in Nevada County, and to hydraulic and placer mining in Siskiyou, Trinity and Sierra Counties. The gain in copper production is due chiefly to the steady operation of the Mammoth mine and smelting works in Shasta County, and the increased yield of the Mountain Copper Co. in the same county. There was also a good production of copper from Calaveras County. Yuba County maintains its position as leading gold producer in the state, the bulk of which comes from the dredging districts. Amador County, the leading county in the Mother Lode region, is a close second. There has been a general advancement in development work and in the installation of improved reduction plants. The latter part of the first half of the year was dry and thus the increase in gold production was not so great as it otherwise would have been. The beginning of the second half of the year showed a decided improvement in the water-supply in several counties owing to unusual rains. The rains in California mining districts are usually confined to the winter season, but in 1912 the Mother Lode counties received rain in a large amount as late as April, and in the present year there was rain in the Mother Lode region and in some of the northern counties, chiefly Siskiyou, as late as July.

### SALT LAKE CITY—Aug. 16

**The Utah Copper Payroll** amounts to approximately $375,000 per month, and total expenditures for wages, supplies, etc., are said to be between two and three times this amount. The output of the company since the beginning of operations is reported to have been approximately $65,000,000 in copper, gold and silver. The last quarterly dividend paid in June was $1,187,000 or a little more, and total dividends to date amount to $18,080,562. During the first six months of 1913, there were produced 5,669,915 lb. copper.

**The Value of Phosphate Rock** produced in the United States according to statistics for the year 1909 was $10,881,869. A report on the fertilizer resources of the country made by the Bureau of Soils of the Department of Agriculture gives what are regarded as conservative estimates of the phosphate rock in 1911. Utah, Idaho, Wyoming and Montana have the largest resources, there being estimated to be in these four states combined 2,500,000,000 tons of high-grade rock, and low-grade material equivalent to an additional 6,667,000,000 tons of high-grade rock. The high-grade phosphate in these states carries 72% tri-calcium phosphate. Tennessee, South Carolina, Kansas and Florida are the other states in which phosphate deposits are found. The combined estimated phosphate rock in the latter states amounts to 349,000,000 tons.

**The Mill at Silver City**, which is being erected by Jesse Knight will not be ready before Oct. 1. The main mill building is up, and some of the heavy equipment including crushers, etc., has been installed. The building is about 200 ft. long and 50 ft. wide, with a maximum height of 75 ft. The capacity of the first section is expected to be 100 tons daily, which may later be increased. Ore can be dumped from the cars of the Knight railroad to the bins above the crushers. Details of the milling process or method of treatment have not been made public, but it is understood that a leaching process will be used. The metallurgical work is under the direction of N. C. Christensen. Tintic low-grade ores have presented new problems in concentrating or treatment, and up to the present time it has not been possible to mill them successfully. There is a large tonnage of low-grade ore on hand.

### BUTTE—Aug. 14

**Electrical Workers Have Struck** for higher wages, all linemen working for the public-utility companies of Butte, and within a radius of 20 miles, having stopped work the morning of Aug. 12. A committee of the electrical workers appeared before the Butte Miners Union at the regular meeting and gave the assurance that no attempt would be made to close the mines or reduction plants and that the electricians employed at these places will remain at work. The electrification of the Butte, Anaconda & Pacific R.R. between Butte and Anaconda has been halted, and as a result the company has given up hope of having the line in readiness to operate by electricity this month as was recently announced. The companies immediately affected by the walkout are the Butte Electric Light & Power Co., Butte Electric St. Ry. Co., Independent and Bell Telephones, Western Union and Postal Telegraphs, and the Butte, Anaconda & Pacific R.R. The men asked for a raise in wage from $5 to $6 per day for journeymen and from $6.50 to $8 for foremen and splicers; an 8-hr. day; half holiday on Saturday and double time for holidays and overtime.

### CALUMET—Aug. 16

**A General Fight Between Deputies and Strikers** occurred Thursday, Aug. 14, in the afternoon at the Seeberville location of the Champion mine, at one of the boarding houses and resulted in the killing of two strikers and the wounding of three others. This is the most serious trouble experienced since the beginning of the strike. The deputies went to make an arrest of one of the men for threatening a guard at the Champion property. The man was approached in the yard, but refused to accompany the officers and escaped into the house, from which a shower of bottles, etc., was hurled upon the officers, accompanied by the firing of revolvers. The deputies then rushed into the house where a general melée ensued. Several arrests in different places in the district have been made for intimidations, and at the Kearsarge mine, one of the militia men was found by a sentry, unconscious and with a wound on his head. At the Quincy a sentry wounded a striker trying to get through the guard line. A small quantity of rock was hoisted at the Champion, of the Copper Range Consolidated, and at the Calumet & Hecla mine rock was hoisted at the No. 5 Calumet shaft and also at Red Jacket shaft. The underground force is being materially increased and in all probability hoisting will be resumed in the other shafts shortly. Much repair work is being done underground and the rock coming from this source is being hoisted and crushed. As a result of the meeting of the non-union employees of the Calumet & Hecla, when the committee received a registration of all employees who wanted to return to work, the company has a list of fully 70% of its employees, who are waiting to be notified to return to their former places. A reduction has been made in the military force and there are now about 1200 men remaining in the district, which force will probably be maintained until conditions become more settled. The sheriff has a large force of deputies who are coöperating with the military force. C. E. Mahoney, vice-president of the Western Federation of Miners, has returned, but nothing has been given out from union headquarters regarding the payment of strike benefits by the Federation.

### DULUTH—Aug. 12

**Shipping Has Become Normal** again and the fleet of vessels that was thrown out by the strike of the ore-dock workers has been put on regular schedule. Twelve boats cleared within the 24 hr. ended Aug. 12, laden with ore for lower lake points. There are more than a dozen boats now at the Allouez docks, in Superior, but they are being loaded in good time. More than 400 men are at work, which is more than the usual number. D. M. Philbin, in charge of the Great Northern properties, offered to take back all the striking men, excepting the Finns, who have caused a lot of trouble, and to give the men free lodging and board until the strike is ended. This is the second time that the Industrial Workers of the World have been defeated here. The first was last summer when trouble was experienced at the Northern Pacific merchandise docks. Mining operations that were interrupted at the open pits on the Mesabi range are running full force again, and the ore-train crews that were laid off have returned to work.

### DEADWOOD—Aug. 12

**The Lundberg, Dorr & Wilson Mill,** in Fantail Gulch, near Terry, in the Black Hills, South Dakota, has been permanently closed. This mill has been operating practically continuously since January, 1904, and has been a well known factor in Black Hills metallurgy. The mines of the company were opened in the early '80s, and as no recovery could be made by amalgamation or concentration, the first ore produced was shipped to Omaha, part way by wagon. The freight and treatment charge amounted to $40 per ton. Later the ore was smelted at Deadwood. After producing more than $1,000,000 gross, the Buxton Mining Co., the original owners of the property, stopped operations and turned the property over to lessees, believing that the mine was worked out and that no further profit could be made from it. It was finally sold and the new owner leased it to John Lundberg, who mined the ore and treated it at the cyanide plant of Lundberg & Dorr, at Deadwood. Later the corporate name was changed to Lundberg, Dorr & Wilson, which firm bought the property and built a new mill to treat ore running from $4 to $6 per ton, of which there was believed to be a large quantity in the mine. A cyanide mill was designed to treat 75 tons per day, but its capacity was gradually increased to 110 tons, and both mining and milling costs were reduced until $3 ore was profitably treated. The mill is of interest historically as it has passed through the whole period of American cyanide practice. When the mill was designed, sand leaching was the accepted method of operating and slime was undesirable, both on account of the difficulty of separation from sand and the recognized losses in decantation, then the accepted method of slime treatment. The necessity of retaining all mill tailing, as well as efficiency, led to the introduction of a Moore filter, which installation was the first one to remain in successful operation for any length of time. The difficulties met with in separation by hydraulic cones was overcome by the invention of the Dorr classifier, in 1904, and from this mill the use of mechanical classifiers spread to all cyanide operations. Chilean mills were used for fine grinding for the first time in the Black Hills, and belt elevators for raising pulp crushed in cyanide solution. The total amount milled was approximately 285,000 tons, three-fifths of which came from the company's mines and the rest from custom ore. The total production as estimated was $1,500,000. As the ownership of the property is a partnership, the earnings are not of general interest beyond the fact that the net profits, after deducting the cost of the plants and all improvements, are several times as great as the estimate made before the property was bought, although the actual value of the ore has been less than estimated.

### NOME—Aug. 2

**A Complaint by the Dredging Companies** has been made against the new Alaska mining law. Under the new law they must perform $100 worth of labor within 90 days from discovery for every 20 acres of mineral land staked, and after next year they will have to perform $100 worth of labor every year for every 20 acres of mineral land they desire to hold. This will make it costly to hold large areas of land. A dredging company, of course, must have a large area of [illegible] or the enterprise cannot hope to be successful. The new [illegible] the dredging companies, will not only put them out of business, but by forcing them from the field through excessive annual labor requirements the money they have paid for the claims and the improvements they have put into the claims during the last few years will be lost. No one can deny that the dredging companies are going to suffer by the new law, but there is hardly a change of law that does not benefit somebody and injure somebody else. The new law was written for the benefit of the individual prospector who is willing to work and whose work is of the kind that opens a country quickly. It was aimed against the speculator-prospector. These speculators have gobbled up hundreds of square miles of land in the territory, in the form of association claims, without so much as making certain that the land is mineral land. Some of the land that is acquired from these speculators by large mining companies is so low-grade that it could not be worked by individual operators, but it is also true that the system reduces the field for the individual miner. Most good Alaskans would prefer Alaska to be a country of the many individual miners, rather than of a few comparatively large mining companies. The intent of the law is to give the individual a chance again, in the hope that there may return more prosperous times such as existed before the gross value of the association claim law began.

### CORDOVA, ALASKA—Aug. 7

**The First Gold from Sushanna** or Shushanna has been shipped. The largest individually owned part of this shipment was made by Billy James, the discoverer, who sent out $10,000 in dust with which to pay for supplies at Chitina. Since then various amounts of gold dust have been brought out to McCarthy. The gold is all coarse; the nuggets ranging from $5 to $35 each. None of the panning goes below $4. The diggings are shallow, the distance to bedrock being but from 1 to 5 ft. The wash is porphyry-slate, with no boulders. Pay has been found on Bonanza, Eldorado, Coarse Gold and Johnson Creeks. Those looking for the Shushanna on the Government maps will fail to find the name, as it is there spelled Chisana (not to be confounded with Chisna, which is in the Slate Creek district). To the prospectors and Indians the river is known as the Shushanna. That this district would become one of the great mineral-bearing regions of Alaska has for years been the firm belief of many miners who have prospected in the vicinity. As far back as 1904, indications of placer gold were found on the right limit of the Shushanna from the bend of the river to the glacier, a distance of from 40 to 50 miles. The Shushanna has in the past been but superficially prospected for placer gold. In fact, little was known of the region as a placer up until the time of the stampede. The formation at the head of the Shushanna consists principally of diorite, or what is commonly called greenstone, together with limestone. Ten miles below the glacier, at the head of the Shushanna, the formation changes into slate and sedimentary rock. Thirty miles below that, near the bend of the river, the formation runs into schist, which is the formation of the Klondike, Fairbanks, Nome and other great placers. The same formation is found on the Nabesna, which is the right-hand fork of the Tanana. The mean distance between the Shushanna and the Nabesna rivers is about 40 miles, a high range of mountains dividing the two. The district is most easily reached from the States via Seattle to Cordova and from there by the Copper River R.R. to McCarthy, a distance of 190 miles and from there by trail to Scoli Pass and from there to the Shushanna, a distance of about 100 miles, or a total distance from Cordova of practically 300 miles. From Skagway the trip is made via White Horse, Lake Kluane to the White River crossing, up the Beaver to the head of the Tanana or Alder Creek, a total distance of about 350 miles. Several have sent outfits from Dawson by the way of White River. They then go from Kirkman landing, above Dawson, with horses on the trail, pole up White River to the mouth of the Snag, then "mush" overland by way of Beaver River. It is estimated that fully 5000 will winter in the new district and so far 400 have left for the strike, passing through Cordova. Many are in from Nome, Fairbanks, McCarthy, Skagway and Dawson and other camps not yet heard from. George Wolf, who made the strike with Billy James, was being grubstaked by Brady Howard. It is claimed that Wolf is taking out $2500 a day. The best claims so far opened are on Eldorado, where with a short string of boxes, with three men working, $500 to $1500 is being washed out daily. Good pay has been struck on six creeks and some prospecting indicates that five others have good pay ground.

### TORONTO—Aug. 18

**The Timiskaming & North Ontario Railway Commission** has made six surveys to locate an extension of the Elk Lake branch to or beyond Gowganda, but so far no route has been discovered that would warrant construction. The parties are still in the field and every effort will be made to find a route. The Government will build a new colonization road from the Government wharf on Lake Timiskaming into South Lorrain, and another road from Halleybury to the Montreal River, a distance of 14 miles.

# THE MINING NEWS

## ALASKA

DROUGHT HAS HANDICAPPED MINING on the Seward Peninsula. At Nome there are 38 dredges operating this summer, each dredge averaging 12 men, and it is estimated that the dredges provide a payroll to the Seward Peninsula of $5000 per day. In the Fairbanks district the water shortage which has been felt on all the creeks was the worst for many years. However, this section had a steady rain about the middle of July, enabling some of the plants to again start operations.

MATTHIESON—This company, with only five men at work, is taking out $500 per day. The property is in the Seward district.

TOPOK DITCH CO. (Nome)—The property of this company, comprising mines, ditches, machinery, etc., has been sold by the U. S. court, to Oscar Ashby; it is said that $60,000 was the price paid.

## ARIZONA

### Cochise County

THE LOADING PLATFORM AT BENSON is crowded with ore from shippers on the north side of the Santa Rita Mountains. The Royal Blue is shipping ore from a recently encountered 4-ft. shoot as fast as teams can be procured. The Rosario has nearly a full carload of ore on the platform and the Blue Lead continues to be a steady shipper, having maintained its record for regular output since the inception of the company last autumn.

WASHINGTON AND DUQUESNE (Benson)—Shipments continue regularly from these two properties, in spite of a 21-mile wagon haul.

GREAT WESTERN COPPER CO. (Courtland)—This company, which recently bought the old Mammoth-Collins group of mines, on the San Pedro River, 50 miles north of Tucson, has a force of men on the ground preparing for development on a large scale. Machinery is arriving and when installed the shaft, now 750 ft. deep, will be sunk 300 ft. deeper. This mine has been one of the best producers of gold in the county. It is also rich in wulfenite. It is reported that there is considerable good ore in sight and much promising virgin ground.

### Gila County

MIAMI (Miami)—The ground in the northwest section of the orebody that was injured considerably by settling of the capping in April has been restored to working condition and the mine is yielding considerably in excess of 3000 tons of ore daily. Repair work at the Red Springs shaft is almost completed and the retimbering and enlarging of the Captain shaft down to the 420-ft. level is nearing completion also. Launders to carry tailings to a new site east of the present tailings pond are about finished.

INSPIRATION CONSOLIDATED (Miami)—Grading for the flotation test mill is well under way and it should be completed within six months. Its capacity will be 600 tons daily. At the mine, work is lagging somewhat underground because of the general readjustment under the direction of General Manager C. E. Mills. The concrete bins at the mine are well along in course of construction and a separate crushing plant is being installed at the mine to reduce the rock from the Scorpion shaft to a size suitable for concrete material.

### Greenlee County

CORONADO (Clifton)—Nine men were killed and one probably fatally injured, Aug. 14, when a cable pin snapped and two ore cars, carrying 12 tons of ore and 13 miners, dashed down a 38° grade for a distance of 3300 feet.

### Pima County

SAN XAVIER—This property of the New Jersey Zinc Co. ships zinc ore, autotrucks carrying the ore from the mine to Sahuaripa station on the Nogales branch of the Southern Pacific R.R. The mine is also producing some lead-silver ore, which is shipped to El Paso.

OLIVE—Three cars of high-grade lead-silver ore and concentrate are produced each month. Shipments are made to El Paso. The mill is treating 40 tons per day of 8 hr. of ore that comes mainly from the old dumps. Development work is being pushed on the Olive, Swastika and Wedge claims. The shaft of the Wedge mine is 200 ft. deep with 3 ft. of ore in the bottom, assaying 15% lead and 15 oz. silver.

### Pinal County

COPPER REEF (Globe)—An electric furnace with a daily capacity of 50 tons is being used at Globe to test Copper Reef ore of which about 5 tons recently was brought to Globe for the test.

CALUMET & ARIZONA (Superior)—An unconfirmed report is to the effect that the main tunnel has encountered a well defined vein of copper ore carrying a streak of high-grade silver. Considerable silver has been extracted from shallow surface workings on the property in the past. A crew of men is at work laying the foundation of a 15-drill compressor. The pump station on the 500 has been finished and sinking resumed.

### Santa Cruz County

R. R. R. (Patagonia)—At this copper mine in the Patagonia district only eight men are working. A two months' extension of time has been granted for the next payment on the property.

## CALIFORNIA

### Amador County

CENTRAL EUREKA (Sutter Creek)—The shaft is being deepened. It is expected to sink 200 ft. below the present lowest level before the mill is again put in commission. It is believed that extensive oreshoots will be developed at 200 to 500 ft. below the lowest level.

SOUTH JACKSON (Jackson)—Six men were recently laid off and it was reported that the mine would close down. This report has not been corroborated. It is said that the drift west at the 500-ft. level failed to develop satisfactory ore. The drift east is reported to have cut a vein, or vein matter, immediately following the laying off of the men. It is estimated that about $100,000 has been spent in development work, and it is believed that the mine will yet be a producer.

ZEILA (Jackson)—The force has been reduced, and mining is being confined to the upper levels. It is reported that a large oreshoot has been disclosed in the north end of the mine, but too far from the shaft for profitable extraction. The mine has been examined by prospective purchasers within the last two years, and there was at one time a probability of a sale. What the present action indicates is known only to the owners of the mine. It is believed that when the present supply of surface ores is exhausted the mine will either be temperarily closed down, or be sold.

### Butte County

RUMBLE (Oroville)—At this drift mine, on Thompson flat, the shaft was recently cleaned out and deepened. An electric hoist was installed, and a new pipe line laid.

### Calaveras County

SOUTH CAROLINA (Carson Hill)—Ten new stamps are now installed. The mill has now 20 stamps crushing ore.

UTICA (Angels)—The Stickle mill did not close down, as recently reported. The stamps are dropping on ore from the Cross shaft.

WATERMAN (Angels)—A cement lining is being built in the 3-compartment shaft, from bedrock to a height of 6 ft. above the collar, or a total of 26 ft. The purpose is to make the mouth of the shaft fireproof. The shaft will be deepened to 1000 ft., that depth having been reached with a 5-in. drill.

### Eldorado County

LUCKY MARION (Greenwood)—A grass fire west of Greenwood destroyed the stamp mill and other buildings, July 16.

CHANNEL BEND (Georgetown)—This old producing mine on American River, near Josephine, known in the early days as the Egle Bar mine, will be reopened by N. L. Kohn and others.

UNION (Eldorado)—It is reported that this mine will be reopened. The old shaft is about 1600 ft. deep. The equipment includes a 20-stamp mill, pipe line, ditch, and steam and water hoist.

BLUE ROCK (Georgetown)—This old gravel mine, which has been operated in a primitive way continuously for 60 years and has produced large amounts of gold, has recently been taken over on a lease by Leo and Thomas Flynn, Henry Miller, Peter Morgan and Thomas Armstrong. Improved mining methods are contemplated.

### Fresno County

SUNNYSIDE GOLD MINING CO. (Fresno)—This is a new incorporation organized to develop quartz claims in the Sycamore district.

### Placer County

PROGRESSIVE PLACER CO. (Iowa Hill)—A corporation of Ohio men has taken over this old gravel mine in Bumpus Cañon, and it is reported that improved gravel-mining machinery will be installed of 500 cu.yd. daily capacity.

CHARLES GAWS (Auburn)—These gravel claims on the north fork of American River, one mile below Auburn, are reported to have been bonded to a syndicate that will start prospecting with Keystone drills. If drillings show satisfactory gravel a dredge will be built. The name of the syndicate has not been made public.

### Plumas County

COREY & WARE (Belden)—The tunnel is expected to tap the channel 40 ft. further in.

GOLDEN ANCIENT (Quincy)—The pay channel has been found in a new shaft, and it is reported that a large quantity of gravel has been disclosed. L. A. & C. C. Smith, of San José, are operating the property.

### Sierra County

NEW JERSEY (Forest)—At this drift mine the tunnel is being extended to tap the northeast extension of the Gold Star gravel deposit.

MIDDLE NORTH FORK (Downieville)—The incline sunk by Morse Bros. and associates has reached bedrock, and rich prospects in coarse gravel are being taken out.

RUBY (Downieville)—Operations have been resumed on this drift mine by Oakland men who hold an option. The Ruby joins the Wisconsin and in early days was worked extensively, with rich returns.

## COLORADO

### Clear Creek County

PORTLAND—This property, on Albro Mountain, has been reopened. The shaft has been cleaned out and it is reported that the showing in the bottom justifies additional sinking, which the company contemplates doing in the near future.

UNITED STATES MILL—This plant, on lower Fall River, has been leased to Mason & Bartlow, who are overhauling the machinery and placing it in working order, preparatory to treating ore from the Shafter mine and other properties.

CALVIN—This group of properties, near the head of Virginia canon, is being developed by the newly organized Calvin Mining Co., capitalized at $100,000. This property has produced some pay ore in the past and it is reported that recent conditions have been encouraging.

COMBINATION MILL—(Idaho Springs)—The tube mill which is reported to have required 40 hp. has been replaced by a Traylor pan. It is claimed that this pan grinds the pulp received from the stamp battery to 200 mesh with a consumption of 12 hp., and that the change has increased the efficiency of the mill.

KEYSTONE—Development has been resumed on this property on Bellevue Mountain. The work is being conducted through the Lucania tunnel and the compressed-air power is being purchased from the Restedt compressor plant on Fall River. The ore is complex, containing gold, silver, lead and zinc. It is the intention to ship to the plant of the Sutton, Steele & Steele Co., at Denver.

DORIT—The 50-ton mill is completed and is now in operation. It is reported that the ore delivered to the mill averages $8 per ton in gold, silver and lead, and that the recovery is satisfactory. The company estimates a substantial reserve of milling ore in its mine and contemplates systematic development sufficient to maintain this reserve. This plant differs from the other plants in the district in that it is equipped with a Lane mill.

BLUE RIDGE (Dumont)—Extensive development is being done in this property, on Columbia Mountain. The upper and lower workings are being connected by a raise, which requires an extension of about 100 ft. to complete the connection. It is reported that the raise is in pay ore. The east drift from the bottom of the 100-ft. winze, sunk from the lower level, has opened a vein of smelting ore. It is reported that the ore assays 175 oz. silver per ton, and that the smelting streak is accompanied by 4 ft. of milling ore that will assay $10 per ton.

### Eagle County

ELKHORN (Eagle)—At a depth of 20 ft. rich ore has been cut by a diamond drill.

NORTH DAKOTA (Eagle)—This mine, adjoining the Lady Belle, is under lease to Marion Henry, of Leadville.

LADY BELLE (Eagle)—Up to Aug. 10, 28 carloads of ore had been shipped from this mine; two more are being loaded.

ZARMAN RANCH (Eagle)—Diamond drilling on this ranch is being done by a company organized by George Wilkenson, James Diltz and B. Hickman. At a depth of 75 ft. ore similar to that found at the Lady Belle was cut.

### Lake County

NEW MONARCH (Leadville)—The Rainey and Nicholson leases are being equipped with two more hoists, the installation being made by the Colorado Power Co. The Rainey will have a 37-hp. hoist and the Nicholson a 15-hp. Two shafts will be sunk at once.

### Summit County

FRENCH GULCH DREDGING CO. (Breckenridge)—A 46-lb. lot of retorted placer gold which was taken out of the stream-bed deposits of French Gulch by the Reiling dredge, has been shipped. The value of the shipment was about $10,000.

MEKKA PLACER (Breckenridge)—B. F. Hall, who has been operating the high bars of the Mekka placer, up from the Reiling dredge, has shipped a 44-oz. retort to the mint. The hydraulic operations have disclosed richer pay which will no doubt result in larger clean-ups while it lasts. More gravel has been moved this season on the Hall lease than used to be moved under former operation in three seasons.

## GEORGIA

### McDuffie County

EDMONDS—This mine is being reopened by A. J. Overton.

## IDAHO

### Cœur d'Alene District

MORNING (Mullan)—It is reported that the Federal company plans to increase the zinc-slime plant. Under the new plan all mill feed will be reduced to slime.

STEWART (Kellogg)—The question of providing for the purchase of additional property and stock in other companies will be voted on at the annual meeting, Aug. 29. The company has made all arrangements for building a large concentrator at the mouth of Big Creek, between Wallace and Kellogg.

[illegible]E BOY—Contractors have started work on the new tunnel at this property, which is being operated under lease. The work is now being done by hand, but machine drills will be used as soon as the new compressor is installed. Some ore is being taken from the old stopes in the upper level, which is rich in silver.

SNOWSTORM (Larson)—The mill at this property is treating 7000 tons of ore per month, the extraction being good. Better results are being obtained by milling the ore than by shipping, as in the past. The company is sinking a shaft, east of the fault, in an effort to recover the vein. When the shaft is down 600 ft., a crosscut will be driven about 200 ft. to the vein. If necessary, the shaft will be sunk to the 1000-ft. level.

LACLEDE (Burke)—Ore has been encountered in the winze, which is being sunk from the No. 2 level. The shaft was started on the vein 1800 ft from the portal of the tunnel and 200 ft. from where the tunnel crosscut the vein. In the past the flow of water caused considerable trouble, but at present little water is found. This is probably due to the draining of the country by the deeper workings of the Hercules and Tamarack. The Laclede lies between these two properties.

BIG FOUR (Marcus, Wash.)—Development work with a double shift of miners is to be begun immediately. A shaft has been sunk to a depth of 105 ft. on the orebody and a tunnel has been driven in on the vein 190 ft., showing good gold and silver ore. The new work will be the driving of crosscut tunnel 250 ft. to tap the vein 200 ft. below the present workings. The prospect comprises eight claims, including 80 acres of heavy timber, and lies only two miles from the Spokane Falls & Northern Railway.

## MICHIGAN

### Iron

IMPERIAL (Michigamme)—This property has been closed down for almost two years, but there has been a considerable amount of ore in stock, the shipping of which was commenced a week or two ago. A total of 54,000 tons was sent out last summer and the pile will be about gone when this season ends. The property is leased by the Cleveland-Cliffs Iron Co., and was recently put in condition for mining. The ore is limonite and not readily disposed of in the market, although it melts well with some ores.

## MINNESOTA

### Cuyuna Range

CONSOLIDATED CUYUNA IRON CO. (Crosby)—Drilling operations have been started on Sec. 34, 47-29. The company is newly organized by Cuyuna range men; capitalization, $500,000.

INLAND STEEL CO. (Crosby)—Stripping operations have been started at the Thompson mine, one steam shovel being at work. This property was operated as an underground mine until recently.

LOCKER-DONAHUE CO.—This company has platted the town of Steelton, on the shore of Mahnomen Lake, near the Cuyuna-Mille Lacs mine. The Iron Mountain shaft and Duluth-Brainerd shaft are near-by.

CUYUNA-DULUTH IRON CO. (Ironton)—The first shipment from the property was made last week to the Lake Superior Iron & Chemical Co. at Ashland, Wis. The company has contracted to ship 50,000 tons this season.

PITTSBURGH STEEL ORE CO. (Riverton)—A contract has been let to the American Concentrating Co., of Philadelphia, for the erection of a concentrator at the Rowe mine. Some of the details of the process to be used have not yet been finally passed upon.

PENNINGTON (Crosby)—The first shipment was made from the open pit, Monday Aug. 4. This Tod-Stambaugh property will be a continuous shipper from now on. The management expects to ship 100,000 tons or more this season. This is the first open pit on the Cuyuna range.

IRON MOUNTAIN MINING CO. (Crosby)—Considerable difficulty is being experienced in sinking the new 3-compartment shaft, due to quicksand several feet thick, immediately above the ore formation. This is a condition not uncommon on the Cuyuna range, although usually the thickness of the bed of quicksand is not great enough to cause trouble.

### Mesabi Range

COLUMBIA (Virginia)—The city of Virginia and the Interstate Iron Co. have come to terms over this mine, the council finally agreeing to vacate several streets and alleys for the sum of $4000. The area of the tract is about equal to 70 city lots, and the company has been endeavoring for some time to get permission to remove the ore underneath. The overburden will have to be removed The land is at the city limits and will not cause any inconvenience to the residents of the city.

### Vermilion Range

VERMILION (Tower)—At this mine of the Consolidated Vermilion company an exploration shaft is 40 deep. It has been in ore from the surface, the outcrop being ore of a good grade. The ore at a depth of 40 ft assays 60% iron. The outcrop is on the side of a large ravine, and the indications are that the deposit extends under the swamp at the bottom.

SIBLEY (Ely)—The Oliver Iron Mining Co. will in the near future complete at this mine a new shaft, which will be raised and timbered up from the old workings. The shaft will be 1400 ft. deep and will be 10x20 ft., with five compartments The headframe will be of steel with a concrete backing and will be similar in design to other steel shafthouses that have been erected by this company.

LUCKY BOY (Elk)—At this property of the Vermilion & Mesabi Iron Co., drifting has been resumed on the 210-ft. level. Operations had to be suspended at that point for some time because of a heavy inflow of water. A large orebody was found at a depth of 90 ft., and more ore was found at a depth of 140 ft.; good ore was also found on the 210-ft. level, and the shaft will be sunk deeper and another crosscut driven at 260 ft.

## MISSOURI

### Joplin District

A RECORD FOR SHALLOW OREBODIES in the Joplin district was made this week at Aurora, when a lead vein was encountered 5 ft. below the surface by Stratton Bros., working a lease of the U. Z. ground. Two loads of wash dirt were taken out in one day, with the shaft down only 10 feet.

ELLIOTT & CO. (Joplin)—Rich ore has been found for a distance of 57 ft. by drilling on the Sleepy Hollow land. Two other drill holes also showed zinc ore. Two shafts are to be sunk soon.

DEXTER & CO. (Joplin)—A 200-ton concentrator is being built on a lease of the Gray land southeast of Joplin. Drilling revealed a large area of mineralized ground and a shaft has been sunk into the ore.

ZENA D (Joplin)—Zinc ore has been discovered on a 40-acre lease of the Shoemaker land, southeast of the city. The ore is found from 149 ft. to 167 ft., the level now being worked; some galena also is being hoisted.

WHIRLWIND MINING CO. (Joplin)—A depth of 94 ft. in the mine at Zincite has been attained. An 18-ft. face of zinc ore is being worked. Plans for a concentrator have been made. Hand jigs now are being used.

WILSON MINES (Duenweg)—The plant has been remodeled, increasing the capacity, and ore from two shafts will be treated. The bull jig was removed and replaced with an ordinary rougher, and a sand jig was also installed.

GERSTER & RAINES (Joplin)—Following the destruction by fire of the Red Lion mill the Red Lion lease was purchased and a 200-ton mill on this lease has just been completed. Production was resumed the first week in August.

PACIFIC (Carthage)—The mine has been drained and operations are to be started in the drifts where ore is in sight. Two pumps have been installed, one for emergency, and the operators believe constant operations now can be conducted.

TWO BOBS MINING CO. (Thoms Station)—This company has just opened up at the 108-ft. level on a lease of the Snapp land what is termed an old-fashioned lead bonanza. The ore now being hoisted is as rich as any seen in this field for several years.

WHIRLWIND MINING CO. (Carl Junction)—New steam equipment has been installed at the lease on the Budd M. Robinson land. Some good ore was developed at 60 ft., but in sinking deeper still richer dirt was found and the 94-ft. level shows exceptionally good ore.

CRAGG MINING CO. (Joplin)—A 300-ton concentrator is to be built on a lease of the James Luke land, on West Seventh St. It will be built on a lot adjoining a mill that has been operated several years. The operating of this second mill is to be continued after the new mill is completed. Zinc ore is being hoisted from sheet-ground formation.

VINEGAR HILL MINING CO. (Joplin)—This company has purchased a one-half interest in a lease of the Cooper land, at Hattenville, Okla., from the Church-Mabon Co., paying $50,000 for it. The development on the lease consists of 16 drill holes, each said to be in ore. Drilling on the land was begun several months ago. Shafts are to be sunk to the ore formation.

BEAR CAT—(Sarcoxie)—The lease of this company on the J. W. Boyd land was sold to the Grasselli Chemical Co. The lease covers a period of 20 years and includes the mine and 70 acres of land. The retiring company of Kansas City men has been in control since last February. It is the plan of the Grasselli company to improve the plant and conduct a development campaign.

### St. Francois County

THE MINERS WENT OUT ON STRIKE Saturday, Aug. 16, as was threatened earlier last week. The mines are closed; no rioting or disorder has yet been reported.

## MONTANA

### Butte District

ALEX SCOTT (Butte)—It has been decided to continue sinking the shaft from the 1900-ft. level, its present depth, to the 2200-ft. level, and the work will be commenced at once. The ore being hoisted at present is coming from the 600-, 1200- and 1900-ft. levels.

### Fergus County

KENDALL (Kendall)—After thoroughly inspecting and sampling the workings, a company of mining men who were considering the advisability of reopening the property on a lease, decided that the showing was insufficient to warrant it. It is probable that no further attempts will be made to operate the mine.

### Granite County

SWASTIKA (Philipsburg)—The shaft has nearly reached the 100-ft. level. The shaft water is carrying considerable copper in solution and the management is preparing to build precipitating tanks to recover this copper.

### Lewis & Clark County

EUREKA—Anaconda men have taken a lease and bond on this gold property situated 12 miles east of Helena. They are preparing to instal a sinking pant and develop to a depth of 500 ft. or more.

OLD DOMINION (Helena)—The work of concentrating the old dump at this mine in Blue Cloud gulch has been started. After screening, the residue from the screenings is to be jigged, and the resulting product shipped to the East Helena smelting works.

### Lincoln County

KALISPELL-LINCOLN (Libby)—A bar of gold weighing 61 oz., the result of the first cleanup of the summer's work from 26 tons of ore mined at this property in the West Fisher district, has been sent to Libby. The bar is valued at $1220.

## NEVADA

### Humboldt County

SILVER KING (Golconda)—This property, 10 miles from Golconda, is being worked by lessees. A shaft has been sunk 60 ft., and a crosscut is being driven to cut the vein. The property is only three miles from Iron Point railroad station.

CHARLESTON NATIONAL MINING CO. (National)—This company is operating a lease on the ground of the Charleston Hill Gold Mining Co., adjoining the National Mines Co. on the south. A 60-hp. engine and a five-drill compressor have just been installed, and a 35-hp. Fairbanks-Morse hoist will be installed at once. The shaft is 250 ft. deep. When the 300-ft. level is reached a crosscut will be driven to the vein.

### Lyon County

MONTANA YERINGTON (Yerington)—Two crosscuts from the shaft, each 200 ft. long, have cut a wide oreshoot.

RENO YERINGTON (Yerington)—The sinking of the incline shaft is progressing rapidly. The contact is being followed on its dip, and it is expected that the ore will be struck at the 200-ft. level.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Aug. 7, 1913, were as follows: From Mason Valley Mines Co., 1762 tons; from Nevada-Douglas, 1283 tons; from other mines, 935 tons; total, 3980, or a daily average of 569 tons; five cars of matte were shipped.

NEVADA-DOUGLAS (Ludwig)—Development on the 8th level has opened some good-grade copper ore. At the Copper Casting shaft drifting and crosscutting are in progress, and a car of ore is being shipped every second day from this development. On Douglas Hill, crosscutting from the lowest level to cut the "spot" ore is in progress. This ore will average 5% copper. The Greenwalt concentrating process is to be tested in Denver, Colo., on a 25-ton lot, with the intention of erecting a plant at Ludwig if the experiments are successful. W. C. Orem, general manager for the company, emphatically denies the report that there will be a merger of the Nevada-Douglas and the Mason Valley Mines companies.

### Mineral County

THE WATER SUPPLY OF LUNING is being rapidly exhausted. The situation is serious and other wells must be sunk at once.

ELECTRIC POWER FOR RAWHIDE will be supplied in the near future. The power line to Fairview passes within three miles of Rawhide, and the connecting line will be built.

TODD GOLD MINES CO. (Luning)—It is reported that operations will be resumed in the near future.

NATIONAL MILL (Rawhide)—This mill of 20 stamps and cyanide plant is nearing completion. It is expected to be in operation by Oct. 1.

AURORA (Aurora)—The foundations for the 100-stamp mill are completed, also the bunk houses, shops, etc. A delay in the delivery of material and machinery, caused by recent heavy rains, has retarded the work.

WAGNER AZURITE COPPER CO. (Luning)—A leaching plant is being erected. The ores will be treated with sulphuric acid and the copper precipitated by electrolysis. The acid will be purchased, and the power will be generated at the plant, a gasoline engine being used to drive the dynamo.

### Nye County

PLACER MINING AT MANHATTAN is still being carried on. Recently nuggets weighing as much as an ounce have been washed out.

### Washoe County

NEVADA-LEADVILLE MINING CO. (Leadville)—This company is operating a block of ground under lease from the Tohoqua Mining Co. A 50-ton concentrator has just been erected.

TOHOQUA MINING CO. (Leadville)—A 50-ton concentrator has been in operation for the last year, concentrates and some crude ore being shipped to Utah. This company is the first in recent years to pay a bullion tax in Washoe County.

### White Pine County

CONSOLIDATED COPPER MINES (Kimberly)—Stockholders did not subscribe liberally to the $2,500,000, 7% convertible bonds at par, as, it is understood, they took less than $300,000. No attempts have yet been made to make a market for them.

NEVADA CONSOLIDATED (Ely)—This company has reconsidered its first decision not to accept the terms of the workman's compensation act passed at the last session of the Nevada legislature. The company has filed its formal acceptance of the terms of the act with the Nevada industrial commission. The acceptance of the new law, which is not compulsory, by this company means much for the success of the measure in the state at large.

## NORTH CAROLINA

### Montgomery County

TWIN REEF (Candor)—This property is under option to W. F. Mack and associates. The shaft has been unwatered and retimbered, a headframe has been built and a steam hoist has been installed. Drifting on the vein is now in progress.

### Randolph County

HOOVER HILL—A power dam has been built across the Uwharrie River and electric machinery, and washers for disintegration of surface gold-bearing material have been installed. Pumping out the Hoover Hill mine will soon be started; the water will be used in the washing machines.

### Rowan County

GOLD HILL—Walter G. Newman, it is reported, will commence unwatering this mine.

## OREGON

### Baker County

BI-METALLIC—Operations have been started by Anthony Mohr, one of the owners. This silver mine was formerly owned by Portland people, when it was known as the Intrinsic, under which name $50,000 was spent in development.

IMPERIAL (Sumpter)—This mine in the Cable Cove district has been idle, and in care of a watchman for the past six years. Local men have taken a lease on the mine, and have already started taking out pay ore. The ore is base, and is shipped to a smeltery at Salt Lake, being hauled to Sumpter [illegible].

GEM CONSOLIDATED GOLD MINING CO. (Baker)—The first permit to a mining company under the new Oregon corporation law has been issued to this company. The property is at the site of the early mining city of Gem, which had a population of 7000 in the days when placer mining in that district was at its height. There is no trace of a city left.

## PENNSYLVANIA

### Allegheny County

STANDARD CHEMICAL CO. (Pittsburgh)—It is reported that this company recently exported the first shipment of radium from this country. The lot weighed 250 milligrams and was valued at $30,000.

### Westmoreland County

PITTSBURGH STEEL CO. (Monessen)—The new blast-furnace plant has been completed. The furnaces have been built at a cost of approximately $4,000,000. They will be supplied with ore from the Rowe mine, on the Cuyuna range, Minnesota, which recently has been acquired by the company. The new furnaces are 90 ft. high and 22 ft. 9 in. in diameter. The output will be 40,000 tons of steel ingots per month, or 70 cars per day.

## SOUTH CAROLINA

HAILE (Kershaw)—A cyanide plant is being built at this property.

## TEXAS

### El Paso County

SOUTHWESTERN MINES CO. (Sierra Blanca)—A lead-zinc vein in altered granite is being developed on an 860-acre tract nine miles from Sierra Blanca, 100 men are being employed. A concentrator is in operation, and from ore taken out in development 220 tons of 50% zinc concentrate, 60 tons of lead concentrate containing 1 oz. silver per unit of lead, and 20 tons of auriferous iron concentrate are being shipped per month. Development work totals 5000 ft. Two vertical shafts have been sunk on this vein, the deeper to a depth of 480 ft. A low-grade deposit of gold and silver bearing chalcopyrite in altered granite near a limestone contact, on another portion of the property, has been developed but little, a shaft having been sunk 100 ft.

## UTAH

### Beaver County

CEDAR TALISMAN (Milford)—Ore carrying lead and silver has recently been opened on the 700-ft. level. The vein is 4 ft. between walls.

MOSCOW (Moscow)—The monthly production is 20 cars, valued at about $25,000. Work is in progress on the new three-compartment shaft, which is to be sunk 1000 feet.

MAJESTIC (Milford)—Twenty-one cars of copper ore were shipped during July, and the August production will probably show a considerable increase. New development is being done at the Hoosier Boy and Hickory.

### Juab County

TINTIC SHIPMENTS for the week ended Aug. 3 were 164 cars.

EAGLE & BLUE BELL (Eureka)—With the new boiler in operation the total boiler capacity, three boilers, is 300 hp. Profits are said to be keeping well ahead of dividend requirements. As well as opening up ground at present productive the company is doing considerable prospecting in new ground

CHIEF CONSOLIDATED (Eureka)—During the six months ended July 1, 1913, there were marketed 30,854 tons of ore, which sold for $206,563, and net profits were $83,792 Receipts, with $303,023 cash on hand, Jan. 1, 1913, were $519,336. Expenditures, including dividend No. 1 of $87,645, operating costs of $122,776; mining claims, $2594; Eureka City Mining Co., $19,000; buildings and machinery, etc., were $237,874, leaving cash on hand July 1, 1913, $281,462. The tonnage was nearly four times greater than that for the same period of 1912, but the grade of the ore averaged much lower, partly as a result of mining all of the quartz encountered in stoping. A large amount of development was done, in all 4064 ft The crosscut to the Gemini, 2135 ft. in length, was completed, furnishing better air and a needed emergency outlet The reserves of ore give assurance of steady productivity and earnings, and the regular payment of dividends.

### Salt Lake County

OHIO COPPER (Bingham)—Superintendent McDonald and mill manager Kidney have resigned

ALTA CONSOLIDATED—Ore running well in copper and silver has been opened 30 ft above the main tunnel level.

TAR BABY—A ventilation system has recently been installed in this company's tunnel in Big Cottonwood The tunnel is in 800 ft., and the face is mineralized with lead

U. S. SMELTING, REFINING & MINING CO (Midvale)—A demand for higher wages was made last week by foreign employees at the smelting plant For a time a strike seemed imminent, but the matter was finally adjusted

[illegible] (Salt Lake City)—The lower tunnel is in 1250 ft. [illegible] mineralization showing lead copper and silver [illegible] developed between the quartzite and the limestone. The [illegible]tive point is under the 90-ft winze sunk from the [illegible]

UTAH COPPER CO (Bingham)—The compressor plant and transformer station on level G, southwest of the junction of Carr Fork and Bingham Cañon, was struck by lightning, Aug. 2 during a thunder shower, and burnt to the ground. The plant was equipped with a large electrically driven Nordberg compressor. It was one of several compressor plants about the workings. The transformer station will be rebuilt.

## WASHINGTON

### Chelan County

NORTH AMERICAN ORE CO. (Leavenworth)—This company has been incorporated to develop mica on Mad River.

### Okanogan County

LAKEVIEW-DIVIDEND (Oroville)—Shipments are being made to the smelter at Grand Forks.

MOLSON (Chesaw)—Preparations are being made to increase the capacity of the mill at this mine to 40 tons daily.

### Stevens County

WASHINGTON (Chewelah)—Copper-sulphide ore has been found on this property.

IRON CROWN (Chewelah)—This property is being developed under the direction of E. H. Winslow. The ore is of good grade in gold, silver and lead.

### Snohomish County

TRAIN SERVICE FROM SILVERTON TO MONTE CRISTO has again been established on the Northern Pacific R.R.; 75 men are employed in the mining camps in the Monte Cristo district and the owners plan to begin making shipments early in September.

## CANADA

### British Columbia

THE ROCHFORD GOLD DREDGE, built for W. Hanford and associates of Seattle, by the Shaacke company of New Westminster, will be in operation on the Fraser River, near Hope, some time in August.

SERIOUS RIOTING AT NANAIMO AND LADYSMITH, where the coal miners, members of the United Mine Workers of America, have been on strike for some time has resulted in the calling out of the militia. Mobs practically took possession of the two towns during the afternoon and night of Aug. 12. Several have been hurt, one or two quite seriously. Special constables sent over from Vancouver were met by a mob of infuriated miners and chased back onto the boat from which they attempted to land. Reports of the rioting in various coal towns of Vancouver Island, Aug. 12 and 14, show the following results: Two mines shut down and flooding; Nanaimo River bridge blown up; hotel and strikebreakers' houses at Ladysmith and company property at Extension burned; store at Extension wrecked and looted; Nanaimo Herald forced to suspend publication.

SULLIVAN GROUP (East Kootenay)—This property has shipped 20,000 tons of ore in the last year. New development work was begun and water power was developed from Mark Creek.

BLUE BIRD (Rossland)—This mine will be operated, the deal with W. R. Foley having been consumated. The mine will be unwatered in a few weeks.

PANAMA (Bear Lake)—About 2000 sacks of ore are being packed down for shipment to the smelter, being the output of the mine for the last few months. The ore is rich in silver, with little or no lead. It has been decided to develop the mine on a more extensive scale and a gasoline compressor and hoist will be installed this autumn. The engine will be placed inside the mine, a chamber having been blasted out of sufficient size to give room for it.

### Ontario

ALEXO (Iroquois Falls)—Twenty-two cars of nickel ore containing 1,588,500 lb. were shipped during July from this mine to the Mond Nickel Co.

YORK ONTARIO (Cobalt)—A rich oreshoot showing from 1 to 3 in. of high-grade has been picked up and followed for 20 ft.

RIGHT OF WAY (Cobalt)—Drifting is being undertaken along the Cobalt Lake fault. The shaft was put down to a depth of 365 ft. and about 100 ft. of drifting done at that level Up to date no favorable results have followed. The company has taken an option on the Flynn claims lying south of the Tough-Oakes property in the Kirkland Lake district.

BRITISH-AMERICAN NICKEL CORPORATION—This company has been incorporated with a capitalization of $30,000,000 and holds 17,000 acres in the Sudbury district. Already considerable prospecting has been undertaken and up to May 1. 6,800,000 tons of nickel ore have been blocked out. The $30,000,000 capital stock of the corporation consists of $10,000,000, 6% debentures and $20,000,000 common stock, all of which has been issued. Dr. F. S. Pearson is said to be interested.

COBALT-LAKE (Cobalt)—A plan of operations has been decided on for the development of several acres at the north end of the lake hitherto unprospected. Work is to be done north and west of the old No. 4 shaft on the east side of the lake. A crosscut has been started at a depth of 300 ft. to pick up the fault veins. It will be driven under and across the lake and worked from by drifts from the veins when encountered Another long crosscut will head from the 225-ft. level northward down the center of the lake, from which other workings will be started at intervals.

## MEXICO

### Mexico

EL ORO MG. & RY. CO., LTD (El Oro) In July 23,250 tons of ore and 14,080 tons of tailings yielded $169,880; railway profit amounted to $13,970; total profits to $60,800.

### Puebla

TEZIUTLAN COPPER CO (Aire Libre) A 500-ton concentrator is being built under the direction of Franz Cazin, chief engineer.

## ASIA

### India—Mysore

**Kolar Goldfield**—The production of gold from the mines of the Kolar district in July was 49,457 oz., being 947 oz. more than in June, and 452 oz more than in July, 1912. For the seven months ended July 31 the total was 336,618 oz. in 1912, and 339,440 oz.—or $7,016,225—in 1913, an increase of 2822 oz. this yeaer.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Aug. 20

The metal markets generally have been rather strong, and prices have been firm, with some inclination to advances in price.

### Copper, Tin, Lead and Zinc

**Copper**—The market during the week of Aug. 14-20 has been rather quiet so far as the volume of sales has been concerned. This was to be expected after the heavy business of the previous two weeks and a reaction was rather in order. Prices, however, have been firm and there was no disposition to make concessions. During the past two or three days, there was an increase in demand and in inquiries from domestic consumers which was readily met by the principal sellers, although at a very slight advance. The quotations most usual were 15¾@15⅞c., usual terms. Producers are now well sold ahead and are having difficulty in making deliveries on time.

The strike in the Lake Superior District continues. The Calumet & Hecla is said to be making preparations to start up its mines and has secured a list of its old men who are ready to work. So far, no actual step has been taken and the mines are still closed. Business in lake copper was confined to some small lots which were on hand and the prices for that description are almost entirely nominal.

The quotation for Lake copper is nominal at 16c. At the close electrolytic copper in cakes, wirebars and ingots is quoted at 15.60@15.65c., while casting copper is quoted at 15⅛@14¼c. as an average for the week.

The London market has been quiet, and transactions have been of practically small volume. On Aug. 14, spot and three months were quoted at £69 17s. 6d. and on Aug. 15 at £69 13s. 9d. On Aug. 19 the market declined to £68 15s. for both positions, but closes at £69 2s. 6d. for spot and £69 3s. 9d. for three months.

Base price of copper sheets is now 21c. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16¼@16½c., carload lots at mill.

Exports of copper from New York for the week were 9069 long tons. Our special correspondent gives the exports from Baltimore at 2971 tons for the week.

Visible stocks of copper in Europe on Aug. 15 are reported as follows: Great Britain, 48,130; France, 2860; Rotterdam, 3700; Hamburg, 2070; Bremen, 1800; total, 28,560 long tons, or 63,974,400 lb. This is an increase of 110 tons over the Aug. 1 report. In addition to these stocks 1700 tons are reported afloat from Chile and 4400 tons from Australia, making a total of 34,660 tons.

**Brass Prices** are announced as follows to date from Aug. 18: Sheets, high brass, 16⅝c. net per lb.; low brass, 18½c. Wire, high brass, 16⅜c.; low brass, 18½c. Rods, high brass, 16⅜c.; low brass, 19¼c. Tubes, brazed, or open seam, 21⅛c. Angles and channels, 21⅛c. Scrap allowances are 11⅛c. net per lb. for high brass and 12½c. for low brass.

**Tin**—The London market remained unusually steady throughout the week. Although transactions on some days were very heavy, hardly any change in the quotations took place. There was a good deal of buying by consumers in this market for prompt and August delivery, while very little interest was shown in futures, which were frequently offered at below the importation price. The close is firm at £188 5s. for spot and £186 15s. for three months, and about 41½c. for August tin here.

Messrs. Robertson & Bense report the receipts of tin ore and concentrates at Hamburg, Germany, in July at 2309 tons, of which 2279 tons came from Bolivia and 70 tons from South Africa.

Receipts of Bolivian tin at Liverpool in July included 55 tons of bars and 1855 tons of concentrates; equivalent to a total of 1168 tons fine tin.

Tin production of the Federated Malay States in July was 3897 long tons. For the seven months ended July 31 the total was 27,394 tons, a decrease of 199 tons from last year.

**Lead**—On Friday, Aug. 15, it became known that a strike had broken out in southeastern Missouri, which closes all the mines in that district. This accentuated the strong position of the metal, and the market advanced one-quarter of a cent, to 4.75c., New York. It is reported that the question at issue in the strike is the recognition of the Western Federation of Miners in the district.

The London market is quiet and slightly lower, Spanish lead being quoted at £20 7s. 6d. and English lead 10s. higher.

**Spelter**—The market is firmer. There has not been much demand, but sellers are holding for higher prices, due to the higher cost for ore and the decreased production on account of the shortage of gas. At the close, St. Louis is quoted at 5.55@5.60c. and New York at 5.70@5.75c. The present prices of ore at Joplin leave little margin for smelters.

The London market is quoted at £20 12s. 6d. for good ordinaries and 5s. higher for specials.

Base price of zinc sheets was again advanced ¼c. on Aug. 15, and is now $7.75 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

### DAILY PRICES OF METALS

#### NEW YORK

| | | | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| Aug. | Sterling Exchange | Silver | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 14 | 4.8635 | 59 | 16 | 15.50<br>@15.60 | 41¾ | 4.50 | 4.40<br>@4.45 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 15 | 4.8640 | 59¼ | 16 | 15.50<br>@15.60 | 41⅝ | 4.50<br>@4.75 | 4.45<br>@4.65 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 16 | 4.8645 | 59¼ | 16 | 15.55<br>@15.60 | 41⅜ | 4.75 | 4.65<br>@4.70 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 18 | 4.8640 | 59⅛ | 16 | 15.60<br>@15.65 | 41⅜ | 4.75 | 4.65<br>@4.70 | 5.65<br>@5.70 | 5.50<br>@5.55 |
| 19 | 4.8640 | 59⅛ | 16 | 15.60<br>@15.65 | 41⅜ | 4.75 | 4.65<br>@4.70 | 5.65<br>@5.70 | 5.50<br>@5.55 |
| 20 | 4.8645 | 59¼ | 16 | 15.60<br>@15.65 | 41½ | 4.75 | 4.65<br>@4.70 | 5.70<br>@5.75 | 5.55<br>@5.60 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

#### LONDON

| | | Copper | | | Tin | | | |
|---|---|---|---|---|---|---|---|---|
| Aug. | Silver | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | Lead, Spanish | Zinc, Ordinaries |
| 14 | 27$\frac{3}{16}$ | 69⅞ | 69⅞ | 74¾ | 189 | 187¾ | 20¼ | 21 |
| 15 | 27$\frac{5}{16}$ | 69$\frac{11}{16}$ | 69$\frac{11}{16}$ | 74¾ | 187¾ | 186¾ | 20 | 20½ |
| 16 | 27$\frac{5}{16}$ | .. | . . | .... | . | .... | .. | . |
| 18 | 27¼ | 69¾ | 69$\frac{11}{16}$ | 74½ | 187½ | 186 | 19¾ | 20½ |
| 19 | 27¼ | 68¾ | 68¾ | 74¼ | 187¼ | 186 | 20 | 20⅝ |
| 20 | 27$\frac{5}{16}$ | 69⅛ | 69$\frac{3}{16}$ | 74¼ | 188¼ | 186¼ | 20⅜ | 20⅝ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅓c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

**Imports and Exports in Great Britain** of metals other than iron and steel, are reported for the six months ended June 30, as follows, in long tons, except quicksilver, which is in pounds:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Copper | 61,130 | 68,023 | 26,981 | 35,677 |
| Tin | 21,571 | 23,417 | 25,644 | 22,051 |
| Lead | 107,445 | 104,779 | 23,703 | 31,846 |
| Zinc | 70,881 | 73,049 | 4,378 | 4,758 |
| Quicksilver, lb. | 3,199,125 | 2,988,302 | 1,003,798 | 1,323,906 |
| Minor metals | 3,660 | 4,300 | 13,257 | 14,745 |
| Ores: | | | | |
| Tin ore | 15,233 | 17,262 | | . |
| Pyrites | 455,502 | 432,187 | | .. |

## Other Metals

**Aluminum**—The market continues quiet and business has been on a moderate scale. Quotations are again off a little, 22½@23c. per lb. being named for No. 1 ingots, New York. The foreign market is reported easier.

**Antimony**—The market continues dull with only small sales. Stocks are large and it seems hard to work them off. Cookson's is quoted at 8.35@8.40c. per lb.; Hallett's at 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business is fair and prices remain unchanged. New York quotations are $40 per flask of 75 lb., with 58@60c. per lb. asked for small lots. San Francisco, $39.50 for domestic orders and $37 for copper. The London price is £7 5s. per flask, with £7 quoted from second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

**Nickel**—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb. according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Exports from Baltimore for the past week included 280 tons nickel residues to Bremen.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold is being taken for India and the Bank of France is reported to be picking up small lots. The bulk of the gold arriving, however, went to the Bank of England.

Imports of gold at New York for the week were $579,740, from Mexico, South America and Australia. There were no exports.

**Iridium**—The demand continues well up to the supply and there has been no drop in prices. Dealers continue to ask $85 per oz. for pure metal.

**Platinum**—Prices are steadily maintained, although the market has been rather quiet. Dealers ask $45@46 per oz. for refined platinum and $49@52 for hard metal. The foreign market continues steady. Stocks are reported rather large, but in strong hands.

**Silver**—There is little change to report in the silver market and prices have varied but little. The Indian Bazaars have been the principal buyers but the China banks have also been in the market but their demands have been easily filled. The tone of the market continues dull.

Exports of silver from London to the East, Jan. 1 to Aug. 7, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| India | £4,640,700 | £4,354,000 | D. | £286,700 |
| China | 933,500 | 502,000 | D. | 431,500 |
| Total | £5,574,200 | £4,856,000 | D. | £718,200 |

Imports of silver at New York week ended Aug. 16, $216,663 from Mexico and Central America. Exports were $579,740, nearly all to London.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Aug. 16

The high price of zinc blende is $50, the base per ton of [illegible] ranging from $46@48 per ton for choice grades, and [illegible] for blende carrying in excess of 8% iron. Calamine [illegible] a base of $21@23 per ton of 40% zinc. The average [illegible] grades is $43.24 per ton. Lead sold at $51.50@55 per ton [illegible] metal contents, with the average of all grades [illegible] ton.

SHIPMENTS WEEK ENDED AUG. 16

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| Totals this week... | 10,682,600 | 652,630 | 1,691,650 | $290,865 |
| Totals 33 weeks... | 354,402,890 | 25,888,050 | 58,904,070 | $9,793,384 |

| | | | |
|---|---|---|---|
| Blende value, the week | $236,223 | 33 weeks | $7,914,761 |
| Calamine value, the week | 8,846 | 33 weeks | 328,546 |
| Lead value, the week..... | 5,796 | 33 weeks | 1,550,077 |

### PLATTEVILLE, WIS.—Aug. 16

The base price paid this week for 60% zinc ore was $44@46 per ton. The base price paid for 80% lead ore was $54@55 per ton.

SHIPMENTS WEEK ENDED AUG. 16

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week ............... | 3,325,250 | 82,000 | 994,430 |
| Year to date.......... | 92,823,780 | 4,587,990 | 38,374,930 |

Shipped during week to separating plants, 1,752,600 lb. zinc ore.

## IRON TRADE REVIEW

### NEW YORK—Aug. 20

The iron and steel markets are in rather an uncertain condition, so far as new business is concerned. In some lines, new orders are coming in fairly well, but in others, new business is on rather a moderate scale.

Structural-steel orders have not been on an especially large scale, but in the East a number of contracts of moderate size have been closed, making altogether a considerable volume of business. Among these orders is one placed by the American Zinc & Smelting Co. for material for its new works at Langeloth, Penn. Quite a number of bridge orders have also been placed.

The outlook as to steel prices is somewhat better in respect to the fact that the current prices on wire products, representing $3 a ton off the maximum seem likely to prove the basis of trading for the fall movement, instead of there being any further recession. This would make prices better than a year ago.

Sheet prices are now lower than two or three weeks ago, and there is an improvement in buying, several large agricultural implement makers having contracted for their season requirements, while the current run of small sheet orders is better.

The steel-price situation on the whole is much better than was expected last May in even the most optimistic quarters. Prices have held well, the recessions todate from the top point being $3 a ton in wire, $2 to $4 a ton in sheets, $2 a ton in small sizes of pipe, with slight concessions in plates and shapes, confined to eastern territory. There may be further recessions, but probably of slight moment, before the expected fall buying movement fills the mills up again, as it is confidently expected to do.

The reduction in prices of wire has not brought oat a heavy business so far, although jobbers are beginning to come into the market for their fall orders. There is rather active competition for these orders and also for others which are on the market for plates.

New business in pig iron continues to be in moderate-sized lots, but there is a good deal of it. In Eastern territory, there is rather active buying of foundry, while in the West, basic iron is in fair demand. There has been no special advance in prices, but the current quotations have been rather firmly held.

### PITTSBURGH—Aug. 19

Shading in plates, and shading to a less extent in structural shapes, is confined to eastern territory and occurs only with the most desirable orders. Pittsburgh and more western mills must meet the competition of eastern mills if they desire to sell in the East, but only in rare instances have they done so. As to the country at large, the basis of 1.45c., Pittsburgh, on plates and shapes is well maintained. As to the steel-bar price of 1.40c., Pittsburgh, there is no question in any territory.

Operations in the steel industry are practically at full capacity, except that wire mills are running at 50 to 75% of capacity, and sheet mills are averaging, for July and August, 70 to 75% of capacity, with tin mills averaging in the same period about 90% of capacity. In bars, plates, shapes and tubular goods, mills continue to operate substantially full, while the rail mills are doing at least as well as last year. The total output of steel has been decreased only slightly.

**Pig Iron**—The market is quiet all along the line, as to sales of any round tonnage, but there is a moderate amount of prompt buying. The recent burst of buying is clearly at an end, and it did not last long enough to produce any material advance, th ugh it arrested the decline and put the market on a firm basis. Bessemer, for years a specialty, has developed such a scarcity that small lots have gone at an advance, one sale of 500 tons being made at $15.85 while a slightly smaller lot went at $16, valley, against a former openly quoted market of $15.50. Other quotations are unchanged, and we quote: essemer, $15.75@16; basic, $14@14.25; malleable, $14.25; No. 2 foundry, $14; gray forge, $13.50@13.75, at Valley furnaces, 90c. highere delivered Pittsburgh.

**Ferromanganese**—The new price of $56, Baltimore, is being shaded a dollar a ton on prompt lots, while there is little negotiation for forward, and this market is largely nominal. We quote prompt at $55@56 and forward at $56, altimore, freight to Pittsburgh being $2.16.

**Steel**—The weakening tendency noted in last report has continued, until now it is reported a lot of 2000 tons of sheet bars went at $26, and further developments are expected, there having been hardly enough done to establish a market. Former quotations of $27 on billets and $27.50 on sheet bars, maker's mill, Pittsburgh or Youngstown, may now be considered as largely nominal. Rods are $28, Pittsburgh.

### IRON ORE

The strike of the loaders at the Allouez docks in Superior and the Missabe docks in Duluth has interfered with the shipments of ore. A number of men have been employed to take the places of the strikers, but shipments are still slow.

### SAULT STE. MARIE CANAL

Freight passing through the Sault Ste. Marie canals in July was 12,278,124 short tons, the largest business ever reported. For the season of navigation up to Aug. 1 the total tonnage was as follows, in short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| East-bound | 23,266,029 | 27,393,691 | I. 4,127,661 |
| West-bound | 7,366,045 | 10,279,796 | I. 2,913,752 |
| Total | 30,632,074 | 37,673,487 | I 7,041,413 |

The total number of vessel passages this year was 10,850, showing an average cargo of 3472 tons. The mineral freight included in the total were as follows, in short tons, except salt, which is given in barrels.

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 6,486,454 | 9,412,435 | I. 2,925,981 |
| Iron ore | 20,248,973 | 23,344,642 | I. 3,095,669 |
| Pig and manuf. iron | 296,648 | 198,762 | D. 92,114 |
| Copper | 46,938 | 47,467 | I. 509 |
| Building stone | 2,282 | 5,993 | I. 3,711 |
| Salt, bbl. | 362,286 | 335,136 | D. 27,150 |

Iron ore was 62% and coal 25% of the total freight this year.

### COKE

The coke market continues unchanged. The contract price of $2.50 per ton for furnace coke is firmly held by Connellsville coke makers. Production is regular and shipments have kept up well.

**Connellsville Coke**—Surplus coke is being offered, with such limited demand that $2.25 on prompt furnace has been quoted without finding many takers. Nominally at least the $2.50 price is maintained on contract quotations, and it remains to be seen whether production will be curtailed further to protect the contract market. Furnaces are all covered for August, and there are hardly any negotiations for September or later delivery.

## CHEMICALS

### NEW YORK—Aug. 20

The general markets are still quiet and no improvement is looked for until September.

**Arsenic**—The market continues dull, and there is little demand. Prices are $3@3.25 per 100 lb., but are rather nominal at that figure.

**Copper Sulphate**—Business has been on a moderate scale. Quotations are a little easier, $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—Not much business has been done, but the market is a little firmer. The current quotations are 2.32½c. per lb. for spot and September; 2.35c. for September-December, and 2.40c. for deliveries later than December.

Advices from Chile are that over 75% of the producers have agreed to join the new combination and to limit production. It is believed that the combine will soon become effective.

### PETROLEUM

Oil production in California for the six months ended June 30 is reported at 47,221,836 bbl., an increase of 3,524,094 bbl., or 8.1%; over the first half of 1912. Deliveries were 47,454,451 bbl., an increase of 7,506,565 bbl., or 18.8% over last year.

A London despatch says: "The Shell-Royal Dutch Combine has acquired control of the California Oilfields Co. The latter is an important English concern whose production, amounting to more than 4,000,000 bbl. per year, has hitherto been sold to the Standard Oil Co. under contract. That contract is now expiring and the purchase by the Shell people is regarded here as a particularly important advantage in the fight against the Standard."

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded

| | March | April | May | June | July |
|---|---|---|---|---|---|
| Alaska shipments | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 |
| Anaconda | 22,900,000 | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 |
| Arizona, Ltd. | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 |
| Copper Queen | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 |
| Calumet & Ariz. | 4,250,000 | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 |
| Chino | 4,464,723 | 3,925,409 | 3,883,611 | 3,682,706 | 4,686,250 |
| Detroit | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 |
| East Butte | 1,400,000 | 1,400,000 | 1,268,595 | 1,055,646 | |
| Mammoth | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 |
| Giroux* | 625,000 | 600,000 | 625,000 | 610,000 | |
| Mason Valley | 1,608,492 | 1,264,304 | 1,186,560 | 1,097,014 | 990,000 |
| Miami | | | 1,943,900 | 2,612,000 | |
| Nevada Con. | 5,555,320 | 5,650,000 | 5,933,275 | 6,344,863 | 5,403,919 |
| Ohio | 591,651 | 690,001 | 650,071 | 537,400 | |
| Old Dominion | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 |
| Ray | 4,287,000 | 4,379,128 | 4,384,400 | 4,392,612 | |
| Shannon | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 | 880,000 |
| South Utah | 62,224 | 132,267 | 200,000 | | |
| Tennessee | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 | 1,247,804 |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 2,900,000 | |
| Utah Copper Co | 8,248,880 | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 |
| Lake Superior* | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 |
| Non-rep. mines* | 6,203,606 | 6,000,000 | 6,300,000 | 6,000,000 | 6,200,000 |
| Total prod | 102,619,054 | 104,224,079 | 109,824,500 | .......... | ........ |
| Imports, bars, etc. | 24,215,480 | 25,578,297 | 22,205,942 | .......... | ....... |
| Total blister | 126,834,534 | 129,802,376 | 132,030,442 | .......... | ........ |
| Imp. ore & matte | 11,911,041 | 7,177,363 | 10,528,562 | .......... | .... |
| Total Amer. | 138,745,575 | 136,979,739 | 142,559,004 | .......... | ... |
| Miami† | 3,102,200 | 2,312,900 | ........ | .......... | 2,890,000 |
| Shattuck-Arizona | 1,234,450 | 1,158,326 | 1,026,170 | 1,059,625 | ..... |
| Brit. Col. Cos: | | | | | |
| British Col. Cop | 844,735 | 794,000 | ...... | .......... | ...... |
| Granby | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 | ........ |
| Mexican Cos : | | | | | |
| Boleo† | 2,204,720 | 2,811,200 | 2,424,800 | 1,984,640 | .. |
| Cananea | 4,772,000 | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 |
| Moctezuma | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 |
| Cape Cop., S. Af. | 732,480 | 586,880 | 387,520 | 414,400 | ...... |
| Kyshtim, Russia | 1,478,400 | 2,544,640 | 1,490,000 | ... | ........ |
| Spassky, Russia | 974,400 | 974,400 | 721,280 | 835,520 | ....... |
| Exports from | | | | | |
| Chile | 7,840,000 | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 |
| Australia | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 |
| Arrivals—Europe† | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VII, '12 | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | ... | ....... |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | ... | ..... | ......... | 53,594,945 | 66,420,480 | 120,015,385 |

Note— From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Caledonia, Nev | Aug. 14 | Sept. 12 | $0.025 |
| Carbonate, Ida | July 27 | Aug. 25 | 0.001 |
| Columbus Ext., Utah | Aug. 17 | Sept. 5 | 0.02 |
| Con. Imperial, Nev | Aug. 22 | Sept. 19 | 0.01 |
| Dalmatia, Ida | Aug. 5 | Sept. 3 | 0.002 |
| Duluth, Ida | July 31 | Aug. 30 | 0.001 |
| Eastern Star, Ida | July 25 | Aug. 25 | 0.002 |
| Emerald, Utah [illegible] | ..... | Sept. 13 | 0.005 |
| Empire, Ida | Aug. 12 | Sept. 12 | 0.002 |
| Eureka, Ida | Aug. 11 | Sept. 11 | 0.001 |
| Exchequer, Nev | Aug. 28 | Sept. 17 | 0.02 |
| Florence | Aug. 16 | Sept. 16 | 0.001 |
| Hypotheek, Ida | Aug. 15 | Sept. 9 | 0.003 |
| Independence Lead, Ida | July 5 | Aug. 29 | 0.002½ |
| Iron Mask, Ida | Aug. 16 | Sept. 13 | 0.0025 |
| Keystone, Utah | Aug. 2 | Sept. 2 | 0.01 |
| Lake Copper, Mich | ..... | Sept. 9 | 2.00 |
| Lucky Calumet, Ida | Aug. 11 | Sept. 10 | 0.005 |
| Morning Star, Utah | Aug. 8 | Sept. 1 | 0.0025 |
| North Franklin, Ida | July 31 | Aug. 28 | 0.005 |
| Potosi, Nev | Sept. 4 | Sept. 26 | 0.02 |
| Snowstorm, Ida | July 28 | Aug. 28 | 0.003 |
| Sunset, Ida | Aug. 15 | Sept. 6 | 0.0015 |
| Sunshine, Ida | July 1 | Sept. 10 | 0.001 |
| Tar Baby, Utah | Aug. 1 | Aug. 27 | 0.0025 |
| Utah [illegible] | Aug. 16 | Sept. 6 | 0.02 |
| Yellow Jacket, Nev | ..... | ..... | 0.10 |

### Monthly Average Prices of Metals

#### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

#### COPPER

| | New York | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | | 17.644 | ..... | 78.670 | |
| September | 17.508 | | 17.698 | | 78.762 | |
| October | 17.314 | ..... | 17.661 | | 76.389 | |
| November | 17.326 | | 17.617 | | 76.890 | |
| December | 17.376 | | 17.600 | | 75.516 | |
| Year | 16.341 | .. | 16.560 | ..... | 72.942 | ..... |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

#### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | | 208.351 | |
| September | 49.135 | | 223.762 | |
| October | 50.077 | | 228.353 | |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton.

#### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | ...... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | ...... | 4.924 | ...... | 22.292 | ...... |
| October | 5.071 | ...... | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | ...... | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

#### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | ..... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ..... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

#### PIG IRON IN PITTSBURG

| | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | ... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ..... | 16.03 | ...... | 15.63 | ..... |
| October | 17.90 | .... | 17.18 | ...... | 17.22 | .... |
| November | 18.07 | ..... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ..... | 18.73 | ...... |
| Year | $16.01 | ... | $14.93 | .... | $15.28 | ...... |

## STOCK QUOTATIONS

COLO. SPRINGS Aug. 19

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02 |
| Cripple Cr'k Con | .01 |
| C. K. & N. | .08 |
| Doctor Jack Pot | .05 |
| Elkton Con | .54 |
| El Paso | 3.18 |
| Findlay | .02 |
| Gold Dollar | .06 |
| Gold Sovereign | .02 |
| Isabella | .11 |
| Jack Pot | .04 |
| Jennie Sample | .06 |
| Lexington | .05 |
| Moon Anchor | ‡.01 |
| Old Gold | .02 |
| Mary McKinney | .59 |
| Pharmacist | .01 |
| Portland | .95 |
| Vindicator | .85 |
| Work | ‡[illegible] |

SALT LAKE Aug. 19

| Name of Comp. | Bid |
|---|---|
| Beck Tunnel | .05½ |
| Black Jack | .07 |
| Cedar Talisman | .00½ |
| Colorado Mining | .13 |
| Columbus Con | .02 |
| Crown Point | .01½ |
| Daly-Judge | 6.25 |
| Grand Central | .50 |
| Iron Blossom | 1.20 |
| Little Bell | .01 |
| Lower Mammoth | ‡.02 |
| Mason Valley | 6.00 |
| May Day | .05 |
| Nevada Hills | .88 |
| New York | ‡.02 |
| Prince Con. | .28 |
| Silver King Coal'n | 3.12½ |
| Sioux Con | .02 |
| Uncle Sam | .02½ |
| Yankee | ‡.08 |

TORONTO Aug. 19

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .05 | Foley O'Brien | .15 |
| Coniagas | 6.50 | Hollinger | 14.70 |
| T. & Hudson Bay | ‡65.00 | Imperial | ‡.01 |
| Timiskaming | .26 | Jupiter | .27 |
| Wettlaufer-Lor. | .11 | Pearl Lake | .28 |
| Apex | ‡.005 | Porcu. Gold | .08 |
| Crown Chartered | ‡.00¼ | Preston E. D. | .02 |
| Doble | .10 | Rea | .15 |
| Dome | 13.00 | Swastika | .04 |
| Dome Exten | .07 | West Dome | .10 |

SAN FRANCISCO Aug. 19

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 6.75 |
| Belcher | .21 | Jim Butler | .60 |
| Best & Belcher | .08 | MacNamara | .12 |
| Caledonia | 1.25 | Midway | .47 |
| Challenge Con | .07 | Mont.-Tonopah | 1.07½ |
| Chollar | .01 | North Star | .78 |
| Confidence | .19 | West End Con | 1.32½ |
| Con. Virginia | .11 | Atlanta | .14 |
| Crown Point | .21 | Booth | .01 |
| Gould & Curry | .03 | C. O. D. Con | .03 |
| Hale & Norcross | .07 | Comb. Frac | .03 |
| Mexican | 1.17 | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | .45 |
| Ophir | .21 | Round Mountain | .51 |
| Overman | .45 | Silver Pick | .03 |
| Potosi | .01 | Tramp Con | ‡.01 |
| Savage | .11 | Argonaut | 2.00 |
| Sierra Nevada | .07 | Bunker Hill | 1.70 |
| Union Con | .12 | Central Eureka | 13 |
| Yellow Jacket | .16 | So. Eureka | ‡2.62 |

N. Y. EXCH. Aug. 19

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 73½ |
| Am. Agri. Chem | 44½ |
| Am.Sm.&Ref.,com | 66⅛ |
| Am.Sm.&Ref.,pf | 100 |
| Am.Sm.Sec.,pf B | 84 |
| Anaconda | 36½ |
| Batopilas Min | 1¼ |
| BethlehemSteelpf | 73⅜ |
| Chino | 39⅝ |
| Federal M.&S.,pf. | 41½ |
| GreatNor.,ore,ctf. | 35 |
| Guggen. Exp | 45 |
| Homestake | 104 |
| Inspiration Con | 15⅝ |
| Miami Copper | 23⅛ |
| Nat'nalLead,com | 48 |
| National Lead, pf. | 107 |
| Nev. Consol | 16 |
| Phelps Dodge | 192½ |
| Pittsburg Coal, pf. | 84½ |
| Quicksilver, pf. | 3⅝ |
| Ray Con | 19⅛ |
| RepublicI&S.com. | 23¾ |
| Republic I & S. pf. | 87½ |
| SlossSheff'd.com. | 29 |
| Sloss Sheffield, pf | 80 |
| Tennessee Copper | 30⅞ |
| Utah Copper | 51 |
| U. S. Steel, com | 63¼ |
| U. S. Steel, pf. | 107¾ |
| Va.Car Chem., pf | 94½ |

BOSTON EXCH. Aug. 19

| Name of Comp. | Clg. |
|---|---|
| Adventure | 2¼ |
| Ahmeek | 275 |
| AlaskaGold M | 18⅞ |
| Algomah | ‡1⅛ |
| Allouez | 35½ |
| Am. Zinc | 21⅝ |
| Ariz. Com., ctfs. | 2⅜ |
| Bonanza | .32 |
| Boston & Corbin | .99 |
| Butte & Balak | 2¹⁄₁₆ |
| Calumet & Ariz | 63¾ |
| Calumet & Hecla | 435 |
| Centennial | 13⅞ |
| Cliff | 1½ |
| Copper Range | 40 |
| Daly West | 2¼ |
| East Butte | 11⅞ |
| Franklin | 4⅝ |
| Granby | 62¼ |
| Hancock | 17½ |
| Hedley Gold | ‡30 |
| Helvetia | .30 |
| Indiana | 5⅛ |
| Island Cr'k, com. | 51 |
| Island Cr'k, pfd. | 83 |
| Isle Royale | 19¾ |
| Keweenaw | 1⅛ |
| Lake | 6½ |
| La Salle | 3¾ |
| Mass | 2¾ |
| Michigan | 1 |
| Mohawk | 43½ |
| New Arcadian | 1¾ |
| New Idria Quick | ‡3⅞ |
| North Butte | 27⅝ |
| North Lake | 1⅝ |
| Ojibway | .80 |
| Old Dominion | 49 |
| Osceola | 80 |
| Quincy | 60 |
| Shannon | 6⅞ |
| Shattuck-Ariz | 25¾ |
| Superior | 24½ |
| Superior & Bost. | 2⅝ |
| Tamarack | 28 |
| Trinity | 4⅝ |
| Tuolumne | .85 |
| U. S. Smelting | 37 |
| U. S. Smelt'g. pf. | 47⅝ |
| Utah Apex | 1¾ |
| Utah Con | 9¼ |
| Victoria | 1 |
| Winona | 1½ |
| Wolverine | 44½ |
| Wyandot | ¾ |

N. Y. CURB Aug. 19

| Name of Comp. | Clg. |
|---|---|
| Barnes King | ‡1.73 |
| Beaver Con | .29 |
| Big Four | .32 |
| Braden Copper | 6⅞ |
| B. C. Copper | 2⅜ |
| Buffalo Mines | 2⅛ |
| Can. G. & S. | .22 |
| Con. Ariz. Sm. | ¼ |
| Davis-Daly | 1⅞ |
| Diam'field-Daisy | .02 |
| Ely Con | .08 |
| Florence | .20 |
| Giroux | 1 |
| Gold Hill Con | ‡¼ |
| Goldfield Con | 1⁵⁄₁₆ |
| Greene Cananea | 32 |
| Greenwater | .04 |
| Internat. S. & R. | 115 |
| Kerr Lake | 3⅝ |
| Keystone | ‡2 |
| La Rose | 2³⁄₁₆ |
| McKinley-Dar-Sa | 1¼ |
| Min. Co. of A. new | 2¾ |
| Motherlode Gold | ‡.40 |
| Nipissing Mines | 8⅞ |
| Ohio Copper | ⅝ |
| Pacific Sm. & M. | ¹⁄₁₆ |
| Puebla S. & R. | ¹⁄₁₆ |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N. J. | 372 |
| Stewart | 1¹⁄₁₆ |
| Tonopah | 4⅛ |
| Tonopah Ex | 2⅛ |
| Tonopah Merger | .69 |
| Tri-Bullion | ⅛ |
| Tularosa | ⅜ |
| Union Mines | ¹⁄₁₆ |
| United Cop., pfd. | 2½ |
| Yukon Gold | 2 |

LONDON Aug. 9

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 14s 9d |
| El Oro | 0 14 3 |
| Esperanza | 1 1 3 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 5 3 |
| Santa Gert'dis | 0 16 3 |
| Stratton's | 0 1 9 |
| Tomboy | 1 4 3 |

BOSTON CURB Aug. 19

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 4 |
| Boston Ely | 51 |
| Butte & Lon'n Dev. | 32 |
| Butte Central | 03 |
| Cactus | 02 |
| Calaveras | 2¼ |
| Chief Cons | 1¾ |
| Corbin | 99 |
| Cortez | 20 |
| Crown Reserve | 1⅛ |
| Eagle & Blue Bell | 93 |
| First Nat. Cop. | 2³⁄₁₆ |
| Houghton Copper | 3½ |
| Majestic | 33 |
| Mexican Metals | 47 |
| Moneta Porc | ‡07 |
| Nevada-Douglas | 1⅛ |
| New Baltic | 60 |
| Oneco | 85 |
| Raven Copper | 14 |
| Rhode Island Coal | 01 |
| Smokey Dev. | 1 |
| S. W. Miami | 2 |
| South Lake | 4 |
| Trethewey | 24 |
| United Verde Ext. | 55 |

‡Last quotation

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# The Argo Cyanide Mill, Idaho Springs, Colo.

By Stephen L. Goodale*

*SYNOPSIS—Description of a recently-constructed custom mill at the mouth of the Newhouse tunnel. Different ores are received in separate bins and mixed as desired for milling. Concentration, amalgamation and cyanidation is the combination process employed. Stamps are used for crushing in cyanide solution. Counter-current decantation is practiced for slime washing.*

⁂

Situated near the mouth of the Argo, better known as the Newhouse, tunnel, is the Argo mill, which was put into commission early this year. It is still undergoing minor changes such as are usually made in a new plant as improvement ideas occur to those in charge. The plan of treatment was worked out at the Hudson mill by the present management, and in building the Argo mill, certain defects of the earlier one were overcome. An important improvement is the gravity handling of pulp and consequent elimination of elevators, necessary at the Hudson because of its situation on nearly level ground.

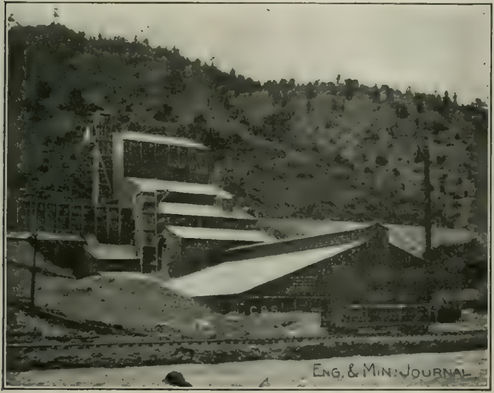

Fig. 1. View of Argo Mill from across Clear Creek

### A Steel-Frame Building on Dump Ground

The mill is housed in a steel-frame building covered with corrugated iron. It is built on a steep piece of made ground at the edge of the tunnel dump. Four terraces or principal floor levels in the mill are the upper, or battery and amalgamating floor; the second, Card concentrator floor; third, tube-mill level; and fourth, that containing the six slime-treatment tanks, concentrate bins, boiler, compressor, zinc boxes, etc. The sampler is entirely separate from the other parts of the mill.

As the building is on dump-made ground, it was necessary to carry all foundations to an unusually great depth to rest them on bed rock. Battery pillars are over 20 ft. deep and have an open passage or channel through the center into which the holding-down bolts of the foundation extend. Below this they unite into one solid reinforced-concrete pillar reaching under the length of the four batteries to bedrock. The pillars for the tube mill also extend to bedrock, and it has recently become necessary to extend those for the head thickener tank to bedrock also, because settling has been sufficient to throw the tank out of level. Other foundations have been taken well below the original surface into good gravel but not to bedrock. Three reinforced-concrete retaining walls support the upper terraces and these are now being more strongly buttressed.

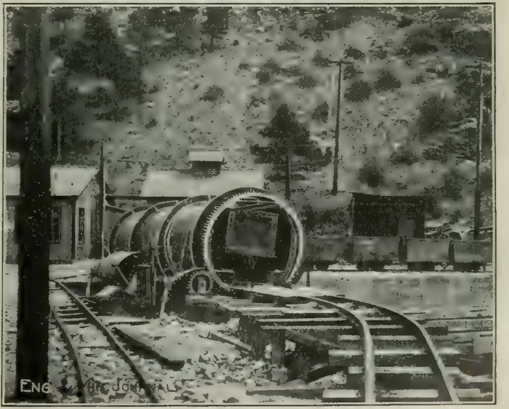

Fig. 2. Ore Distributor and Tipple at Argo Mill

The building is to be heated by radiation from the vats, solution piping, etc., and since the mill solutions must be kept at a temperature of 70° F. or more for the success of the process, it is hoped that this source of heat will be sufficient, although radiators will probably be required in parts of the sampler. Steam coils are placed in the vats and the end of the steam line is open into the vat which is taking water wash. Steam for this purpose is generated by one of the old Newhouse-tunnel boilers, erected on the lower floor of the mill. The presence of the boiler will doubtless aid in heating.

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*Professor of metallurgy, University of Pittsburgh, Pittsburgh, Penn.

### Ore Is Mechanically Sampled

The sampler is to the left of the mine, Fig. 1, and the main-treatment thickener tanks are in the lower wing of the mill nearest the creek. Ore for treatment comes from the tunnel and is trammed by motor, three cars at a time, into the tipple, which is then brought over the proper bin, and the three cars overturned, held fast in the tipple cylinder meanwhile. An incline track has been installed connecting the Colorado & Southern Ry. siding with the top of the tunnel dump, so that ore may be handled cheaply from railroad cars and to the receiving bins. Regular tunnel cars are used for this transfer and are pulled to the top of the dump by a small electric hoist and moved from there to the bins by a motor. Twenty-two separate bins are served by this distributing device. They are not enclosed, but will be later as protection from rain and snow. A steel-pan conveyor takes the ore from any one or combination of bins and delivers it to the gyratory crusher in the sampling plant.

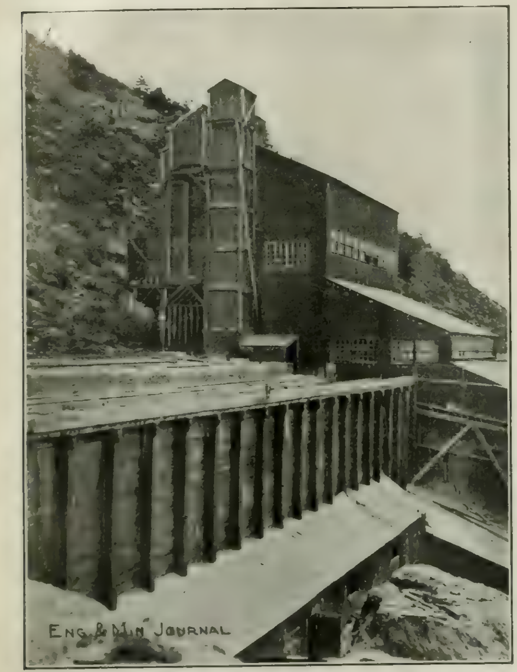


Fig. 3. Ore Bins and Upper Part of Argo Mill

A sampling plant in connection with a mill is an innovation in the district. The purchase of ore on the basis of careful sampling is a necessity with this type of mill because great value is locked up in process of treatment. With the simpler amalgamating and concentrating mills it is possible to treat each lot separately, milling for the account of the owner without purchasing it outright. Even with these simpler mills it is probable that sampling would give results more satisfactory. The treatment schedule reproduced herewith shows the present basis for the purchase of ores.

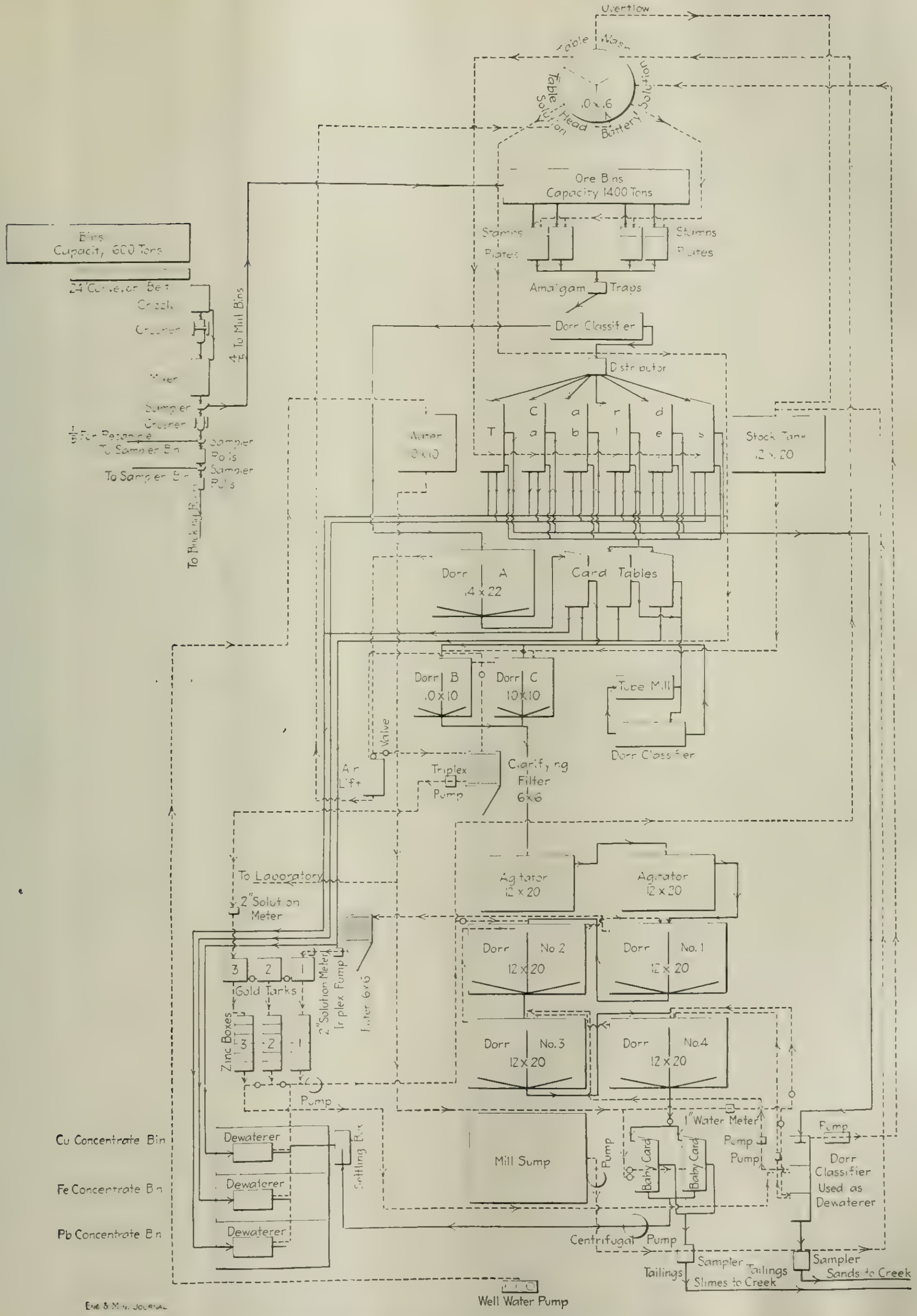
The practice in sampling is to take a 20% cut of the ore which has been crushed in the gyratory to pass a 1½ in. ring, sending the 80% to the mill. The 20% portion is then crushed by rolls, and a second 20% cut taken, the 80% portion here being reserved until after settlement for the lot has been made with the shipper, when it is sent to the mill. A third 20% cut is taken, the 80% portion going to the mill. The final sample, 1/125 of the original lot, is finished by hand and four assay samples made up as usual.

Ore sent to the mill is elevated and conveyed to a single 1400-ton flat-bottom bin at the top of the mill. It is distributed throughout the bin, the full width of the mill, by an automatic traveling-belt tripper. No belt elevators or conveyors are used in any part of the plant except those used to raise the sampled ore to the top of the mill.

### Gravity Stamps Followed by Amalgamation

There are twenty 1000-pound, high-speed, short-drop stamps, arranged in two sets of 10, each driven by a three-phase, constant-speed motor which is geared to the shaft which carries the pinion for the main-belt drive. This gearing was made too light and the teeth have been stripped, but heavier gears are to be installed. The usual arrangement of bin gates with suspended Challenge feeders has been adopted. The mortars have an extra large base, 42 in. wide by 58 in. long, and are set on a thin lead plate directly on the concrete. Eight 1¾-in. holding-down bolts are used for each mortar. Most of the ores likely to be milled are easily crushed and slime readily, and stamp duty is consequently high. About 135 tons per day is crushed by the twenty stamps when using a 12-mesh battery screen and a 4-in. discharge. All crushing is done in cyanide solution. All solution flows to the stamps through a barrel placed in front of each battery. Lime may be conveniently added in the barrels when required.

The amalgamating plates, following the usual practice in the district, are only 5 ft. long. Longer plates would make a higher saving, but this added amount was found by experiments made with longer plates at the Hudson mill to cost more than it would be worth because of the great difficulty of keeping long plates in good order when crushing in cyanide solution. Each plate discharges into an amalgam trap, all four of which are placed in one 4x4-ft. wooden tank, which discharges through a central bottom pipe to the Dorr classifier. These amalgam traps are electrolytic and constitute one of the particularly interesting features of the mill. They consist of a lower cone 12 in. in diameter and 12 in. deep, holding a copper plate floating on a bath of mercury. The pulp is discharged through a 2-in. pipe, 3 in. above the cone plate and insulated from the lower cone, though rigidly fastened to it. This pipe is enlarged above to 6 in. and is connected to the positive side of a direct-current circuit, the copper plate in the cone below forming the cathode. The 6-volt current for this use is made by a 4-kw. generator placed on the second terrace just below



FLOW SHEET OF ARGO MILL, IDAHO SPRINGS, COLO.

the traps to secure short leads. The installation of this efficient device, which gave good enough results at the Hudson mill to justify its adoption here, is doubtless an ample corrective for the rather short apron plates.

### Dorr Classifiers Separate Sand for Concentration

The pulp from the traps is separated by a duplex Dorr classifier into sand and slime, the term slime throughout this paper being used to indicate not only the colloid but also the fine granular sand which accompanies it. The sand flows through a simple cone distributor to five Card concentrators, the placing of which is an admirable example of efficient space utilization, a point which doubtless originated in a study of the Hudson mill, the only one where the writer has seen such close placing of concentrating tables. So close are they set to each other that only the ends, and not the sides, are easily accessible. By fitting the tables so closely it was possible to get them on the most convenient level, and it is still possible to conveniently make the occasional adjustments necessary.

### Four Concentration Products Made

These tables make four products: a lead concentrate and an iron concentrate, which pass through small Dorr classifiers and proceed to their respective bins, a middling, which is reconcentrated on another Card concentrator on the terrace next lower down and a final tailing which passes to a three-unit Dorr classifier, where it is dewatered and washed, first with barren solution and then with water, and then run to the creek. The sand tailing carries only 50 to 70c. per ton in both silver and gold, but it is possible that it may be treated in the near future by amalgamation to recover gold that has been brightened by the cyanide without having been in contact long enough for complete solution. Such treatment is successful with ores carrying coarse, rusty gold as some of the Gilpin and Clear Creek County ores do. The treatment is similar to that applied to the Annie Laurie ore in southern Utah some years ago.

Concentrate from the middling table is sent to the copper-shipping bin. Tailing from this table unites with the spitzkasten underflow, and the combined material goes to a small classifier. The slime from it goes to two 10-ft. agitators and the sand to a 3x10-ft. tube mill. The tube-mill discharge is returned to the classifier. The single-compartment spitzkasten which receives the slime overflow of the first classifier, will in future deliver its underflow to a Card concentrator instead of to the tube mill as is now done.

In the original plan of the mill it was designed to concentrate the underflow from the 14x22-ft. thickener on two Card concentrators, but trouble was experienced in feeding the tables from that source, the pipes frequently stopping up, and feeding irregularly. The spitzkasten has been installed to divert the heaviest of the material, as otherwise it would not be caught until reaching the lower end of the mill, and would thus be subject to the action of the cyanide solution a long time.

### Agitation both Mechanical and Air

The overflow from the head thickener is pumped to the [illegible] mill by a triplex plunger pump, to which can be [illegible] to the overflow of the two 10-ft. agitators which take the tube-mill product. The pipe connections here are such that if desired the overflow of the agitators and thickener can be sent direct to a precipitation box, and this would doubtless be done with certain ores, then supplying battery solution from a lower-grade source. The underflow from the head thickener, together with the underflow of the two 10-ft. agitators, goes to the two 12x20-ft. agitators, and constitutes the feed for the large treatment tanks. The agitation is accomplished mainly by compressed-air lifts, although mechanical stirrers are also used in three of the agitators. Five air lifts are used in the 12x20-ft. vat, which has no mechanical stirrer. Air is furnished for these agitators by a 14x8-in. compressor run at 200 r.p.m., and an old fire-tube boiler is used for an air reservoir. Careful technical control and thorough previous experimenting are indications that the Argo mill is likely to continue operations for a long time, and will not join the ranks of the "monuments" so plentiful hereabout.

### Counter-Current Slime Washing

Four 12x20-ft. Dorr thickeners follow the agitator tanks, and are arranged three in series for the main slime treatment, and one on settler service for various slime overflows from the lower part of the mill. The counter-current principle is applied in treating the pulp on its way through these tanks. In detail, the flow is as shown in the accompanying flow sheet. The concentrate from the two Card tables carries sufficient copper to be classed as a copper product and is delivered through a dewatering classifier to the copper bin for shipment. Tank 4 is set 68 in. higher than tank 1, and the intermediate ones are set at intermediate levels so that the solution may run back by gravity. The overflow of tank 1 flows to a clarifying leaf-filter, whence it is drawn to the zinc boxes. The pulp, or underflows, are brought forward from one vat to the next by simple 12-in. diaphragm pumps. The filter for the overflow, as well as the one receiving the overflow of the 10-ft. thickeners, has 15 small-size leaves of the Moore type.

The cyanide solution is made up to the proper strength for the ore under treatment, at present 1½ lb. to the ton of solution in the agitator tanks. Sump solutions and overflows from various apparatus are pumped up by either small centrifugal or plunger pumps to their appropriate re-use or storage higher up in the mill. The mill laboratory work is carried on at a portable table fitted with burette stands, sink, etc., and situated now on the lowest level. The solution-storage capacity required, comprising only two 12x20-ft. tanks, one of which is just up the hill from the ore bins and not yet under cover, is rather small, especially considering the varied kinds of ore likely to be treated.

### Zinc Shavings Used for Precipitation

There are three 5-compartment zinc boxes, built of sheet iron and painted with P. & B. paint, the bottom sloping steeply to one side. The outlet of each compartment is at the middle of the low side instead of at the low corner, which would have been more convenient for cleaning out. Pregnant solution is drawn by means of two plunger pumps from the clarifying filters and delivered continuously through solution meters to three small pregnant-solution tanks above the zinc boxes. In the head compartment of each box is placed an electrolytic oxidizer, consisting of a frame carrying 20 anodes and cathodes 5 in. wide and immersed 4 in. deep in solution. These serve as an antidote for cyanicides in the solution.

In cleaning up, the zinc is removed from a compartment and the precipitate washed down into a 4-ft. wooden vat set down into the concrete floor, using a 1½-in. hose screwed to the compartment outlet to prevent leakage or spattering. A single filter leaf, 20 in. square, connected to the suction end of a centrifugal pump, is used to collect the slimy precipitate from this vat. It is planned to replace this single leaf by a collector of 6 similar leaves, so arranged that each can be swung out of the tank by itself for removing the precipitate, thus making this part of cleaning up more continuous. The precipitate is scraped from the filter into a large iron pan, dried over a slow fire and screened to break up the fine zinc. It is then sampled and sold to the refinery. The zinc boxes are raised several feet above the floor to permit ready inspection and cleaning beneath. The floor, which is concrete, smoothly faced, slopes to a drain from which any spills can be easily gathered. Barren solution flows to the mill sump.

ARGO REDUCTION AND ORE-PURCHASING WORKS—TREATMENT SCHEDULE

Gold—Pay $19 per oz., if 0.05 oz. to 1.5 oz. per ton.
Pay $19.50 per oz., if 1.5 oz. and over per ton.
Silver—Pay New York quotation, date of assay, for 60 per ct. of the silver assay, if one oz. and over per ton.
Lead—Deduct 2% from the fire assay and pay 25c. per unit for the balance.
Copper—Deduct 1.5% from the wet assay and pay $1 per unit for the balance.
Zinc—No pay. No penalty.
Sampling—No charge for 12-ton lots and over; $1 per ton for less than 12-ton lots.

TREATMENT CHARGES

| Gross Value of Ore per Ton | Charge per Ton |
|---|---|
| Up to $3 | $2.00 |
| Over $3 to $4 | 2.50 |
| Over 4 to 5 | 3.00 |
| Over 5 to 6 | 3.25 |
| Over 6 to 7 | 3.50 |
| Over 7 to 8 | 3.75 |
| Over 8 to 9 | 4.00 |
| Over 9 to 10 | 4.25 |
| Over 10 to 11 | 4.50 |
| Over 11 to 14 | 4.75 |
| Over 14 to 20 | 5.00 |
| Over 20 to 25 | 5.75 |
| Over 25 to 30 | 7.00 |
| Over 30 to 35 | 8.00 |
| Over 35 to 40 | 9.00 |
| Over 40 to 45 | 9.50 |
| Over 45 to 50 | 10.00 |
| Over 50 to 75 | 11.00 |
| Over 75 | 12.00 |

A Colorado & Southern Ry. siding runs up close beside the mill at the lower level, so that concentrate has to be wheeled but a short distance from the bins to the cars. Coal for the boiler can thus cheaply be brought to the coal bin, and other supplies delivered conveniently.

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## Sapphire Concentration

Special Correspondence

The method of recovering the stones from the ground of the New Mines Sapphire Syndicate, Yogo, Mont., is rather unusual and interesting. The matrix containing the stones is an intrusive igneous rock, weathered to a yellow clay, for a depth of approximately 20 ft. from the surface. From this portion the sapphires are easily separated by washing. Below this belt, where the rock is harder, it has been found necessary to disintegrate it by exposing it in piles to the weather and wetting occasionally. The ore is placed on inclined floors and left for several months during the winter; the frequent freezing and thawing causes the lumps to slack and disintegrate. A large stream of water is then played on the piles and the material sluiced similarly to placer gold. Beyond the first set of riffles is a settling basin, where the lump material, carried down, undergoes further disintegration; thence it passes over more riffles to the second and final disintegrating basin. The riffles are cleaned four or five times in 24 hr., and the concentrate separated in a rocker sieve into three sizes, the oversize from a ⅝-in. screen being carefully examined for sapphires before being discarded. Further concentration is then obtained by passing the material over screens with meshes of two different sizes, the larger sapphires being then picked out by hand. The smaller ones, suitable for watch jewels, etc., are shipped in the rough. The stones are shipped to London semiannually, where they are cut and then sent to the market.

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## Shaft-Sinking Methods at Butte

By H. S. Munroe*

Shaft sinking, an epoch-making affair in many camps, is in Butte an ordinary phase of mining. There is hardly a time, under average conditions, when new shafts or extensions are not in process of sinking. There is in the camp a class of labor, largely Finns and Canadians, young, strong and extraordinarily efficient, who do not deign to do mining work other than sinking. Constant practice has made them past-masters, and, given ordinarily good supervision, it is doubtful if as good a class of men for the sinking of vertical shafts with machines could be found anywhere.

### Three-Compartment Shaft Design

With a few exceptions the Butte shafts are of standard design, consisting of two hoisting compartments, each 4 ft. 6 in. by 4 ft., and a longer compartment which is usually divided into a small "chippy" compartment and a pipe- and ladderway. The wall plates are 19 or 20 ft. long and are usually not spliced. The end plates are uniformly 6 ft. long. The sets are put in on 5-ft. centers.

Depending on the use to which the shaft is to be put and the ground conditions, the wall and end plates are of 12x12-in. up to 12x16-in. timber, the greater dimension being always the vertical one. The spreaders (or dividers) are of 10x14-in. up to 12x18-in. material, the vertical dimension of the spreader being 2 in. more than that of the plates, thus giving the center posts an inch more bearing at each end than would be possible were the spreaders of the same vertical dimension as the plates. The corner posts are 12x12 in., and the center posts of 10x12-in. timber. Guide posts of 10x12 in. are often put in to give the guides a solid backing of timber. Lagging 2 in. thick is used and is wedged to as heavy a stringer as the ground space will permit, for instance, 5x10 in. Ordinarily 4x6-in. guides are used, but in cases where the shaft is to be used for hoisting a large tonnage with heavy skips, guides as heavy as 4x10 in. are installed.

### Placing the Timbers

In placing the timbers the hanging bolts are left for five or six sets only, never more than ten. For lining in the timbers, comparatively short lines are used, care being taken to place the blocks on a perfect set when moving them down. It is seldom that more than five sets are lined in from the same set above. While the practice varies with individuals, generally four lines are used, one in each corner or one in each of three corners and another either in the middle of a wall or end plate or in a corner of the wall plate and a spreader. The sets are tried for level every 50 ft. and if found out of level, special posts are put in to bring the next set back to level.

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*Mining engineer, Golden, Colo.

### Drilling and Blasting Methods

Up to a few years ago either two or three $3\frac{1}{4}$-in. piston machines were employed for sinking. This is still the prevailing practice but where conditions of ground and water are favorable heavy hammer machines are often used. The ground can be broken more closely with the latter and if conditions are right, fully as great speed may be realized. Where the piston machines are used, a couple of stopers and pluggers are kept available for plugging where the ground has not broken quite large enough for timbers. With piston machines the men try to pull enough ground for two sets of timbers each round. It does not often happen that this can be realized consistently, but occasionally it can. In one shaft which I watched for two months, 19 sets were placed for nine rounds the first month and 21 sets for 10 rounds the second. To do this sort of work it is necessary to finish with at least 14-ft. drills in the cut holes. Where hammer machines are used it is aimed to pull about 6 ft. to the round and this is often accomplished.

The greatest advantage of the air hammers over the piston machines lies perhaps in the blasting. Often the first blast will break bottom, whereas with the piston-machine rounds it is always necessary to blast twice and often three times. As to the practice with piston-machine rounds of blasting and mucking out the cuts first and then blasting the rest of the round, opinion is divided. It is undoubtedly the most economical procedure, but where cost is subordinated to speed, I rather favor blasting the whole round at one time, as occasionally luck favors the operator enough to allow of a clean break. Ground conditions are always a strong governing influence in this also; often blasting the whole round at once is sheer foolishness. In loading, two primers are always used with about 12 ft. of fuse for each. Electric firing is not in favor in Butte.

### Mucking and Hoisting

Buckets swung under sinking cages are used almost universally and the muck is hoisted entirely through the middle compartment. One end compartment is kept lined for an air shaft and the other end bulkheaded every 50 ft. or so for safety. After a blast the men will go down and sink a "well" under the middle compartment, using round-point shovels. They will often get this 6 or 8 ft. under the level of the muck pile on the ends. Then keeping the buckets in this "well" they will place a slide of lagging and shovel with square-point shovels. With six men in the bottom, 100 buckets is not an unusual tally for a straight mucking shift of $7\frac{1}{2}$ working hours. Two buckets are used, the empty being loaded while the loaded bucket is being hoisted, dumped and lowered.

Differing from the practice in many camps, when the loaded bucket has cleared the collar, doors are shut over the shaft, a car run on them and the bucket dumped directly into the car instead of into a bin or chute as is often done elsewhere. The doors are 3 or 4 in. thick and are connected up to a single counterbalance weight so that the labor of opening and closing is slight. The bail on the bucket is hung slightly under the level of the center of mass of the loaded bucket with a locking ring to hold the bucket in an upright position. To dump, the ring is merely knocked up and the bucket dumps itself. Until recently, large rocks were sent up in chains, but this having resulted in several fatal accidents, the practice was prohibited and nothing is now sent up except in buckets.

Timbers are sent down in the usual way. The wall plates are swung under the cage with chain and clevis and the short timbers lashed to the deck of the cage. Long sinking-shoes are used on the cages, but the guides are kept down to the second set from the bottom, the last set being placed minus one of its spreaders, to facilitate the landing of the succeeding wall plates.

As to safety: Ladders are kept down within three or four sets from the bottom and a chain ladder is usually hung from there down. The law requires two sets of signaling apparatus, usually the ordinary bell rope and an electric pull bob. Where available, clusters of electric lights on long extension cords are used for lighting. These are continually causing slight shocks in the wet shafts, but are preferable to candles.

Most of the sinking is done on contract or bonus, usually the former. The foremen hire and fire the men and everyone on the contract participates in the profits. Four, five and six men per shift are worked in the bottom, the fewer the men the greater the economy for both company and contractors. The contract price varies from \$25 to \$35 per ft. and includes all the labor of sinking, so far as the bottom is concerned, including extending ladders, placing bulkheads, etc., but not including any pumping or electrical work. The contract is usually made to require work three shifts per day and seven days per week, especially where water is bothersome. All men working in the bottom are guaranteed \$4.50 per shift.

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## Nickel in Madagascar

In a memorandum to the Société des Ingenieurs Civils de France, M. Bonnefond, chief of the Service of Mines of Madagascar, says that a deposit of garnierite, said to be extensive, has been discovered by an English company near Ambositra near the east coast of the island. Some of the ore carries 7 to 8% nickel, but the average tenor will probably not be over 3 to 4%. About 10 km. distant there is a waterfall, which could be made to give 10,000 hp. for the operation of the mines. The ore mined would have to be carried down the river to Manonjary, which is a poor port, as vessels cannot approach within 4 km. on account of shoals. The estimated cost of transporting and loading the ore is 65 to 70 fr. per ton; freight to Marseilles or Havre, 55 to 60 fr. The deposit is on a high plateau, 1300 m. above the sea level.

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**Utah Asphalt for Road Building is** to be tested at Washington by B. H. Burrell, senior road engineer in the Government service. On the receipt of the report it is proposed to build for experimental purposes a roadbed one-quarter mile long between Salt Lake City and Murray. Following the advice of Mr. Burrell it is the plan to lay the road in stretches, side by side, with the asphalt in various combinations so as to ascertain the best method of treatment. The combinations are in general to be as follows: Gravel base with rock-asphalt facing; slag base with rock-asphalt facing; concrete base with rock asphalt on clean concrete surface; concrete base with a brush of bitumen and rock-asphalt facing over bitumen. The road is to be built by the county commissioners at an estimated expense of about \$2000. The experiment will be of much value in the campaign of road building to be undertaken by Salt Lake County.

# Sanitation in Mines and Mine Towns*

*SYNOPSIS—Improved change houses are being built in Lake Superior region. Underground conditions should receive attention. Sanitation around the miners' houses of the greatest importance. Improvements necessary in sewage, garbage and manure disposal. The outdoor privy is a constant menace. School training and visiting nurses can accomplish much good. Good work by some companies should be continued and imitated.*

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It is undoubtedly true that better living conditions around the mine and better physical health make for more satisfactory service got from the miners. The health of the men may be conserved in many practical ways. Much has already been accomplished and due credit should be given to the many companies in the Lake Superior region who have paid special consideration to the health of their men.

The old wooden drys are now being replaced by buildings equipped with abundant hot and cold water, individual basins or buckets, lockers for street and mine clothes, and drying and ventilating systems which effectually take care of the wet clothing of the miner. The plan of suspending the wet clothes by means of a rope or chain, with individual lock, has much to commend it. The shower bath, a part of all modern drys, has made bathing possible for the men who have not the proper facilities at home. Their constant use has demonstrated their value. The introduction of water closets in the drys has not always met with complete success, but in most cases it is working advantageously and improving the underground conditions.

### CONDITIONS UNDERGROUND

Dry closets should be placed in every main level underground and should be provided in the ratio of one to every 25 men. These closets should be made of wood or iron of a size to be conveniently handled by two men, and should be taken to the surface, emptied and washed out with a hose. Lime should be kept convenient to the boxes and used regularly. There is no more fruitful source of disease than the human excreta left in the mine workings.

The drinking water should have the most careful attention and under no circumstances should the men be permitted to drink water that is not known to be pure. This can be made possible only by furnishing good water so that it can be readily obtained. The plan of the Oliver Iron Mining Co. in providing bubbling fountains, thus doing away with the old dirty drinking cup, is to be highly commended.

Anything that will lessen the frequency among our miners of tuberculosis, typhoid, diphtheria, scarlet fever and other contagious or communicable diseases, should be carefully considered. There should be a more rigid quarantine in contagious cases, and the mining companies should coöperate more fully with the health officers, making and enforcing regulations designed to improve our unenviable record in this matter.

Owing to the relation that the physicians bear to the mining companies, they may hesitate to suggest things which might appear as criticism of existing conditions or methods of mine management, and they should therefore be given full authority to correct undesirable conditions. I believe we would get better results in this matter of sanitation by employing the physicians, at a stated added remuneration, to make periodical inspection of the properties.

Proper ventilation should be provided underground, thus adding to the efficiency of the men and incidentally prolonging their lives. Tuberculosis and similar diseases would then be less prevalent.

### SANITATION IN THE HOME

The sanitary condition of the home has a great influence on the lives of the men. What can reasonably be expected of a man living in unhealthful surroundings? I believe that the mining companies owe a duty to the men employed by them and to the community in which they live. One of the most efficient ways of fulfilling this obligation is to provide satisfactory homes, with healthful surroundings for the men and their families. Any work of this kind must be done in such a way that the men will be led to coöperate and there will be no suggestion of paternalism. The importance of providing houses for rental is generally recognized but after the house is provided it is just as essential that its condition be not neglected. We have seen houses where the waste water must be thrown out upon the ground. The advantage of this in providing a good place for the propagation of fish worms is offset by its assistance in the propagation of other less desirable things. The old boxed-in cupboard sink may yet be found. It is a place for refuse and vermin, a rotten, dirty, slimy hole. Where such exist, let them be torn out. The drainage around the houses and other properties requires careful attention. Ditches should be dug and kept open, even if the boys fill them up, and no stagnant water left to breed mosquitoes and infection.

### GARBAGE, STABLES AND PRIVIES

Garbage and refuse should be deposited in covered receptacles, preferably galvanized-iron cans, and where such services are not rendered by the city or village, the companies should provide for its regular collection and disposal not less frequently than once a week. It has been found feasible in some places to have the occupants of the premises purchase the cans, which are supplied at wholesale rates, or through the company at cost, with the understanding that proper collection is assured. Rubbish should not be dumped around promiscuously but should be deposited in a designated place, collected and disposed of. Few of the men have time or facilities for economically doing this, and if not looked after by the city or the company, it will not be taken care of at all satisfactorily. A refuse burner, costing little, can be so located as to make the disposal of rubbish a simple matter and comparatively an inexpensive one.

It is desirable in many cases to permit the keeping of a cow or horse, but provision should be made for the care of the manure. It should not be allowed to accumulate from month to month, but should be removed promptly. It also should be treated with chloride of lime, or with a kerosene and carbolic acid mixture. In those localities having no sewer connections, the question of privies is a serious matter. Too often the privy is set on the ground with no proper receptacle for the human excreta, and this often spreads over the ground, even if a pit is dug. This is frequently allowed to collect throughout the season and become a menace to the family. The houses being more or less open, vermin enters without hindrance, and the ever-present, disease-carrying fly, fresh from the privy, feeds on the baby and the household food. We have just begun to appreciate the danger from these pests. The companies which have already set an example in their campaign against the fly should be congratulated, and the rest of us stimulated to an equal effort. These outhouses should be provided with a proper receptacle, be emptied and properly cleaned at regular and not too infrequent intervals. Either earth, slacked lime or chloride of lime should be constantly used.

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*Reprinted from a paper entitled, "Sanitation for Mine Locations," by W. H. Moulton, secretary of the pension department of the Cleveland-Cliffs Iron Co., Ishpeming, Mich.; prepared for the Minnesota meeting of the Lake Superior Mining Institute, Aug. 26, 1913.

Much good can be accomplished by the teaching of sanitation in the public and parochial schools. The value of the physical inspection of school children is only just beginning to be appreciated. It is a health precaution of great merit and should be in effect in all our communities.

The most efficient agency in extending the benefit of this work of sanitation is the visiting or public-health nurse. A number of mining companies in the Lake Superior region have already introduced this service with much success. No other person can have the same opportunity to reach the homes and the members of the families and to teach the benefits of fresh air, cleanliness and other sanitary precautions. The importance of fresh air is a point that cannot be emphasized too strongly. The mining companies are to be commended for the work that has been done for the men, their families and the communities in which their operations are conducted, but with this commendation must come the realization that there is still much to be accomplished.

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## Utah Copper Co.

Report of operations of the Utah Copper Co. for the second quarter of 1913, including April, May and June, shows that the production of copper in concentrate was 9,834,894 lb., 10,312,605 lb. and 11,637,949 lb. for the respective months, a total of 31,785,448 lb. A total of 1,910,214 tons of ore were treated, 55% in the Magna mill and 45% in the Arthur plant. Average grade of ore was 1.2807% copper.

Copper was produced at an average cost per pound of 8.933c. If miscellaneous income in Utah, including that of the Bingham & Garfield Ry., were applied as cost reduction, the cost per pound of copper would be reduced to 8.160 cents.

Earnings for the quarter are on a basis of 15c. per lb. received for copper. The total amount in hand, sold and unsold, at the end of the quarter, was 33,620,594 lb., inventoried at 13.778c. per lb. No copper due for delivery from the refinery remained unsold.

Both plants were in continuous operation, averaging [illegible] tons per day. Financial results are as follows:

| | |
|---|---|
| [illegible] milling operations | $1,832,071 |
| [illegible] etc., in Utah | 11,495 |
| [illegible] da Cons. Copper Co. dividends | 375,187 |
| Total [illegible] for the quarter | $2,218,753 |
| Dividend | 1,186,628 |
| Net surplus for quarter | $1,032,125 |

## The Action of Oxidizers in Cyaniding

Commenting upon a former paper by Morris Green[1], W. B. Chomley, of Western Australia[2], remarks that he agrees with Mr. Green and has not found any beneficial effect from oxidizers in cyanide solution. From the fact that cyanide itself is a strong reducing agent, it appears to him that the action of an oxidizer in the presence of KCN cannot do anything but harm. Of course, bromo-cyanide might be quoted as an exception, but as its use has only proved of value in dealing with telluride ore, it seems probable that its beneficial effect is due to some inherent quality which enables it to attack the tellurium, rather than to its oxidizing action.

When experimenting with $KMnO_4$ in cyanide solution he noticed a strong odor of ammonia. In fact, J. Moir and J. Gray pointed out that $NH_3$ was one of the products of the action of $KMnO_4$ on KCN in their paper on "The Destruction of Cyanide." The estimation of KCN by the common method with $AgNO_3$ in the presence of $NH_3$ would be unreliable, and it may be that the unaccountable failure to get gold in the solution under some conditions is due, to some extent, to the fact that the quantity of KCN which was shown by testing was not really there. That this decomposition of KCN into ammonia will go on sometimes without the addition of artificial oxidizers, there is some evidence. At one time periodical tests of the efficiency of the roast from a furnace working on sulpho-telluride concentrate, had to be made. This was done by shaking for a given time a weighed quantity of the roasted product with a measured quantity of a standard solution of KCN and then estimating the loss of KCN. On some occasions it appeared that the strength had actually increased to considerable extent. On further investigation, using stronger solutions and more ore to exaggerate the results, ammonia fumes were given out in noticeable quantities. That this was not due to any peculiarity of the cyanide itself, was proved by the fact that, using the same KCN solution on different samples of ore, the same result was not always brought about. This presented the possibility of all sorts of errors when making comparative tests of any kind with different solutions of apparently the same strength. Since that time when treating low-grade slime, it has often been noticed that the treatment samples showed that the solution of gold had stopped while there was still apparently 0.02% KCN present, and no amount of extra agitation would reduce the gold value; but on the addition of more KCN the undissolved value immediately dropped to a trace, although there was no apparent alteration in the KCN strength. The only explanation of this is that in the first place there was no KCN present, and the reaction when testing with $AgNO_3$ was due to a small quantity of ammonia.

It is apparently true that the whole of the author's paper goes to support the experience of most metallurgists, namely, that in connection with the cyanide process, all oxidizing should be done on the ore before coming into contact with the cyanide.

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**Large Deposits of Lead and Zinc ore on the Red Sea** are reported to have been discovered recently at Gabal-el-Rossas, about 540 km. south of Suez, near Mersa Helena Bay.

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[1] Journ. Chem., Met. and Min. Soc., So. Afr., Feb., 1913; also Eng. and Min. Journ., June 21, 1913.

[2] Journ. Chem., Met. and Min. Soc., So. Afr., May, 1913

# Conditions in the Joplin District

By Temple Chapman*

*SYNOPSIS—A discussion of conditions in the Joplin, Mo., district, considering the variety of orebodies and their principal characteristics. Sheet deposits occur in the Webb City and Joplin sections, while at Miami, steady veins are usual. Royalties are lower than formerly.*

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In 1912 the Joplin district received between $50 and $60 per ton for top-grade zinc ore, prices not reached in any former year. The increasing zinc production of Butte and other Western points and the decrease in the tariff on zinc ore and spelter make it unlikely that Joplin operators will get better than an average price of $45 per ton in the future. Operators are heeding this probability in the character of prospecting they are now doing.

The different camps scattered through the Joplin district vary greatly in the character and size of their orebodies, in their working costs and in the kind of milling plants required.

The sheet-ore mines of Webb City and Joplin recover an average of about 2½% of blende; which is a value of only $1 per ton of rock when concentrate sells for $40. Mining and milling costs average about $1 per ton. Sheet-ore mines have improved their methods until many plants handle up to 600 tons of rock per day. Several such mines make a recovery of 3% to 3.5% blende and show the high output of 100 to 120 tons of concentrate weekly. Casually, this appears to yield a large profit, but 100 tons of $40 concentrate, less 10% royalty, leaves only the $3600 necessary to pay $1 pér ton on 3600 tons of rock. Of course, when ore was selling at $60, such mines were profitable, but their investment cost is so high, say, $50,000 for drilling, shafts, plant and general getting underway, that the average sheet-ore mine hardly has a chance to get back its investment during the time of "peak" prices and breaks even or worse during times of ordinary prices. Regular and large areas of ore in sheet ground are attractive to the investor, but for practical mining results the regularity of sheet ore proves deceptive. What otherwise is a regular formation over 40 acres will show richer pay streaks and leaner loss streaks.

### Thom Station Mines Require Small Capital

Thom Station possesses, in the Pocahontas, the greatest producing mine ever known in the Joplin district. The Thom Station mines are in soft timber ground and the ore deposits are irregularly shaped rich pockets, 9 out of 10 of which have been too small to return profits equal to the investment. Mining costs per ton of rock are high, owing to the small tonnage obtainable from restricted ore faces in ground requiring heavy timbering. Smaller plants, cheaper sinking, etc., mean much smaller investment requirements than sheet ground and make Thom Station more of a poor man's camp. The ore is "free" and a mine may be opened up by sinking a shaft into ore and may then be operated, perhaps profitably, with no other top plant than a portable boiler, hoist and three or four $30 "hand jigs." There are still a few successful hand-jig plants once so universal over the Joplin district, but now impossible in most camps.

I referred to the "free ore" at Thom Station. Most of it consists of pebbles of zinc in loose muddy ground. The crude ore, by sluicing or hand-jigging and without crushing, yields high-grade concentrate and the process may be compared with placer operation.

Neck City and some sheet-ground mines have "free-milling" ore, but it must be crushed out of hard rock and cannot be jigged by hand. Galena, Miami and Webb City low-grade sheet ground produces a so called "chatty" or finely mixed ore in hard rock which contains lead and iron and some oil, and yields a poor concentrate.

The mines at Neck City have always been notable for containing large pockets of disseminated ore yielding 6% to 8% of high-grade concentrate. A higher proportion of mines at Neck City have been profitable to their owners than in any other camp in the district. Hence drill-hole ore discoveries indicate different things with the same amount and grade of drill cuttings, depending on the camp in which the strike is made. In Thom Station a rich hole may have found only a small pocket. In Neck a good hole means almost sure success. So too in sheet ground, rich ore (or poor) occurs in big patches, big enough to reward one for opening ground and building a mill. In Miami a good hole usually indicates that the lucky driller has hit a vein and the experience there has been that the vein is as long as is the property. I will speak of Miami later. In general it is becoming plain that although all Joplin ore deposits have certain common characteristics, each main camp (Joplin, Webb, Carterville, Neck, Alba, Miami, Galena, and others) has its own individual peculiar features which are decidedly marked and must be taken into account by investors and prospectors who hope to have success reward their mining.

We consider Miami, the most southwesterly camp, as having what may be called very intense vein formation, although veins or channels of ore have not been unknown elsewhere.

Springfield to the east has mines with veins as long and as regular as any in Miami. Aurora, Peacock, Thom Station (Tuckahoe) and Porto Rico have also had long-channel mines. The enriched portion of sheet ground also often runs in channels, and channels or half circles of ore have made rich mines in Chitwood, Neck and Prosperity.

### Ore Deposits Not Regular

Our generalizations work down to the local miner's theory that ore is where you find it and in actual mining, especially in exploration and prospecting, the theories and geology only guide by the warning to keep a sharp lookout for the local camp features and peculiarities. For instance; pocket mines are usually overlaid with shale and clay, often discernible from the surface, and sheet ore lies under lime, which is indicated by a surface of reddish boulders and flint ground. The old idea of prospecting in the "draws" or valleys was due to the same theory: that such depressions indicated "soft ground" or absence of limestone.

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*Webb City, Mo.

The Miami ores occur chiefly in long veins, sometimes nearly flat but oftener near vertical, 20 to 30 ft. thick and of largely unknown depth and length. The original ore vein [illegible] has been worked north and south for over a mile and from 100 ft. deep down to over 200 ft. and still going. Parallel and branch veins are being discovered by drills and proven by shafts which extend the range from Miami north to the Kansas line, about 8 miles. Some think a solid, continuous vein has been delineated and they claim Miami deposits have the regularity and certainty of sheet ground with the richness of soft ground.

But actual mining is hardly so satisfactory as this theory and shows the ore vein to resemble a string of sausages rather than a rope. Hence Miami offers the prospector the same pleasing uncertainties of mining in general, and the drill prospector finds sometimes the rich sausage and sometimes the lean string in between. However, one may drill on the strike of the vein a mile or two ahead of the camp and have fair chances of hitting ore.

The big areas of prairie land which have been obtainable from the Indian owners at low royalties have offered big prizes to the prospector. These favorable terms permit the successful drillman who holds, say, 400 acres at 5% to sub-lease portions of his holdings at a moderate advance in royalty, say, 40-acre lots at 10% and thus obtain success upon very little capital investment. Many operators from Missouri are watching the Miami developments and are glad to sublease land in the main ore range where the local prospectors have proven the ore and are willing to pay them reasonable royalties. Joplin is fortunate in its skilled native nonunion labor and in its cheap power, coal, gas and electricity. Royalties are perhaps somewhat lower than formerly and many companies are buying land and avoiding royalties. The Joplin district is in a healthy condition, although ore prices will probably be $10 or $15 lower than in 1912, and should prosper in the future.

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# The Reclamation of Flue Dust

The treatment of iron blast-furnace flue dust is discussed in the *Iron Trade Review*, May 1, 1913, by Albert F. Block, the article being based on work at the Northwestern Iron Co. In the nodulizing process, flue dust is treated in kilns similar to cement kilns in construction. They are usually about six feet in diameter, and from 80 to 120 ft. long, and are lined with firebrick. The flue dust is heated in the kiln by means of powdered coal, which is blown in at about nine ounces nozzle pressure. The amount of coal required is about 300 lb. per ton of nodules.

Fuel oil and gas have also been used, but they increase the cost of operation above that with powdered coal. The temperature of the kiln in the hot zone is about [illegible] F. Exact temperature control is difficult to get on account of the variable coke content of the flue dust. The nodules produced by this process are usually dense and often fused and glazed, and therefore do not offer a large surface contact for the reducing gases in the iron furnace.

Furnaces which are using nodules thus produced show an increase in production and a decrease in the coke consumption, but it is plain that not more than 10% of nodules can be used successfully, and that the best results are obtained with not over 6%. The kilns are inclined about six degrees from horizontal, and to prevent the nodules from fusing onto the brick, a heavy chain is passed through the kiln and is allowed to drag on the brick while the kiln is rotating. The cost of producing nodules in the rotary kiln is about $1.25 per ton, and the nodules contain 60 to 65% of iron.

## THE HEBERLEIN PROCESS

So far as is known, only one Heberlein pot is used in the United States for the treatment of flue dust. This is in operation at the Zenith Furnace Co.'s plant, at Duluth. The standard Heberlein pot is 9 ft. in diameter, 4 ft. 6 in. high, and is a single casting. The grate is 15 in. above the bottom, and the conical holes in the grate are ⅜ in. in diameter.

The Gröndal process is stated to have been only a partial success on flue dust, owing to the great variation of the carbon content. This renders it impossible to regulate the heat of the kiln. For instance, with a high-carbon flue dust the extra heat generated causes the briquettes to fuse, and in this state the mass runs down between the cars and the side walls of the kiln. When the car is moved out of the high-temperature zone, the fused mass becomes solid, making it impossible to push the car any further. On the other hand, if the kiln is not operated at a temperature high enough to ignite and burn all the coke, the briquettes are soft and produce a large amount of fines. By working with a mixture of 75% of fine ore and 25% of flue dust, at the Northwestern Iron Co., results with the Gröndal process have been satisfactory. The kilns are 6 ft. wide and 195 ft. long. The cars are 6 ft. 6 in. long and 6 ft. wide. The kiln therefore holds 30 cars, each loaded with one ton of briquettes, and a car is discharged every 15 min. Crude oil is used for fuel. There are three combustion chambers per kiln, and two burners to each combustion chamber.

The fine ore and flue dust are tempered by means of a spray pipe discharging into a pug mill. The material is delivered to small hoppers over the presses, from which it is fed in the presses mechanically. Each kiln requires two presses, and each press one operator. These operators take the briquettes from the presses and put them upon the cars, which are two tiers high. When the car has been loaded, the charging door is opened and the car is moved into the kiln by a mechanical pusher. The admission of a car automatically discharges the car of burned briquettes.

The cost of producing briquettes is about $1.55 per ton, divided as follows:

| | |
|---|---|
| Labor .... | $0.41 |
| Fuel .... | 0.60 |
| Repairs .... | 0.15 |
| Interest and depreciation | 0.20 |
| Royalty .... | 0.09 |
| Power .... | 0.10 |
| Total cost of briquettes | $1.55 |

It will be noted from these figures that briquetting by the Gröndal process is an expensive means of preparing fine ore and flue dust for the blast furnace. The process also consumes all of the coke in the flue dust. The cost of a four-kiln plant is about $100,000.

# Churn Drilling in Southwestern Wisconsin

By W. F. Boericke*

*SYNOPSIS—Operation of churn drills in Wisconsin is carried on principally for prospecting. The deposits are usually not more than 150 ft. deep, and light rigs may be successfully used. Both steam and gasoline machines are favorably regarded. Difficulty results from drilling through broken or open ground in which drillings may be lost. Drilling must be systematically and carefully carried on in order that valuable information shall be secured. Drill holes are used for ventilation and other purposes, aside from their use in prospecting.*

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The ore in the Wisconsin zinc field is confined to the Galena and the upper part of the Platteville limestones. Below what is locally called the glass rock there are no evidences of zinc in commercial amount. This fact is so well established that no drilling is ever attempted there.

### Drill Holes Are Comparatively Shallow

Holes are comparatively shallow, varying with the contour of the country, but rarely exceeding 200 ft., except in the extreme south end of the field. The majority of the holes are 125 ft. or less to the glass rock. The formations that must be drilled through are, in order, the gray rock, the brown rock, the blue rock and the "green bed," all of which belong to the Galena limestone, then the oil rock, clay bed, and glass rock, which come under the Platteville, or Trenton classification. Considerable flint is found in the upper part of the Galena limestone, which is a true dolomite, and varies much in hardness. It breaks well, and there is usually no trouble in making a clean separation of the zinc from the limestone. This fact is important in connection with testing drill cuttings.

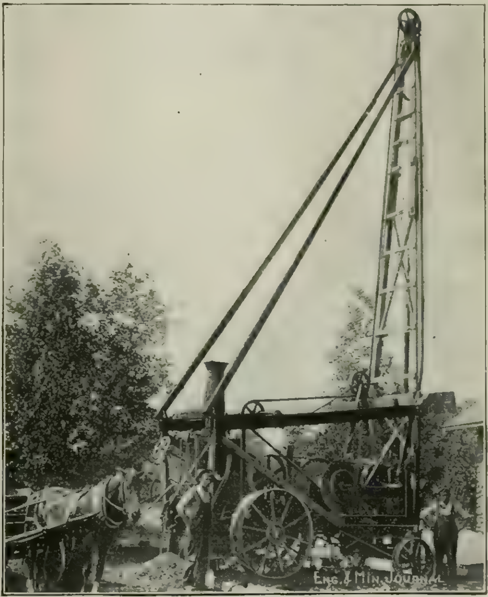
### Drill Cuttings Are Difficult to Save

The water level is usually encountered near the blue ground, and this makes it easier to sludge out and keep the hole clean. A strong flow of water, however, is detrimental, as the cuttings are either lost entirely or the fines carried away and a wrong impression gained of the value of the ground. Crevices are common, and this means more trouble for the driller to keep the hole perpendicular and prevent sticking and lost tools. Often the hole goes through open ground consisting of a vug or pocket lined with calcite crystals, and here again there is danger of losing all the cuttings of the last run. Where the ground is inclined to cave or run, or where there is much open ground to be drilled through, the holes are frequently cased, but this casing may be recovered later if desired. Core drilling has never been an unqualified success in the district, on account of the higher cost, and because it is often impossible to get good cores on account of broken and open ground, which also causes deflection.

### Steam and Gasoline Drills Each Have Advantages

Both steam and gasoline drilling machines are common in the Wisconsin field, and as the holes are shallow, the drills are comparatively light. This is important, as most of them are nontraction, and the drills must frequently be set up on hills or slopes where horse power only is available. The gasoline machines are equipped with single-cylinder engines of 6 to 10 hp., while the steam drills are usually rated at 12 hp., the No. 3 Keystone being a popular size. Derricks are 30 ft. high and the rope used is $1\frac{3}{4}$-in. hawser-laid manilla.

Each type of drill has advantages, and with experienced drillmen does good work. The gasoline drill is the cheaper in first cost, and is lighter and easier to handle. This is a positive advantage in moving round a rough, hilly tract of land. Only one man is needed for its operation, the engine requiring no attention, but usually a helper is needed for sludging out, shaping the bit, etc. There is less trouble in providing fuel than with a steam machine, while with the latter there is some difficulty in supplying water to the boiler. If another drill hole is near-by, a small gasoline pump-jack is used to supply water through a pipe line, and this, in winter, is likely to give trouble by freezing up. If this is not possible, the water must be hauled in barrels at additional expense.



One Type of Steam Drill on Wisconsin Zinc Fields

### Steam Drill More Reliable

On the other hand, the steam drill is far more reliable is a heavier and sturdier machine, adapted for deeper holes, and with a skilled operator is more flexible. The blow can be varied better to suit the nature of the ground, and greater drilling speed and cleaner cuttings obtained. So much depends on the willingness of the human factor to take pains; on his knowledge of the ground and previous experience in orebearing formations, that it is hard to say that better results can be obtained with one machine than another. Mere speed in itself counts little; clean cuttings, a minimum of fines, and a saving of all metallics possible are what is wanted. Speed is only the main object when drilling for other purposes than prospecting, as for ventilation or for water.

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*Mineral Point, Wis.

Two men are usually needed. The drillman himself manipulates the drill, feeding additional rope as needed, turning the drill, etc. His helper attends to the boiler, on a steam drill, assists in sludging out, sharpens the bit, and is generally useful.

Under ordinary conditions in average rock, the drills, both steam and gasoline, run about 44 strokes per minute. As has been noted, the steam drill is more flexible than the gasoline, and the makers claim a quicker upstroke, with lessened danger of a struck drill. The latter is the bane of a driller's life for it often means a day's tieup, with the chance of losing his whole string of tools, which involves a considerable expense for a poor man, when accompanied by the necessity of drilling an entirely new hole.

### Ability of the Operator the Most Important Factor

There is no question that for deep drilling the steam drill is easily superior to the lighter built, cheaper gasoline machine. But with shallow holes, not over 150 ft., both seem to make about the same daily progress. Much depends on the skill of the driller, and his familiarity with the ground. Then naturally the time of the year in which the drilling is done counts a good deal in drilling speed. The drillmen have to work usually in the open, protected at best by a flimsy shed, open on one or two sides, and affording little protection from the wind and cold. It is remarkable that they stand up to it as they do, for they frequently keep up their monotonous work in below-zero weather, without, however, reaching summer speed.

During January, a gasoline machine put down three holes in 13 working days, totaling 337 ft., or 24 ft. per day. During the same month a steam machine put down one hole 146 ft. deep in eight days, or 21 ft. per day. Another steam drill put down a hole 258 ft. deep in 10 days, or 25.8 ft. per day. These are fair average figures in ordinary ground, without breakdowns or accidents. Of course, the holes being drilled for prospecting purposes, some time was lost in washing the cuttings and testing for zinc and lead.

### Drilling Usually by Contract

The usual method in this district is to contract for drilling instead of putting machines in the field and paying for labor, fuel, etc. The contract price varies from 60c. to 75c. per ft. This is inclusive of expense of moving, setting up, and removing the drill. It is usually understood that the hole must be completed in order to get the contract price.

The actual daily expenses of running a gasoline drill may be approximated thus: One man each at $3 and $2.25 per day, $5.25; 4 gal. of gasoline per 10 hr. at 20c., 80c.; sharpening drill, one fifth of $5, $1; repairs and depreciation, $1; total, $8.05. If daily progress of 25 ft. be made, at 60c., this leaves $6.95 profit for the contractor. From this an allowance must be made for breakdowns, lost tools, etc. There is no record of any contractor getting rich overnight.

### Intelligent Drilling an Aid to Prospecting

On the practical value of drilling as an aid to prospecting much has been said pro and con. It is only lately that drilling has been put on a really scientific basis in this district. Previously it was intrusted to men interested in making footage only, and entire reliance was placed on their testimony without other supervision or assistance. Results were gathered in the most haphazard fashion, regular reports and maps were unknown, and thousands of dollars were spent for small result. Accurate maps and plats of the drill holes were seldom made, and as a result, instances have been only too common where shafts were sunk or drifts run based on insufficient data, with discouraging results. Consequently, drilling is regarded in some quarters with unmerited disfavor.

Despite the undoubted fact that most drillers make a conscientious effort to give their employers an honest report, neither oversanguine nor too conservative, too much reliance should not be placed upon them. The personal equation varies too much. I once submitted a sample of zinc cuttings to three drillers. The first declared they were extremely rich and as good as he ever saw; the second said they were moderately good, no more, while the third was quite unimpressed. As a matter of fact, the cuttings were rich, assaying over 30% zinc. If a man is used to drilling rich ground, he will be quite indifferent to "shines" of jack. The reverse will be true where a driller has had a run of blank holes.

It is generally recognized that the drilling must be done in a systematic manner to be of any use for planning development or prospecting. If it is not so done, the results are liable to be misleading and dangerous. Daily reports should be made out of the number of feet drilled, with a detailed statement of the character of ground cut, presence of materials, water level, etc. Sludgings should be tested every 3 ft. in blank ground, and as often as necessary where ore is cut. The greatest care is necessary to clean out the hole and prevent salting of cuttings, otherwise a small sheet may appear to be several feet in thickness, by contaminating succeeding sludgings. Samples of all cuttings should be arranged regularly in little piles, marked with the depth, so that the examining engineer can check up the driller's report on his visit. An accurate survey should be kept of the holes, and elevations taken of the surface, that profiles may be made in the office. In this way all dips and rises of the orebody may be known, and the shaft so planned as to make drainage and tramming most economical. The daily reports received should be condensed and embodied in a general report of the whole, showing a complete record, with all changes of formation, crevices, openings, in fact, anything that may be valuable in subsequent development.

### Ore Is Examined under Microscope to Determine Value

All cuttings are first carefully panned and washed and then examined under a microscope for ore. In this field the only materials reported are galena, jack, pyrites, known locally as "sulphur," and calcite crystals, called "tiff." Frequently the unwashed cuttings are dried and assayed, giving the approximate worth of the ground in units of lead and zinc. But after sufficient experience an engineer can estimate closely what a sample of cuttings will run without resorting to assay. By taking into account the formation in which they occur, he can tell if the ore makes on the top flat, the pitch, or the oilrock, and thus gain valuable information for subsequent mining.

In spite of the most careful work, however, it is easy to arrive at wrong conclusions. If a hole strikes an orebearing crevice running vertically, there will be cuttings all the way down, and thus give the impression of a very rich orebody, when the sheet may be only half an inch wide, with bare walls on each side. The same thing is true of a pitching crevice, which may appear to be much wider than it really is. If the drill is dull, the ore may be ground into powder and escape without detection in the wash water. If the ground is open or pockety, the cuttings may be entirely lost, and the blank hole reported where payable ore exists.

### Multiplicity of Holes Necessary for Positive Information

The only salvation is to drill enough holes to remove uncertainty. If an apparently rich hole is drilled, but a circle of holes in a 50-ft. radius fails to show a continuation of the run, the presumption is that the first hole went down on a rich seam, and no payable body exists. Common sense plus geological knowledge is needed to prospect ground successfully. It is generally cheaper to spend money in proper drilling than incur the expense of sinking a shaft on unjustified hopes.

Intelligently planned drilling should show to an operator the presence of ore, the probable height of stope, the general direction of the run, the probable grade of the ore or percentage of "sulphur" to jack, and the amount of water to be handled. Also the general dip of the orebody, and the best place for the shaft.

### Drill Holes May Serve Other Purposes Than Prospecting

There are other uses of drill holes besides prospecting. Where there is no escape shaft, or where ventilation is poor, three or four drill holes are necessary for air in the hot summer months, and in case of a serious accident to the shaft, might save the lives of the men underground. When drill holes are used for air, it may be necessary to provide forced instead of natural drafts. Holes dripping water entrap a great deal of air into the mine, on the principle of the hydraulic compressor. If these are at a lower elevation than the shaft or other holes, they may furnish all the air necessary for a shift. Otherwise a small fan and electric motor make a good outfit. Some mines equip the drill holes with sails, which are free to revolve with the wind, and so force additional air into the workings. Drill holes should never be left open. If cased to the surface, they should either be carefully covered with boards or rocks, or if it is desired to keep them open, the casing should be extended 6 ft. or more above the ground. Otherwise they are a menace to stock, as well as a source of danger to the men below.

Frequently water and air lines are run directly to the surface from the mine through drill holes, thus saving shaft room, as well as eliminating needless piping and friction where there is not a straightaway run to the shaft. This saving might well pay in a short time for the expense of drilling for this purpose alone. Drill holes have been also used for draining water during shaft sinking, and for providing air in raising.

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# Concrete Shaft Station, Wolverine Mine

By Claude T. Rice

At the twenty-first level of the Wolverine No. 4 shaft, which is sunk in the foot wall, leaving a brow of rock between the station and the lode, the ground became heavy over the station and caused much trouble. It was necessary to retimber the shaft frequently, as timbers did not last longer than six or eight years, failing by decay alone in that time. Whenever it was necessary to retimber, it was also necessary to remove much of the ground, which caused a repeated enlarging of the arch over the station. In an attempt to overcome this difficulty, W. F. Hartman, the company engineer, suggested that reinforced concrete should be tried for supporting the ground. The plan was adopted by Fred Smith, the superintendent, and the station which was put in has now stood for over a year, with no sign of failure in the concrete.

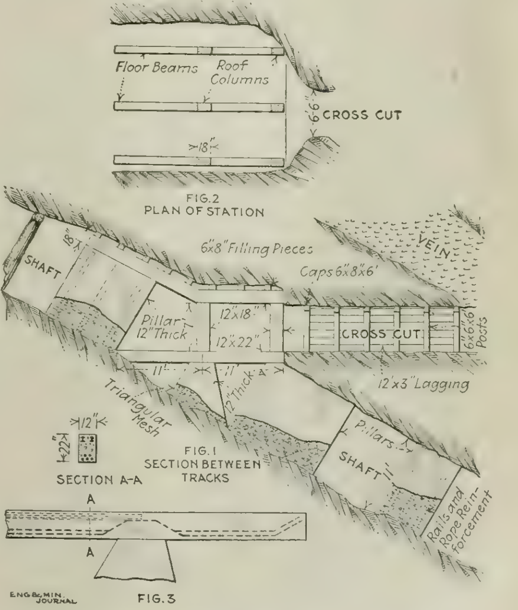

FIG. 2 PLAN OF STATION

FIG. 1 SECTION BETWEEN TRACKS

SECTION A-A

FIG. 3

Concrete Supports for Heavy Ground

The station is illustrated in Fig. 1. It will be observed that there are two heavy tongues of ground, one between the crosscut and the vein and the other between the floor of the crosscut and the roof of the shaft. Before the upper one could be supported by concrete in the crosscut, it was necessary to place reinforced pillars under the lower one. Unless these two tongues were firmly held in place, there would be a tendency for the whole piece of ground to slide down the shaft.

For these concrete pillars a mixture of about 1 : 2 : 6 or 7 was used, reinforced by such suitable iron scrap as lay about the mine, old rails being the most available. There are, however, two objections to the use of scrap for reinforcement. It should not be rusty or the bond between it and the concrete will be defective; and furthermore, it is necessary to watch the workmen closely to insure that the reinforcement will be put in properly and in the desired quantity. Strands of old hoisting cable, properly cleaned by means of a wire brush and a hook worked in between the strands where the worst of the rope dope is to be found, serves admirably for reinforcing, as the use of the rope in hoisting has removed practically all of the grease.

Another method of reinforcing pillars is to use made-up reinforcement forms, which can be built into columns at the surface or nailed to the forms before the concrete is poured. Triangular-mesh reinforcement, which is put on the market by the American Steel & Wire Co. is handy, owing to the fact that it is hinged at each of its main members. Expanded metal is also good, but Hy-Rib, although it saves the cost of forms, is too expensive to use underground. Mr. Hartman prefers triangular-mesh reinforcement, and he uses style 42, which is 4-in. mesh material, folding nicely into reinforcing columns for the sizes of posts and pillars generally required in mine work. In his work, he has evolved standard forms that can be made up by the blacksmiths during spare time. For instance, triangular-mesh of the style mentioned, is purchased in the so called 30-in. rolls, and can easily be made into columns two mesh, or 8 in. wide, by 5 mesh, or 20 in. deep, by wiring together two lengths of the reinforcement. Mr. Hartman stiffens such a reinforcing column as this, by means of wire lacing running both crosswise and diagonally through it. It is possible for two men to make up ten 8-ft. columns of this kind in two hours.

### TRIANGULAR MESH FOR REINFORCING PILLARS

In Fig. 1 is seen the triangular-mesh reinforcement. This is put in with its narrower side down, and is centered in the form. The concrete, which has been mixed usually on the level above and slid down the shaft in troughs to the platform, is then shoveled into the form, the sides of the latter built up and more reinforcement columns put in as the concrete rises. To guard against a plane of weakness developing in the finished pillar, the reinforcing columns are wired together. The work of shoveling the concrete into the forms and of tamping, is made easier by placing the reinforcement in the pillars crosswise instead of on end. If desired, the concrete pillars can be reinforced with rails and ⅜-in. strands of 1⅛-in. discarded hoisting cable. In this case the old mine rails are placed at right angles to the plane of the shaft at intervals of about 3 ft. and the ⅜-in. strands of rope thrown into the forms in sets of three not over 12 in. apart vertically. The rails must not touch the ground or they are likely to take more than their share of the weight and crack the concrete. Before any of these pillars are put in, the loose rock is picked off the foot wall and the ground washed down so as to insure a good tight bond between the concrete and the solid rock of the foot wall.

The skip tracks at the Wolverine mine are close together, the manway being carried along the side of the shaft instead of in the center as is the practice in some of the Lake Superior incline shafts. For this reason, there is room for pillars only 12 in. wide, as they must be put in without interfering with the hoisting. On the side next the manway, the pillar is made somewhat wider.

### PILLARS AND BEAMS SUPPORT FLOOR

Resting on these pillars and the foot wall, the floor beams of the station are put in. To insure that they will not be injured by the skip's catching on them, they are made 12x22 in. in cross-section. Fig. 3 shows in general the manner of reinforcing these beams. The upper part is reinforced by two mine rails and five pieces of old 1⅛-in. hoisting cable are used in the bottom. Three of the ropes are turned up at an angle of 45° near their ends, and when passing over a support, in order to help the concrete in resisting shearing stresses. To increase the bond between the concrete and the ropes, the latter are allowed to fray at the ends. One of these beams lies between the two skip compartments, one between the manway and the adjacent skip compartment, and the other next the wall of the outside skip compartment.

### COLUMNS AND BEAMS SUPPORT STATION ROOF

The columns that support the roof beams are set over the pillars in the shaft. They are 12x18 in. in cross-section and are reinforced with triangular-mesh reinforcement, style 42. The roof beams which rest on these columns are reinforced in a similar manner to the floor beams, shown in Fig. 3, except that the rails are omitted. Transverse bracing beams are placed between the roof beams at the posts. They are 12x12 in. in cross-section; and are reinforced by three 1⅛-in. ropes, placed 1 in. from the under surface of the beam, the two outside ropes being turned up at an angle of 45° at the posts and ends to resist shearing stresses.

This whole structure is poured in place and care is taken to secure a good bond between the different members. A mixture of 1 : 2 : 4 is used, the rock being trap from the mine. It is crushed in rolls to 2-in. size and used without screening. The reinforcement is placed in the beams and pillars so that 1% of the beam area will be iron.

Where wire rope is used, it is assumed to have half the strength of a bar of the same diameter and proper allowance is made for this in the area computations of the reinforcement requirements.

### SMALL SHAPES MADE ON SURFACE

The concrete filling pieces are made 6x6 in. in section and from 7 to 8 ft. long, being reinforced with six ⅜-in. strands of old hoisting cable. These filling pieces, as well as the posts, caps and lagging slabs used in the crosscuts to the lode are made in forms on the surface. In all these a mixture of 1 : 2 : 4 is used, and they are permitted to set and season at least a month on the surface before being sent into the mine. The posts of the drift sets are made 6x6 in. in cross-section and are 6 ft. long. They are reinforced by four ½-in. bars, which are held in the proper position with regard to one another by wrapping with ¼-in. rodding. The caps are made 6x8 in. in cross-section, and 6 ft. long, reinforced with three pieces of 1⅛-in. cable. The lagging slabs are 3x12 in. in cross-section and 4 ft. long. A strip of triangular-mesh reinforcement, 2 meshes wide, is used in reinforcing them.

The ground in which these concrete sets are used is heavy, due to the cracking of the brow between the lode and the crosscuts, which, as originally driven, was considerably larger than at present. The weight, however, is a regular one, and not so trying as that encountered in swelling ground. The sets are not cracking to any extent, and the lagging is standing well, bending slightly but without even showing hairline cracks.

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## Rand Mining Policies

Special Correspondence

There is evidence that Rand mining methods have undergone some change during the last 12 months, and that the policy of milling large tonnages has been to some extent displaced by selective mining. To better illustrate the position, the accompanying table is given, showing the Rand results of the last few years as published by the Transvaal Chamber of Mines.

| Year | Sorting per Cent. | Stamps | Tubes | Tons Milled | Stamp Duty Tons | Yield per Ton s. d. | Cost per Ton s. d. | Profit per Ton s. d. |
|---|---|---|---|---|---|---|---|---|
| 1908 | 15.50 | 8591 | 89 | 18,196,586 | 6.27 | 31 5 | 18 0 | 13 5 |
| 1909 | 14.45 | 9158 | 134 | 20,543,759 | 6.79 | 28 7 | 17 1 | 11 6 |
| 1910 | 13.64 | 9205 | 170 | 21,432,541 | 7.19 | 28 1 | 17 7 | 10 6 |
| 1911 | 13.01 | 9432 | 216 | 23,888,258 | 7.88 | 27 7 | 18 0 | 9 7 |
| 1912 | 12.57 | 9449 | 262 | 25,486,361 | 8.39 | 29 0 | 18 8 | 10 4 |

A striking feature of these figures is the improvement in yield and profit per ton for 1912, as compared with the preceding year, after a constant decline in both for the preceding four years, the most difficult to account for satisfactorily being the higher yield. That it was not due to closer sorting the figures show, as the percentage of waste rock sorted out was less in 1912 than during any of the previous years. Nor can it be said to be due to any general improvement in the content of the reefs, for throughout the history of the Rand the average grade of ore sent to the mills has constantly declined. Moreover, several of the richest mines are becoming exhausted. With such a constant decline in the yield, and a similar increase year by year in working costs, the outlook for Rand mining has not been rosy, and if by any reasonable means the situation could be improved, it was plainly the duty of those in charge to do so.

Five years ago the outcry was all for lower costs, and for a brief period the efforts to secure them were successful. Since 1909, however, largely as a result of the repatriation of the Chinese, native labor has been scarce and expensive; white labor, owing to the phthisis scourge, has been more inefficient and legislative burdens have increased, making costs advance from 17s. 1d. in 1909 to 18s. 8d. per ton last year. It was with the object of reducing costs, and thereby increasing profits, that the merging policy was inaugurated, but figures show that in neither has success been achieved.

In furtherance of it, larger mills and heavier stamps were introduced on these fields, the average stamp duty having increased from 6.27 tons per stamp per 24 hours to 8.39 tons last year. For this increase in average stamp duty, the introduction of tube mills has been largely responsible and today examples are increasing, where 150 stamps and 10 tube mills are handling the same amount of ore that required 300 stamps six years ago. Naturally with such a marked increase in tonnage milled by individual mines, a reduction in the average cost per ton ought to be realized, and the fact that anticipations in this respect are not fulfilled needs, perhaps, some explanation.

Last year's figures appear to indicate that all attempts to reduce working costs having failed, the experiment of cleaner mining, accompanied where possible by selective mining, with the object of increasing the yield and profit, is being tried. Only partial success seems to have resulted from the adoption of this policy, due principally to its reduced output, thereby increasing the costs, which, as a rule, absorb most of the advantage gained in higher yield. That increased attention is being given to this new phase of Rand mining, is shown by the fact that the Consolidated Goldfields of South Africa has sent its consulting engineer to the Rand at the wish of some of the shareholders, to advise upon its adoption at the mines under the control of that group. A striking illustration of the unsuitability of the new policy for such a low-grade mine as the Simmer Deep, belonging to this group, was given by the chairman of that company, at the recent annual meeting of shareholders. He explained that out of a million and a half tons of payable ore developed in the mine, of an average assay of 4.2 dwt. per ton, only 6% of the total would exceed 4.7 dwt., so that this new policy of selective mining was quite unsuited to the conditions prevailing at the Simmer Deep. The chairman did, however, explain that at this particular mine past records proved that large-scale operations reduced the working cost and thereby added to the profit. The company hoped to pursue this policy in the future, its adoption having been precluded in the past by the scarcity of native labor, and want of available working capital. The Simmer Deep would seem to be one of those mines on the Rand where this new policy of increasing the grade of the rock sent to the mill by selective mining cannot with any prospect of success be adopted. There are several mines on the Rand, as well as in the same neighborhood, in exactly the same position. Several of these are deep mines, and underground conditions are being reached on the Rand, where picking and choosing of the reef to be worked cannot be adopted with so much success as formerly. As the mines grow in depth these conditions will become more pronounced, and will dominate the method of mining to as great an extent as the character and distribution of ore.

In the far east Rand more than in the central section, the unpayable areas are more extensive and easily defined. In the central Rand the gold contents, though varying, are more uniform in occurrence and do not fall so much below the level of payability. On the other hand, in the far east Rand, the proportion of payable reef embraces only from 40 to 60% of the ore exposed by development and it is under these conditions that most scope exists for the new mining policy to produce the best results. As a matter of fact it has been practiced lately in the far east Rand to a greater extent than elsewhere. In one large mine, the operations have been transferred from a barely payable area and concentrated in the richest section of the mine; in a neighboring mine, only the best areas are being stoped, the apparently unpayable areas being avoided by both development and stoping operations. The policy of the first example can only be justified when unavoidable, while the second has already brought its own retribution, in the shape of unequal movements of the hanging wall, and serious loss of profits. Both are detrimental to the future welfare of the mine and are storing up immense tonnages of unpayable ore. There may be instances where the new policy may appear to be carried to the extreme, but no one will for a moment deny that on the far east Rand a prudent, selective mining policy is necessary. No one will deliberately mine unprofitable ore with the sole object of following a fixed system of mining, while under the Rand conditions it seems equally foolish to unnecessarily concentrate the stoping operations to the richest sections of the mine and thereby sacrifice profits capable of being earned under a saner working method.

The East Rand Proprietary mines last year illustrated in a striking manner what selective mining can do. With a quarter of a million tons less treated, as compared with 1910, the recovery was advanced 4s. 6d. per ton and the working costs, owing to the smaller tonnage treated, were increased 5s. per ton. The result was that profits were sixpence per ton less on the average, while the aggregate profits fell to the extent of £209,000. Another striking result of increasing the grade and costs at the East Rand Proprietary mines was to add four million tons to the already heavy accumulation of unpayable ore in the mine, which, under the old mining policy, was regarded as payable. Now this East Rand company is fairly typical of an average Rand mining company, for here good areas alternate with poor ones. Declining grade goes with depth, so that it will be interesting to see the period for which it will be deemed prudent to carry out the new policy, the permanent success of which is open to so much doubt. If it cannot succeed in this instance, there are numerous others where, if applied to the same extent, it must result in similar failure.

From what has been said it will therefore appear that the improvement in last year's yield was mainly due to this new mining policy. Rand gold mining admittedly differs from quartz mining, and each mine has to be handled according to its merits and underground conditions. As the mines grow in depth the grades fall, mining troubles increase, and the time is fast approaching when the best policy for each and every mine will need careful consideration.

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## The Iron Mining Industry

According to statistics of the Department of Commerce, the total number of iron mines in the United States in 1909 was 183. The number of persons engaged in the industry on Dec. 15, 1909, or nearest representative date, was 55,176, of whom 52,230 were wage earners. The expenses of operation and development amounted to $74,071,830 per year, of which the payment for salaries and wages constituted somewhat less than one-half. The production of crude-iron ore was 51,917,129 tons for the year. Some of the ore produced in New York state is concentrated at the mines, and the net production, after concentration, for the country as a whole, was 51,717,920 tons. The quantity used for blast furnaces at the mines or shipped from the mines for use in affiliated blast furnaces or for sale were 50,521,208 tons, and its value at the mine was $106,539,574.

Manganiferous ore and other byproducts to the value of $407,508 were produced, making the total value of products $106,947,082. The value of iron ore produced in other industries such as gold and silver, limestone quarrying, brick and tile manufacturing in 1909 was reported as $175,965, which, added to the net value of ore at the iron mines, gives a total value of iron ore for 1909 amounting to $106,715,539.

The Lake Superior district, comprising Minnesota, Wisconsin and Michigan and the Southern district, which comprises Alabama, Georgia and Tennessee, were the principal producing districts. The combined production of these two representing 91.9% of the total ore used by the operators in their own blast furnaces or sold in the market. The predominance of the Lake Superior district in the iron-mining industry is shown conspicuously.

Minnesota led in output of iron ore with a production of 28,214,713 tons. Michigan was second with 11,924,955 tons and Alabama third with 4,312,360 tons. New York and Wisconsin follow in the order named, with 1,024,173 and 1,002,666 tons, respectively. Other scattering states produced 3,902,901 tons.

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## The Census Bureau

WASHINGTON CORRESPONDENCE

Very severe criticism is being visited upon the Census Bureau because of the unsuccessful outcome of the work of the office during the census-taking process which has just closed. Much of this criticism is being brought to the attention of the administration and is causing the leaders of the present government considerable serious thought as they realize that conditions in the office are now in a somewhat demoralized state and that they will be very severely judged if they do not introduce some means for rectifying the situation. As yet the new director has not appeared to be inclined to do anything of a material character toward changing the nature of the situation in the office.

One of the criticisms which has been brought strongly to the attention of the administration is an article in the *Journal of Political Economy*, in which the whole census situation is surveyed, and specially severe criticism is visited upon the portion of the census which deals with mining. This is described as being substantially worthless. In summing up the article in question says:

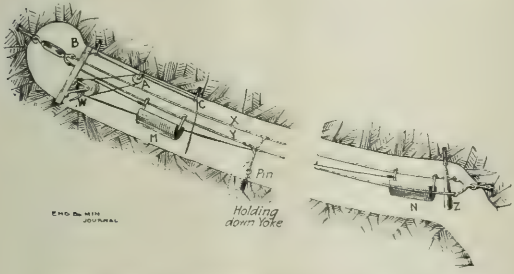
> What will be considered by many persons the breakdown of the census of 1910 is the more regrettable because it undoubtedly deals a serious blow to the movement for a scientific and permanent Census Bureau. The principal argument that has been urged in past years in behalf of the placing of the census upon a permanent basis has been the fact that thereby efficiency, speed and technical capacity would be advanced and the decennial renewal of a purely political, slow and incapable force would be avoided. The argument in favor of putting a scientifically educated student of economics in charge of the bureau has been that by so doing statistical methods and administrative management would be improved, the tone and the personnel of the undertaking would be raised, and the general conditions under which the work would be carried on would be improved. Experience has furnished some ground for the belief that nothing has been gained in personnel, while there has been actual retrogression in the matter of speed and real efficiency and probably in the technical value of the figures themselves. The latter point, as has been elsewhere noted, may possibly be considered, in a measure, still open to question, if viewed from a long-range standpoint. From a closer point of view it is certainly the case that the figures for the census as now presented are less available for immediate use and less closely comparable with those of former years than has been the case during any census of recent decades. Believing this, members of Congress and others vested with authority will almost inevitably be disposed to discriminate against the idea of the permanent scientific bureau and to do what they can in favor of the restoration of the old conditions. The trend of the reaction is already observable in the substitution of a political appointee for a statistically trained man in charge of the bureau.

# DETAILS OF PRACTICAL MINING

## Improvement in Underground Trolley Conveyors

By E. M. Weston*

One defect of the aërial rope automatic bucket conveyors in use in inclined stopes on the Rand is that unless the haulage ropes be wound on separate clutched drums and have power devices to wind and unwind and thus shorten or lengthen the ropes, the buckets can load from one place in the stope only. To avoid this, Herbert Krause, underground manager of the New Kleinfontein mine, invented the conveyor shown in the accompanying sketch. It is really an adaptation of the Whiting hoist principle underground, and is not patented. The sketch explains itself. *X* and *Y* are the main ropes stretched parallel from top to bottom of the slope. *Z* is a swinging stop block to take up any shock. *M* and *N* are two side-tipping, long, shallow trucks of any convenient size, usually 4 to 10 cu.ft. capacity. *O* is the haulage rope which passes around the two grooved truck wheels *W*, and over a pulley *A* which is made to traverse along another rope *BC*, so that working length of *O* in the stope is varied. This gear can work in a stope as low as 45 in. and on a dip of 15 to 35 degrees.



Adjustable Overhead Gravity Stope Tram

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## Long Distance Measurements with Stadia

It frequently happens in surveying practice that it becomes necessary to take a reading across a body of water or across a gulch, which need not be extremely accurate, and to obtain which by taping would be difficult or impossible. It is not always realized, says the *Canadian Engineer,* July 17, 1913, how great a distance may be read in this manner by the stadia method. The ordinary 13-ft. rod will, of course, give approximately a reading of 1300 ft. By using only one-half the stadia interval, that is, from the center wire to the top or bottom wire of the telescope, this maximum reading can be increased to 2600 ft. A still greater increase can be had by using some natural object as part of the stadia rod, for instance, by setting a target at the bottom of a stump, holding the rod on top of the stump and measuring from the target to a point high on the rod. In such case, of course, the rod man must measure the distance from the target to the top of the stump. When using only half the stadia interval, care must be taken that it is an exact half of the full interval or a proper allowance be made. By using natural objects in this way, distances of 4000 ft. have been measured. It is not advisable to go much beyond this interval, however, since with an ordinary telescope it will be difficult to distinguish target and rod.

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## Safety Rules—Steam Shovels*

(1) Seamless tubing should be used in all boilers.

(2) Guards should be placed around water-gage glasses.

(3) A blue light should be provided at the rear end of the boiler.

(4) All gears, setscrews and crankshafts should be covered.

(5) Steps should be provided for getting on the running board.

(6) The running board should be railed.

(7) Ladder and hand rails should lead to the sheaves at the point of the boom.

(8) The hoisting chain at the foot of the boom should be guarded.

(9) A proper signal should be given before a steam shovel is moved on its track.

(10) Steam-shovel engineers should make a daily inspection of the machine under their charge and of all the cables and chains on their shovels, and report defects immediately to the master mechanic.

(11) See that ladders, footboards, hand holds, running boards and steps are kept in constant repair and free from cans, grease, snow and ice.

(12) No person whose duty does not require it should be permitted on steam shovels.

(13) No gasoline should be kept inside of a steam shovel.

(14) No person should be allowed near any car being loaded at a pocket or by a steam shovel. Warning is given that chunks of ore frequently roll over the side of cars being loaded and it is an extremely dangerous practice to be around or near the same at such times.

(15) Stripping banks alongside steam shovels and wherever men are at work should be trimmed down of all loose material. Bank trimmers should notify men working below them. Men should not stand behind the shovel.

(16) Proper care should be taken to prevent trestle legs from falling and injuring workmen.

(17) Keep away from in front of the shovel to avoid

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*Union Club, Johannesburg, South Africa.

*From Inland Steel Co.'s book of rules.

crushing between dipper and truck: do not attempt to pass under the dipper.

(18) Chock or block steam shovel and cars when set on grade and apply the car brakes.

(19) Short whistle blasts on steam shovels and locomotive engines should signify, "Look Out for Blast." Two long whistles should signify that blasting is over and work may be resumed.

(20) Care should be taken to keep black powder well covered when charging holes in open pits and to leave none scattered around the holes. Sparks from locomotives or steam shovels may cause an explosion.

(21) Men dumping stripping cars should step back as soon as toggle-chains are knocked off and cars dumped.

(22) Shovels under steam should not be left without a competent man in charge.

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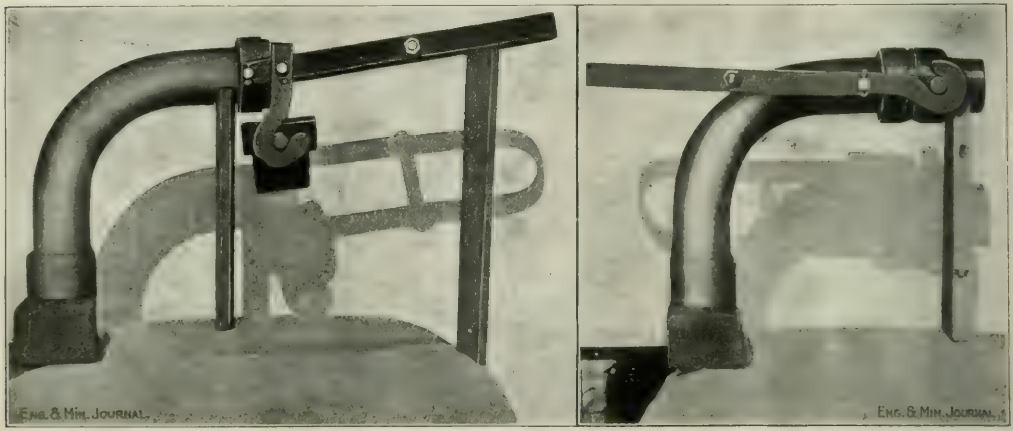
## Rapid-Acting Pump Suction Joint

The accompanying illustrations show a special 3-in. joint for use on sinking-pump suctions. It was invented and constructed at the Springs Mines on the Rand. Its operation is so simple as to need no description, the joint being opened and the suction disconnected by simply throwing the lever. In sinking two shafts, according to B. D. Bushell (*Bull.* 104, I. M. M.), so heavy a flow of water was encountered as to make it necessary to keep the sinking pumps in operation up to the last possible minute before blasting. The use of the joint aided greatly in this.



SUCTION JOINT FOR SINKING PUMP

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## Sod-Calked Ditches

On the Seward Peninsula, Alaska, ditches through rock section are stopped against leakage, in many instances, by the use of sod. The peculiarly tough and tenacious sod, which is abundant in many places in the North (Water Supply Paper No. 314, U. S. Geol. Surv.), is cut with mattocks into pieces one or two feet square and placed bottom up in the ditch to be stopped. Two layers are usually so placed, with joints broken as well as possible, and the whole bed carefully tamped. The sides are made tight with a sod wall consisting of pieces laid one above the other, bottom up. Above the waterline the grass continues to grow and binds the material more closely and firmly with its roots. The best sod contains grass roots and little moss, the latter being less tenacious and more readily decaying; but where this cannot be obtained, sod of inferior quality has to be employed.

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## Stoping Methods, Mount Lyell

As the result of several serious accidents at the Mount Lyell mines, A. Montgomery, state mining engineer of Western Australia, was requested by the Tasmanian government to inspect the mine workings and report on their safety. His rather favorable report, embodied in the semiannual report of the Mount Lyell Mining & Ry. Co., Ltd., gives an excellent and interesting description of the stoping methods employed in the Mount Lyell mine proper.

The orebody is a huge chimney of cupriferous iron pyrites, giving an irregular oval shape in horizontal sections; it has been followed down for over 800 ft. from the surface. With the exception of some schist inclusions, the orebody is remarkably homogeneous, consisting of pure fine-grained pyrites. On the No. 6 level it is over 400 ft. long and up to 250 ft. wide, varying somewhat from these dimensions at other points.

The mining method adopted has been to determine the size and shape of the orebody at each level by drifting through and around it and then to lay out a systematic scheme of working each block between levels by cutting it up into sections divided by 25-ft. pillars of solid ore, the pillars so disposed as to form a continuous support from the bottom of the mine to the opencut on the surface. There is one main longitudinal pillar and two transverse ones with several smaller detached pillars left where the ground appears to require more support. On the Nos. 6 and 7 levels there are five principal stopes or sections divided from one another by the main pillar system, and on the No. 8, there are three such sections, inasmuch as the orebody there is smaller. Each section has a main drift with crossdrifts at right angles, running to the circumscribing pillars or to the walls, as the case may be. The crossdrifts are usually three sets or 21 ft. apart, and all drifts are timbered with strong square-sets, approximately cubical and measuring 7 ft. in each dimension. The sills of the sets are laid on heavy lagging 15 ft. long and running from 8 to 10 in. in diameter. The object of this is to permit the floor to be picked up easily when it is reached by a stope from below. The posts of the sill square-sets are extremely heavy, being often from 2 to 2½ ft. in diameter, since for a while they have to carry a considerable weight of filling.

When the sill floor has been completely stoped by the square-set method, as many as possible of the sets between the drifts are filled. Meanwhile one or more filling chutes have been made by raising to the level above or by winzing down. These chutes are connected through to the surface opencut, from which the filling is obtained. Overhand stoping is now begun, the work being carried so as to preserve a dome-shaped roof corresponding to the cone of filling, which forms naturally as the filling comes from the chutes. Stoping proceeds by alternately breaking down and removing the ore and running in the filling to take its place. Most of the holes drilled are water holes, and a complete water service is maintained throughout the mine, each drill being supplied with a hose and spraying jet in order to reduce the amount of dust.

The manner of carrying the stopes with a domed back makes it possible to preserve the strongest form of roof. As the stoping proceeds upward, the load of the filling is largely removed from the sill sets, since they are all filled between drifts.

There are usually four manways in each main stope, one near each corner, but in addition numerous ore chutes are maintained through the filling, these being rarely more than 20 ft. apart. Handling the ore is, therefore, simple, since it can be easily moved down hill on the surface of the filling to the nearest chute. When the broken ore has been removed, the passes are built up nearly or quite to the back, leaving only enough space for a man to crawl through. This gives enough room for the next layer of ore to fall freely.

The filling is run in, mixed with enough water to make it much resemble rather wet concrete in consistency. Timber chutes are erected to various parts of the stope so that it can be run with little shovelling at fairly flat angles if desired. Since this filling sets so hard as to require a pick to break it and subsides only a little after being put in, it is extremely strong.

The ore is firm and strong and the arched backs need little support, but where they show a tendency to slab off, they are suported with timber stacks; or, if a considerable area of bad ground is encountered, square-sets are resorted to. These timber supports are allowed to be buried in the filling.

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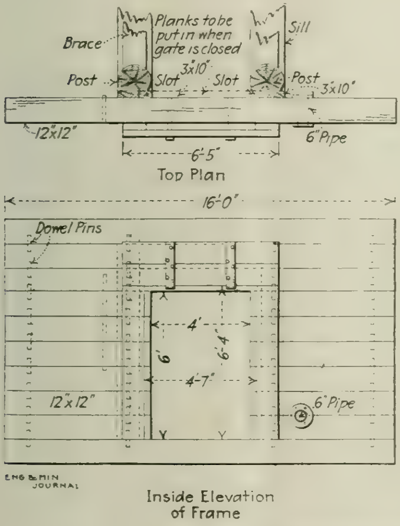
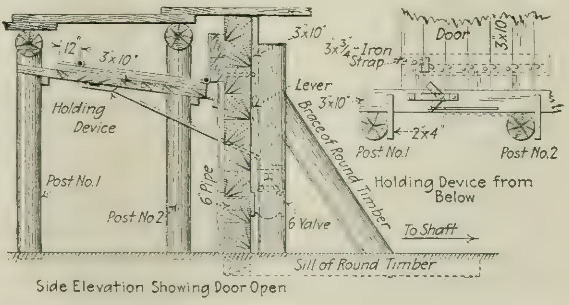
## Safety Flood Gates

The Bangor mine, on the Mesabi Range, is one of the properties of that district opened and operated in the face of extremely difficult and harassing conditions. The orebody is overlaid by quicksands and water-bearing formations. In mining by the slicing system, these materials were often permitted by the caving to enter the mine workings and their control was a serious problem.





Drift Bulkhead and Gate for Flood Control

Flows of fine sand which resembles clay and is impervious to water, occurred with great suddenness, and to limit them to immediately adjacent portions of the mine and prevent their filling the whole drift and even the shaft bottom, the drifts were equipped at intervals with safety flood gates, of the design shown in the accompanying illustrations, taken from "Iron Mining in Minnesota," by Charles E. van Barneveld.

The gates are designed to open toward the face of the drift, that is, away from the shaft. They are normally held open by a trigger device, which can be released by the last man of the crew making his escape. In case the bottom of the drift is already partly filled with débris, the bottom 12 in. of the gate is hinged so that the main part of the gate can be shut to cover the obstructing material.

The construction of the bulkhead frame and the door itself is not extremely heavy, as their purpose is not so much to withstand a permanent and high head as to stop quickly a rapid horizontal rush of sand and water.

Usually, when a sand rush is feared, a safety man is stationed at each controlling gate, whose duty it is to see that all hands are passed through and to close the gate. A contemplated improvement involves an opening near the top with a hinged flap, so that a man might pass through a closed gate with several feet of sand behind it.

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# Automatic Switch for Locomotive Haulage

The automatic mine switch shown herewith is designed for use with trains of mine cars drawn by a locomotive, where it is desired to send the cars on one track and the locomotive on another. The switch, as described by J. E. Jones in *Coal Age*, July 26, 1913, is thrown and maintained in one position by the side of the locomotive pressing against the switch lever; as soon as the locomotive passes, a spring returns the switch points to their normal position and the following train is sent to a different track from that taken by the locomotive. The lever *C*, which is caught and pushed over by the locomotive side, has a vertical portion carried in bearings in a standard. It is bent again to form a horizontal arm above the bearings, and this portion, acting as a crank, pulls over or pushes over the switch points by means of a connecting rod to the bridle. In Figs. 1, 2 and 3, the arrangement is such that the locomotive pulls the points over and takes the straight track. The latch spring *A* pulls them back to the position shown when the locomotive has passed, the small, coiled spring being inserted only to take up shock. In Figs. 4 and 5, the device is shown arranged to push the points over and allow the locomotive to take the right-hand track. The returning spring *D* in this case is of the coil type.

The switch must be exactly designed for specific conditions. The dimensions shown herewith, of a switch in use with a Whitcomb gasoline locomotive, are suitable for a track of 38-in. gage.

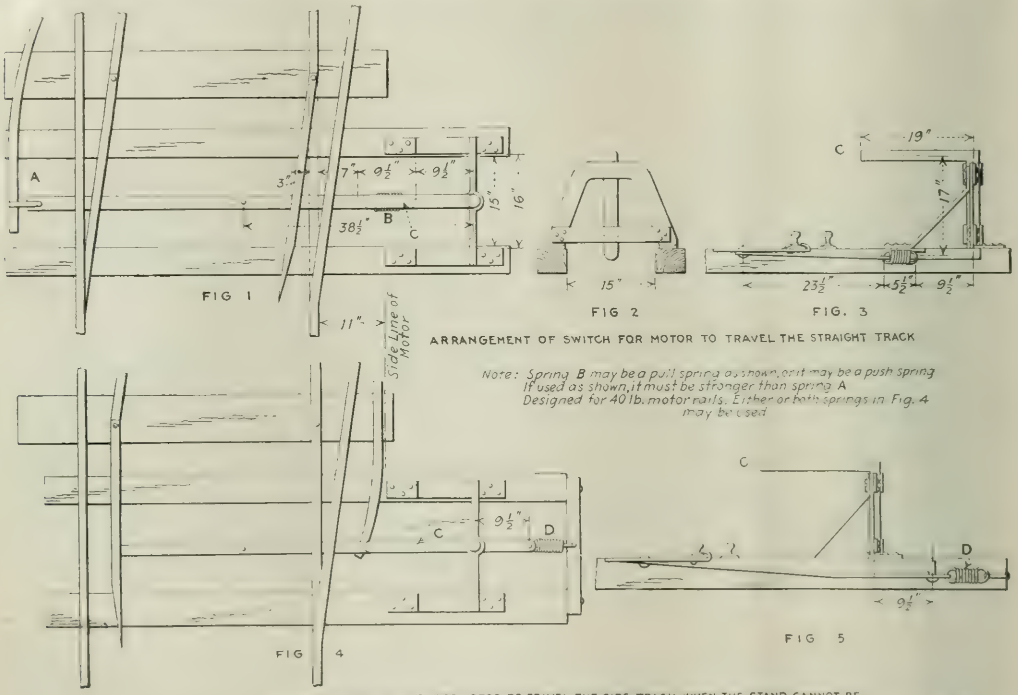

FIG 1 FIG 2 FIG. 3

ARRANGEMENT OF SWITCH FOR MOTOR TO TRAVEL THE STRAIGHT TRACK

Note: Spring B may be a pull spring as shown, or it may be a push spring
If used as shown, it must be stronger than spring A
Designed for 40 lb. motor rails. Either or both springs in Fig. 4 may be used

FIG 4 FIG 5

ARRANGEMENT OF SWITCH FOR MOTOR TO TRAVEL THE SIDE TRACK WHEN THE STAND CANNOT BE PLACED ON THE OPPOSITE SIDE

Automatic Device for Eliminating Flying Switches in Mine Locomotive Haulage Systems

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# Permissible Radii for Pipe Bends

The accompanying table from the National Tube Co.'s Book of Standards, gives the advisable radius and the minimum radius to which pipe of standard thickness may be bent.

TABLE OF RADII FOR WROUGHT-PIPE BENDS

| Size of Pipe In. | Advisable Radius, In. | Minimum Radius, In. | Size of Pipe In. | Advisable Radius, In. | Minimum Radius, In. |
|---|---|---|---|---|---|
| 2½ | 15 | 10 | 10 | 60 | 40 |
| 3 | 18 | 12 | 11 | 66 | 44 |
| 3½ | 21 | 14 | 12 | 72 | 48 |
| 4 | 24 | 16 | 13 | 84 | 60 |
| 4½ | 27 | 18 | 14 | 90 | 68 |
| 5 | 30 | 20 | 15 | 100 | 76 |
| 6 | 36 | 24 | 18 O D | 125 | 90 |
| 7 | 42 | 28 | 20 O D | 150 | 120 |
| 8 | 48 | 32 | 22 O D | 165 | 132 |
| 9 | 54 | 36 | 24 O D | 180 | 144 |

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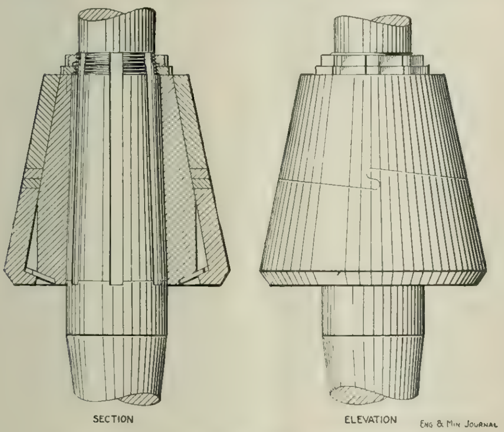
**The Straight-Sided Sinking Bucket** is preferred to the barrel-shaped bucket or the bucket wider at the top in Butte (A. I. M. E. Bull., August 1913), since without a wide bottom a bucket will not rest steady on the muck.

# DETAILS OF METALLURGICAL PRACTICE

## Head for Gyratory Crushers

Rock crushers of the Gates type have a conical head by means of which the breaking is accomplished, the head having an eccentric motion which allows pieces of rock to get in between the head and the walls of the machine, and breaks them when the eccentric motion reduces the size of the opening. Wear of this conical head is uneven and is principally on the lower half, so that the upper half may be still useful when the lower half is worn out. In order to avoid this wasteful condition, U. S. patent No. 1,066,277 has been granted to D. G. Hunter and T. G. Murton, of Germiston, Transvaal, S. A., for a conical crushing head divided into two or more parts, any of which may be taken out and replaced without the necessity of discarding the others. As shown in the accompanying drawing, the head is divided into two or more parts by a spiral division, it being thus possible to put them together and lock them in such position readily and still have them available for replacement at any time. The drawing shows a two-part head.



Removable Head for Gyratory Crusher

## Cleaning Elevator Buckets

Elevator buckets handling damp ore containing a percentage of fine material, sometimes find difficulty in discharging the fine portion, which tends to pack in the bottom of the bucket. To avoid this difficulty, the operators at the New Reliance mill, Trojan, S. D., have devised an arrangement, described by H. C. Parmlee, in *Metallurgical and Chemical Engineering*, Aug., 1913. A plate of sheet iron is fitted loosely into the bottom of each bucket, and two bolts, passing through amply large holes in the bucket bottom, are rivetted to it. The plate has a movement of about 1 in. In discharging the load, the plate falls and the movement and jar cleans the bucket.

## Power Consumption in Bearings

A series of tests was made in factories driven by electric motors to determine the power consumed in bearings. The power required to drive the motors with different loadings could be accurately measured and by subtraction, the power absorbed by the line shafting obtained. The results are given by C. A. Graves, under whose direction the tests were made (*Amer. Mach.*, June 5, 1913).

In obtaining the data, ammeters and voltmeters were used to measure the power of direct-current motors, and wattmeters for alternating-current motors. The testers were instructed to count the hangers in which the shafting revolved, and also the loose pulleys on the shafting and countershafting over which the belts were passing. Then all work was stopped on the various machines and the amount of power input into the motor was measured. All the belts were then removed from the shafting and countershafting, one at a time, and readings taken of the amount of power input into the motor after each belt was removed, until only the motor driving-belt remained. The motor driving-belt was then removed, and the amount of power required to drive the motor free measured. In many instances, the belts were replaced in reverse order to check the results.

The difference between the amount of power required with the belts on and the amount required where the motor was running free, represents the amount of power absorbed by the bearings, subject to a slight correction due to the efficiency of the motor at various loads. Under these conditions of test, however, the extra tension on one side of the belt when operating a machine, and consequently the increased friction on the bearing, is not measured. This amounts to approximately 20%, but as this increased friction is due to work done, and occurs only when the machine is operating, it is not considered in this article.

Referring to the classifying of a hanger and a loose pulley together as a bearing, it was found that the average loose pulley, either on a shaft or countershaft, absorbed nearly as much power as a hanger, and in some cases it was found that nearly twice as much power was used by a loose pulley as an adjacent bearing on the same shaft. Therefore, as the tests progressed, because there was so slight a difference between these two, both were classed as bearings, and they were counted together.

The results of these tests show that the average shafting in the stone-working industries uses the largest amount of power and this is due to lack of care in keeping the shafting in alignment and also to dusty, gritty surroundings. In this line of business, on the average, a horsepower would be absorbed by approximately five bearings. In machine-shop practice, cases of excessive friction were found which were due to lack of lubrication, but in the average shop the shafting losses per bearing were not excessive, although in a great many cases the total loss because of excessive bearings was more than necessary. In the various industries the average bearings absorb approximately 0.12 of a horsepower each. This means that 100 bearings will use 12 hp. in friction during every hour of operation. Few realize what a saving can be effected by a little attention given to this subject; for instance, the operation of an extra length or two of shafting just because it might be used some time, may mean a waste of 1000-hp.-hr. per year.

The data were classified in order to observe the effect of the size of the shafting, as shown in Table I. The smaller fraction diameters are classified under the nearest simple fraction. For example, 2-in. diameter includes sizes between $1\frac{15}{16}$ in. and $2\frac{1}{8}$ inches.

TABLE I. BEARING FRICTION OF VARIOUS SIZES OF LINE SHAFTING

| No. of bearings | Size of shaft | Average r.p.m | Maximum hp. per bearing | Minimum hp. per bearing | Average hp per bearing |
|---|---|---|---|---|---|
| 66 | $\frac{15}{16}$ in.-1 | 428 | 0.052 | 0.010 | 0 036 |
| 706 | $1\frac{1}{8}$ in | 382 | 0 079 | 0.016 | 0.033 |
| 37 | $1\frac{1}{4}$ in | 425 | 0 119 | 0 040 | 0 062 |
| 492 | $1\frac{1}{2}$ in. | 392 | 0 193 | 0 035 | 0 089 |
| 155 | $1\frac{3}{4}$ in | 218 | 0 113 | 0 029 | 0 078 |
| 409 | 2 in | 242 | 0 300 | 0 028 | 0 133 |
| 21 | $2\frac{1}{4}$ in | 264 | 0.321 | 0 124 | 0 257 |
| 83 | $2\frac{1}{2}$ in. | 243 | 0 300 | 0 085 | 0 255 |

A test was made in a factory with a complete equipment of Hyatt roller bearings and the result of the test on the eight separate shafts is given in detail in Table II.

TABLE II. FRICTION OF HYATT ROLLER LINE SHAFT BEARINGS

| Section of shaft. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Number of hangers............ | 22 | 7 | 11 | 7 | 7 | 7 | 7 | 8 |
| Number of loose pulleys........ | 40 | 24 | 20 | 19 | 5 | 8 | 2 | 22 |
| Total bearings. . | 62 | 31 | 31 | 26 | 12 | 15 | 9 | 30 |
| Horsepower to drive shafting.. | 1.716 | 0.858 | 0 724 | 0.804 | 0.288 | 0 549 | 0.281 | 0 938 |
| Horsepower for bearing ....... | 0 027 | 0.028 | 0.026 | 0.031 | 0 024 | 0 036 | 0.031 | 0.031 |
| R.p.m. shafting. | 275 | 300 | 300 | 200 | 275 | 200 | 240 | 180 |
| Diameter shafting | 2 in. | 2 in. | 2 in. | $1\frac{15}{16}$ in | $1\frac{15}{16}$ in | $1\frac{15}{16}$ in | $1\frac{15}{16}$ in. | $1\frac{15}{16}$ in. |

The average friction loss of these 216 bearings amounts to 0.0286 hp. By comparing this loss with the losses of 2-in. babbitted bearings it will be noted that there is a reduction of approximately $^1/_{10}$ hp. per bearing by the use of roller bearings. What the reduction in power will save in dollars and cents, however, must be taken up separately for each installation.

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## Cottrell's Filtering Medium for Bag Houses

The corrosion of ordinary woven fabrics by converter and roaster gases is a well known phenomenon. F. G. Cottrell, of Berkeley, Calif., has patented a process to avoid this (U. S. pat. 1,060,065). His experiments have shown that if any sort of cloth be heated out of contact with air, it commences to decompose at between 150 and 200° C. During this partial carbonization there is a decrease in tensile strength, and an increase in brittleness, but with care, a fabric can be produced which will still have sufficient strength to act as a filter, and yet will be resistant to acid. As an example, samples of cotton cloth weighing 350 grams per square meter, and having a tensile strength of 2300 kg. per m., were heated to from 300 to 340° C. for periods of 10 min. to three hours. During the treatment they lost 68 to 76% of their weight, and at the end had tensile strengths of 30 to 85 kg. per m. On boiling with sulphuric acid, they were found to be completely resistant to acid of 50 to 64% strength.

In general, it may be said that the higher the temperatures used, the shorter the time of exposure necessary. A few minutes' heating between 300 and 350° C. is equivalent to several days or a week between 200 and 250° C. Mr. Cottrell prefers to take bags or tubes woven in one piece, as in the ordinary bag-house construction, and in this form submit them to this charring process. After this heat treatment, the fabric will no longer burn with flame, but will only char or smoulder slowly.

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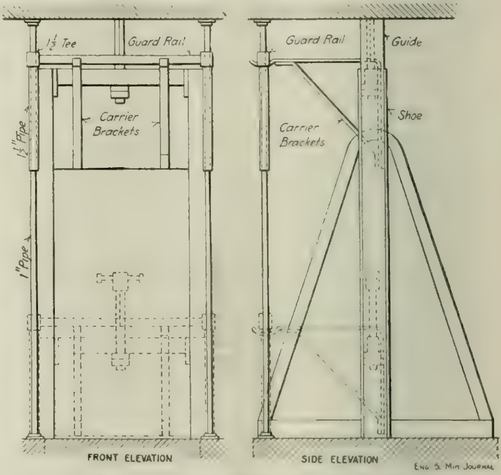
## Safety Gate

In the cyanide plant of the Alaska-Treadwell company a lift is installed with a safety gate. As illustrated, the gate proper consists of a horizontal top piece made of 1½-in. pipe with two vertical pieces of 1½-in. pipe which slide upon two guides of 1-in. pipe. The gate is actuated by a bracket attached to the lift. This bracket projects outward and the ends of its horizontal pieces engage the top bar of the gate, which is thus lifted along with the cage. It will be noted that the device is extremely simple, and, while it would have to be modified for the purpose, it should be applicable to the collar of a mine shaft.



Sliding Gate Actuated by Cage

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## Extracting Tin from Base Bullion

Extraction of tin from base or lead bullion forms the subject of U. S. patent No. 1,060,527, issued to B. C. Besley, of Howell, N. S. W.

The process consists of melting salt in an appropriate vessel, a crucible or reverberatory furnace, and introducing the lead bullion. The latter, solid or melted, sinks through the salt, preventing volatilization. Oxide of lead, preferably litharge, is thrown into the furnace, and after about half an hour the tin becomes associated with the lead oxide and leaves the molten lead. Tapping removes the molten lead carrying the silver and the tin-lead oxide is removed in lumps. The latter is smelted in a reducing atmosphere, producing a marketable lead-tin solder. When the process is carried out in crucibles or pots, the products are found in separate strata after cooling, and may be broken apart.

# THE COST OF DOING THINGS

## Yardage in Ditch Excavation

The accompanying table will be found very useful in expediting the preparation of estimates of yardages in ditch excavation. They are of exact application wherever the estimate is made from center cuts, without resort to cross-sectioning, which is common practice where the ground is fairly level. After the profile has been determined from levels taken over the center line in the field, and the grade of the bottom of the ditch fixed, it is a simple matter to determine the center cuts at 100-ft. intervals. Then the table can be entered directly for yardages, using the average of adjacent cuts. The tables give the yardages for 100 ft. of distance. If shorter or longer intervals are used they can still be made to apply by the application of the proper factor; thus if the interval used for 200 ft., the yardage will be twice that given; if 50 ft., the yardage will be one-half. The tables given apply to ditches having a bottom width of 2, 3 and 4 ft. respectively. Side slopes are taken at 1:1, the slope most commonly used.

DITCH 4′ WIDE AT BOTTOM, SIDE SLOPES 1 : 1, CUBIC YARDS IN 100′ FOR CENTER DEPTHS

| Depth | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 1.52 | 3.11 | 4.78 | 6.52 | 8.33 | 10.22 | 12.19 | 14.22 | 16.33 |
| 1 | 18.52 | 20.78 | 23.11 | 25.52 | 28.00 | 30.56 | 33.19 | 35.89 | 38.67 | 41.52 |
| 2 | 44.44 | 47.44 | 50.52 | 53.67 | 56.89 | 60.19 | 63.56 | 67.00 | 70.52 | 74.11 |
| 3 | 77.78 | 81.52 | 85.33 | 89.22 | 93.19 | 97.22 | 101.33 | 105.52 | 109.78 | 114.11 |
| 4 | 118.52 | 123.00 | 127.56 | 132.19 | 136.89 | 141.67 | 146.52 | 151.44 | 156.44 | 161.52 |
| 5 | 166.67 | 171.89 | 177.19 | 182.56 | 188.00 | 193.52 | 199.11 | 204.78 | 210.52 | 216.33 |
| 6 | 222.22 | 228.19 | 234.22 | 240.33 | 246.52 | 252.78 | 259.11 | 265.52 | 272.00 | 278.56 |
| 7 | 285.19 | 291.89 | 298.67 | 305.52 | 312.44 | 319.44 | 326.52 | 333.67 | 340.89 | 348.19 |
| 8 | 355.56 | 363.00 | 370.52 | 378.11 | 385.78 | 393.52 | 401.33 | 409.22 | 417.19 | 425.22 |
| 9 | 433.33 | 441.52 | 449.78 | 458.11 | 466.52 | 475.00 | 483.56 | 492.19 | 500.89 | 509.67 |
| 10 | 518.52 | 527.44 | 536.44 | 545.52 | 554.67 | 563.89 | 573.19 | 582.56 | 592.00 | 601.52 |
| 11 | 611.11 | 620.78 | 630.52 | 640.33 | 650.22 | 660.19 | 670.22 | 680.33 | 690.52 | 700.78 |
| 12 | 711.11 | 721.52 | 732.00 | 742.56 | 753.19 | 763.89 | 774.67 | 785.52 | 796.44 | 807.44 |
| 13 | 818.52 | 829.67 | 840.89 | 852.19 | 863.56 | 875.00 | 886.52 | 898.11 | 909.78 | 921.52 |
| 14 | 933.33 | 945.22 | 957.19 | 969.22 | 981.33 | 993.52 | 1005.78 | 1018.11 | 1030.52 | 1043.00 |
| 15 | 1055.56 | 1068.19 | 1080.89 | 1093.67 | 1106.52 | 1119.44 | 1132.44 | 1145.52 | 1158.67 | 1171.89 |

DITCH 2′ WIDE AT BOTTOM, SIDE SLOPES 1 : 1, CUBIC YARDS IN 100′ FOR CENTER DEPTHS

| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 0.78 | 1.63 | 2.56 | 3.56 | 4.63 | 5.78 | 7.00 | 8.30 | 9.67 |
| 1 | 11.11 | 12.63 | 14.22 | 15.89 | 17.63 | 19.44 | 21.33 | 23.30 | 25.33 | 27.44 |
| 2 | 29.63 | 31.89 | 34.22 | 36.63 | 39.11 | 41.67 | 44.30 | 47.00 | 49.78 | 52.63 |
| 3 | 55.56 | 58.56 | 61.63 | 64.78 | 68.00 | 71.30 | 74.67 | 78.11 | 81.63 | 85.22 |
| 4 | 88.89 | 92.63 | 96.44 | 100.33 | 104.30 | 108.33 | 112.44 | 116.63 | 120.89 | 125.22 |
| 5 | 129.63 | 134.11 | 138.67 | 143.30 | 148.00 | 152.78 | 157.63 | 162.56 | 167.56 | 172.63 |
| 6 | 177.78 | 183.00 | 188.30 | 193.67 | 199.11 | 204.63 | 210.22 | 215.89 | 221.63 | 227.44 |
| 7 | 233.33 | 239.30 | 245.33 | 251.44 | 257.63 | 263.88 | 270.22 | 276.63 | 283.11 | 289.67 |
| 8 | 296.30 | 303.00 | 309.78 | 316.63 | 323.56 | 330.56 | 337.63 | 344.78 | 352.00 | 359.30 |
| 9 | 366.67 | 374.11 | 381.63 | 389.22 | 396.89 | 404.63 | 412.44 | 420.33 | 428.30 | 436.33 |
| 10 | 444.44 | 452.63 | 460.89 | 469.22 | 477.63 | 486.11 | 494.67 | 503.30 | 512.00 | 520.78 |
| 11 | 529.63 | 538.56 | 547.56 | 556.63 | 565.78 | 575.00 | 584.30 | 593.67 | 603.11 | 612.63 |
| 12 | 622.22 | 631.89 | 641.63 | 651.44 | 661.33 | 671.30 | 681.33 | 691.44 | 701.63 | 711.89 |
| 13 | 722.22 | 732.63 | 743.11 | 753.66 | 764.30 | 775.00 | 785.78 | 796.63 | 807.56 | 818.56 |
| 14 | 829.63 | 840.78 | 852.00 | 863.30 | 874.67 | 886.11 | 897.63 | 909.22 | 920.89 | 932.63 |
| 15 | 944.44 | 956.33 | 968.30 | 980.33 | 992.44 | 1004.63 | 1016.89 | 1029.22 | 1041.63 | 1054.17 |

DITCH 3′ WIDE AT BOTTOM, SIDE SLOPES 1 : 1, CUBIC YARDS IN 100′ FOR CENTER DEPTHS

| | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 1.15 | 2.37 | 3.67 | 5.04 | 6.48 | 8.00 | 9.59 | 11.26 | 13.00 |
| 1 | 14.81 | 16.70 | 18.67 | 20.70 | 22.81 | 25.00 | 27.26 | 29.59 | 32.00 | 34.48 |
| 2 | 37.04 | 39.67 | 42.37 | 45.15 | 48.00 | 50.93 | 53.93 | 57.00 | 60.15 | 63.37 |
| 3 | 66.67 | 70.04 | 73.48 | 77.00 | 80.59 | 84.26 | 88.00 | 91.81 | 95.70 | 99.67 |
| 4 | 103.70 | 107.81 | 112.00 | 116.26 | 120.59 | 125.00 | 129.48 | 134.04 | 138.67 | 143.37 |
| 5 | 148.15 | 153.00 | 157.93 | 162.93 | 168.00 | 173.15 | 178.37 | 183.67 | 189.04 | 194.48 |
| 6 | 200.00 | 205.59 | 211.26 | 217.00 | 222.81 | 228.70 | 234.67 | 240.70 | 246.81 | 253.00 |
| 7 | 259.26 | 265.59 | 272.00 | 278.48 | 285.04 | 291.67 | 298.37 | 305.15 | 312.00 | 318.93 |
| 8 | 325.93 | 333.00 | 340.15 | 347.37 | 354.67 | 362.04 | 369.48 | 377.00 | 384.59 | 392.26 |
| 9 | 400.00 | 407.81 | 415.70 | 423.67 | 431.70 | 439.81 | 448.00 | 456.26 | 464.59 | 473.00 |
| 10 | 481.48 | 490.04 | 498.67 | 507.37 | 516.15 | 525.00 | 533.93 | 542.93 | 552.00 | 561.15 |
| 11 | 570.37 | 579.67 | 589.04 | 598.48 | 608.00 | 617.59 | 627.26 | 637.00 | 646.81 | 656.70 |
| 12 | 666.67 | 676.70 | 686.81 | 697.00 | 707.26 | 717.59 | 728.00 | 738.48 | 749.04 | 759.67 |
| 13 | 770.37 | 781.15 | 792.00 | 802.93 | 813.93 | 825.00 | 836.15 | 847.37 | 858.67 | 870.04 |
| 14 | 881.48 | 893.00 | 904.59 | 916.26 | 928.00 | 939.81 | 951.70 | 963.67 | 975.70 | 987.81 |
| 15 | 1000.00 | 1012.26 | 1024.59 | 1037.00 | 1049.48 | 1062.04 | 1074.67 | 1087.37 | 1100.15 | 1113.00 |

## The Waihi Gold Mining Co.

The annual report of the Waihi Gold Mining Co., Waihi, New Zealand, for the year ended Dec. 31, 1912, states that gold and silver sold during the year from 147,828 tons of ore treated amounted to $1,353,302. Gross profit amounted to $581,804, after crediting miscellaneous income. Income tax, expense of examining other mines, construction and depreciation not charged in operating account, amounted to $338,892. Dividends to the amount of $723,032 were paid during the period. Operations were suspended for the greater part of the year, on account of a strike called on May 13. During the time of the strike it was possible to mine only a limited tonnage. In 1911 the production was 350,699 tons, or more than double that of 1912. The total operating cost was apparently about $5.75 per ton of ore treated, consisting of: Stoping, development, pumping and general mine expense, $1.67; transporting ore to mill, 10c.; crushing ore through rock breakers, 10c.; milling, 47c.; cyaniding, 75c.; concentrate treatment, 10c.; refining, 13c.; repairs, 21c.; superintendence, etc., 14c.; the remainder of the cost being made up of office expenses, rents, taxes, directors' fees, etc. Of the cyaniding cost, about 46.5% was for cyanide and zinc. The company now operates its mine through four shafts, all approximately 1200 ft. deep, with the exception of No. 6, which is 1023 ft. Total development amounted to 7274 feet.

The reserves consisted of 750,634 tons of payable ore at Dec. 31, 1912; in addition to this there are 711,541 tons in arches and pillars, 54,114 tons broken in shrinkage stopes and 32,478 tons in stock on surface.

At the Waihi mill, operating 90 stamps and five tube mills, 36,888 tons of ore was crushed. The average number of stamps running was 70.073, representing a daily average of 4.83 tons per stamp. The proportion of ore treated as sand was 30.12%; as slime, 68.01%, and as concentrates, 1.87%. All concentrates from this mill are sent to the Victoria mill for treatment. The extraction was 91%, or 92.2% of gold and 84% of silver contents.

The Victoria mill operates 200 stamps and 11 tube mills; during the period it ran 172 days with an average of 126 stamps, and crushed 110,940 tons of ore. The stamp duty was 5.118. The standard screen used on the mortars was 10 mesh and the average number of tube mills running was 6.7. At this mill, 20.28% of the ore was treated as sand, 78.49% as slime and 1.23% as concentrate. The average extraction was 89.5%. At the concentrate treatment plant a 96% extraction is obtained at a cost of about $6.60 per ton. A summary of the two mills and concentrate plant shows an extraction of 92.2% of the gold and 77.6% of the silver contents, or a total of 89.7%. The average assay of the ore fed to mills was: Gold, 8 dwt. 12 gr.; silver 3 oz. 10 dwt. 22 gr. Including mine, mill and bullion samples, about one assay was run for every 24 tons of ore treated. The tube mills are operated at about 25 revolutions per minute.

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## Underground Costs in Minnesota Iron Mining

The following data were taken from Bulletin No. 1 of the Minnesota School of Mines. In underground mining all regular breaking (drifting and stoping) is run on contract, a contract gang consists of four men, two on day and two on night shift. The contractors do their own breaking, timbering, mucking and local tramming. The tramming distance to the ore chutes where they deliver the ore to the company varies from 75 to 300 ft. Owing to the rise in the bedrock the ore sometimes has to be transferred in tramming. All contract prices are adjusted to meet the varying conditions. The contractor furnishes all supplies except timber which is delivered by the company to a convenient point. He also sets his own timber and lays his track. The usual list of tools consist of four picks, four augers (3½, 4, 6 and 8 ft.), two pyramid-pointed moils of 1¼-in. octagon steel, 5 and 6 ft. long; two scrapers, two tamping sticks, two [illegible] shovels (at $1 per pair), one 7-lb. hammer and one [illegible] and one ax (at $1 each), one powder heater, rented at [illegible] per month, one box in which to store powder, fuse [illegible]. Picks and augers are supplied, sharpened and [illegible] by the company. The contractor pays $6 for 240 [illegible] candles and $8 per 50-lb. box of Red Cross dynamite. Stoping contracts are usually let at so much per car drawn from chute. In square-set slicing the price is sometimes based per set or car. In slicing, under ordinary conditions a double slice 16 ft. wide, 15 ft. high, 50 ft. long is taken out in two weeks by a four-man gang. The usual rate for a single slice one set wide is from 150 to 175 ft. per month.

Horizontal openings, whenever possible, are run in the ore on account of the cheapness and speed with which they may be driven. The Mesabi mines are rarely equipped with machine drills, hence crosscuts in rock are avoided. The main haulage levels or drifts are usually timbered with a three-piece set of unframed timber; 9-ft. posts and 10-ft. cap; inside timber dimensions 8x9 ft. It takes two men about 1½ hr. to put in a set. The ore is soft and holes are put in with auger or gad. A round consists of five to seven holes 6 ft. deep. A 6-ft. hole is drilled in from 10 to 30 min. The back holes are loaded with seven to 10 sticks of 40% dynamite and lifters with six sticks. The average monthly progress on main haulage drifts of this size ranges from 100 to 125 ft. a month and contract price ranges from $3 to $4 per ft. including cost of timbering. The rate on wet ground or ground containing many layers of taconite sometimes runs as high as $5 to $6 per foot.

In running rock drifts by hand the advance is from 25 to 40 ft. per month. With compressed air the speed of driving in rock will range from 50 to 75 and sometimes 100 ft. per month. Contract prices on rock drifts range from $9 to $12 and sometimes to $20 per foot. The rate of advance in smaller drifts ranges from 200 to 225 ft. per month on a four-man contract. At the Corsica mine a piece of heavy ground was encountered that necessitated spiling. Six-inch round poles, 8 ft. long, were sharpened and driven over a false set, about 12 poles to a set. The contract labor price was about $2 and cost of timber (sets at 4-ft. centers) and lagging about $1.50 per ft., making a total price of $3.50 per ft. for a spiled drift. Owing to the nature of the ore there is frequent crushing and displacement of timbers in many of the mines and repair work is constantly going on. The older the mine the heavier the repairs. Two men can take out and replace from 1½ to 3 sets of timber in a 10-hr. shift for large and small drifts respectively. Often retimbered ground will not hold over one week. From 10 to 15 men on repairs are usually required in addition to the repair work done by contractors who receive regular wages on this work. This work is sometimes contracted for $1 to $1.25 per ft. for 8x7-ft. drifts. Raises vary from 4x5 ft. to 5x8 ft. according to the purpose for which they are to be used. They are contracted for at $1 to $3.50 per ft. depending upon the ground and method of timbering.

The mine timber costs from 4.5 to 5.5c. delivered at the yards, per running foot for pine and tamarack up to 10 in. diameter at the small end, cut in 16-ft. lengths. Timber for heavy drift sets costs from 8, 15 and 20c., depending upon the size and market conditions. Lagging costs about $5 per cord piled in the yard. A contractor framing timbers makes from $2.50 to $3 per day. Current contract rates are as follows: Three-piece set, 7c. to 10c. each; square-set posts, top and bottom respectively, 12 and 9c., respectively, square-set caps, 7c. each. Ties are made of 6-ft. lagging squared at top and bottom and cut into 6-ft. lengths for 2.5c. each. They are cut in two underground.

# Butte Meeting, A. I. M. E.

*SYNOPSIS—Special correspondence covering the meeting of the Institute at Butte day by day.*

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The 105th meeting of the A. I. M. E. opened at Great Falls, Mont., on Saturday morning, Aug. 16, the headquarters being at the Rainbow Hotel, the new and comfortable hostelry of one of the most charming towns of Montana. In connection with this meeting, no excursion had been officially arranged and the visiting members drifted in in small groups. Their reception and the management of all the meetings in Montana was directed by Charles W. Goodale, and let it be said right here that there was never a more accomplished and painstaking chairman and never a meeting that was conducted with fewer hitches or any more attention to the enjoyment of visiting members.

### Great Falls

On Saturday morning the party was taken in automobiles to see the great falls of the Missouri River, where construction work for power development has just been begun. The Rainbow Falls, whereof the power has already been developed, were also visited, and the Giant Spring, on the other side of the river. Returning to Great Falls, luncheon was served at the Rainbow Hotel. In the afternoon, a visit was paid to the reduction works of the Anaconda company, which are noted for their posession of the tallest and largest chimney of the world, an extraordinarily large converter, an electrolytic-copper refinery, and many unique features of metallurgical practice.

In the evening the first technical session of the meeting was held in the county court room, which had courteously been put at the disposal of the Institute by Judge Ewing. President Rand made a brief, opening address in well chosen words, following which several technical papers were read, these relating especially to the metallurgical practice at Great Falls. Most of the papers read at this session, as well as at the subsequent sessions, had previously been published in the bulletins of the Institute and no special reference to them will be made in this chronicle of the meeting. It will be sufficient to say that all of these papers were enthusiastically received, and some of them induced discussion, but in the main they were of a character to cause their acceptance as expositions of an advanced technical practice without discussion.

The Great Falls local committee consisted of Messrs. A. E. Wheeler, J. H. Klepinger and W. T. Burns. Unfortunately, Mr. Wheeler had been called to Europe just prior to the meeting. He was missed, but his confreres ran things admirably.

### Helena and East Helena

The original plan was to take the party from Great Falls to Butte by special train, with a brief stop at Helena for luncheon. This was abandoned for the reason that the attendance at Great Falls was not so large as expected, probably because this part of the meeting had not been advertised in the bulletins issued from New York so well as should have been done. Consequently the special train was abandoned and two special cars were hauled to Butte by regular trains. This change of plan proved fortunate inasmuch as it gave the party an opportunity to visit the plant of the American Smelting & Refining Co., at East Helena.

Leaving Great Falls at about 9 a.m. and arriving in Helena at about 12.30 p.m., the party was taken in special trolley cars, provided by the Helena local committee, to the Placer Hotel, where a bounteous luncheon was served. After luncheon the party divided, some to see Helena and some to see the smelting works. The latter were of good interest, exemplifying most of the latest features of the practice of silver-lead smelting.

During the visit to Helena the courtesies of the Montana Club were extended and were enjoyed by a party of the visitors. The Helena local committee comprised Frank M. Smith, William Scallon, and George T. Wickes. Leaving Helena at 4.20 p.m., the Institute party reached Butte at about 8.30 p.m.

### Butte

The Butte committee consisted of C. W. Goodale, E. P. Matthewson, J. D. Pope, G. A. Packard and D. C. Bard, Mr. Goodale being the chairman and Prof. Bard the secretary. Headquarters were at the Silver Bow Club, the courtesies of which fine institution were extended to all visitors during the meeting. On Sunday evening there was an informal reception at the club, not on the program, but interesting just the same and doing much to make the visitors acquainted with each other.

On Monday morning the meeting convened in the Auditorium, C. F. Kelley delivering the address of welcome and President Rand responding. Technical papers then were read. At noon luncheon was served in the Silver Bow Club. In the afternoon visits were paid to the mines and mills of Butte. In the evening there was another technical session.

### At Anaconda

On Tuesday morning the party proceeded to Anaconda by special train, going directly to the Washoe reduction works, which were inspected, after which luncheon, tendered by the Anaconda local committee, was served at the Hotel Montana. In the afternoon there was a technical session in the Margaret theater. The Anaconda committee consisted of E. P. Matthewson, Fred Laist, E. M. Dunn, C. D. Demond, L. V. Bender, H. S. Ware and H. L. Welsh. Returning to Butte, the evening was passed in social entertainment, including an exhibition of moving pictures of power development in Montana, taken by Max Hebgen, general manager of the power companies; and in a visit to Columbia Garden.

### Wednesday

Wednesday was devoted to technical sessions in the morning and evening, and to a visit to mines and mills during the afternoon. At mid-day a buffet luncheon was served at the Silver Bow Club. At the conclusion of the evening session, President Rand announced that the serious business of the meeting had been done. He expressed the thanks of the visiting members for their hospitable reception at Butte and his appreciation of the great interest in the Institute. As an exhibition of the latter, he announced that a petition had been received by the directors to establish a Montana local section, which petition had been granted. E. P. Matthewson will be chairman of the new section.

### Picnic at the Southern Cross

On Thursday morning, the party went by special train to the Southern Cross mine of the Anaconda company, about 20 miles west of Anaconda. This mine is situated in a highly picturesque position and has surroundings admirably adapted for a picinc. The officers of the Anaconda company who gave this entertainment carried out the picnic idea.

After an hour spent around the surface workings of the mine, during which time those went underground who wanted to, the party assembled at headquarters, where everyone received a miner's dinner pail and a bottle of Budweiser. With this provender groups collected under the trees for luncheon. The dinner buckets were of the full kind that politicians talk about in their campaign speeches, and the bottles of beer were of the quart size, which, as one visitor put it, was very thoughtful of the company. After luncheon there was general conversation and some assembling of college men. It was noteworthy that in the party of about 150 engineers, there were 18 M. I. T. men, 16 from Columbia and seven Harvard men, this illustrating the extent to which technically trained men are permeating the ranks of engineers in practice at the present time. Soon after luncheon the party started homeward for Butte.

### The Banquet

The concluding event of the Montana meeting was a grand banquet at the Silver Bow Club, tendered by the mining companies of Butte. About 250 were seated at the tastefully decorated tables. The college idea, which had been started earlier in the day, found further expression at the banquet, in a quite impromptu way, and it was no stretch of the imagination to pass in thought from the dining hall of the Silver Bow Club to an alumni gathering in New York.

W. L. Saunders presided as toastmaster, of course, in his well known, felicitous way. The toasts were wisely limited in number. They were "Butte," by C. F. Kelley; "The A. I. M. E.," by C. F. Rand; "Montana," by Lee Mantle; "The Press," by J. H. Durston; and "Coöperation for Institute Progress," by Bradley Stoughton.

### In Conclusion

The registry at the Montana meeting was about 160 and was representative of the best of the A. I. M. E. membership. The meeting will be remembered as one of the most successful in the history of the Institute. The mining companies and mining men of the four places that were visited were overwhelming in their hospitality and lavish in their entertainment. Mines, mills and smelting works were everywhere thrown open to examination and no restraint was imposed upon the seeker of information. Special trolley cars and railway trains were provided whenever needed and the requirements of the inner man, both in the matters of food and drink, were generously supplied. While the engineers of the party were attending the technical sessions, the ladies were entertained by the ladies of Butte, Anaconda and Great Falls. The Montana meeting passes into history as one of the red letter meetings of the Institute.

## Use of Electricity in Butte Mining

The Anaconda Copper Mining Co. operates 22 mine shafts and plants at Butte. Of these, 15 are large plants and hoists, with which most of its ores are hoisted. In 1912 this company commenced using compressed air in place of steam, to operate a number of its large hoists, and at this date has 10 main hoisting engines and 10 auxiliary hoists driven by air.

The compressed air is furnished from a central plant containing six compressors, each having a capacity of 7500 cu.ft. of free air per min. compressed to 90-lb. pressure in large receivers, and conducted by suitable pipelines to the various hoists, the air being reheated before passing to the engines. Each of these compressors is driven by a 1200-hp. synchronous motor, directly attached to the drive shaft, and takes electric current at 2200 volts. Two additional compressors are being installed, making eight in all; this will complete the compressing plant. Seven of these machines will run continuously, and they will use 8000 electric horsepower. The excess air, or blowoff, goes into the rock-drill air system. The hoisting engines, as formerly used with steam, had cylinders 30 or 32 in. in diameter with a 72-in. stroke. To adapt them to the use of compressed air, the old cylinders were replaced with new ones, 34 in. in diameter, having valve mechanism of the most approved type.

The air in rock-drilling operations is used at 85-lb. pressure, and for the large operations is usually furnished from three or four central plants, the smaller mines using individual machines. A total of 13,455 electric horsepower is used for this purpose, the voltage ranging from 440 to 2200.

In draining the mines, electrically driven pumps are principally used, for which a total of 4780 electric horsepower is necessary. The large pumps are of the quintuplex vertical-plunger type, with a capacity of 600 gal. against a head of 1200 ft.; the smaller units are of various types. Centrifugal pumps are not used on account of the acid water.

The mines of the district are warm, due to the oxidizing of the sulphide minerals, so that forced ventilation is largely resorted to. For driving ventilating fans, 2500 electric horsepower is used, and in addition to fans and blowers, compressed air is used after blasting to clear the mines of powder gases and foul air. Underground, the stations, main crosscuts and main drifts are electrically lighted, as well as the surface plants and property. A total of about 1300 hp. is used for lighting purposes.

Electric locomotives are being introduced for all the tramming, both underground and surface, and this work requires 1860 electric horsepower. Direct-current at 500 volts is used for surface tramming, and at 250 volts for all underground tramming. There are a few storage-battery locomotives in use at Butte, but the usual system uses a trolley. The mine locomotives are of 18-in. gage, weighing three tons; have two 10-hp. motors; and develop a draw-bar pull rated at 1200 lb. The average load hauled per trip is 12 tons, including weight of cars and ore, on the usual mine track with grade of 0.5%.

At Butte, Anaconda and Great Falls, all the Butte ores are treated, except that zinc concentrates, containing about 50% of zinc, are shipped to the natural-gas districts

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Note.—Excerpts from an article by John Gillie, presented at the Butte meeting of the A. I. M. E.

for smelting. Of the copper ores, about 80% is reduced to converter or blister copper, containing the gold and silver, which is shipped to the large electrolytic refineries on the Atlantic coast. The remaining 20% is fully treated, merchantable wire bars and other forms of finished copper being produced, and the gold and silver separately obtained, at an electrolytic refinery in Great Falls. In these ore-reducing plants, 24,177 hp. is used, in driving concentrators and blowing engines, and in operating cranes, shops and the different power machinery in connection therewith.

In connection with the use of electricity in mining, it might not be out of place to briefly mention the electrification of the Butte, Anaconda & Pacific Ry., which is now nearly completed. This railroad connects the mines at Butte with the reduction works at Anaconda, and handles about 5,000,000 tons of freight yearly, consisting of ores from the mines and supplies of all kinds to both mines and works. In addition to the freight thus hauled, the passenger business between the two cities is taken care of by this road. The conditions, including grades, curvature and climate, are sufficiently severe to prove thoroughly this method of railway transportation. The constructing engineers adopted for this work a 2400-volt direct-connected system, with overhead trolley. Freight locomotives will consist of two units, each weighing 80 tons. Passenger locomotive will be one 80-ton unit geared higher to permit of a speed of 45 miles per hr. A part of the road has been electrically operated for several weeks, and is working satisfactorily.

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## Copper-Country Strike Comments

### Houghton Correspondence

The socialistic element has continued to dominate the situation, during the last few weeks of the strike in the Lake Superior copper country, covertly under direction of prominent politicians trying to make capital out of the situation and holding out the only hope that was being held out to the strikers and to the officials of the Western Federation of Miners. This element seems to have much influence and the independent business men of the copper country are convinced that the strike would be over and the mines working normally if it were not for the moral support given the strikers and the courage put into their leaders by reason of the action of the State and Federal governments in sending investigators and mediators to Houghton, and it is felt in some places that this action was at the instance of these politicians.

There is no doubt that the majority of the workingmen of the district never wanted the strike and did not countenance it when it was called. The majority of the men desire to return to their work and several thousand have returned. But it has required a great deal of nerve and courage to go to work under the existing circumstances. The situation is that practically all of the English and Scotch miners are back at work. A large number of the Italian miners had signified their intention of returning to work. They claim that the situation was misrepresented to them, that they have not received their strike benefits, as promised, and that they can see nothing to be gained by remaining away.

The Finns and the Austrians are holding out for the Western Federation and the continuance of the strike, and most of these are socialists, particularly the Finns. The spirit of unrest and opposition to any organized government is born and bred in the Finn. It comes with him from his native land and when he gets a home and a job in this country it is difficult for him to distinguish between license and liberty. The Finn socialist is against the government, no matter what the government may be. There are two Finnish daily newspapers published in Houghton and several weeklies. One of these dailies is avowedly socialistic and its editors, managers and employees are the leaders in the strike movement. Moreover, some of its most active men are employed by the secret service of the Western Federation and their speeches are of such an inflammatory nature that there is general fear that they will incite some of the more ignorant believers in their doctrines to dynamite outrages. The other Finnish daily has recently come out in favor of the strike and that position has added to the general antagonism toward the Finns as a class, upon the part of the public that generally is hopeful for a return to normal conditions.

By the end of the third week in August, the strike had cost the workingmen more than $1,000,000 in lost wages. In some instances it has cost the workingmen their jobs, for the mining companies in resuming operations are diligently weeding out the more rabid of the agitators and socialists and refusing to take them back at any cost or on any terms. They are showing a preference for the better class of labor and are securing promises from all of the men who return to work that they are going to keep away from affiliation with the Western Federation of Miners. These facts are becoming pretty well known throughout the country and a general influx is anticipated in a short time. In fact quite a few of the miners from the southeastern Missouri lead district, where the Federation recently called a strike, have already arrived and have applied for work and not a few of the workmen from this district who went to Detroit to take jobs in the automobile factories are inquiring about positions in the copper country. It is thought that these last anticipate a strike outbreak instigated by the Industrial Workers of the World, in a short time.

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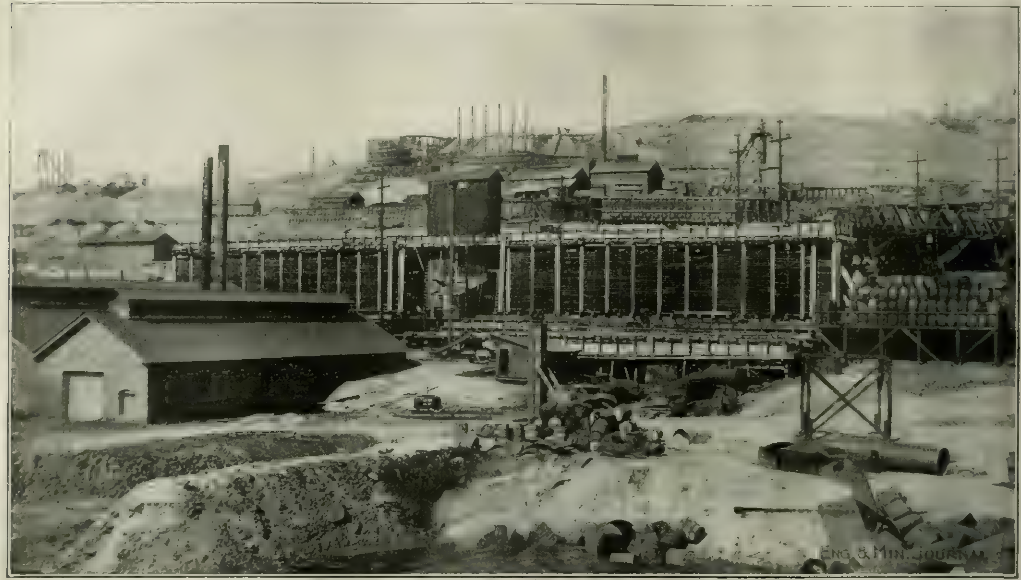
## Chino Copper Co.

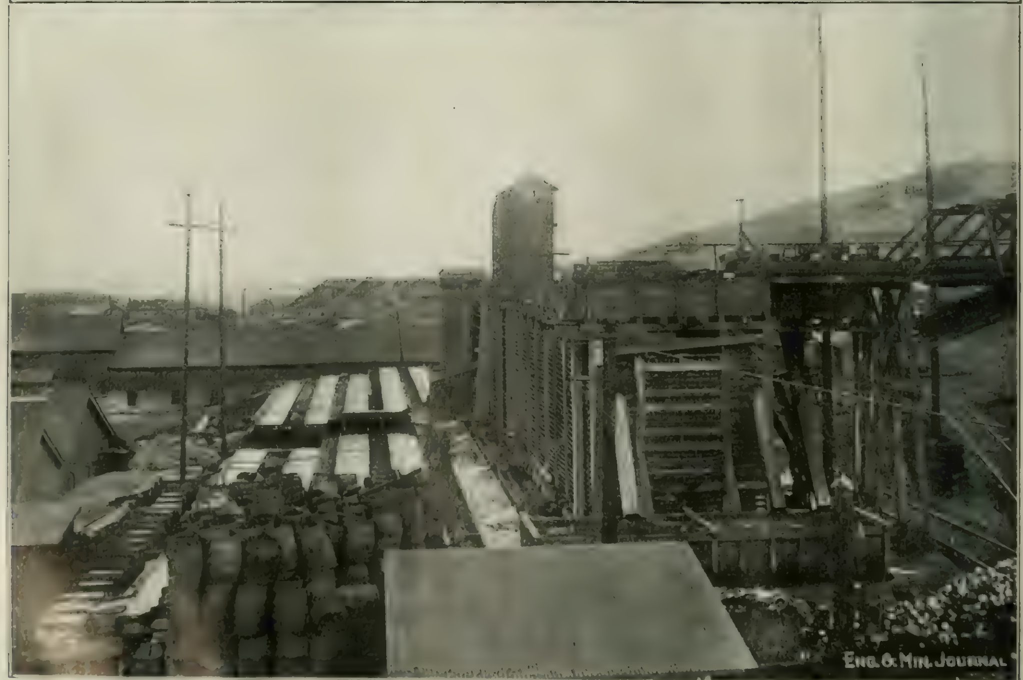
For the second quarter of 1913, including April, May and June, the Chino Copper Co. produced 4,046,813 lb., 1,067,486 lb. and 3,876,533 lb. of copper, respectively, a total of 11,999,832 lb. The total amount of ore milled was 492,850 tons, an average of 5416 tons per day.

Average copper in ore was 1.88%, and average extraction 64.48%, corresponding to a recovery of 24.33 lb. copper per ton of ore. Cost per pound of copper was 9.01c. If miscellaneous earnings were credited, it would be 8.71c. per lb. All costs are included in this figure, together with 30c. per ton of ore treated for extinguishment of mine development and stripping expense. During the quarter, $1,510,500 par value of the company's bond issue was exchanged for 60,420 shares of stock, leaving $751,500 par value of bonds outstanding.

Net profit from milling operations was $682,052; miscellaneous income, $34,706, a total of $716,758. Dividends of $629,790 were paid, leaving $86,968 surplus. Copper on hand at the end of the quarter, sold and unsold, was 14,519,877 lb., inventoried at 13.828c. per lb. average.

# PHOTOGRAPHS FROM THE FIELD





Precipitating Plant at Leonard Mine, Butte, Mont.

Melting Room, Cylindrical Crucible Furnaces in Foreground

Hearth of Cupel Furnace Lowered on Truck and Removed

Shovelers. The Hammer-Point Pick Is Much Used in Australia

Drilling in Square Set Stope, One Man Running Water Nozzle

Timbering in Many Peaks Mine

No. 6 Dam from Power Station Stack

Workings of the Mount Morgan Gold Mining Co., Queensland

# Michigan Iron Ranges

Marquette Correspondence

Only one property in the Michigamme field of the Marquette range is active, and this one is being wrought on a meager scale. Operations are, in fact, confined to surface work. The mine is the Portland, a possession of the Rogers-Brown interests. Work preparatory to actual mining, such as building a shaft house and installing a crusher plant, is in progress; 25 men are employed. Under the new system adopted, ore from the mine will be dumped into a pit, the bottom of which will be inclined, and will run into skips which will hoist it to the crusher. As is the case at the other Michigamme properties, the Portland produces limonite ore of low grade, and for which at present there is little demand. It had been expected that the Cleveland Cliffs company's Imperial mine in this district would be operated this year, but the property continues inactive. There recently was erected at the Imperial a fine steel headframe, aside from which the hoisting plant was overhauled and bettered.

While a start has been made in opening the Athens mine at Negaunee on the Marquette range, it probably will be two years hence before the property is in a position to produce ore in any great quantity. The initial depth of the shaft will be 2200 ft. The first 40 ft. of this is overburden, which has already been penetrated and which will be walled with concrete 1½ ft. thick. The concrete will extend well into the orebody. Eventually drifts will be driven to the Negaunee mine of the Cleveland Cliffs Iron Co. a few hundred feet northeast. The Cleveland Cliffs company and Pickands, Mather & Co. are jointly interested in the Athens and will develop and operate the tract as the Athens Mining Co. The existence of ore was revealed by diamond drilling, exploration of which nature still continues. Temporary buildings have been constructed. Next spring a permanent power house, a shop building and other structures, contracts for which have already been awarded, will be erected.

### Draining Lakes for Ore

At some time in the future, probably many years distant, part of Lake Michigamme will cease to exist. The iron formation in that part of the Marquette range traverses the northern end, and eventually this end of the lake will be drained to permit mining the ore. Excepting Lake Gogebic, Lake Michigamme is the largest inland lake in upper Michigan. Unwatering its basin will not be without precedent on the Marquette range. Lake Angeline, at Ishpeming, was drained years ago, and there have already been mined from under its old bed many millions of tons of ore. North Lake, west of Ishpeming, where the Cleveland Cliffs company is developing ore, will probably be unwatered at no distant day, as ores undoubtedly occur beneath it. In the Cascade district of the Marquette range, the Volunteer Ore Co., of Duluth, has drained a portion of Palmer Lake. There are deposits of ore under both Lake Bancroft, at Ishpeming, and Teal Lake, at Negaunee, and these two bodies of water, too, will disappear some day.

The Montreal Mining Co., operating in the Wisconsin part of the Gogebic range, has awarded a contract for the erection of an office building, 20 houses for mine employees and a residence for the superintendent. Ten miners' dwelling houses at Ramsey and 10 at Wakefield, also on the Gogebic, will be built by the Castile Mining Co., operating on the Michigan side of the Montreal River. The contracts for all of this work have been given to the Foster Construction Co., of Milwaukee. Operations will be rushed, in the hope of completing the work before the advent of severely cold weather. At Ironwood the Foster company has under way much construction work for the Newport Mining Co.

### Miners Coming in from Copper Country

Many miners thrown out of employment in the copper country on account of the labor strike are finding work in the iron districts, notably on the Gogebic range and in the Iron River field of the Menominee. These miners are English-speaking, in many instances men of Cornish birth, and their coming to the iron ranges is welcome.

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# Ray Consolidated Copper Co.

Report of this company for the second quarter of 1913, months of April, May and June, show a production of 4,514,565 lb.; 4,495,217 lb.; and 4,392,612 lb. of copper, respectively, or a total of 13,402,394 lb., produced at an average cost of 9.558c. per lb., after crediting income from the Ray & Gila Valley R.R., but no other miscellaneous income. The average cost for the half year is 9.5348c., which includes all operating and general charges as well as a charge of 12.5c. per ton of ore treated, or 0.56c. per lb. of copper produced, for the extinguishment of mine development expense.

In addition to copper contained in concentrate, there was produced 84,294 lb. from ores shipped direct to the smelter without concentration, making a total of 13,486,688 lb. produced. Total ore milled for the quarter was 587,877 tons, a daily average of 6460 tons. Average mill recovery was 66.915%, and 35,938 dry tons of concentrate were produced, containing an average of 18.647% copper. Ratio of concentration was 16.358 : 1.

The first quarterly dividend, at the rate of $1.50 per share per year, was paid on June 30, the sum being $543,662. Direct operating profit for the quarter was $716,601; miscellaneous income, $10,158, making a total profit of $726,759. Copper on hand and in transit, sold and unsold, was 16,833,979 lb., inventoried at 14.148c. per lb. Average cost of mining, exclusive of 12.5c. development charge, was 73.92c. per ton, and the milling cost was 45.25c. per ton.

Seven sections of the mill at Hayden were in continuous operation and the eighth will be in use in August. Underground development for the quarter amounted to 22,870 feet.

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# Russian Iron and Steel

Iron and steel production in Russia for the year ended Dec. 31 is reported as below, in long tons:

| | 1911 | 1912 | Changes |
|---|---|---|---|
| Pig iron | 3,525,000 | 4,118,000 | I 593,000 |
| Steel ingots | 3,874,000 | 4,418,000 | I 544,000 |
| Finished steel | 3,258,000 | 3,674,000 | I 416,000 |

The pig-iron production was the largest ever reported. The exports of pig were 1000 tons; imports, 44,000; making approximate consumption, 4,161,000 tons. The production of steel was also the largest ever reported in a single year.

# CORRESPONDENCE AND DISCUSSION

## A Five-Ton Smelting Furnace that Smelts

Replying to Mr. Mace's recent rejoinder to my criticism concerning a "Five-Ton Smelting Furnace that Smelts," it seems to me that Mr. Mace fails to meet my objections. In Mr. Mace's first article in the JOURNAL of May 3, in which the drawings of a five-ton Partridge furnace, together with more or less so called "data" of a test run made in Knoxville last fall, are given, the author lays no claim to any new discoveries in the chemistry of smelting, but really attributes his remarkable results to two causes, both pertaining to the above furnace: (1) The enormous increase in his blast volumes, due to the "continuous aperture," and (2) the recovery of heat from the slag.

Since the volume of air passing through this "aperture" is a measure of its efficiency and varies directly with it, therefore our author insists that his furnace is receiving the full volumetric displacement of his blower, *i.e.*, for the matting charge, when the furnace proved most efficient, 600 cu.ft. of free air per min. are passing into the furnace. The heat necessary to heat this weight and volume of air (or the resulting gases after combustion of oxygen) is more than that derived from the combustion of all the coke claimed to be used on the charge (5%) and three-fourths of all the sulphur (¾ of 8%). Again casting up our heat balance sheet and allowing a heat recovery of 90% from the slag and also all the heat from the formation of an iron bisilicate slag $FeO.SiO_2$, we have evolved per minute:

| | |
|---|---|
| Heat from combustion of carbon in coke | 7,721 |
| Heat from combustion of sulphur in charge | 2,910 |
| Heat from formation of silicate | 968 |
| Heat from slag absorbed by blast | 4,584 |
| Total | 16,183 |

The heat evolved by the combustion of the sulphur is of little benefit to the smelter since the oxidation of most of this element takes place at the top of the charge, but since I have calculated the oxygen for this as delivered by the blast, we will let it stand. According to Mr. Mace, there are 600 cu.ft. (46.8 lb.) of air at ordinary temperature and pressure delivered diluted to the furnace, and this is instantly heated to 2156° F. If the temperature of air to begin with is 60°, then the volume at 2156° is 3021 cu.ft., and the necessary heat units to effect this increase in temperature and volume would be (if we allow for the increase in the specific heat of the gases with increase in temperature, at their high temperatures), something over 40,000 B.t.u. per min. Of course, some of this heat will be absorbed by the ore column, but in a 4-ft. ore column containing not more than 50% voids, the velocity at the tuyere zone would be 66 ft. per sec., so there would be little chance for retardation or cooling. We have available (allowing liberally for everything) 16,183 B.t.u. per min. There is required to heat the blast alone 40,000 B.t.u., leaving a deficit of, say 23,817 B.t.u. Then there is the heat lost in jacket water, that contained in molten matte, and the heat units otherwise lost in radiation which must be provided for. Evidently, then, Mr. Mace must do one of two things, cut down the volume of his blast, or increase his fuel. He informs us that "the greatest metallurgist in the world would be unable to keep the furnace going 30 min." on the calculated amount of air, so we are forced to the other conclusion, viz., that Mr. Mace is using more than 5% of coke on his "matting" charge.

But why continue our inquiries any further since Mr. Mace assures us that he is too busy "to delve into the realms of thermo chemistry," while his furnace is in blast, with a "green crew" on his hands hustling around, charging in nearly a shovelful of ore and fuel every minute, and it is evident that he has no taste or disposition to do so when he is not thus engaged?

It is encouraging to one of the profession to note that Mr. Mace still insists upon the necessity of having a trained man in charge of the furnaces, but many operators, I think, would object to paying one-third of the total cost of smelting for superintendence.

ROYAL P. JARVIS.

Miami, Ariz., Aug. 10, 1913.

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## Promoting and Engineering Ethics

In connection with the discussion of professional ethics as applied to mining engineers, the following question has been asked. "Should a mining engineer engage in promotion"? The revival of this topic, in this instance, is prompted by an article published in the JOURNAL of May 24, 1913, and entitled "Consulting Engineers." While I do not place myself in the category of those who are said to be a "financial drain," "increasing the cost of all metal-winning processes," (did anybody whisper "sour grapes"?) I wish to shed publicly a few tears of pity and commiseration for some of the unhappy companies which, although they may have prospered and paid large dividends, nevertheless have been so blind to the interests of their stockholders as deliberately to encourage the growth of such pernicious parasites as consulting engineers.

If it is true that the majority of the practical mining men have an abhorrence for the engineer whose mission in life is said to be that of "pestering" the "man on the job"; why is it that these "diabolically ingenious" ones, who have acquired the "superficial knowledge of several districts" and have chosen to make an honest effort to transmute that superficial knowledge into bacon and beans, are continually pestered in turn by the hordes of "practical" mining men who are seeking capital to develop holes in the ground? Is it a matter of pure revenge? Furthermore, considering the almost universal repulse which greets their advance, is it not within the proprieties to consider that the hostility toward consulting engineers is in many cases merely a manifestation of the "knocking" so often the result of "lost motion" in a crank-pin box?

I venture to state that of the thousands of mining prospects which have been partly developed, incorporated, promoted, passed through stages of apparent prosperity, lingering illness and death or prolonged cataleptic coma, but a small percentage had the experience of being guided by a consulting engineer of university training and even a superficial knowledge of various districts.

But when the corpse is in a condition fit for the undertaker, and sometimes fairly stinking of loot and graft, the "practical" mining man frantically beseeches the consulting engineer to come to the rescue and, to continue the analogy, bring the pallid child back to life by applying the pulmotor or by blood transfusion. The consulting engineer is generally expected to supply the paraphernalia and often also is requested to find the healthy subject who will furnish the blood. A practicing physician, called in an emergency to remedy the bungling efforts of an ignorant midwife, is bound by his code of professional ethics to do all that he can to preserve life.

Coming back to the mines, the trouble seems to lie in the fact that the ordinary promoter and his associates have too often usurped the field properly belonging to the usually technically trained consulting mining engineer, graduated from the ranks of the "man on the job." Have we not all heard the story of the mining engineer who wired his principals that the mill would have to shut down on account of the mine shaft having caved in, and who received a telegram from the promoter instructing him to "purchase a second-hand shaft and resume operations at once"?

Often the man on the job, himself frequently a university graduate, could successfully perform the functions of consulting engineer; were he consulted. But the necessity for making a good showing, temporarily at least, until certain stock can be placed to advantage, on an excessive capitalization, impels the promoter and his associates to crowd on the engineer such a multitude of tasks that he is unable to devote sufficient time to working out problems the importance of which are quite apparent to him, but which his employers refuse to heed. The engineer is compelled to do what he is told, though it may be entirely at variance with his own convictions. In such cases he truly is pestered. If he is quite young and entirely honest, he may feel that possibly he himself may be in the wrong, as he frequently may be; but it is certain that such conditions tend to reduce his efficiency. What he commonly does is to hunt another job; either voluntarily or involuntarily. If later developments at the mine should prove that he was right, it is unlikely that the officials of the company will take great pains to advertise the fact; yet the engineer may justly feel that he is entitled to act in a consulting capacity with respect to similar problems in other localities. Should he have the good fortune to associate himself with congenial employers and succeed in making good with them, he becomes established. But the supply of congenial employers is apparently limited.

Careful observations have demonstrated that the average term of employment of the technically trained young mining engineer is about one year or possibly less. Wherein lies the fault? Partly with the engineer, beyond a doubt, due slightly to his disinclination to bow submissively to the rule of those who, like a certain well known inventor, contend that: "The college bred ones are not worth a ——." However, is it not reasonable to suppose that the non-technical promoter deserves the greater share of condemnation for the short lives of both employment-terms of mining engineers and of mining enterprises themselves?

The varied experience of the average mining engineer of several years' standing tends to make him conservative rather than blatantly optimistic, and it is my sincere belief that the mining investor stands a reasonable chance of protection when placing his speculation with an enterprise promoted by a mining engineer who, however obscure he may be, has had the opportunity to observe the causes of the failures of others.

For the mining engineer whose reputation is free from the slightest stain and whose professional or business honesty has never been questioned, the promotion of engineering enterprises on a rational basis is a perfectly legitimate field. It is quite ethical for him to observe the field, investigate the probable fertility of the soil, and then to plough it.

William B. McKinlay.

New York, July 21, 1913.

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## Automatic Weighers in Dusty Situations

In an article by Claude T. Rice, in the Journal of June 21, 1913, the statement is made that dust interferes seriously with the working of automatic-weighing devices of the type used on belt conveyors, and that agents have not been desirous of installing them.

This is a subject, the importance of which is increasing daily, and I believe that attention should be called to the fact that belt-weighing devices until recently have all been operated by strictly mechanical means of considerable refinement. These mechanisms have depended for their accuracy upon the precise relation of moving parts which were subject to wear. Such conclusions as the one reached by Mr. Rice must of necessity be based on experience with weighers of the mechanical type.

There is now on the market, however, a device made by the company with which I am connected, which works on a radically different principle (cf., Eng. and Min. Journ., Sept. 16, 1911, p. 551). In this device the moving parts are so reduced in number and their functions are such that dust, even in the most aggravated cases, does no harm whatever. It is no longer correct, therefore, to imply that any one should hesitate to install a conveyor scale on account of the presence of dust.

E. H. Messiter.

New York, Aug. 6, 1913.

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## Regulating Moisture in Sand Discharged by Dorr Classifier

In my article on "Regulating Moisture in Sand Discharged by Dorr Classifier" (published in the Journal of Aug. 2, 1913), I stated that, "By using this appliance the amount of water in sands could be reduced from 60% to only 12%."

The determinations of moisture had been made in the laboratory, and I did not check them myself until lately, when some doubt as to their exactness had risen. I found that the correct figures were consecutively 69% and 19.5%.

M. G. F. Söhnlein.

Machacamarca, Bolivia, June 28, 1913

# EDITORIALS

## Silver Prices

The silver market for the last six months has been remarkably steady, showing only a very gradual and slow decline from the high point reached in January of this year. The average for that month was very close to 63c. in New York and 29d. in London, the highest point which has been reached for several years. The conditions, however, have not proved sufficient to maintain the level which was then reached, and although the strong speculative interests which have dominated the market for nearly three years past are still in evidence to some extent, it was not possible to advance the prices in the face of adverse conditions. The considerations which advanced silver at the close of the last year, were chiefly the anticipation of a heavy demand from China, but the political and business conditions in that country have been adverse throughout nearly the whole of the present year. The new government was not strong enough to undertake the expected revision of the currency, and the unsettled state of political affairs prevented the revival of trade which many looked for. The placing of a large government loan, which had been generally expected, was not possible, and consequently the demand for silver has been only on a moderate scale.

The average price of silver in London, however, has declined by only a small amount, falling from 28.983d. in January, to 27.074d. in July, and it seems inclined to remain at about that level. Possibly it might have fallen further, but two or three influences combined to hold it at about that point. The first was undoubtedly the support of the syndicate of Indian banks and speculators, and the second was the comparatively moderate receipts of new silver. Nevertheless, shipments from London to the East for the seven months of the present year have been the smallest recorded for six years. In the early months, they were rather in excess of those in 1912, but for the last three months they have been falling off and the total to date is now considerably below that of last year at the same time. Indian crops and exports have been fairly good but the demand from that country has not been sufficient to overcome the effect of the heavy stocks accumulated there, which have been weighing on the market for nearly a year and a half. To the effect of these stocks was added the large imports of gold into India, which were the heaviest ever known and which necessarily took the place, to some extent, of the silver which has been needed there.

The success of the speculative syndicate in preventing any great fall in prices has been remarkable, and it seems likely that it will continue, notwithstanding the existence of large unsold stocks. At the present time, it is estimated that stocks in London are about £4,200,000. Those in Bombay are comparatively low, being £460,000, but in Shanghai and Hongkong they have risen to a pretty high figure, being reported at £6,060,000. This makes a total of a little over £10,700,000, which is a heavy amount to carry; unless political affairs in China brighten sufficiently to require some of it for immediate use, and this looks rather doubtful.

On the other hand, the new supplies coming in have been unusually light. The production in Mexico has been considerably reduced so that the shipments from that country have shown a decided falling off. The United States has furnished about the usual amount, the quantity of silver refined here having been kept up by receipts from South America and other countries, so that the net exports so far this year have been a little larger than they were a year ago. The net exports from this country—nearly all of which went to Europe—for the seven months ending with August, were 28,885,000 oz., approximately. The shipments from London to India and China for the same period, were 42,542,000 oz., and these, as we have said, were the lightest for several years.

There appears to be no disposition at the present time to start any speculative movement in silver, the market being quiet and the important interests being satisfied with the present price. There is no reason to anticipate any special movement. The Indian crop advices are favorable, indicating that there will be a normal demand for the metal. The currency reserve is reported large, so that there is little or no probability that the Indian government will be in the market for a good while to come. If anything, a decline, rather than an advance, might be anticipated, but it is not likely that there will be any notable change for some time to come.

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## The Mexican Situation

The Mexican situation still continues extremely doubtful and disturbed. The special envoy or messenger sent by President Wilson to the City of Mexico does not seem to have been able to come to any agreement with the Huerta government, although a more pacific understanding was probably reached before Governor Lind left Mexico and some of the doubts expressed on his first arrival had disappeared. It is clear, however, that no offer from the United States to mediate between the contending parties will be acceptable, or is likely to be considered at all. It is perhaps hardly correct to speak of two contending parties, for the opposition to President Huerta is split into several factions. The insurrection is still strongest in Northern Mexico and the operations of the contending parties there are followed by bands of guerillas to whom much of the existing disorder is to be attributed.

President Wilson has promised to submit to Congress a message outlining the situation as it appears to our government, and also his proposed policy in the matter, but up to date this message has been held back, presumably in the expectation of receiving more definite advices from Mexico. Congress seems to be inclined to support the President generally, and the inflammatory proposition of Senator Penrose to appropriate $25,000,000 for the purpose of sending an army into Mexico to protect Americans and American property received no support worth mentioning.

A tentative suggestion has been made from Washington that citizens of the United States generally should leave Mexico. In view of the large personal and property interests of Americans in that country, it is very doubtful whether this suggestion can or will be adopted. A good many have already left the disturbed districts and probably many others would like to do so if they could. A general exodus seems to be rather too stringent a proceeding to be adopted. At the best, the situation is a [illegible] and it is almost impossible to predict how it will develop.

It is reported that some of the companies owning mines in Sonora and Chihuahua are arranging to withdraw their American employees as far as possible, leaving their property in charge of Mexican foremen and assistants for the time.

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## Australian Mining Accidents in 1912

In the mines, other than coal, of New South Wales during 1912, 31 men were killed and 32 seriously injured. This is a death rate of 1.565 per 1000, and is slightly more than the average for the last five years. In Queensland, the number of deaths was 26 and the number of accidents, 198 for the same year. This corresponds to a death rate of 2.45 per 1000, and is the highest obtaining in Queensland since 1888. Of the 26 fatal accidents, two occurred in shafts, 11 were due to falls of ground, and five were the results of accidental explosions. These figures, taken from the annual reports of the mining departments of the two states in question, show that Australia is far ahead of the United States in the question of mine safety. Taking our death rate somewhere between 4 and 5, it is evident that we have a long way to go yet before attaining to the standard set by the southern commonwealth. The cause is not far to seek. Conditions in American mines are not essentially any more dangerous, and the character of our labor is as high or higher. It is simply that in Australia, public opinion, as reflected in the actions of the government, has done its work. The great interest taken by the state governments in the question of safety is well evidenced in the reports mentioned. The Queensland report, for instance, includes a complete list and detailed analyses of all the accidents occurring during the year, the study of which is sure to be of the greatest value as indicating the lines along which accident prevention must move.

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## Chinese Iron Competition

The proposed placing of pig iron on the free list has brought one of the Pennsylvania senators to the front, with doleful anticipations of the closing of our merchant furnaces by the rush of imports from China. His figures as to wages and other costs in that country make a striking contrast to those of the Pennsylvania iron makers, but when we come down to actual facts, the prospects of any real competition seem sufficiently remote. China has certainly large resources in iron ore and coal, but their development so far has been exceedingly slow, and does not seem to increase. The largest iron works in China are those at Hanyang, and in this country the plant would rank as a small one; moreover, its total production is far below the consumption in the country. What foreign trade it has is chiefly with Japan, and that country takes more iron ore than pig or finished iron, preferring to do the smelting in its own furnaces.

One attempt was made on the Pacific Coast to import Chinese pig regularly under contract, but that resulted in a rather disastrous failure. The exports of iron from China reached their highest figure in 1911, with 68,630 tons, but in 1912 fell to a little less than 8000 tons. In both years little or none of the exported iron went further than Japan; even if it had all come to this country the quantity would have been less than 0.002% of our consumption.

We are not advocating free pig iron especially; but its opponents to secure success must find some better argument than Chinese competition. The awakening of industrial China is slow and must be slow, in the nature of things. Forty or fifty years from now iron from the East may be a factor in our industrial situation, and then it may be time to protect ourselves. At the present time, however, it seems simply a waste of time to talk about it.

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## Australasian Gold Production

The official returns of the various states of Australia show that in the first half of 1913 the gradual decrease in gold production, which has been going on for several years, still continues. The total for the six states of the Commonwealth of Australia and the Dominion of New Zealand is given in the table below, in fine ounces, South Australia and Tasmania being partly estimated. The total decrease, as compared with the first half of 1912, was 6%, and the quantity is the smallest for several years.

AUSTRALASIAN GOLD IN 1913

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Western Australia | 627,849 | 638,369 | I 10,520 |
| Victoria | 245,900 | 229,700 | D 16,200 |
| Queensland | 170,400 | 131,191 | D 39,209 |
| New South Wales | 94,037 | 87,283 | D 6,754 |
| South Australia | 3,500 | 3,750 | I. 250 |
| Tasmania | 17,900 | 17,250 | D. 650 |
| Commonwealth | 1,159,586 | 1,107,543 | D. 52,043 |
| New Zealand | 199,277 | 170,276 | D 29,001 |
| Total | 1,358,863 | 1,277,819 | D. 81,044 |
| Total value | $28,087,698 | $26,412,519 | D $1,675,179 |

Western Australia alone shows a gain for the half year, but it is rather notable that there should be such a gain after a decrease that has continued for over four years. The change was largely due to an improvement in the grade of ore in some of the Kalgoorlie mines. Queensland had the largest proportional decrease among the other states. Its great mine, the Mount Morgan, continues to prosper, but its chief values are getting to be yearly more in copper than gold. The older and larger districts of Victoria are still gradually falling off, with no new discoveries to take their places.

In New Zealand, the Waihi—the most important mine—has not yet recovered from the decreased values in the lower levels, though better things are promised by the newer explorations. The dredging returns are also lower, as the best ground is being worked out. The dredge men are beginning to turn their attention to new fields and some of them are securing placer ground in the Philippines.

Copper seems to be Australia's hope for the future, with tin as a second. There is also a probability that the iron resources of the continent will be developed before long on a considerable scale.

## BY THE WAY

The Rand will have to take a back seat as a gold producer. An esteemed contemporary reports the gold production of the Ashanti mine, in West Africa, in June, at 9798 tons, and that of the Abosso mine, in the same country, at 8049 tons. At this rate West Africa will be this year the greatest gold producer on record. In order that the value of gold may not depreciate too fast, and that Prof. Irving Fisher may not have another fit, we hasten to add that the West African gold is extremely low grade; the 9798 tons produced by the Ashanti being valued at $165,000 only.

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In this country we find the prospecting spirit rampant in all walks of life, and if the ambitions of a recent zealous, though somewhat misguided, prospector could be realized, Kingman, Ariz., would be the unique possessor of a lead-pencil mine. An employee of the Postal Telegraph Co., engaged in digging post holes along the main street of the town, discovered several pieces of lead ore and promptly located the street for several blocks, posting his notice on one of the poles which had just been placed. He took a sample of the ore to a local assayer and, in the meantime, proceeded to try to peddle his claim. The sample assayed over 50% lead, but despite this fact, prospective purchasers seemed to be over-cautious about making any investment. Chagrined but not disheartened, he chided one of them thus: "Begorra, mon! Thot's some lid. Fifty percint. Why, mon, thot's rigular lid-pencil lid."

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Report comes from West Virginia of a sovereign cure for labor troubles. In the light of current labor events in the Middle West, this cure might be of some value to our metal miners. It seems that the Weyanoke Coal & Coke Co., after long suffering with transient labor, the "hobo" miner, devised the scheme of offering prizes for the best gardens, flower and vegetable. After a year of suspicion on the part of most of the employees, the sight of a few real gardens and of the real money prizes made the next year a bonanza garden year for that camp. The beneficient influence of gardening is said to have given the company a corps of steady, orderly, contented, æsthetically inclined, and well fed miners. Steep country, rocks and aridity will militate against the adoption of this remedy in many metal-mining camps, but even under such discouraging conditions, one often sees rather pathetic attempts to till the soil. A little patch of earth in the corner of the cañon coaxed by irrigation with tailing water to support some hardy beans and radishes is a not uncommon sight in the Southwest. Seriously, however, education and help along such lines will often repay a mining company. In Grass Valley, the miner ekes out his wages by owning a house and working a rather complete plant of vegetables, fruit, chickens and perhaps a cow. The relative reliability of the married man with a family is well recognized and he is always considered a desirable element in a camp. When a miner owns his house, garden and stock, he is still more likely to stick to his job. It must be admitted, however, that the situation often looks different to the miner. He has to stick to his job because he is stuck with his house and must stand treatment from his employer that he would never stand, if free to move.

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The Rio Tinto Co. is looking ahead to provide for continued and increased production from its mines. At the recent annual meeting in London, Chairman C. W. Fielding said: "A very small proportion of the ore mined in the past has had to be hoisted up shafts, because comparatively short tunnels driven in from the valleys have enabled our engineers to bring out the mineral from the lodes without any great use of shafts, winding engines or inclines. The lowest tunnel hitherto in use for the two main lodes, the San Dionisio lode and the South lode, is not, however, at a sufficiently low level for the removal of the bulk of the mineral which will have to be extracted from these lodes after about the year 1917. The directors who have recently visited the mines have thoroughly gone into the mining questions in general, and means of moving out and transporting ore in particular, and have authorized the construction of a new deep-level tunnel, 200 ft. lower than the present lowest approach, through which very many millions of tons of mineral as the years go on will be brought to the market on an entirely down grade. This down grade continues on the railway, and practically until the ore goes on to the vessel at the port of Huelva. This new tunnel to be constructed will be about three miles in length and will take three or four years to drive, but its total cost will not represent more than about 1d. per ton on the cost of mineral which will be got out through it."

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It is hard to knock some people out, says the *Australian Mining Standard*, and, therefore, it is not surprising that a deputation of miners should have waited upon the New South Wales Minister for Mines to urge that provision should be made in the Mining Act Amendment Bill, now under consideration, for an export duty on ores. "Vast quantities of ore," it was stated on behalf of the deputation, "were being shipped to Germany and other places, and it was felt by the members of the deputation that the imposition of the proposed duty would lead to great mining development in the States, and encourage the smelting industry. They would like to see state smelting works established." It is not two years ago since the whole matter was exhaustively gone into at the instance of the Commonwealth Government by the smelting companies themselves, the mining industry, and the Mines Department of New South Wales, when the Under-Secretary for Mines reported that while the establishment of additional smelters would lead to a greater consumption of coal and coke, this would be offset by the disadvantages and restrictions which an export duty would impose on the output and disposal of the products of the metalliferous mines, and that in the interests of the mining community the department opposed the scheme. The smelting companies and the mine owners themselves emphatically endorsed the views of the department. In fact, the information gathered in New South Wales was that no one was in favor of the proposed export duty. Dealing with the request for a state smelting works, he pointed out that if a plant were erected in Australia, and equipped with modern appliances for the treatment of such ores as are now exported for treatment, it would cost £4,000,000 at least.

## PERSONALS

[illegible] has left Los Angeles for New Mexico.

[illegible] Stark, of London, has been in Phoenix, Arizona

[illegible] president of the British Aluminum Co., is traveling in Canada.

[illegible] has been appointed manager of the Kelvin-Sultana Copper Co. at Kelvin, Arizona.

[illegible] has just completed a motor trip from Denver [illegible], Me., and back to Denver.

[illegible] E. Woodbridge, of Duluth, Minn., has returned [illegible] a visit to Salt Lake City and Butte.

[illegible] Becker, president of the Stahlwerk Becker, Willich-[illegible] Krefeld, Germany, has arrived in this country.

C. R. Corning has become manager of the Huanchaca company, the well known French concern operating in Bolivia.

M. B. Yung has opened an office for general mining work and assaying at 2 Gresson Street, Wanchai, Hongkong, China.

Ira B. Joralemon, mining geologist for the Calumet & Arizona Co., has been examining properties north of Phoenix, Arizona.

J. P. McFadden, formerly of Michigan, is now superintendent of the Surprise silver-lead mine, near Cody, Slocan British Columbia.

Robert Scott is at Ione, Nev., installing one of his improved quicksilver furnaces, a 50-ton plant, for the Nevada Cinnabar company.

F. L. Sizer, general superintendent of the Mascot Copper Co., Dos Cabezas, Arizona, has been examining mines in the Santa Catalina mountains, north of Tucson.

Hon. T. W. Crothers, Canadian Minister of Labor, has sailed for England to study industrial conditions, especially in relation to coal mine strikes and disputes.

W. Berkeley Williams has been elected vice-president of the Alabama Co., which purchased the properties of the Alabama Consolidated Coal & Iron Co. at foreclosure.

George D. Blood, recently superintendent for the Silver King Coalition Mines Co., has been retained as consulting engineer for the Daly Judge Mining Co., at Park City, Utah.

W. M. Brewer, of Victoria, B. C., has gone to the Bridge River section of Lillooet district to investigate mining conditions there for the British Columbia Department of Mines.

John E. Rinta, after 10 years' active service as foreman and superintendent successively, with the Rambler-Cariboo silver-lead mine, Slocan, B. C., has been appointed manager as successor to W. E. Zwicky, resigned.

David H. Ladd, metallurgist of the Wallaroo & Moonta Mining & Smelting Co., of South Australia, was in New York last week. He left there for a short stay at Houghton, Mich., whence he will go to Germany on business.

Lindsay N. B. Campbell, formerly connected with the Vulcan Iron Works, Seattle, Wash., and the Northwest Steel Co., Portland, Ore., is now superintendent of construction at the West Coast Steel Works, Tacoma, Washington.

Prof. L. C. Graton is at Butte, Mont., with a corps of assistants, in connection with his study of the secondary enrichment of western copper deposits, an investigation to which the large producers of the West have jointly contributed.

C. Offerhaus, for four years past with the Paul Schmidt & Degraz Furnace Co., has resigned and has accepted a position with the Maschinenbau-Anstalt Humboldt at Coln-Kalk, Germany. He will have charge of the metallurgical department.

Walter H. Case, who has been manager of the Hazel Mining & Milling Co. property at Van Horn, Texas, has resigned and has been appointed consulting engineer for the same company. He will have his office at 512 Trust Building, El Paso, Texas.

Frank Williams, for a number of years superintendent at the South works, Worcester, Mass., of the American Steel & Wire Co., has been appointed superintendent of the entire [illegible] of the company at New Haven, Conn. He is succeeded [illegible] South works by Edward Hentz.

[illegible] Snyder, vice president of the Bethlehem Steel Corporation, has returned from a trip to Scotland, where he had [illegible] consult with Scottish ship builders over the building of [illegible] of ore freighters which the company is planning for transporting iron ore from its Chilean properties to this country.

Charles Graham, of Middlesboro, Nicola Valley, B. C., superintendent for the Nicola Valley Coal & Coke Co., has been appointed superintendent for the Corbin Coal & Coke Co., at Corbin, Crow's Nest district. Robert Fairfoull, who has been overman at the No. 2 mine, Middlesboro colliery, is his successor as superintendent for the Nicola Valley.

Herr E. Schaltenbrand has resigned as managing director of the Stahlwerks-Verband, of Dusseldorf, popularly known as the German Steel Syndicate, and has taken a position with the Hohenlohe interests in upper Silesia. Herr Schaltenbrand has been very well known among leading steel makers of the United States by reason of his prominence in the affairs of the German Steel Syndicate.

## OBITUARY

W. J. Evans died at his home at Bourne, Oregon, Aug. 19, of ptomaine poisoning. He was the chief owner of the Molly Gibson mine in Baker County, and was interested in other mines.

Thomas H. Martin, of Crosby, Minn., died in Chicago, Aug. 15, aged 45 years. He was born in Ishpeming, Mich., and when a young man entered the employment of the Cleveland Cliffs Iron Co. He remained with that company for a number of years. Some years ago he went to the Rogers Brown Ore Co., taking charge of a mine on the Menominee Range; two years ago he went to Crosby to take charge of the company's operations on the Cuyuna range.

Thomas G. Proctor was killed July 9 in an automobile accident at Oak Bay, near Victoria, B. C. He was 51 years old. He was born in England and came to the United States when a young man, and engaged in cattle ranching. In 1891 he went to British Columbia and took an interest in mining in the Kootenay district. He was interested in many mines and for some time past had been managing director of the Lucky Jim Zinc Mines, Ltd. He made his home at Nelson until two years ago, when he moved to Victoria.

Charles Austin Burcham, vice-president of the Yellow Aster Mining & Milling company, and one of the most prominent of mine owners in the state of California, suddenly died at the West Lake Hospital, Los Angeles, Aug. 15, aged 54 years. He was born in Vallejo, Calif., where he received his first schooling, and after the completion of his preliminary education he entered a business college from which he graduated. In 1880 he went to Southern California and engaged in the cattle business in San Bernardino County. In 1890 he directed his attention to mining. After five years' prospecting with varied success he with two partners discovered and located a prospect which was later developed into the Yellow Aster mine, which has made a notable record, and built the town of Randsburg. Mr. Burcham was active manager of the mine throughout its development, and was also interested in other local enterprises. He leaves a widow.

## SOCIETIES

**Old Freibergers in America**—Dr. Richard Beck, president of the Freiberg Bergakademie, Freiberg, Saxony, has been in Canada attending the International Geological Congress. After the meetings of the Congress, Doctor Beck expected to visit several places in the United States before his return to Germany. A complimentary dinner will be given in honor of Doctor Beck at the Engineers' Club, New York, on Sept. 9, to which all former students are invited. For further particulars, Old Freibergers should write C. L. Bryden, 1701 Jefferson Ave., Scranton, Penn., secretary.

**Canadian & American Peat Societies**—A joint meeting of the Canadian and American Peat societies was held at Montreal, Aug. 18, about 20 members being present. P. L. Smyth, vice-president of the Canadian society, read a paper by President John H. Hoff, of New York, on the utilization of peat in agriculture, which was followed by a discussion on the use of peat litter as bedding for cattle and subsequently as a fertilizer. G. H. Condict, of Plainfield, N. J., treated of the utilization of peat tide land. B. F. Haanel, of the Canadian Department of Mines, dealt with the peat industries of Europe. Several other papers were presented. Visits were made to the peat fuel plants at Alfred, Ont., and Farnham, Que., after the meeting.

# EDITORIAL CORRESPONDENCE

### BUTTE—Aug. 21

**The Strike of the Electrical Workers** caused a further delay in the work of electrifying the Butte, Anaconda & Pacific Ry. The men were out 8 days and then returned to work under an agreement to submit their grievances to a board of arbitration composed of labor union men and representatives of the public utilities companies affected by the strike. For a time there was fear that the strike would result in closing all the mines and power companies, but the central labor unions and the Butte miners union refused to endorse the strike because it was called improperly and without notice to the companies and without authority from the national officers of the electrical workers.

### SAN FRANCISCO—Aug. 20

**Dredge Construction and Repairs** in the American River and Yuba Basin districts have kept the shops busy and required the employment of a large amount of skilled and unskilled labor in the first half of 1913. There have been no completions of entirely new boats, but one of the old boats has been rebuilt and another overhauled and repaired in the Natoma field. No. 7 dredge was entirely reconstructed with new steel hull and went into commission in Blue Ravine May 12, No. 6 dredge, after thorough overhauling and complete repair, resumed digging on Sulkey Flat, July 31. Natoma No. 5 dredge, which sank starboard side down in 49 ft. of water June 8, was righted and ready for repairs July 18. Being an old boat, built in 1905, there was some doubt whether it could be righted intact. No damage resulted from the righting, and the damage done by sinking was confined chiefly to the twisting of the revolving screen, the breaking of some minor parts of the machinery, and the destruction of the principal part of the housing. The boat will be repaired and some new parts and improvements put in. Natoma No. 2 dredge, digging in the Fair Oaks field, had a hole punched in the starboard bow on July 3. The boat was prevented from sinking, righted and repaired and resumed digging within four hours. The hole was about 5 in. wide, large enough to have sunk the boat but for the prompt work of stopping the leak, which was done by cementing between the outer and inner walls of the hull. In the Poverty Bar field on the middle fork of American River the activity of the Guggenheim interests bears evidence of permanence in the recent filing of incorporation papers in Placer County, of the Yukon Gold Mining Co. and the commencement of construction of a 7½-cu.ft. bucket-elevator dredge. The Beaver Gold Dredging Co., operating on the west side of American River near Loomis, has made improvements and changes in the operating parts of the dredge, which permit the replacing of the land in condition for agricultural purposes. In Yuba Basin district the active construction of the steel hull of the new all-steel dredge Yuba No. 14 is in progress. The stocks were in place and the laying of the bottom plates of the hull was begun Aug. 5. It is expected that the dredge will be completed within five months. The delay has been due to the non-arrival of the steel hull, which was built in the East and shipped in parts ready for setting up. This will be the largest of all the gold dredges. The hull will be 155 ft. 6 in. long, 58 ft. beam, 5 ft. overhang. The dredge will be equipped with 16-cu.ft. buckets and designed to dig 65 ft. below the water line. The boat will operate on Yuba River about two miles east of Hammonton. A feature of this construction, of interest to all large mining operators requiring heavy hauling, is the use of a caterpillar engine and a train of five trucks with a capacity of 96,000 lb. at one load. The train will carry a single piece of machinery 60 ft. long. Yuba No. 5 dredge, one of the old boats operating near Hammonton, was sunk on July 31 in 60 ft. of water, going port side down. This is a 7½-cu.ft. dredge built by the Yuba Consolidated Goldfields in 1905. The sinking was caused by the bucket line going off the tumbler and landing on the hub. This caused a twisting and straining of the hull and made a leak that owing to the position of the ladder could not be repaired in time to save the boat from sinking. The new construction at Natoma and Hammonton, No. 7 and No. 14, is by the Yuba Construction Co. of Marysville. The repair work is by the shops of the operating companies, the Natomas Consolidated and Yuba Consolidated Goldfields. It is noticeable that the boats which have sunk were among the first built in these fields and that the sinking was due in all cases to the rotting of the wood in the hulls. The more important fact is that the machinery of the boats undergoing repairs has required little replacement, and in each instance the indications are that the life of the wooden hull boat will be approximately doubled without the cost of complete reconstruction. The life of Natoma No. 7 with new steel hull should exceed the period of seven years operation with wooden hull.

### DENVER—Aug. 20

**Labor Trouble in the Southern Coal Fields** of Colorado seems imminent. At the meeting of the State Federation of Labor at Trinidad, Aug. 18, F. J. Hayes, national vice-president of the United Mine Workers of America, and who heralds himself as the representative of 400,000 union miners, delivered his ultimatum which is to the effect that unless the operators in district No. 15 recognize the union, a strike will be called. The fiat of the operators is that under no conditions will the men be negotiated with as unionists. The operators claim that less than half of the coal miners in Colorado are now paying dues to the union. A strike would be disastrous, as it would tie up a monthly pay roll of at least $1,500,000 and affect every industry in Colorado, and it will have no public sentiment at home to back it, for the elements of wages and hours of labor are not in dispute, and it will not therefore appeal to the sympathy of the people at large. It is hoped that wisdom will prevail, but both sides to the controversy are firm in their refusal to concede a point.

### CALUMET—Aug. 23

**The Lake Superior Strike** was begun one month ago, having been called July 23. The event was marked by a parade of the strikers and an address by John Mitchell, the labor leader, who spoke in the morning at Calumet and in the afternoon at Hancock. Between 1750 and 1800 men were in line, with several women and children who were featured under the banner "What Papa is Striking For." The parade showed conclusively that the ranks of the strikers are gradually diminishing. The Federation has added another failure to its long list. The Calumet & Hecla is operating eight shafts and shipping about 1800 tons of rock to the mills daily, about 3000 men having signified their desire to go to work and the number is being daily increased. The Quincy is hoisting at two shafts, No. 2 and No. 6, and is shipping to the mill, as is the Champion property of the Copper Range Consolidated where hoisting is being done at two shafts. The Superior is shipping to the mills of the Lake Milling & Refining Co. At the Superior the men are being cared for at the property to avoid the possibility of interference from the strikers' pickets, and it is likely that similar arrangements will be made to take care of the men that have expressed their desire to go back to work at some of the mines at the northern end of the district. At the Mohawk, Ahmeek and Kearsarge branches of the Osceola Consolidated the Federation has been particularly strong, but the men are becoming dissatisfied with conditions and the future outlook and are applying for their former positions. In the village of Red Jacket, Wednesday evening, Aug. 20, a party of 20 strikers attacked a squad of deputies, two of whom were severely handled and if it had not been for the prompt arrival of the militia serious trouble would have occurred. Seven arrests were made as a result of the fracas.

### MARQUETTE—Aug. 23

**The Invasion of the Iron Ranges** which the organizers of the Western Federation of Miners have threatened, stating that after the strike in the copper country is won by the Federation the steel interests will be compelled to recognize the organization, has not caused uneasiness, either among the mine workers or the operators. The threat is generally considered a bluff. The iron miners display no desire to invite labor trouble and it is declared that an invasion by outside agitators, such as took place in the copper country, would be resented and resisted. The mine workers are enjoying the best wages and working conditions in the history of the region. Furthermore, it is realized that, like those in the copper district, the operators will never have any dealings with the labor organization. The mine workers at Ishpeming, the largest field on the Marquette range, have a union, but this is now in no way affiliated with the Western Federation of Miners and the members assert they are through with that organization for all time. There is reason for their attitude, for the Federation is endeavoring to take from them their business block on Cleveland Ave. and some $1500 in cash, now on deposit in one of the Ishpeming banks. The Ishpeming union surrendered its Western Federation charter one year ago, because of excessive assessments levied against the miners for the support of the agitators and for the [illegible] of strikes in various parts of the country. Protests to the head officials were ignored. Instead, the levies continued to be made, and they were more than the [illegible] could afford to pay. Soon after the charter was surrendered the Federation officials started legal proceedings to obtain possession of the Ishpeming union's business block, its funds on deposit in the bank and all other property owned by the organization. The case is one in chancery and will be tried before Circuit Judge R. C. Flannigan at Marquette in September. Prosecuting attorney M. J. Kennedy, of Marquette County has been retained by the Ishpeming union. The Federation officials are basing their case on a clause in the organization's by-laws, printed in fine type, to the effect that when a subordinate union withdraws or becomes defunct, its holdings shall revert to the Federation. The officers of the Ishpeming union assert they did not know of the existence of this "joker" until after the withdrawal. In view of the fact that the business block was acquired by the Ishpeming union long before it became affiliated with the Federation, the members feel that the Federation has no right to claim either the realty or the bank deposits. The Federation never contributed toward paying for or maintaining the building, nor did it ever contribute anything toward the union's bank account. The block was paid for by assessing the members of the home union and with the rentals. The Ishpeming union bought the Cleveland Ave. property in 1898, and it became affiliated with the Federation six years later when the United Mineral Mine Workers' Association was absorbed by the Western organization. The union has an injunction against President Charles H. Moyer and Vice-president C. E. Mahoney of the Western Federation restraining them from entering its property or in any way interfering with the building or its contents. The property is in the name of the Ishpeming union and has been since the block was purchased by the miners.

### DULUTH—Aug. 23

**Stockpiles on the Vermilion Range** owned by the Oliver Iron Mining Co. are getting low. From present prospects there will not be more than 20,000 tons altogether at these mines by the close of navigation. The Section 30 mine is the only independent shipper on the Vermilion, but from present prospects there will be two or three others next year, the Consolidated Vermilion, and Vermilion & Mesabi. It is expected that ore will be opened any day at the North American, and this property is a prospective shipper for 1914 also. The steamer "E. N. Saunders" took a cargo of 6500 tons of manganese ore from the Cuyuna-Mille Lacs mine, from Superior last Sunday for the Bethlehem Steel Co.

### FLAT RIVER—Aug. 24

**Settlement of the Strike** is being attempted at a conference between the striking miners and operators with the state board of mediation, meeting at Farmington. The meeting was adjourned Aug. 21 with a prospect of bringing about a settlement. It is understood that an offer of a 20c. per day increase to the miners has been favorably received and may be the means of bringing about a termination of the strike. It is said the miners agreed not to enforce their demands that the unions be recognized by the operators. The operators, in connection with their 20c. offer, stipulated that further consideration of grievances be considered solely by the local union committees without the participation of the council of the Western Federation of Miners. Under the operators' propositions, all other demands of the union men are to be taken up in due course after the chief difficulty has been settled and the men are back at work. The strikers' demand that all striking miners be put back to work without prejudice and the operators have agreed to put all of them back that they are able to. The strikers are [illegible] vehicle in the lead belt to search in an effort to apprehend imported strikebreakers. Vehicles bearing women [illegible] escaped the espionage, and several wagons and [illegible] containing only women have been subjected to [illegible] by the miners. It is generally thought that a settlement will [illegible] be effected in order to prevent the indefinite suspension of at least three companies. Water has already risen above the pumps in shafts owned by the St. Joseph Lead Co. Mines of the Desloge Consolidated Lead Co. and the Doe Run Lead Co. are in extreme jeopardy and it is only a question of hours until they will be beyond the possibility of immediate reopening. The Federal Lead Co. is operating its pumps with strike breakers imported from St. Louis. A coterie of St. Francois County officials proposed that negotiations be opened favoring a settlement with the Doe Run, St. Joseph and Desloge companies, leaving out the Federal and the St. Louis Smelting & Refining companies. The latter are Guggenheim corporations, and considerable feeling against them is being manifested on account of the importation of strike breakers. The St. Louis Co. is barely operating its pumps with its own men. Bathing is a forgotten luxury in Flat River, Bonne Terre and Leadwood, where the water supply has been cut off by the suspension of pumping. A sudden demand for coal-oil lamps was created when electric currents were stopped. Four passenger trains on the Mississippi River & Bonne Terre R.R. have been taken off. Union officials have asked the strikers to abstain from drinking. As a result the saloons of Bonne Terre, Elvins and Farmington are receiving less patronage from the miners than before the strike. Very little disorder is noticeable. The entire district is virtually without police protection. Flat River, an unincorporated town of 5000, has a police force of two men, a constable and a deputy sheriff. Several deputies have been sworn in to guard property of the Doe Run Lead Co., situated outside the business and residence section, and also property of the St. Joseph company at Leadwood. Bonne Terre, about the size of Flat River, is also unincorporated and has only two or three peace officers. All of the mining towns with the exception of Elvins are without jails. Elvins, with a population of 2500, is incorporated. The companies have always fought the incorporation of the other towns. The Federal Lead Co.'s shaft No. 7, in Flat River, was abandoned by the pumping crew, composed chiefly of strike breakers. The crew was not large enough to keep steam up and cope with the water. It is the first one of the Federal's shafts to be abandoned. The mine will be completely flooded within a few hours. Union men deserted the gas and water plants at Bonne Terre, Aug. 17, in sympathy with the striking lead miners. The union men at the gas plant walked out after giving the public notice they would do so unless the electric power generated for commercial purposes was discontinued for use to pump the mines. [Later dispatches dated Aug. 26, state that the operators have granted an increase in wage, the union will not be recognized, and the men will return to work at once.—Editor.]

### VICTORIA, B. C.—Aug. 15

**Troops Have Been Called Out** by Attorney-General Bowse. Militia and regulars to the number of 1000 have been sent to Nanaimo, Ladysmith and Extension in the strike zone on Vancouver Island. At Extension, 40 non-union miners barricaded themselves in a tunnel and a battle ensued between them and the strikers. One non-combatant was shot and fatally injured. Alexander McKinnon, a non-union man, was badly injured at Ladysmith by dynamite, and is not expected to live. Several non-union men were beaten up by the strikers, while numbers of them, including some of the mine bosses and superintendents escaped to the woods. At Extension eight buildings, including the tipple and approaches to the mine, are reported burned, also three big motors, 35 cars and considerable equipment. One of the slopes in the mine is on fire, but the fire broke out before the riot. Twenty-five special police, who were hurried over from Vancouver when news of the disturbance was first received, were met at the wharf by the union miners, stripped of their badges, revolvers and handcuffs and sent back on the boat by which they arrived. Many of the miners at Ladysmith are foreigners. Four leaders of the strikers have been arrested at Cumberland and placed in the jail at Nanaimo.

The wives of the strikers have been active, encouraging the miners in their attacks on the coal mining companies' properties. At Nanaimo they closed up the office of a newspaper that they considered had been unfair to them in its reports of the strike troubles. Since the strike commenced the Cumberland mines have been operated by the aid of Chinese miners, but fearing race riots these men are reported to be quitting work. The disturbance is likely to lead to an investigation of the unionists' grievances, which the coal companies have been avoiding and which the provincial government has hitherto refused to grant. No news of any fresh disorders has been received since the troops arrived on the scene and it is likely that quiet will now prevail. Between 1000 and 5000 miners are involved in this strike. [Later advices state that some of the mines are resuming operations, recognition of the union having been accorded.—Editor.]

# THE MINING NEWS

## ALASKA

IDITAROD DISTRICT YIELD this season will be, according to estimates, $2,500,000. Dry weather and a consequent shortage of water has interfered to some extent with operations. Most of the production will come from a few large operators. Riley & Marsten, on Flat Creek, are employing 200 men, while another company is working 120 men on Discovery claim.

RUBY DISTRICT PRODUCTION up to July 1 was $200,000. The present output is reported to be at the rate of $150,000 per month, which will give an output for the season of $600,000. There are no large crews at work, most of the mining being done by three or four men working together. Poorman Creek, 60 miles from the town of Ruby, promises to become the banner creek of the camp.

CIRCLE DISTRICT reports a continuation of the unusual water famine that has been felt so keenly this summer in every camp in the Yukon valley and also in Nome. On Mastodon Creek every plant has been forced to close down, with the exception of the Elmer dredge, which is reported to be having a prosperous season. An important recent discovery of pay is reported from a tributary of Hope Creek, where Carl Anderson and partners are said to have found ground averaging a little more than $1 per sq.ft. of bedrock.

THE HOPE AND SUNRISE DISTRICTS are experiencing a quiet boom. In 1896 this district, known as the Cook Inlet district, was the scene of wild mining excitement. Men rushed in from all parts of the world, following discoveries on Bear, Palmer and Resurrection Creeks. The country was over-prospected, and when the Klondike stampede took place it was deserted. Claims reverted to the Government. Now, owing to systematic prospecting, there are some good-sized crews at work on their own grounds, making better than wages, and some who are in the coarse pay.

RHOADS & HALL (Cleary)—The latest developments on the 140-ft. level of the winze have been unsatisfactory. The vein is wider than in the upper levels, averaging 3 ft., but the ore is too low-grade to yield a profit under the present high cost of mining. The sinking of a vertical shaft has been postponed indefinitely.

## ARIZONA

### Gila County

AN ELECTRIC SMELTING TEST, the first test of an electric-smelting furnace in Arizona was made in Globe a few days ago by Raymond S. Wile, of the Pittsburgh Electric Furnace Co. In smelting Copper Reef ores the slag contained 0.35% copper. About 3500 kw. per ton of charge was required for smelting. The furnace has a capacity of 15 tons per 24 hr., not 5 tons as stated in a previously published item. The furnace is of the resistance, vertical-shaft type, 6 ft. high, and is lined with magnesite. The orifice is 22 in. in diameter at the top and tapers down to 20 in. at the bottom. A stationary electrode is fixed in the bottom of the furnace. At the top a 5-in. Acheson graphite electrode is suspended and operated by a winch. The heat is started by an arc, and as the charge melts the upper electrode is withdrawn partially, remaining immersed in the charge just sufficient for the resistance of the charge to maintain the necessary heat. The molten bath is always kept at a height of 3 ft. Near the bottom of the furnace are two spouts, the upper one for drawing off the slag and the other for copper.

INSPIRATION CONSOLIDATED (Miami)—The mill work is well under way. The first portion to be begun is the eastern corner where the three-story warehouse walls are rising. At present only one of the large concrete mixers is in operation, but the installation of another will double the amount of construction work in the near future. Excavation for the 600-ton flotation test mill has been completed and pouring of concrete will begin early in September. The present rate of construction calls for 150 cu.yd. of concrete daily. Constantly recurring reports of smelter construction at Burch, a station on the Arizona Eastern R.R., four miles from Miami and six miles from Globe, have no foundation in fact. It is generally understood, however, that the International Smelting & Refining Co. will build a smeltery in the district in the near future, despite the fact that the Miami Copper Co. has entered into a new 10-year contract with the Cananea company for reduction of its concentrates.

### Mohave County

GOLD IN KINGMAN was discovered a few weeks ago. A piece of rock was picked up on Oak St., which roused the interest of the finder. Later prospecting disclosed a small vein crossing the street from which a sample of ore was taken right on the surface. This sample assayed $97 per ton in gold.

HORSHOE (Cerbat)—It is expected that work here will be started immediately; Frank O'Dea is owner.

PINKHAM (Kingman)—Drifts are being driven on the 220- and 320-ft. levels; good ore being found on both.

SAVANIC (St. George, Utah)—This property is situated north of the Colorado River about 20 miles south of St. George. Development work is opening a large shoot of copper ore.

WHITE ELEPHANT (Cerbat)—It is said that the 200 level is in the best ore yet encountered in the mine. The Pacific Investment Co., which is operating the property, has purchased a 2-ton Gramm auto truck for hauling ore to the railroad, four miles away.

VALLEY VIEW—At the bottom of the shaft a shoot of good shipping ore has been found. Work has been suspended temporarily pending the arrival of heavier timbers required by the bad ground in the bottom of the shaft and near the old workings.

NEVADA-ARIZONA (Hackberry)—Work is progressing rapidly on the new mill. It is expected that it will be in operation within a week or 10 days. Much development work has been done within the last few months. The Roosevelt tunnel is in more than 700 ft., much of that distance in good milling ore. One shoot of ore cut by this tunnel is more than 200 ft. long. A contract is to be let to sink the Lucknow shaft below the 200-ft. level.

## CALIFORNIA

### Amador County

GRITTON (Volcano)—An attempt to reopen this old gravel claim is being made. The purpose is to extend the tunnel into the main channel of Shake Ridge. Recent prospectings proved the presence of platinum in the old tailing.

KENNEDY EXTENSION VS. ARGONAUT (Jackson)—The trial has been set for Sept. 15. The complaint was filed Dec. 1, 1909, by H. G. Perry, secretary of the plaintiff company. The complaint charges that the Argonaut has mined 50,000 tons of ore from the ground of the plaintiff, valued at $500,000, and asks for $200,000 damages in addition. The legal question is one of extralateral rights.

### Butte County

KLONDYKE GRAVEL MINING CO. (Clipper Mills)—It is reported that manganese ore has been disclosed in this mine.

STEIFER MINING CO. (Magalia)—A new concrete dam is being built across the west branch of Feather River, one mile above the dam built three years ago. The new dam will give 100 ft. additional head to the water used for mining. During the present season the diminished supply of water has been unequal to the demand for power. The increased head will enable the company to operate in dry seasons.

REINER (Stockton)—This mine at Altaville, one mile from Angels Camp, has been closed down temporarily. John C. Benson, manager, states that the closing down was due to the necessity of rebuilding the mill which was burned last year, before proceeding further with the extraction of gravel. He says that rich pay gravel has been disclosed in a winze from the drift at the depth of 400 ft. It is reported that the pay checks received by the miners July 15 were debited to the merchants who cashed them, by the bank at Angels Camp because there was not sufficient funds in the bank at Stockton on which they were drawn; but that it is believed the matter will be straightened out, and that the mine will resume operation when the money can be raised to rebuild the mill.

### Inyo County

BISHOP CREEK (Bishop)—The mine and mill have been closed down. It is reported that Gaylord Wilshire, manager, states that he expects to resume operations within 60 days. A 20-stamp mill was recently built. A pumping system was also installed, and electrical connections made. In fact, the equipment is said to be complete in every detail. A cyanide plant was ordered, and the machinery is reported to be on the ground ready for installation. The orebodies are said to have been sufficiently developed to justify the expense of equipment; the ore is of medium grade. Algernon Del Mar has resigned the position of superintendent. He completed the work of installation with the exception of the cyanide plant.

### Kern County

SILVER FLAT MINING CO. (Inyokern)—This recently discovered property, 10 miles east of Inyokern, has been taken over on bond and lease by J. F. Flood, of Los Angeles. Two veins have been opened up, each 5 ft. in width, one of them carrying a pay streak 18 in. wide. The ore assays $50. Abundant water can be developed at a depth of 80 feet.

LAST CHANCE CANYON—Placer grounds embracing 29,000 acres, and including the Sunrise, Sunset, Last Chance, Mesa Spring and Joshua placer claims, in the Black Mountain mining district, have been secured under option by Douglas & Fisher, of Los Angeles. These placer deposits were worked dry, with not altogether satisfactory results. Water is now being developed in Nugget Gulch.

KING SOLOMON (Randsburg)—A recent cleanup made at the Red Dog mill of 45 tons of ore showed an average recovery of $60 per ton. This ore was mined from what is known as the Shipsey ground. Both hoists are running. Ore is also being mined from the Lamberson shaft. A cleanup of 10½ tons from the Nosser-Murphy lease is reported to have averaged $110 per ton. The shaft on this lease will be deepened to the 200-ft. level.

### Tuolumne County

APP CONSOLIDATED MINING CO. (Jamestown)—The repeated efforts of Daniel Manning to realize on a judgment for $17,500 against this and other companies and the late W. A. Nevills, has again failed in the superior court of Fresno County. Manning was injured in the App mine in February, 1902. He obtained judgment for $5000 damages. The case was reversed on appeal and in the second trial he obtained judgment for $17,500.

## COLORADO

### Clear Creek County

LUCKY FIND ([illegible])—A crosscut is being driven to cut the vein [illegible] ft. below the upper workings.

CENTRAL CAPITAL—Development will soon be resumed on this property on Griffith and Alpine Mountains. A vein of lead-[illegible] ore was encountered 500 ft. from the portal of the [illegible] tunnel which will be thoroughly developed by the [illegible] now in control of the mine.

[illegible] (Idaho Springs)—An encouraging strike has been [illegible] lessees in this property in the Russel district. The shaft is [illegible] ft. deep. On account of the discovery on the [illegible]-ft. level, the other levels will be repaired and placed in [illegible] order so that the property may be thoroughly explored. [illegible] intention of the operators to install addi[illegible]

[illegible] (Idaho Springs)—This property on Seaton [illegible] being developed through the Newhouse tunnel [illegible]. Stoping is now in progress on a 3-ft. vein of [illegible] and carload shipments have been started. The [illegible] being delivered to the Argo mill at the portal of the Newhouse tunnel. The milling ore is accompanied by a streak of smelting ore, which is sorted and sacked for shipment to the smeltery.

JOE REYNOLDS (Idaho Springs)—During the last few weeks prospecting with a diamond drill has been in progress in this property on Columbia Mountain, resulting in the discovery of new ore on the fourth and seventh levels. The property was shut down five years ago on account of litigation which has recently bees settled. The Joe Reynolds company has secured a right-of-way through the Leasch tunnel, and the tunnel workings are being retimbered and placed in working order.

### Pitkin County

MOLLIE GIBSON (Aspen)—This old mine is now in shape for production again, having been unwatered by the Smuggler Leasing Co. by a drift from the Free Silver shaft to a point below the Mollie Gibson. It is stated that there are large bodies of ore in the lower levels, and with the completion of the Mollie Gibson shaft this ore can be profitably mined.

### San Juan Region

GOLD KING (Gladstone)—The gravel deposits below the old Gold King mill, in the gulch leading out of Gold King Basin north of Ophir Loop, are being successfully sluiced by W. G. Gibson and William Martin. Considerable gold, amalgam and quicksilver is being recovered.

BALLARD (Telluride)—J. C. Weller, owner of this property on Ballard Mountain, has purchased the Mammoth mill, which was erected in Bear Creek Gulch, about half a mile above the old Bear Creek mill on the Mammoth property, and used only a short time. The building and machinery will be moved to the site of the new Ballard mill below the Junta mill, where it will be erected and placed in working order before winter. The new plant will include stamps, amalgamating plates, bumping tables and Frue vanners. It is proposed to erect a two-bucket tramway between the mine and mill. The profile of the proposed tramway has been surveyed.

CARRIBEAU (Ophir)—J. B. Olson and Ralph Hanson have secured a bond and lease on this group. The purchase price is placed at $150,000. The first payment is reported to have been made. The property includes 23 lode claims, a 20-stamp mill, mine and mill buildings, a tramway connecting the mine and mill, and developed water rights capable of furnishing 140 hp. The water power and milling equipment are practically in working order and a substantial quantity of milling ore is reported to be blocked out in the mine. The Montezuma and Carribeau properties are the most extensively developed of the group and are being reopened and placed in working order. Alterations and improvements are being made in the mill.

### Teller County

EL ORO GOLD MINING CO. (Cripple Creek)—A rich strike has been made in the Eclipse tunnel on Battle Mountain. In cleaning out an old drift on the tunnel level it was found that the walls had caved exposing a vein.

MARY NEVIN (Cripple Creek)—A four-drill compressor is being installed at the main shaft of this mine on Rosebud Hill by the Kolman Leasing Co. The mine is producing steadily and with machine drills the output will be increased.

## MICHIGAN

### Iron

M. A. HANNA CO. (Wakefield)—Preparations are being made to strip the Wakefield mine, which was recently taken over from Michigan men who own the leases. The overburden is estimated to be 65 ft. thick, and the stripping contract will be a large one. The orebody is extensive and was located but a few months ago. It is believed that the property will be in shape to ship some time next season.

ATHENS (Negaunee)—The work of sinking the shaft is going ahead rapidly, but it will be several years before ore will be coming to the surface. The property is being opened by the Cleveland-Cliffs Iron Co., but Pickands, Mather & Co. have an interest in the leases, although that company will not take any part in the operations. The shaft will be sunk to a depth of about 3000 ft., and will be lined with concrete to the bottom. The drills were still in ore at 2280 ft., when the holes caved. The mine will probably be connected on one or two levels with the Negaunee mine, which is a short distance to the north.

OLIVER IRON MINING CO. (Crystal Falls)—It is now [illegible] that a body of ore has been located by drills that [illegible] in operation to the south of Crystal Falls for sev[illegible]. The find was made on lands owned by the Mich[illegible] & Iron Co. The Oliver company has held a lease [illegible] pany's holdings for more than a year, and drills [illegible] operation at numerous places, but no informa[illegible] given out from any other section than the [illegible] field. The drills that were used in the Witch [illegible] River districts for more than a year have [illegible] the results not being obtainable.

## MINNESOTA

### Cuyuna Range

BRAINERD-CUYUNA MINING CO. (Brainerd)—A drill hole is now being put down on the proposed shaftsite. A spur will be laid in to the property by the Northern Pacific, the main line of which crosses the property.

ADAMS (Oreland)—A station is now being cut for the pumps. Two steam pumps and one electrically driven pump will be installed, each of approximately 1400 gal. capacity. It is necessary to drift 200 ft. from the shaft to reach the orebody, which drifting is now in progress.

ROGERS, BROWN ORE CO.—This company has shipped, to Aug. 14, a total of 480,000 tons this season from its three shafts, Armour No. 1, Armour No. 2 and Kennedy; 365,000 tons of this went to the Iroquois Furnaces, Buffalo, N. Y., of the Rogers-Brown company, and the rest to various independent companies.

DELL DEVELOPMENT CO.—The Jones-Ardis furnace plant of this company will be situated at Aitkin. The new furnace will be vertical instead of horizontal, as the previous ones have been, and it is hoped successfully to extract the manganese from the low-grade ores of the North Range of the Cuyuna district. The plant will have track connections with the Northern Pacific and the Soo Line.

IRONTON—(Ironton)—This mine, which is owned by the Duluth-Cuyuna company was formerly opened a few days ago, when several hundred Duluth people, many of whom are stockholders in the company, visited the mine. Five cars of ore were loaded for shipment. The ore produced at the Ironton is similar to that mined at the Armour No. 1, which is a near neighbor. The deposit is a large one and the shipments next year should be large as the property is well equipped with machinery.

### Mesabi Range

AT THE NEW NORTHERN PACIFIC DOCKS at Superior, Wis., the first shipment of ore was received Aug. 19 when 7000 tons were dumped into the pockets. Construction work is still in progress, and the ultimate cost will be about $2,000,000. The dock is 647 ft. long, 20 ft. high, with a 4200 ft. approach. It has 152 pockets of 350 tons capacity each, being 50 tons more than any other dock now in use. Is of fireproof construction, being concrete and steel entirely.

INLAND STEEL CO. (Crosby)—The Thompson mine of this company, formerly operated underground but now being stripped, has one steam shovel at work; 700,000 cu.yd. of overburden are to be stripped. The shaft will be used later for removing a portion of the orebody which cannot be stripped.

OLIVER IRON MINING CO. (Hibbing)—It is believed that this company will in the near future drain the water from Carson Lake, as it is known that a large orebody exists under the lake. When the water has been removed the property will be stripped preparatory to mining next year. The lake is not extensive and the task will not be a great one.

## MISSOURI

### Joplin District

A GOOD RUN OF ZINC has been found at Belleville, northwest of Joplin, by a company of Webb City operators. One shaft showed a 12-ft. face of ore, and the company is working in an old shaft now, hoping to strike the same vein and operate the two shafts. Only zinc is found.

SCOTT & GREGG (Galena, Kan.)—This company has just opened up an old-time bonanza on the Templar ground.

LULU V. (Spring City)—A modern concentrator has just been completed on this property and will begin operations this month. This is the latest developed mine in the Spring City camp.

MORGAN & CO. (Spring City)—A new prospect has been opened on the E. G. Doane land and zinc-silicate ore carrying from 40 to 47% zinc is being taken out in large quantities. The ore found at a shallow level occurs in large chunks and layers in a red clay formation.

TEN PER CENT (Joplin)—This company has encountered good zinc and lead on a 40-acre lease of the Howard Murphy land at Tanyard Hollow. Several drill holes showed ore. One subleasing company has discovered calamine at the 50-ft. level and will install hand-jig equipment.

ISHERWOOD (Carl Junction)—Continued increase in the turn-ins from this mine have prompted the company to plan the erection of a mill. Only hand jigs are used now, but the mine is considered to be one of the richest ever opened at Carl Junction. Huge chunks of almost pure ore were taken out a few weeks ago.

PINNACLE (Oronogo)—Recent development work has resulted in a larger output of both zinc and lead ore. An old shaft, that has been idle for several years, is being worked again, and the ore conveyed over a tramway to the mill, affording sufficient supply to keep the plant in operation. The richest ore is found at the 240-ft. level

MOORE & CO. (Joplin)—This company has purchased the old Monitor mill, and will have it removed to a lease on the Spencer land at Thoms Station. The mine is being operated under the name of the Texas Mining Co. Nine drill holes, put down during a recent prospecting campaign, showed ore at a depth of 153 to 165 ft. When the shaft had reached the 160-ft. level, three drifts were cut, each in ore. Hand jigs have been used, but were found inadequate

EDNA LEAD & ZINC CO. (Galena, Kan.)—The development of an old producing tract of 40 acres in the southwestern part of the camp where for many years shallow operations have been carried on, has been undertaken. The company has drilled the ground for deeper level work, has overhauled the 150-ton concentrator and pumped out the mine. Besides working the deeper levels, the company has subleased the shallow levels to nine different companies, so that the tract is now one of the most active in the entire district after an idleness of several years.

## MONTANA

### Butte District

BUTTE & ZENITH (Butte)—The shaft will be sunk from its present depth of 500 ft. to the 1000-ft. level. The property is three miles west of Butte.

### Beaverhead County

HECLA (Melrose)—Development work is being carried on steadily, and with the completion of the concentrator now building, mining operations will be commenced on the ore blocked out. The Longmaids, of Helena, secured the mine about a year ago and have done a large amount of work preparing it for operation.

### Deer Lodge County

SILVER CHAIN (Anaconda)—Butte men who have been operating this silver mine since last autumn on a lease, recently made a shipment of ore to the Washoe smeltery. The property is in Olson Gulch, and has been idle since 1899, previous to which time it produced a large amount of silver ore.

ORO FINO (Georgetown)—Ore assaying from $15 to $20 per ton was recently encountered at a depth of 20 ft. in this property. The extent of the discovery has not yet been ascertained, but drifting on the shoot is being carried on as rapidly as possible. Development work is also being done on the 100-ft. level.

SOUTHERN CROSS (Georgetown)—About 100 men are employed at this property of the Anaconda company, and 100 tons of ore are being mined and shipped daily to the Washoe smeltery at Anaconda. Extensive development work is being done on the 500-ft. level, and it is probable that the ore shipments will be largely increased in the near future.

### Park County

MONTANA CONSOLIDATED GOLD MINING CO. (Livingston)—George B. McCaron, of Livingston, has been appointed receiver of the property, mines, mills and water power plant of this company, incorporated for $10,000,000 and having property alleged to be worth $500,000. The petition alleges an attempt by J. T. Barney, of Chicago, to deprive stockholders of properties and charges him, as secretary, with obtaining a sale of the property by fraud.

### Powell County

BIG DICK (Elliston)—The Butte & Elliston Mining Co., which is operating this property in the Nigger Hill district, has shipped a compressor, boiler and other machinery from Butte. It is expected that the tunnel, now being driven, will be completed by Nov. 1. Shipping of ore will begin by Nov. 15. The company owns about 100 acres of ground in the group.

## NEVADA

### Clark County

QUARTETTE (Searchlight)—The 40-stamp mill and power plant caught fire at 2 a.m., Aug. 20. The flames were discovered by the night watchman, but they spread with such rapidity that within 20 min. the entire plant was in ruins. Hard work on the part of the miners was all that saved the assay office, stables and outside buildings from the flames that spread on all sides. Timbers supporting several cyanide tanks close to the mill were partly burnt away, causing one of the large tanks to topple over and weakening the supports of the others. The mill had been shut down for a cleanup. The loss will be about $100,000 with small insurance. The cause of the conflagration is unknown. The mill will be rebuilt at once and steps have been taken to lease the Cyrus Noble mill for use in the interim.

### Lyon County

MASON VALLEY MINES CO. (Thompson)—During the quarter ended June 30, 1913, 31,336 tons of ore were produced. The smeltery treated 59,494 tons, producing 4360 tons matte, which yielded 3,587,693 lb. of refined copper. The financial results are as follows: Gross profit, $86,670; less depreciation, $24,427; deferred charges, $3644; bond interest, $14,047; total, $42,119; net profit, $44,551. The foundations for the two new converters are finished and the converters will be installed at once. A switch on the railroad is being extended to the power house to facilitate the installation of the blower and motor. At the mine a new Word drill sharpener is being installed.

### Nye County

PRODUCTION FOR FIRST SIX MONTHS OF 1913 of Tonopah mines was: Tonopah Mining Co., 87,455 tons; Tonopah Belmont, 81,740; Montana Tonopah, 26,156; Tonopah Extension, 28,071; West End, 25,682; MacNamara, 13,602; Jim Butler, 10,849; Midway, 1530; North Star, 2268; Tonopah Merger, 2113; and Mizpah Extension, 25 tons, total 279,491 tons of $5,608,580 gross value. The production for the first six months of 1912 was 221,500 tons, gross value, $4,630,000.

TORO BLANCO (Manhattan)—An oreshoot of good grade was struck in the shaft on the 245-ft. level. An increased flow of water was also encountered. On the Case lease a large shoot of milling ore has been opened in the winze from the tunnel level.

### Ormsby County

THE BULLION TAX and other questions relating to mine taxation were discussed by the tax commission and a delegation representing the mine owners of the state, composed of Albert Burch, manager of the Goldfield Consolidated, John E. Kerchen, of the Tonopah Extension, A. H. Howe, of Goldfield Consolidated, Henry M. Hough, attorney, Fred J. Siebert, engineer of the Goldfield Consolidated, C. O. Bradley, of the Pittsburgh-Silver Peak, Frederick Bradshaw, of the Tonopah Midway, and W. B. Alexander, Sec'y of the Mine Operators Association. The delegation appeared before the Tax Commission at Carson City. The chief point urged was that a liberal allowance for deterioriation of milling and smelting plants should be allowed, so that by the time a mine is worked out, or the plant has become obsolete, it will not be paying taxes in proportion to its original cost.

### White Pine County

BOSTON ELY MINING CO. (Kimberly)—Rapid progress is being made in the west drift at the 1100-ft. level. The west contract of the porphyry is being driven to and the face of the drift is now about 800 ft. from the shaft.

COPPERMINES CONSOLIDATED CO. (Ely)—No announcement has been made locally of this company's plans. At the Giroux mine the force has been greatly reduced since the first of the month. Indications point toward stripping the Morris orebody with steam shovels. The plant at the deep Giroux shaft was steamed up temporarily to permit an examination of the workings by the new management. It is not probable that the pumps will be started in the near future. This company is profiting from the Nevada Consolidated operations at the Liberty pit. In order to get into the pit the latter company was obliged to secure a right-of-way the full length of the Oro claim from the Giroux company, which reserved all rights to ore extracted in the process of grading approaches, etc. In fulfillment of this agreement the Nevada Consolidated in 48 hr. loaded out 54 cars of Coppermines ore, averaging better than 1.75% copper. This appears to point to an easy way for the Coppermines company to carry out its contract with the Steptoe works and incidentally reduce its mining costs from $2 to 50c. per ton. At the Minnesota, which was the original mine of the Coppermines company, developments in the last year have been extremely favorable. A long drift has been driven from the shaft to the east, which has more thoroughly prospected the ground drilled with Keystones a few years ago. The drift appears to be skimming the top of the enriched zone at about 400 ft. below the surface, and the grade of the ore is rather better than indicated by the drilling. Preparations are being made to sink a new working shaft, which can now be more favorably located than was the old shaft.

## NEW MEXICO

### Socorro County

DEADWOOD MINES (Mogollon)—A new body of ore has been cut by the levels south of the main shaft, toward the Sunburst mine, one of this company's properties. The mill is treating from 350 to 400 tons of ore per week. From the last clean-up 600 lb. of gold and silver bullion and 1500 lb. of concentrate were shipped. A considerable tonnage of custom ore is treated for developing companies.

SOCORRO MINING & MILLING CO. (Mogollon)—Two additional oil engines of the De La Vergne type were recently installed. A proposition to light the business houses of Mogollon with electricity is being considered. Some of the best-grade ore is coming from the 800- and 900-ft. levels. The mill is treating 175 tons daily. In July 2 tons of gold and silver bullion and a large amount of high-grade concentrate were shipped, breaking all previous records in output.

C. H. PUTNAM ENGINEERING CO. (Mogollon)—This company of Los Angeles has been operating the Little Charlie mine, one of the Mogollon Gold & Copper Co. properties, under bond and lease, for over a year, during which time several thousand tons of excellent ore have been mined, part of which was shipped direct to smelter and the rest to local custom works. A 25-hp. crude oil engine and electric hoist have been installed. From 20 to 30 tons of ore are shipped daily.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—This company, successor to the Enterprise Mining Co., is preparing to do extensive development work, chief of which will be sinking the shaft, which reached water level some time ago when work had to be discontinued on account of the excessive inflow. A pump will be installed. It is rumored the mill will be altered to accommodate custom ore that is available from properties developing in the north side of this district.

PACIFIC MINES CO. (Mogollon)—A large amount of machinery for development work is on the ground for immediate installation, including compressor, air drills, crusher, motors and transformers, electric hoist, etc.; a 50-hp. motor for driving compressor is en route from Silver City. Current will be furnished by one of the local companies. The main tunnel is now in 900 ft. and the new shaft has reached a depth of 240 ft. Drifts are being driven on second and third levels; the vein is 5 to 8 ft. wide and assays from $15 to $18 per ton. All ore taken out in development is sent to one of the local custom mills; 120 tons were shipped the first week of August.

## OREGON

### Baker County

THE COMPLAINT AGAINST THE RAILWAY made by Arthur L. White, owner of the Ben Harrison mine against the Sumpter Valley Ry. Co., has been dismissed by the State Railroad Commission which found that it was without jurisdiction, but recommendations were made to the Interstate Commerce Commission in favor of the contentions in the complaint. White charged that the railroad's charge of 15c. on concentrates from the mine to Baker was exorbitant.

BEN HARRISON (Granite)—Concentrates are shipped a distance of 21 miles by team, to the railroad at a cost of $8 per ton. A 100-hp. gasoline tractor which will haul several cars and in that way reduce the cost of getting ores and concentrates to the railroad will be purchased for hauling in the future. The tractor is being shipped from Ohio.

### Lane County

WEST COAST MINES CO. (Oresco)—The sale of the properties of this company, the most highly developed in the Bohemia district, is reported. The purchasers are Washington men and besides taking over these properties it is stated that they will build custom reduction works for treating the low-grade ores of the camp. Herbert Leigh, of Eugene has instituted a suit in the circuit court against the company to restrain it from selling the property till they have paid him $5000 which they agreed to do in case he showed the management where there was a rich orebody, which he did. He states that the company has been milling this ore for some time and that he has not received his pay.

## UTAH

### Juab County

TINTIC [illegible] Drifting is being done in a vein showing [illegible] the bottom of a winze 100 ft below the [illegible] Work is 185 ft. from the surface

SOUTH UTAH MINES (Newhouse)—Rumors relative to a reorg[illegible] been denied by an official of the company. The [illegible] expected to reach 230,000 lb. of copper. About [illegible] daily are being handled.

G[illegible] (Robinson)—One of the largest shoots of ore ever [illegible] property is being mined on the 700. The ore is [illegible] carrying copper, with some silver and gold [illegible] with sorting to bring $20 per ton

[illegible] (Eureka)—The ore recently opened in a [illegible] the main fissure is 10 ft. wide on the 500-ft [illegible] thought to be making to the north and south [illegible] been begun. Prospecting is being done from the [illegible] of the No. 1 workings, with no new develop[illegible]

### Summit County

PARK CITY SHIPMENTS for the week ended Aug. 15 amounted to 3,071,940 lb. The Daly West, Daly Judge, Silver King Coalition, American Flag and Silver King Consolidated made shipments.

MINES OPERATING CO. (Park City)—This company has a lease on the old Ontario mine and has published a statement regarding smoke conditions at its milling plant. This was in reply to some criticism which had been made as to the escape of chlorine gas. The company uses the old Ontario mill which has been remodeled. Roasting with salt forms chlorine which is removed by suction fans. The gases contain little injurious constituents such as sulphurous fumes, arsenic or oxides of the metals: Chlorine is the only element present in sufficient quantity to be injurious to vegetation. During the last few weeks a large condensing chamber has been built for the removal of the chlorine. The smoke from the roasters passes through a spray of cold water which absorbs the gas. Experiments are in progress with a view of making all improvements possible, that will better conditions about the plant, and the amount of chlorine produced has been decreased.

## WASHINGTON

### Ferry County

REPUBLIC MINES CORPORATION (Republic)—The properties of this company have passed into the control of J. L. Harper, former general manager of the company, and his associates, under a two-year bond, for $600,000. The first payment of $100,000 is to be made Jan. 1, 1914, the second, of $200,000, Aug. 15, 1914, and the remaining $300,000 is to be paid on or before Aug. 15, 1915. The purchase contract stipulates, however, that payments may be made on a royalty basis of from 10 to 40% of the net smelting returns from shipments from the mines, depending upon the grade of the ore, but that the installments must be made as agreed, regardless of whether a sufficient amount is produced by the properties. The purchasers assume all the indebtedness of the Republic Mines Corporation, aggregating $81,000, including a $25,000 mortgage held by A. B. Willard, president of the company.

### Mason County

PROSPECTORS IN THE OLYMPIC RESERVE have opened veins of high-grade manganese and copper ores. The vein are from 20 to 500 ft. in width. At the scene of the present operations on the north fork of the Skiokomish River sinking has been carried to a depth of 90 ft., and copper ore is found in large quantities under the manganese. Twenty-five tons of ore are being taken out per day at the present time, and shipments will be started at the rate of 100 tons per day with the completion of the new railroad.

## WISCONSIN

### Platteville District

HOMESTEAD—An additional 10-in. sheet of jack was struck in the west end workings, which assures a long run on the company's own land.

BLACK JACK (Galena)—This mine, recently acquired by the Mineral Point Zinc Co., has been unwatered and mining operations have been resumed.

ENTERPRISE—Rich jack borings were encountered on the Steinhoff property by H. E. Stephens and Charles Kistler who have taken over the Enterprise leases.

WILSON (Potosi)—The first carload of concentrates produced by this company at the Preston Point mine assayed 57% metallic zinc and brought $41.50 per ton.

## CANADA

### British Columbia

HAZELTON FREIGHT RATES on ore to the Trail smelter may be reduced. Canadian Pacific Ry. officials are negotiating with mine owners with a view to such reductions.

CORONATION (Lillooet)—The stamp-mill cleanup for the first 14 days of operation was valued at $22,000. 1650 tons of ore were milled and a recovery of 87% was effected equal to $13.10 per ton. All the ore treated was taken direct from the mine; many hundreds of tons are on the dump ready for crushing.

TASSO (Ludway, Queen Charlotte Isld.)—A. Jones accompanied by a party of miners left Queen Charlotte late in [illegible] for the west coast of Moresby Island to develop properties of this company. Equipment and supplies were taken in [illegible], will be pushed as rapidly as possible. As soon as [illegible] surveys can be completed an aërial tramway will [illegible] and bunkers [illegible] to facilitate shipments of ore.

[illegible] COLUMBIA COPPER CO. (Greenwood)—A small [illegible] mill is [illegible] It will be built at Boundary [illegible] ores from the Lone Star and Washington [illegible] from other properties now being developed [illegible] experiments on Lone Star and Washington ores, which ores contain copper, some gold and little or no silver, prove successful, the capacity of the experimental unit would be increased to treat ore on a commercial scale.

### Ontario

HUDSON BAY (Cobalt)—Another dividend of 300% has been declared.

HOLLINGER RESERVE (Timmins)—An examination of this property was recently made for the Lewisohns.

McINTYRE (Schumacker)—The shareholders have ratified the proposition to issue $250,000 in bonds to meet the expenses of development and finance the erection of a new mill.

MILLER LAKE-O'BRIEN (Gowganda)—A shipment of high-grade ore valued at $40,000 was shipped from Elk Lake recently, having been brought over the 27-mile wagon road in three hours by motor truck.

LUCKY CROSS (Swastika)—During a mill run of 12 days at the new 5-stamp mill, 430 tons of ore were treated, 252 oz. of bullion were produced and the tailings averaged $3.20 per ton, making the average value of the ore treated, $15 per ton.

CROWN RESERVE (Cobalt)—The directors declared, Aug. 11, that the monthly bonus of 3%, hitherto paid along with the dividend of 2% would be dropped, the dividend being continued. The reason assigned was the pinching out of the Carson vein, the principal producer.

NIPISSING (Cobalt)—On Aug. 19, 212 bars of silver containing a total of 254,400 fine oz. were shipped to New York breaking all previous records for a single shipment. This was the result of seven days work at the high-grade mill. The ore came from a recent rich discovery on the 300-ft. level.

HOLLINGER (Timmins)—With the payment of the August dividend of $90,000, the company, since Aug. 1912, has paid out $990,000 to the shareholders. It is unofficially reported that the No. 1 vein has been intersected by the crosscut in the winze on the 425-ft. level. The vein is 10 ft. wide and $30 ore is found.

BEAVER—The station for the 800-ft level is being cut, establishing a new low level for the Cobalt camp. Preparations are being made to crosscut east for the main or No. 5 vein. At 700 ft. the main vein shows a width of 4 in. of ore running between 3000 and 4000 oz. to the ton. A 2-in. stringer of high grade has been picked up at 460 and 530 ft.

## MEXICO

### Chihuahua

ALVARADO MINING & MILLING CO. (Parral)—Representatives of this company and of the Mines Company of America have brought out gold and silver bullion to the total value of $600,000 by wagon trains, to prevent its confiscation by Mexicans. The bullion was transported down the Conchos River valley and crossed into Texas at Presidio.

### Sonora

EL TEMBLOR (Esqueda)—Another car of high-grade ore has been shipped to the Douglas smelter, this being the first consignment from the new vein, which ore assays 200 oz. silver and 2 oz. gold.

MONTE CRISTO (Moctezuma)—Carlos C. Soto has leased his properties including this mine to S. A. Gardanier who has started work and will employ about 50 men and ship the ore which is high grade to the Douglas smelters.

LUCKY TIGER (Yzabal)—In July 5119 tons of ore were crushed in the stamp mill, and in the cyanide plant 4767 tons of current and 1868 of dump tailings were treated. The total recovery is valued at $119,365, $42,395 being net profit.

GUERIGUITO (Cumpas)—W. C. Humphreys has a shipment at the Douglas smelter which will net him a good profit. As conditions are normal in this district a motor truck has been purchased for transporting supplies and ore between the mine and Nacozari.

LA UNION (Fronteras)—This mine, owned and operated by C. B. Bell, of Douglas, Ariz., is one of the most promising in Sonora. Recently nothing but development work has been attempted but 15 men have been employed. The vein is from 3 to 20 ft. wide and nearly a mile in length. The ore carries gold, silver and copper. One car was recently shipped to Douglas and 150 tons more are on the way.

## SOUTH AMERICA

### Chile

WITHDRAWAL OF IRON DEPOSITS from entry by private persons or corporations, in order to give the government time to select such iron properties as it may be thought best to hold, with a view to making them a source of revenue for the general government is the object of a bill now before the Chilean Congress.

### Peru

HUANUCO GOLD FIELDS northeast of Cerro de Pasco have been examined by Carl Hand in the interests of the principal stockholders of the Cerro de Pasco Mining Co. Hand reports that the fields are a "no-pay proposition" and that the reports of gold-bearing gravel running £15 to £30 per yard was the result of a liberal salting of samples. The samples in question were sent through the mails from Ambo and were gravel contained in bags. The placers are along the banks and in the bed of the Huallaga River in the vicinity of Ambo, about 18 miles from Cerro de Pasco and the same distance from Goyllarisquisga. The proposed line of the Amazon Pacific Ry. would cut directly across the land included in the claims. Several thousand acres of land had been denounced by the various claimholders.

## INDIA

### Mysore

FIFTY MEN WERE KILLED in the Kolar gold field, Aug. 22, when a hoisting cable broke, dropping the cage to the bottom of the shaft. Further details have not yet been cabled.

# THE MARKET REPORT

## METAL MARKETS

The metal markets have been rather inclined to be quieter, but there has been no special weakness. It has been more a reaction from unusual activity than any decline.

### Copper, Tin, Lead and Zinc

**Copper**—In the early part of the week just closing, the market was rather quiet and dull, the reaction from the period of large purchasing having continued. On Aug. 26 and 27, however, there was much more inquiry, especially from European sources, and sales improved with a slight advance in price. The larger agencies having their books pretty well filled for the present, made no attempt to press copper on the market, holding rather firmly to their price. The second hands and smaller sellers, however, made some concessions and secured the business which was going at lower terms. The close, however, is rather firm.

The Lake miners' strike continues and its close seems to be quite uncertain, although the Calumet & Hecla has succeeded in getting together a small part of its force and will have some men underground by the end of the week. Lake prices have been purely nominal. It is said that the chief producer is asking 16½c., but this price has not been paid for such small lots as have been sold during the week.

At the close, it looks as though the copper is second hands had been pretty well cleared up and the market is somewhat firmer, with electrolytic copper quoted at 15.50@15.60c., in cakes, wirebars or ingots. The market for Lake is unchanged and nominal at about 16c. per lb. Casting copper is quoted 15@15¼c., as an average for the week.

The London market for standard copper was sluggish on Aug. 21 and 22, but on Aug. 25 it advanced to £69 10s. for both spot and three months. Sentiment improved, with good buying, and on Aug. 26 the market advanced to £70 for spot and £69 18s. 9d., closing on Aug. 27 at £70 7s. 6d. for spot and £70 6s. 3d. for three months.

Base price of copper sheets is now 21c. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16¼@16½c., carload lots at mill.

Exports of copper from New York for the week were 7893 long tons. Our special correspondent gives the exports from Baltimore at 2670 tons for the week.

**Tin**—The market during the latter part of last week was almost stagnant. Local dealers tried to stimulate business in futures by undercutting London prices, without, however, arousing any interest. When the London market began its advance on Aug. 26, conditions in the domestic market changed entirely, and an active business among dealers and consumers developed. The market closes at a small decline from the top, which was reached on the morning exchange of Aug. 27, and the tone must be called steady at £192 10s. for spot and £191 12s. 6d. for three months, and about 42¾c. for August tin here.

**Lead**—The market is firm at last prices: 4.75c., New York, and 4.70@4.75c., St. Louis. The Western market continues above the New York parity, on account of the scarcity of Missouri lead, due to the strike. The last advices, however, are that the strike is over and production will shortly be resumed.

The London market is firmer, good Spanish lead being quoted £20 10s.; English 7s. 6d. higher.

**Spelter**—The market is quiet but firm. St. Louis at the close is quoted 5.60@5.65c.; New York 5.75@5.80 cents.

The London market is firmer, good ordinaries being quoted £21 and specials £21 10s. per ton.

Base price of zinc sheets is now $7.75 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

### Other Metals

**Aluminum**—The market has been quiet, so far as spot sales are concerned, though there is something doing for future delivery. Domestic aluminum sells for 22@22½c. per lb. for No. 1 ingots. Foreign has been sold around 18¼c. in bond. The Tariff question is still unsettling the market

**Antimony**—The market is dull and easy, and there is no change in prices. Cookson's is quoted at 8.35@8.40c. per lb.; Hallett's at 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business is fair and prices remain unchanged. New York quotations are $40 per flask of 75 lb., with 58@60c. per lb. asked for small lots. San Francisco, $39.50 for domestic orders, and $37 for copper. The London price is £7 5s. per flask, with £7 quoted from second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

**Nickel**—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

DAILY PRICES OF METALS

NEW YORK

| Aug. | Sterling Exchange | Silver | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 21 | 4.8640 | 59¼ | 16 | 15.45<br>@15.55 | 41⅛ | 4.75 | 4.70<br>@4.75 | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 22 | 4.8640 | 59¼ | 16 | 15.45<br>@15.55 | 41¼ | 4.75 | 4.70<br>@4.75 | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 23 | 4.8620 | 59½ | 16 | 15.45<br>@15.55 | 41¼ | 4.75 | 4.70<br>@4.75 | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 25 | 4.8625 | 59⅜ | 16 | 15.45<br>@15.55 | 41⅜ | 4.75 | 4.70<br>@4.75 | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 26 | 4.8625 | 59½ | 16 | 15.50<br>@15.60 | 42 | 4.75 | 4.70<br>@4.75 | 5.75<br>@5.80 | 5.60<br>@5.65 |
| 27 | 4.8615 | 59½ | 16 | 15.50<br>@15.60 | 42¼ | 4.75 | 4.70<br>@4.75 | 5.75<br>@5.80 | 5.60<br>@5.65 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Aug. | Silver | Copper | | | Tin | | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| | | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos | | |
| 21 | 27 5/16 | 68 11/16 | 68 13/16 | 74¼ | 187¼ | 186½ | 20⅜ | 20⅝ |
| 22 | 27 5/16 | 68 9/16 | 68 9/16 | 73¼ | 187¼ | 186¼ | 20¼ | 20⅝ |
| 23 | 27 7/16 | | | | | | | |
| 25 | 27 9/16 | 69½ | 69½ | 74¼ | 187¾ | 187 | 20⅜ | 20⅝ |
| 26 | 27 7/16 | 70 | 69 15/16 | 75¼ | 190 | 189¼ | 20½ | 20⅞ |
| 27 | 27 7/16 | 70⅜ | 70 5/16 | 75½ | 192½ | 191⅜ | 20½ | 21 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

**Exports of Metals and Minerals from Spain,** five months ended May 31, reported by "Revista Minera," in metric tons:

| Ex[illegible] | Metals 1912 | Metals 1913 | Ores 1912 | Ores 1913 |
|---|---|---|---|---|
| Iron | 25,013 | 4,943 | 3,465,357 | 4,117,181 |
| Copper | 9,297 | 11,465 | 72,787 | 73,565 |
| Copper [illegible] | 5,608 | 2,350 | .... | . |
| Lead | 76,524 | 91,544 | 1,571 | 742 |
| Zinc | 1,302 | 497 | 48,681 | 46,008 |
| Qu[illegible] | 1,472 | 1,042 | | |
| M[illegible] | | | 11,000 | 10,385 |
| P[illegible] | | | 1,188,575 | 1,359,999 |

[illegible] carrying 2.5% or more in copper are classed [illegible] below that they are included in pyrites. Ex[illegible]lt were 277,388 tons in 1912, and 289,018 tons in [illegible]ease, 11,630 tons.

## Gold, Silver and Platinum

**Gold** has commanded no premium, the price on the open market in London remaining at 77s. 9d. per oz. for bars and 76s. 4d. per ton for bars and 70s. 4d. per oz. for American coin. There was no special demand. London is receiving a good deal of gold from South America.

**Iridium**—There is nothing new in this metal and the price remains high, $82@84 per oz. being asked by dealers.

**Platinum**—A good business has been done, but the market is unsettled for the first time in many months. Sales of refined platinum have been made as low as $43 per oz., and $43.50 is a general quotation. It looks as if some holders of stocks were tired of carrying them. The current quotation is below the cost of importing. For hard metal, $47@49 per oz. is quoted.

**Silver**—The tone of the market for the past week has been steady and well maintained at advancing prices, owing to buying by China and India. It closes steady at 27 [illegible]d. in London.

Exports of silver from London to the East, Jan. 1 to Aug. 14, reported by Messrs. Pixley & Abell.

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £5,010,700 | £4,393,500 | D. £617,200 |
| China | 933,500 | 507,000 | D. 426,500 |
| Total | £5,944,200 | £4,900,500 | D. £1,043,700 |

Imports of silver at New York, week ended Aug. 23, were $64,385, chiefly from South America. Exports were $664,786, nearly all to London.

**Gold and Silver Movement** in the United States, seven months ended July 31:

| | Gold 1912 | Gold 1913 | Silver 1912 | Silver 1913 |
|---|---|---|---|---|
| Exports...... | $40,661,500 | $72,388,064 | $40,260,276 | $38,258,234 |
| Imports ... | 29,012,211 | 35,769,058 | 28,700,590 | 20,927,869 |
| Excess, exp | $11,649,289 | $36,619,006 | $11,559,686 | $17,330,365 |

Exports of merchandise for the seven months were valued at $1,326,798,300; imports, $1,078,868,132; excess of exports, $307,930,168. Adding gold and silver makes the total export balance $161,879,539 for the seven months.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Aug. 23

The base priae paid this week for 60% zinc ore was $46@48 per ton. The base price paid for 80% lead ore was $54@55 per ton.

SHIPMENTS WEEK ENDED AUG. 23

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week .. .. .... ... | 2,729,380 | ..... | 981,300 |
| Year to date ........... | 95,553,160 | 4,587,990 | 39,356,230 |

Shipped during week to separating plants 2,003,210 lb. zinc ore.

### JOPLIN, MO.—Aug. 23

The high price of zinc blende is $52, the base per ton of 60% zinc from $48.50@49.50 for choice grades, and $47@48 base for blende carrying an excess of 8% of iron. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades is $45.28 per ton. Lead was advanced $3, selling on [illegible] of $58 per ton of 80% metal contents with the aver[illegible] all grades $57.76 per ton.

SHIPMENTS WEEK ENDED AUG. 23

| | Blende | Calamine | Lead ore | Value |
|---|---|---|---|---|
| T[illegible] week | 11,549,620 | 662,600 | 1,072,250 | $307,555 |
| T[illegible] weeks | [illegible]52,510 | 26,550,650 | 59,976,320 | $10,100,439 |

Blende value, the week, $267,603; 34 weeks, $8,181,864.

Calamine value, the week, $8975; 34 weeks, $337,521.

Lead ore value, the week, $30,977; 34 weeks, $1,581,051.

# IRON TRADE REVIEW

### NEW YORK—Aug. 27

The iron trade has a little firmer tone and business seems to be improving to a degree, though the buying movement expected in September has not yet set in.

More pig iron orders are being placed and prices are gradually firming up. No large advance is looked for, but concessions are no longer in order.

**Exports and Imports of Iron and Steel** and of manufactures thereof in the United States, six months ended June 30, are valued by the Department of Commerce and Labor, as below:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Exports.............. | $139,545,479 | $155,498,537 | I. $15,953,058 |
| Imports.. ........... | 13,583,412 | 17,785,662 | I. 4,202,250 |
| Excess, exports..... | $125,962,067 | $137,712,875 | I. $11,750,898 |

Actual tonnage of iron and steel exports, so far as given in the reports was 1,423,022 tons in 1912 and 1,494,280 in 1913; increase, 71,258 tons. Imports 99,933 tons in 1912, and 164,804 in 1913; increase, 64,871 tons. Many important articles are given by values only.

### PITTSBURGH—Aug. 26

The yielding in steel prices continues, the open quotation on plates having declined $1 a ton, while billets and sheet bars are obtainable $2 to $3 under quotations maintained until very recently. Galvanized sheets are slightly easier.

The flow of business in steel products continues to be confined to relatively small lots for early shipment. The aggregate is larger than in July, but is far below shipments and some mills are running out of orders to such an extent that they are quite eager for new business. This has resulted in price concessions already, and promises further declines before the mills fill up enough to lengthen the delivery period on new business.

The Steel Corporation has taken an order for 100,000 boxes of tinplate from the Standard Oil Co., for fourth-quarter delivery. The material is to be used in the export trade and the order was therefore taken in competition with the Welsh mills.

There is no material change in the rate at which the local steel mills are booking new business, the new orders, together with specifications on old contracts, amounting to perhaps 60% of the current shipments, which are maintained at practically full capacity.

Shading in plates and shapes began with the eastern mills almost two months ago. At first the Pittsburgh and more western mills maintained their prices, thus losing business in the East. Lately they have been meeting this competition, but have maintained prices for delivery outside of eastern territory. In the past week or 10 days several of the mills have dropped quotations $1 a ton on plates for delivery anywhere, making the market openly quotable at 1.40c., Pittsburgh. In structural shapes there has been some shading, but hardly a general decline.

A large steel interest just east of Pittsburgh is understood to have become much more aggressive for business, this having much to do with the weakening in plates and shapes, while this interest will likely also cut an important figure in the unfinished steel market.

The Carnegie Steel Company is now making openhearth steel at the Edgar Thomson plant its great rail mill—for the first time. Of the 14 basic openhearth furnaces under construction for a year the first was fired Saturday week and the second last week, a third being scheduled for next week, while the whole plant, with a rated capacity of 600,000 to 700,000 tons of ingots annually, will be in operation by November. The Pittsburgh Crucible Steel Co recently started its new plant of six open-hearth furnaces at Midland, Penn., while the Brier Hill Steel Co will probably begin operating its new plant of eight furnaces, at Youngstown, in October.

**Pig Iron**—Last Friday morning the Carnegie Steel Co. purchased 10,000 tons of basic pig from the Pittsburgh Crucible Steel Co., for early delivery from Midland furnace, the price being on the basis of $14, Valley, or $14.90, Pittsburgh. The Steel Corporation is not particularly in need of pig iron. We quote: Bessemer, $15.75@16; basic, $14; No. 2 foundry, $14; malleable, $14.25, forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market continues quiet. Consumers seem to be fairly well covered to the end of the year, and on any possible requirements are holding off on account of the probability of removal of the duty. We continue to quote prompt at $55@56 and forward at $56, Baltimore.

**Steel**—Sales last week of two lots of sheet bars aggregating 3000 tons at only a trifle above $25, maker's mill, have been followed by still lower quotations. The large mills have not yet reduced quotations from their old level of $26.50 for billets and $27.50 for sheet bars, but admit that on the next sales they will have to do much lower. Meanwhile the market can be quoted roughly at $24.50 for billets and $25 for sheet bars.

### IRON ORE

**Imports and Exports of Iron Ore** in the United States, six months ended June 30, long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Imports | 994,376 | 1,136,153 | I. 141,777 |
| Exports | 294,900 | 320,553 | I. 25,653 |

Imports of manganese ore for the seven months were 104,432 tons in 1912, and 191,937 tons in 1913; increase, 87,505 tons.

**British Imports of Iron Ore,** seven months ended July 31, were 3,532,132 tons in 1912, and 4,717,936 in 1913; increase, 1,185,804 tons. Imports of manganese ore were 175,134 tons in 1912 and 379,774 in 1913; increase, 204,640 tons.

### COKE

**Connellsville Coke**—Last Friday a sale of 2000 tons of prompt furnace coke was made at $2.50 and this week a fair tonnage was sold for prompt shipment at this figure, while at least one sale for the requirements of a furnace during September was made at the price. These sales indicate that the $2.50 price will be maintained for at least another month, despite the reported offering of coke early last week at lower figures.

**Coal and Coke Tonnage, Pennsylvania R.R.** Lines east of Pittsburgh and Erie, seven months ended July 31, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 5,525,010 | 6,138,175 | I. 613,165 |
| Bituminous | 26,175,168 | 28,833,947 | I 2,658,779 |
| Coke | 7,451,340 | 8,569,978 | I.1,118,638 |
| Total | 39,151,518 | 43,542,100 | I.4,390,582 |

The total increase this year was 11.2%. The largest comparative gain was in coke.

**Exports and Imports of Fuel in the United States,** six months ended June 30, are reported as follows, in long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Anthracite | 1,131,247 | 2,067,873 | 30 | 31 |
| Bituminous | 6,358,765 | 7,029,958 | 754,705 | 721,619 |
| Coke | 404,069 | 480,982 | 41,627 | 33,680 |
| Bunker coal | 3,822,537 | 3,692,564 | .. ... | |
| Totals | 11,716,618 | 13,271,377 | 796,362 | 755,330 |

Increase in exports, 1,554,759 tons, or 13.3%; decrease in imports, 41,032 tons, or 5.2%. The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. The heaviest exports are to Canada, while that country also furnishes a large share of the imports. The imports are mainly on the Pacific Coast.

## CHEMICALS

### NEW YORK—Aug. 27

The general markets continue quiet with only a moderate amount of business forward. Not much change is expected before next month.

**Imports and Exports of Chemicals** and raw materials in the United States, six months ended June 30, were as follows:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Arsenic, lb. | 2,399,961 | 4,571,890 | | ....... |
| Copper sulphate, lb. | . | ...... | 5,259,541 | 3,286,564 |
| Bleach, lb. | 35,460,695 | 36,501,674 | 400 | 8,460 |
| Potash salts, lb. | 307,549,481 | 293,063,479 | 1,659,059 | 6,058,324 |
| Soda salts, lb. | 5,996,283 | 6,762,729 | 249,395 | 179,472 |
| Acetate of lime, lb. | | .. .. | 36,584,105 | 40,095,980 |
| Nitrate of soda, tons | 255,428 | 378,261 | 5,120 | 3,280 |
| Sulph. of ammonia, tons | 22,373 | 24,594 | 60 | . |
| Phosphate, tons | .. . . | .. . | 585,788 | 652,161 |
| Sulphur, tons | 12,048 | 4,273 | 18,004 | 34,118 |
| Pyrites, tons | 472,522 | 472,853 | | .. |
| Magnesite, tons | 45,082 | 88,286 | 1,217 | 2,067 |
| Chrome ore, tons | 31,564 | 27,409 | | |

Exports include reëxports of foreign material. Some phosphate rock is imported, but is not given separately in the trade returns.

**Arsenic**—The market is dull and demand small. Nothing is coming from Mexico, but the American smelters can easily take care of all that is required just now. Prices are $3@3.25 per 100 lb. and are rather nominal.

**Copper Sulphate**—Trade has been improving and is now on a very fair scale. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market has been dull during the week. Quotations are unchanged at 2.32½c. per lb. for spot and September; 2.35c. for September-December, and 2.40c. for 1914 deliveries.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | March | April | May | June | July |
|---|---|---|---|---|---|
| Alaska shipments | 472,293 | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 |
| Anaconda | 22,900,000 | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 |
| Arizona, Ltd | 3,200,000 | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 |
| Copper Queen | 7,558,709 | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 |
| Calumet & Ariz | 4,250,000 | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 |
| Chino | 4,464,723 | 3,925,409 | 3,883,611 | 3,682,706 | 4,686,250 |
| Detroit | 1,640,671 | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 |
| East Butte | 1,400,000 | 1,400,000 | 1,268,595 | 1,055,646 | .. |
| Mammoth | 1,641,091 | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 |
| Giroux* | 625,000 | 600,000 | 625,000 | 610,000 | . |
| Mason Valley | 1,608,492 | 1,264,304 | 1,186,560 | 1,097,014 | 908,892 |
| Miami | | | 1,943,900 | 2,612,000 | |
| Nevada Con. | 5,555,320 | 5,650,000 | 5,933,275 | 6,344,863 | 5,403,919 |
| Ohio | 591,651 | 690,001 | 650,071 | 537,400 | |
| Old Dominion | 2,853,000 | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 |
| Ray | 4,287,000 | 4,379,128 | 4,384,400 | 4,392,612 | . |
| Shannon | 1,260,000 | 1,238,000 | 1,080,000 | 924,000 | 880,000 |
| South Utah | 62,224 | 132,267 | 200,000 | 185,000 | 140,000 |
| Tennessee | 1,796,394 | 1,718,188 | §1,037,115 | 1,379,220 | 1,247,804 |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 2,900,000 | .......... |
| Utah Copper Co | 8,248,880 | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 |
| Lake Superior* | 19,000,000 | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 |
| Non-rep. mines* | 6,203,606 | 6,000,000 | 6,300,000 | 6,000,000 | 6,200,000 |
| Total prod | 102,619,054 | 104,224,079 | 109,824,500 | 104,006,138 | ...... |
| Imports, bars, etc. | 24,215,480 | 25,578,297 | 22,205,942 | 18,255,267 | .... |
| Total blister | 126,834,534 | 129,802,376 | 132,030,442 | 122,261,405 | ..... |
| Imp. ore & matte | 11,911,041 | 7,177,363 | 10,528,562 | 7,497,002 | ... . |
| Total Amer. | 138,745,575 | 136,979,739 | 142,559,004 | 129,758,407 | . |
| Miami† | 3,102,200 | 2,312,900 | .......... | .......... | 2,890,000 |
| Shattuck-Arizona | 1,234,450 | 1,158,.26 | 1,026,170 | 1,059,625 | 1,019,388 |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 844,735 | 794,000 | | . ...... | .......... |
| Granby | 1,967,962 | 1,857,452 | 1,782,570 | 1,789,000 | ......... |
| Mexican Cos.: | | | | | |
| Boleo† | 2,204,720 | 2,811,200 | 2,424,800 | 1,984,640 | 2,240,720 |
| Cananea | 4,772,000 | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 |
| Moctezuma | 3,062,159 | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,472,000 | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 |
| Cape Cop., S. Af. | 732,480 | 586,880 | 387,520 | 414,400 | ....... .. |
| Kyshtim, Russia | 1,478,400 | 2,544,640 | 1,490,000 | ... ..... . | ......... |
| Spassky, Russia | 974,400 | 974,400 | 721,280 | 835,520 | ......... |
| Exports from | | | | | |
| Chile | 7,840,000 | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 |
| Australia | 6,944,000 | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 |
| Arrivals—Europe† | 15,585,920 | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VII, '12 | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII. | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX. | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI. | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII. | 143 354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | ....... |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV. | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V. | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI. | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | . . | ... ... | ......... | 53,594,945 | 66,420,480 | 120,015,385 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Caledonia, Nev. | Aug. 14 | Sept. 12 | $0.025 |
| Central [illegible] | Aug. 14 | Sept. 14 | 0.025 |
| Columbus [illegible] | Aug. 15 | Sept. 5 | 0.02 |
| Con. [illegible] | Aug. 28 | Sept. 19 | 0.01 |
| Dalma[illegible] | Aug. 5 | Sept. 3 | 0.002 |
| Em[illegible] | | Sept. 13 | 0.005 |
| Emp[illegible] | Aug. 12 | Sept. 12 | 0.002 |
| [illegible] | Aug. 11 | Sept. 11 | 0.001 |
| [illegible] | Aug. 28 | Sept. 17 | 0.02 |
| [illegible] | Aug. 16 | Sept. 16 | 0.001 |
| H[illegible], Ida. | Sept. 8 | Sept. 29 | 0.000¼ |
| H[illegible] | Aug. 15 | Sept. 9 | 0.003 |
| [illegible] | Aug. 16 | Sept. 13 | 0.0025 |
| [illegible] | Aug. 2 | Sept. 2 | 0.01 |
| [illegible], Ida. | Aug. 16 | Sept. 4 | 0.003 |
| [illegible]er, Mich. | ........ | Sept. 9 | 2.00 |
| [illegible] Calumet, Ida. | Aug. 11 | Sept. 10 | 0.005 |
| [illegible] Argentine, Utah | Sept. 1 | Sept. 16 | 0.005 |
| [illegible] Star, Utah | Aug. 8 | Sept. 1 | 0.0025 |
| [illegible] Hope, Ida. | Aug. 19 | Sept. 19 | 0.002 |
| Potosi, Nev. | Sept. 4 | Sept. 26 | 0.02 |
| Snowshoe, Ida. | July 2 | Sept. 2 | 0.005 |
| Sonora, Ida. | Aug. 30 | Sept. 16 | 0.002 |
| Sunset, Ida. | Aug. 15 | Sept. 6 | 0.0015 |
| Sunshine, Ida. | July 1 | Oct. 15 | 0.001 |
| Utah, Nev. | Aug. 16 | Sept. 6 | 0.02 |
| Yellow Jacket, Nev. | ........ | ........ | 0.10 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | ...... | 24.082 | 28.375 | ...... |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, **cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.**

### COPPER

| | NEW YORK | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | ...... | 17.644 | ...... | 78.670 | ...... |
| September | 17.508 | ...... | 17.698 | ...... | 78.762 | ...... |
| October | 17.314 | ...... | 17.661 | ...... | 76.389 | ...... |
| November | 17.326 | ...... | 17.617 | ...... | 76.890 | ...... |
| December | 17.376 | ...... | 17.600 | ...... | 75.516 | ...... |
| Year | 16.341 | | 16.560 | ...... | 72.942 | ...... |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.520 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.116 | 183.511 |
| August | 45.857 | | 208.351 | |
| September | 49.135 | | 223.762 | |
| October | 50.077 | | 228.353 | |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York, cents per pound. London in pounds sterling per long ton.

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | ...... | 4.452 | ...... | 19.655 | ...... |
| September | 5.048 | ...... | 4.924 | | 22.292 | ...... |
| October | 5.071 | | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | | 4.152 | | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | ...... | 6.878 | ...... | 26.443 | ...... |
| September | 7.454 | ...... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | ...... | 14.90 | ...... | 14.85 | ...... |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ...... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | ...... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ...... |
| Year | $16.01 | ...... | $14.95 | ...... | $15.28 | ...... |

## STOCK QUOTATIONS

### COLO. SPRINGS Aug. 26

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02¾ |
| Cripple Cr'k Con. | .01½ |
| C. K. & N. | .12 |
| Doctor Jack Pot | .05½ |
| Elkton Con | .56 |
| El Paso | 3.17 |
| Findlay | .02 |
| Gold Dollar | .06¾ |
| Gold Sovereign | .02¾ |
| Isabella | .10½ |
| Jack Pot | .04½ |
| Jennie Sample | .06 |
| Lexington | ‡.005 |
| Moon Anchor | ‡.01 |
| Old Gold | .06½ |
| Mary McKinney | .60½ |
| Pharmacist | .01½ |
| Portland | .95 |
| Vindicator | .85½ |
| Work | ‡.005 |

### SALT LAKE Aug. 26

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .05½ |
| Black Jack | .07½ |
| Cedar Talisman | .00½ |
| Colorado Mining | .13 |
| Columbus Con. | ‡.02 |
| Crown Point | .01½ |
| Daly-Judge | 6.20 |
| Grand Central | .50 |
| Iron Blossom | 1.20 |
| Little Bell | .10 |
| Lower Mammoth | .01½ |
| Mason Valley | 6.25 |
| May Day | .06 |
| Nevada Hills | .75 |
| New York | .02 |
| Prince Con | .35 |
| Silver King Coal'n | 3.00 |
| Sioux Con. | .02½ |
| Uncle Sam | .04 |
| Yankee | ‡.08 |

### TORONTO Aug. 25

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .06 | Foley O'Brien | .15 |
| Coniagas | 7.00 | Hollinger | 14.75 |
| T. & Hudson Bay | 70.00 | Imperial | .01 |
| Timiskaming | .35 | Jupiter | .25 |
| Wettlaufer-Lor. | .12 | Pearl Lake | .28 |
| Apex | .01 | Porcu. Gold | .07 |
| Crown Chartered | .00½ | Preston E. D. | .01 |
| Dobie | .10 | Rea | .12 |
| Dome | 13.00 | Swastika | .04 |
| Dome Exten. | .07 | West Dome | .10 |

### SAN FRANCISCO Aug. 26

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 7.00 |
| Belcher | .20 | Jim Butler | .61 |
| Best & Belcher | .06 | MacNamara | .11 |
| Caledonia | 1.27½ | Midway | .46 |
| Challenge Con. | .07 | Mont.-Tonopah | 1.10 |
| Chollar | .01 | North Star | .78 |
| Confidence | .14 | West End Con | 1.25 |
| Con. Virginia | .10 | Atlanta | .14 |
| Crown Point | .20 | Booth | .01 |
| Gould & Curry | .03 | C. O. D. Con | .03 |
| Hale & Norcross | .07 | Comb. Frac. | .05 |
| Mexican | 1.07 | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | .45 |
| Ophir | .23 | Round Mountain | .48 |
| Overman | ‡.45 | Silver Pick | .03 |
| Potosi | .01 | Tramp Con. | ‡.01 |
| Savage | .11 | Argonaut | 2.25 |
| Sierra Nevada | .05 | Bunker Hill | 1.50 |
| Union Con. | .11 | Central Eureka | .12 |
| Yellow Jacket | .14 | So. Eureka | ‡2.62 |

### N. Y. EXCH. Aug. 26

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 73½ |
| Am. Agri. Chem. | 44⅛ |
| Am. Sm. & Ref., com. | 67⅛ |
| Am. Sm. & Ref., pf. | 100 |
| Am. Sm. Sec., pf. B | 81 |
| Anaconda | 36½ |
| Batopilas Min. | 1¼ |
| Bethlehem Steel pf. | 72 |
| Chino | 40 |
| Federal M. & S., pf. | 37 |
| Great Nor., ore ctf. | 34½ |
| Guggen. Exp. | 46 |
| Homestake | 107 |
| Inspiration Con. | 15¼ |
| Miami Copper | 23 |
| Nat'nal Lead, com. | 48 |
| National Lead, pf. | 107½ |
| Nev. Consol. | 16 |
| Phelps Dodge | 192½ |
| Pittsburg Coal, pf. | 83 |
| Quicksilver, pf. | ⅜ |
| Ray Con. | 19⅛ |
| Republic I & S com. | 23½ |
| Republic I & S, pf. | 88½ |
| Sloss Sheff'd, com. | 30 |
| Sloss Sheffield, pf. | 86 |
| Tennessee Copper | 31¼ |
| Utah Copper | 51⅛ |
| U. S. Steel, com. | 63⅛ |
| U. S. Steel, pf. | 108 |
| Va. Car. Chem., pf. | 99 |

### N. Y. CURB Aug. 26

| Name of Comp. | Clg. |
|---|---|
| Barnes King | 1⅛ |
| Beaver Con. | 26 |
| Big Four | .33 |
| Braden Copper | 6¾ |
| B. C. Copper | 2¼ |
| Buffalo Mines | 2 5/16 |
| Can. G. & S. | 23 |
| Con. Ariz. Sm. | [illegible] |
| Davis-Daly | 1⅞ |
| Diam'field-Daisy | 02 |
| Ely Con. | 07½ |
| Florence | .23 |
| Giroux | 1 3/16 |
| Gold Hill Con. | ¼ |
| Goldfield Con. | 1 9/16 |
| Greene Cananea | 33 |
| Greenwater | 04 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 3½ |
| Keystone | ‡2 |
| La Rose | 2 5/16 |
| McKinley-Dar-Sa. | 1¼ |
| Min. Co. of A. new | 2¼ |
| Motherlode Gold | ‡.40 |
| Nipissing Mines | 8⅞ |
| Ohio Copper | ⅛ |
| Pacific Sm. & M. | 1/16 |
| Puebla S. & R. | 2 |
| South Live Oak | ‡2 |
| South Utah M. & S. | ¼ |
| Stand'd Oil of N. J. | 373 |
| Stewart | 1 11/16 |
| Tonopah | 4⅛ |
| Tonopah Ex. | 2 |
| Tonopah Merger | 73 |
| Tri-Bullion | 1/16 |
| Tularosa | ⅜ |
| Union Mines | 1/16 |
| United Cop., pfd. | 2½ |
| Yukon Gold | 2 |

### LONDON Aug. 16

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 15s 9d |
| El Oro | 0 15 0 |
| Esperanza | 1 2 6 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 5 9 |
| Santa Gert'dis | 1 1 3 |
| Stratton's | 0 1 9 |
| Tomboy | 1 6 3 |

### BOSTON EXCH. Aug. 26

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1¼ |
| Ahmeek | 275 |
| Alaska Gold M. | 18¼ |
| Algomah | 1⅛ |
| Allouez | 36 |
| Am. Zinc | 20¾ |
| Ariz. Com., ctfs. | 2⅞ |
| Bonanza | .32 |
| Boston & Corbin | .55 |
| Butte & Balak | 2 |
| Calumet & Ariz | 62 |
| Calumet & Hecla | 415 |
| Centennial | 13¼ |
| Cliff | 1½ |
| Copper Range | 39½ |
| Daly West | 2⅛ |
| East Butte | 11½ |
| Franklin | 4½ |
| Granby | 62¼ |
| Hancock | 17¼ |
| Hedley Gold | 30 |
| Helvetia | ¼ |
| Indiana | 5½ |
| Island Cr'k, com. | 51 |
| Island Cr'k, pfd. | 83½ |
| Isle Royale | 18¼ |
| Keweenaw | 1⅞ |
| Lake | 6½ |
| La Salle | 3¼ |
| Mass | 2¼ |
| Michigan | 1 |
| Mohawk | 45 |
| New Arcadian | 1½ |
| New Idria Quick. | ‡3⅞ |
| North Butte | 27¼ |
| North Lake | 1½ |
| Ojibway | 99 |
| Old Dominion | 49 |
| Osceola | 79 |
| Quincy | 60 |
| Shannon | 6½ |
| Shattuck-Ariz. | 25¼ |
| Superior | 24⅞ |
| Superior & Bost. | 2⅛ |
| Tamarack | 26 |
| Trinity | 4¼ |
| Tuolumne | 76 |
| U. S. Smelting | 36 |
| U. S. Smelt'g, pf. | 47¼ |
| Utah Apex | 1¼ |
| Utah Con. | 9 |
| Victoria | 1 |
| Winona | 1¼ |
| Wolverine | 44½ |
| Wyandot | ⅛ |

### BOSTON CURB Aug. 26

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 4 |
| Boston Ely | ¼ |
| Butte & Lon'n Dev. | .37 |
| Butte Central | .55 |
| Cactus | .02 |
| Calaveras | ½ |
| Chief Cons. | 1 |
| Corbin | .99 |
| Cortez | .15 |
| Crown Reserve | 1 9/16 |
| Eagle & Blue Bell | .95 |
| First Nat. Cop. | 2 |
| Houghton Copper | 3½ |
| Majestic | .32 |
| Mexican Metals | .28 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 2 |
| New Baltic | .60 |
| Oneco | .80 |
| Raven Copper | .13 |
| Rhode Island Coal | .01 |
| Smokey Dev. | 1 |
| S. W. Miami | 2½ |
| South Lake | 4 |
| Trethewey | ½ |
| United Verde Ext. | .55 |

‡Last quotation

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# A Methuselah among American Mines

By L. O. Kellogg

*SYNOPSIS—The Sterling iron mine, the oldest mine of importance in New York, has operated continuously for over 160 years. It is situated at Lakeville in Orange County, southeastern New York. Is rich in historical associations. The deposit is of magnetite in a gneiss country. The ore is hoisted in a flat inclined shaft and hand-sorted on picking conveyors. The company owns 17,000 acres, including a lake over the mine workings. Substantial stone buildings erected. Electric power chiefly used.*

⁂

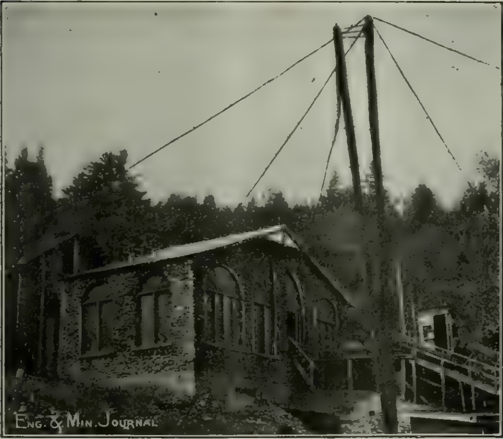

Fig. 1. Hoist House, Derrick, End of Incline and Headframe

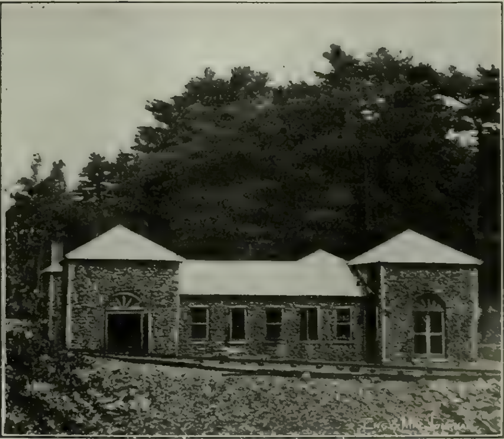

Fig. 2. Offices, Shops and Supply Room

At Lakeville in Orange County, southeastern New York, just north of the New Jersey line, is the Sterling iron mine, the oldest mine of any importance in the state, one of the oldest in the country and certainly the only American mine that has been in continuous operation for over 160 years. Historical associations cluster thick about the property. A bronze tablet erected in the shadow of the old smelting furnace, Fig. 6, reads as follows:

> This tablet was erected by the Daughters of the Revolution, State of New York, June 23, 1906, to commemorate the ruins of Sterling Furnace, which was built on this spot in 1751. This furnace is believed to have been the first place in the State of New York in which iron and steel were manufactured in quantity. From the iron here produced was manufactured in 1778 by Peter Townsend, the great chain put across the Hudson River, near West Point, to impede the progress of the British warships up the river; and the first anchor made in New York State was here manufactured in 1773.

In addition to the first anchors made in the state, some of the first cannon were also cast from Sterling iron, and none of these, it is said, failed under test.

## History of the Property

The section of New York and New Jersey in which this mine is situated, was first owned under grant by Lord Sterling, who has left his imprint on the nomenclature of the region as witnessed by the many names, such as Sterling Pond, Sterling Forest, Sterlington, etc. The mine was discovered in 1750, and the old smelting furnace referred to above, built of lime masonry and running on charcoal, was erected in 1751. Charcoal smelting was continued until 1848, when an anthracite furnace was erected at Sterling Furnace, farther down the valley. The pig iron made was hauled by wagon to Sloatsburg until 1865, when the railroad was built connecting the mine with the Erie road at Sterlington. The property was in the hands of the Townsend family for over 100 years, and so far as known, has never been shut down. The operating company now is the Sterling Iron & Ry. Co. The early workings, now looking like a surface cut, have been abandoned and operations are conducted on another deposit, outcropping near the original discovery but having a different strike and dip.

The ore is a magnetite in gneiss. The deposit has a length on its course of several hundred feet and a thickness varying from nothing up to 20 ft. Its dimension on the dip is not yet determined, as the bottom of the 2650 ft. shaft is still in ore. The strike of the deposit is about northeast and its dip is 18° to 19° to the north. The single shaft in use, lies in the ore and follows the [illegible] foot wall more or less closely. In places it seems hardly more than an inclined track laid through the stope. A pillar is left on both sides of the tracks, but the frequently spaced lenses break through this in many places so as to make it rather a succession of elliptical pillars. No timbering worth mentioning is used, the only support of the back being the pillars at rather wide intervals. These pillars are usually left where the foot wall rises so that little ore remains between the two walls. The hanging can be described only as beautiful. In spite of the large areas left unsupported, it is standing intact in most places after several years. The mine has the deserved reputation of being unusually safe. The ventilation also is surprisingly good, the circulation of the air being aided by some old openings. The mine is, furthermore, free of dripping water, and the only drawback to the complete enjoyment of life underground lies in the unsanitary habits of the men.

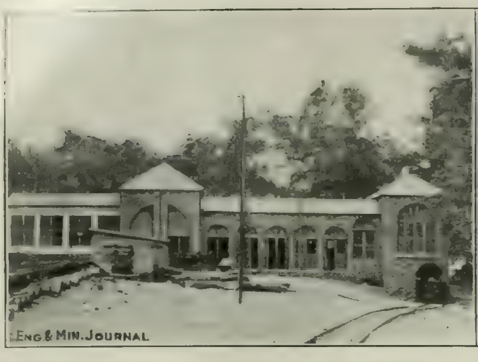

FIG. 3. CRUSHING AND SORTING HOUSE

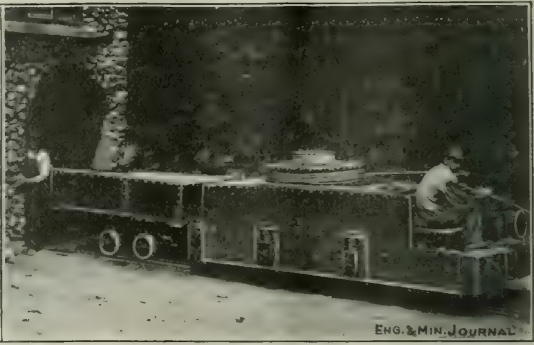

FIG. 4. LOCOMOTIVE WITH GATHERING REEL

FIG. 5. HIGH LATTICED TRANSMISSION TOWERS

FIG. 6. MONUMENT AND COMMEMORATIVE TABLET

### UNDERGROUND METHODS

Drilling is performed with light Ingersoll-Rand machines mounted on tripods, two men, however, being employed on each machine. The system in general is overhand stoping. The broken ore is mucked out about as fast as it is broken. The good words spoken for the hanging cannot be repeated for the foot wall. The irregular nature of this, with alternating ridges and gulches such as it has, interferes seriously with systematic work and makes mucking exceedingly difficult. The broken ore is shoveled and thrown into 2-ton turntable cars, trammed out over a 30-lb., 3-ft. gage track to the loading platform built across the shaft, dumped into the 4-ton cars or skips and hoisted. Some large waste is sorted out underground. The levels are driven every 30 ft. On the northeast the deposit is faulted off.

### SURFACE HANDLING OF THE ORE

The hoisted cars are dumped into a small bin by tripping the door on the lower end. The ore is fed thence to a link-pan conveyor running only 6 or 8 ft. per min. Several ore sorters stand on this and throw lump magnetite into one car and lump waste into another. The smaller material is fed to a gyratory crusher, and, after crushing, discharged on another inclined belt-conveyor. More ore sorters here discard the broken waste to a small belt paralleling the main belt. The two belts dump into different bins. An electric locomotive, Fig. 4, handles the various products of the sorting and loads the railroad cars. It is a General Electric machine, operating at 220 volts and rated to give a speed of 7.5 miles per hr. with a pull of 2400 lb. It is of an unusual type for surface work, operating with a gathering reel and a cable laid on the ground instead of with a trolley and overhead wires. This makes a flexible system, the cable being paid out and reeled up following the movement of the locomotive, which is thus enabled to go anywhere within the limits of the length of the cable; the three-phase system is probably simpler to handle in this way than by the use of double trolleys, and there is something to be said in its favor on the score of safety.

FIG. 7. THE LAKE OVERLYING THE WORKINGS

The discard from the hoisted material amounts to about 25%. The sorted product is a nonbessemer ore of rather high grade, approximating 60%, free of sulphur and a desirable furnace material as being almost self-fluxing. It is shipped all rail to a Pennsylvania furnace. The shipping product is dumped directly from the 2-ton tram cars handled by the electric locomotive into the 45-ton railroad cars, these being backed into a kind of cut, formed by the hill on one side and the dump on the other, and bridged with a sort of trestlework for the tram tracks. The railroad, owned by the company, connects the mine with the station of Sterlington on the Erie. It is eight miles long, and overcomes a difference of elevation to the mine of 400 ft. The maximum grade is 4 per cent.

### POWER INSTALLATION

The electric installation at this mine is extensive. Four sets of electric wires are taken down the shaft, namely, power cable in a lead sheath, a telephone cable, lighting wires and signal wires. The power and telephone cables are supported by clips from guy-wire cables. The power at 2200 volts is used for the main pump, the sinking pump, a pump near the collar to intercept surface water and for the sinking hoist. On the surface the electric power is used for the main hoist, a Lidgerwood double-drum machine, driven by a General Electric three-phase motor; for the picking conveyors; for the crusher and for the locomotive. The only machine not electrified is the compressor, which is a Rand Imperial running on steam generated by anthracite buckwheat. It has two 14x16-in. steam cylinders and two compound air cylinders, 13x16-in. and 22x16-in.

The electric power consumption will run about 200 hp. It is generated at a producer-gas plant on the Erie several miles away, and is brought in at 13,200 volts and stepped down to 2200 and 220 volts for use about the plant. In order to avoid damage to the trees near the mine, the last six or seven transmission poles are built 40 or 50 ft. high and are guyed from the tops. They are constructed of three angles with lattice bracing, as shown in Fig. 5. One would have to go far, probably to Grass Valley, Calif., to find another mine so merciful to a neighboring forest. Apparently no feud with a forest service exists here.

### PROPERTY AND BUILDINGS

The company owns 17,000 acres outright, nearly a township, and includes in its holdings a 350-acre lake. The main shaft and most of the workings lie under this lake, which is 100 ft. deep in places. No one viewing the solid hanging, however, would look for any leakage. Fig. 7, showing the lake, was taken about 300 ft. from the shaft collar. The mine buildings, shown in Figs. 1, 2 and 3, are well built, of local stone, left with a rough finish, and present a most attractive appearance. The large amount of ribbed glass used in their design makes the interiors unusually light. The JOURNAL is indebted to B. M. Moffatt, Jr., general superintendent of the company, for assistance in obtaining the material for this article.

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## Nickel Smelting and Converting

Limestone is used as a flux in nickel smelting at the Canadian Copper Co.'s works, Copper Cliff, Ont., only when the furnaces are in poor condition, says the *Canadian Mining Journal*, Aug. 1, 1913. Its addition lowers the melting point of the slag, and thus cleans out accretions from the sides of the furnace. If much alumina is present, lime is particularly indicated. The coke used is about 11% of the weight of the charge, and a furnace 17 ft. long, smelting about 300 tons of ore, or 400 tons of charge per day, takes about 24,000 cu.ft.

of blast per minute. The settlers used are oval, 19 ft. 6 in. by 16 ft. by 5 ft. 6 in. high.

The slag carries about 33% $SiO_2$ and 55% Fe, and about 0.4% Cu and Ni. The matte carries about 6% Cu, 16% Ni, 42% Fe, and 27% S. Its specific gravity is 4.6 to 4.8; that of the slag is about 3.7.

The basic converters are 37 ft. long by 10 ft. in diameter. Air is used at 10 ft. pressure, and each converter uses about 6500 ft. of free air per minute.

The matte is blown to a high-grade product carrying about 25% Cu, 55% Ni, 0.5% Fe, 19% of S. The converter slag carries about 28% $SiO_2$, 62% FeO, and 2½ to 3% Ni. This slag is resmelted as a flux.

In converting, about 70 to 80 tons of matte are poured into the converter and 5000 or 6000 lb. of dry crushed quartz are added. The slag is poured off after about an hour's blowing, and more matte and flux added. After that, slag is poured off and one pot matte with about 5000 lb. of quartz and waste mine rock charged every 40 min. The entire blow lasts from 70 to 80 hours.

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## Johannesburg Strike

Special Correspondence

When I wrote a fortnight ago, the government had apparently surrendered to the strikers and had, with the consent of the mine owners, agreed that all miners at the New Kleinfontein should be reinstated, and that the free laborers should be removed, the mine owners insisting on their being compensated. The Federation of Trades and the railway men were promised that they would be allowed to place their demands before the government. Before this, neither the government nor the mine owners would recognize the trade unions. The bulk of the men and their leaders considered they had won a great victory and that little trouble would be experienced in gathering in the fruits of it, as they considered that a little rioting and house-burning had cowed and frightened both mine owners and the government.

The real reason that this surrender was made has not, I believe, been published anywhere, and for obvious reasons is not published in South Africa. The truth was that in the compounds of the Central Rand, containing perhaps 40,000 natives, there were food supplies for only a few days, and had the railways joined the strikers, as was certain to take place, a most awful state of affairs would have arisen. The men do not know this, even today, and immediately after the strike was over, started drawing up a list of demands of the various trades that contained requests calculated to render gold production impossible on most of the mines on the Rand. They demanded that the government would immediately call a special session of Parliament to grant a universal eight-hour day with a surface minimum wage for skilled mechanics of 2s. 6d. per hr., with 25s for drill sharpeners and half rates for unskilled laborers. The minimum daily wage for underground skilled workers to be 22s. 6d. for eight hours bank-to-bank, overtime to be paid as time and a half, double pay on Sundays and holidays, and night shift for mechanics to be paid time and a quarter. Power-station men were to work only 40 hours per week and no drill sharpening was to be carried on underground. Tenants in mine houses were to be entitled to one month's notice. Weekly wages to be paid and a fair-wage and conditions clause to be inserted in all foot contracts. The general demands included the abolition of all Sunday work on mines and the prohibition of all important contract labor (aimed at cutting off the supply of native labor), the introduction of wage boards, and other demands, including a mimimum wage for most trades. The railway employees made other demands on the government, many of which are reasonable and which the government has decided to grant. The Transvaal Miners' Association put forward a list of grievances also, of which the most important were the limiting of night shifts to five per week; fixing minimum rates of underground pay; the abolition of discharge notes; that the miners be allowed to elect a third of the mine inspectors, and that two employees act as local inspectors; that compensation for miners' phthisis be increased to $375 for first-stage cases and $750 for advanced cases; that a fortnight's holiday on full pay be granted for each year's service; that Trade Unions be recognized under the law.

The position at date of writing, June 27, is that the government and employers have rejected the bulk of the demands, granting, however, several that are obviously fair and reasonable, and that all arrangements have been made to deal with a general strike. Militia and police have been concentrated on the Rand, special constables nearer in, and every preparation made to deal with disorder among employees. It has been decided to march all the mine natives away from the Rand, and lines of food depots have been established.

The trouble has already led to a cessation of recruiting, and natives are leaving in large numbers for their homes, owing to fear of further troubles. After the miners agreed to resume work, the natives in general compounds attempted to strike work for higher wages and many were severely punished. All these factors are producing a great shortage of native labor, and the mines have already started to discharge miners. If the present state of unrest continues, the output of the Rand must decrease and new work be postponed indefinitely. Apparently the best remedy is for a strike to take place and after a proper trial of strength, peace may be restored. As a matter of fact, the greater number of the mine employees desire no strike. The conditions of work and of pay of the surface employees are the best in the world and 80% of the miners and mine employees who left work, did so owing to moral or physical fear.

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## United States Quicksilver Production

Low prices prevailed in the quicksilver industry during 1912, and it was not prosperous. Most of the producers are old mines, devoid of high-grade ore, which require special skill in working. Operating costs are not being reduced, and little improvement can be expected with the low market price and uncertainty of ore supplies, says the U. S. Geological Survey. The domestic market appears to require 20,000 to 25,000 flasks yearly.

Final figures show production of 25,064 flasks, of which 20,524 flasks were from California and 4540 flasks from Nevada and Texas. There were 20 mines producing the metal, of which 17 were in California and the other three in Nevada and Texas.

The average recovery of metal from ore in California in 1912 was 11 lb. per ton of ore treated, or 0.55% of the ore. In 1911 the recovery was 0.54% of the ore.

# Ore Bedding by the Tennessee Copper Co.

By H. F. Wierum*

*SYNOPSIS—In making acid from smelting-works gases, uniformity in gas analysis is a most important factor. This is gained by the bedding system at the Tennessee company's Copperhill plant. Other advantages, such as decreased coke consumption, are also gained.*

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In making sulphuric acid from the waste gases of blast furnaces when smelting ores high in sulphur, it has been found that the efficiency and economy of the process depends as much upon the furnaces as upon the acid plant. As compared with many periods, sometimes of months' duration, when, by reason of irregular ore analyses, or other conditions, the furnaces have run slowly and irregularly there have been many occasions when with practically no increase in the amount of ore smelted the acid plant has been pushed to its maximum capacity because of the steadiness of the gas and its high $SO_2$ contents. Ordinarily a copper metallurgist gives but little thought to his escaping gases if his slags are good, his fuel low, his tonnage normal and his grade of matte satisfactory. Of course, when one or more of these items becomes persistently unsatisfactory he will, or should, look to his gases to help point out the reason and remedy.

### Gas Grade Sometimes More Important Than Slag Tenor

Attach a huge acid plant to the furnace flues, however, and then tell the metallurgist that the grade of his gas means in reality more in dollars and cents than the copper contents of his slag, and he has one more important and troublesome object in life, one more ever-fruitful subject for telephone calls from his foreman at 2 a.m.; a leaky tap jacket or spout, a runaway on a forehearth, in fact any ordinary bit of hard luck that is but half an incident to the ordinary smelter, becomes a serious matter where it means an interrupted gas supply and the possible upsetting or loss of the acid chamber process, sometimes not recoverable again for a day or two.

The quantity of coke used in blast-furnace smelting is, of course, always an important item of expense and more, the successful husbanding of coke is a matter of pride. To the metallurgist with an acid plant looking to him for good gas it is still more important, for coke plays a star rôle in affecting gas conditions; influencing the temperature of the gases, the grade of matte (which responds to the more or less oxidizing conditions in the furnace), and last, but not least, the percentage volume of $CO_2$. This inert $CO_2$ takes space in the chambers, space that might be used for $SO_2$ and O, and therefore is a dead loss. However, a discussion of the details of acid-making conditions is not the object of this article; suffice it to say that the less $CO_2$ the better, and as coke is one of the chief sources of $CO_2$, the less of it the better, provided the gases are hot enough when they reach the Glover towers to cook nitrate of soda, to concentrate the chamber acid, and to denitrate the nitrous vitrol. A good average temperature is 800° to 900° Fahrenheit.

One more point at the Tennessee Copper Co.'s plant, at Copper Hill, Tenn., needs mentioning. The ore supply comes from three mines, differing considerably from each other in analyses, and ofttimes showing widely divergent analyses on successive days in the output from the same mines. For instance, it is not uncommon for 1000 tons from Burra Burra to analyze:

Today, $SiO_2$, 10%; Fe, 40%; S, 29%.
Tomorrow, $SiO_2$, 20%; Fe, 35%; S, 24%.

a variation which, if unknown beforehand by the metallurgist, will materially affect the slag, matte and gas product from the furnaces.

### Hot Furnace Tops Necessary for Acid Making

In theory and in fact all the items which work toward good metallurgy, with one exception, work also toward good gas conditions, the one exception being the necessity of rather high top temperatures. This requisite makes it difficult, if not impossible, to practice true pyritic smelting.

Digesting all these facts and realizing that, if the acid plant were ever so large it would only make acid in proportion to the grade and quantity of gas supplied to it, and realizing further that both more and cheaper acid can be made from a steady gas carrying say 4½% of $SO_2$, hour in and hour out, than can be made from an average 5 or 5½% $SO_2$ gas that is 7% in the morning and 3% in the afternoon, it was decided to bed the ores.

As stated before, two successive days frequently show a variation of 15 or more units in the excess of iron over silica in Burra ore, but, taken by weeks, two successive weeks' averages rarely, if ever, show a quarter of this variation and many weeks' average analyses are practically identical with each other, hence it was argued that a bed holding a week's output would flatten out these fluctuations in analyses from the daily-unit basis to the weekly-unit basis, and so it has done.

### Cananea Bedding System Used

The system of bedding and reclaiming ore devised by E. H. Messiter and installed by A. S. Dwight, at Cananea, is too widely known to call for a detailed description here. For climates not too severely cold in winter it probably is the most satisfactory all-around system of handling, say 800 tons per day or upward. Cold weather certainly interferes with the operation, though it would not be impossible to provide a protected steam-heating system along the center of each bed. The first cost of the Copper Hill installation was about $7 per ton of storage. There are two beds holding 7500 tons each, and two smaller ones holding 3000 tons each, a total of 21,000 tons, and the total cost was roughly $150,000, not including the sampling mill. There are two of the large reclaiming machines, which alone cost about $33,000, set up at the plant. All told, there are nearly 3000 ft. of belt conveyors, 6000 ft. of actual belting of all sizes from 30-in. to 16-in. The superstructure itself is of wood instead of steel, as at Cananea. The foundations for the beds are poured slag faced in the trenches between beds with either heavy-braced planking or concrete.

In operation, the ore is brought in trains from the mines and dumped after weighing into any one of a long row of bins, each holding 200 or 400 tons.

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*Consulting engineer, Tennessee Copper Co., 2 Rector St., New York.

The company railroad cars are longitudinal bottom-dump cars and the track is supported on the bins. Some of these bins are reserved for limestone or quartz or coke, but no effort is made to keep the products of the three mines separated from each other after weighing. It all passes the sampling and later as "green ore." Three successive cuts are automatically taken at the mill of one-[illegible], one-fourteenth and one-tenth, each cut being subsequently crushed before the next. Lots of the mixed green ore are made of 1000 or 2000 tons each. Care is taken not to have an over-dose of ore from any one mine on a bed, and the analyses of all lots being known (currently while building the bed) quartz or limestone or some one ore is then bedded in calculated proportions to complete the mixture of 7000 or 7500 tons in such a manner as to conform to the exact analysis called for by the desired slag, matte and gas. Last of all, the coke is put on.

The cost of bedding begins when the ore has been dumped from the railroad cars into the bin. A 30-in. belt conveyor runs under the entire row of bins and delivers to the gyratory crusher, the first step in the sampling mill. A two-motion feeder guides the ore from the bin gates to this 30-in. belt. One motion is the travel from bin to bin and the other, a shaking which keeps the ore from blocking the bin gates and delivers it in regular quantities to the belt. Two men, sometimes three, are generally required to operate the shaking feeder. Six or eight men attend to the passage of the ore through the sampling mill, including a final cutting down of the small samples. When the ore leaves the gyratory, which crushes to four or five inches, thirteen-fourteenths of it goes directly to the beds without further crushing.

The rejects from all subsequent cuts also find their way to the main delivery belt, which, by means of a moveable tripper, delivers to the bedding belt over any desired bed. These bedding belts, of which there are two, each one covering a big and a little bed arranged in tandem, are provided with traveling trippers which, in going forward, clutch the belt and travel with it and at the same speed, thus carrying the belt full of ore out to the far end of the beds. At that point an arm on the tripper strikes a stationary dog on the superstructure, which reverses the mechanism and releases the tripper from the belt, so that it (the tripper), starts backward, spilling the ore over its top pulley and down through a spout onto the peak of the bed. The forward movement of the belt is never interrupted, so that the backward movement of the tripper acts as a scraper would act if held down on a conveyor and moved in the opposite direction from the travel of the belt at the rate of, say, 200 ft. per min. The result is a windrow of ore spilled over the length of the bed with surprising uniformity.

From the time the ore leaves the sampling works this bedding process takes little or no manual supervision, though it is thought safer to have a man or two, track walkers as it were, watch the various transfers from belt to belt.

The bed thus formed is triangular in cross-section with a base 35 or 40 ft. across and a peak or altitude about 16 ft. high; each linear foot holds about 23 tons. The two large beds at Copper Hill are a little over 300 ft. long and the two smaller ones about half that length.

### EACH LINEAR FOOT OF BED IDENTICAL

The important fact about a bed thus formed is that each linear foot of the pile is identical, both chemically and physically, with every other linear foot; it makes no difference in what order the various materials are put on. Three thousand tons of fines could be bedded first and then covered with 4000 tons of coarse, still each longitudinal foot would have its proper proportion of fine and coarse. Similarly, if the basic ore is slow in arriving for two or three days, quartz and siliceous ore can be bedded instead of waiting for a layer of one and then a layer of the other. There is a segregation of the coarse to the outer edges and the fines to the center, but this makes no difference whatever, for this segregation is uniform throughout the length of the bed and the reclaiming machine takes a perfect slice or section across the face of the whole bed. The coke is preferably dropped slightly to one side of the peak (the side next the reclaiming belt), so as to subject it to the least possible travel, conveying or handling, and thus avoid breakage.

The reclaiming machines, one of which is now always in reserve and on a reserve bed, travel on a track of about 60-ft. gage, each rail of which is laid along the outer edge or side of a bed so that the machine spans the entire width. It moves forward from end to end of the bed with an almost imperceptible motion, perhaps ½ in. per min. (this would be 2½ ft. per hour, or say 60 tons per hour, or 1440 tons per day). The power is transmitted through a trolley wire carried on the superstructure. The machine carries suspended in front of it a great triangular harrow, approximately the size and shape of the bed section and supported in a forward leaning position against the face of the bed at about the angle of repose. This harrow is the first thing to touch the ore in reclaiming. It moves from side to side with a motion of possibly six inches, imparted to it through a connecting rod and crank disk and pin from a long motor-driven shaft (all motors being carried on the reclaiming machine itself). The teeth of this harrow thus scrape gently the face of the bed, causing the material to trickle down to the foot or toe uniformly over the whole cross-section. Here it lands on an apron of sheet steel carried by the machine at ground level, on which it is continually conveyed laterally across the foot or toe of the bed on this steel apron, by a plow conveyor, also a part of the reclaiming machine.

These plows push the ever-accumulating material across and off the side of the bed onto a belt conveyor, which runs in a shallow trench alongside the entire length of the bed, whence it transfers to other conveyors until it finds its way to the feed-floor charge pockets. From these pockets it is ready to be charged into the furnaces without any further addition of material, and even without weighing, the accurate measurement of the distance traveled by the reclaiming machine into a bed giving an accurate weight of the material reclaimed during any given period. The bedding is done on day shift only and takes, say 10 or 12 men, including the sampling. Reclaiming is done intermittently during the 24 hours and this takes nominally a machine runner, three belt tenders, and a roustabout or two on each shift. The power consumption is small. Belt renewals have been found to approximate $5000 per year and the repairs other than belt renewals, now that the plant is thoroughly broken in, are small. Accurate figures are not at hand at the moment, for these various items, but it can readily be seen that where the total daily cost is divided by a reasonably large tonnage handled, the per ton cost must be small.

In deciding on this installation, however, it was estimated that the actual cost of getting materials to the blast furnaces in this way, might be somewhat greater than by the old method. Economies looked for, were therefore economies in a more excellent metallurgy purely and simply. These metallurgical economies, it is a pleasure to state, have been, and are being fully realized. At first the mere centering of the conveyors on idlers seemed to be a tremendous task and one that required a large force of men. Now one man attends to this matter and kindred details with the utmost ease. Pulleys and gears had to be reset, at first the sampling mill gave much trouble, several wrecks were inevitable incidents in the operations of the reclaiming machine. Plows broke and all manner of trouble was encountered during many months, all of which mechanical troubles have disappeared entirely. There is, however, one condition that must be carefully looked to at all times, viz., not to let the ore supply run short; or to put it in another way, not to clean up the beds because if this is done, as has occurred two or three times at Copper Hill, it means that the mines must supply during a given time at least 8000 or 9000 tons of ore more than the furnaces can or do use, in order to accumulate a bed and a little start on a second bed. If memory serves, this entire expensive bedding plant was idle for seven or eight months, because the beds were empty and the mines could never get ahead of the smelter in the matter of ore supply. About May 1, however, came the annual shutdown of the furnaces and acid plant for repairs. During this shutdown the mines ran and the beds were filled and have been kept running regularly ever since, thus the past couple of months afford a comparison between smelting and acid-making conditions, while running exclusively from the beds as against running in the old way from the bins where analyses are unknown and weights approximate.

To record these differences very briefly: First, the matter of coke, 4½ to 5½% of coke to the charge on the green-ore furnaces is normal when running from the bins. The past two months have resulted in a saving of coke to such an extent that now from 2.8 to 3.2 is normal.

In the matter of tonnage or furnace duty, the average tonnage of charge per furnace day is now approximately 580 (using a month's average), while with the more irregular conditions which obtained, when running on unbedded ore between 80 to 90% of this figure would be normal.

Of all the advantages derived from this system, however, by far the greatest is the uniformity of the gas. This is very striking. For convenience sake, the gas analyses which are taken at various points, half hourly and in some cases every 10 min., are averaged during four six-hour periods of a day. Averaging analyses over six-hour periods oftentimes, however, conceals fluctuations from hour to hour, nevertheless a comparison of the six-hour averages during the last last 60 days, when beds have been operating without interruption, with similar six-hour periods while the bedding plant was not in operation, show an improvement in the gas conditions which has resulted in a wonderfully increased outout of sulphuric acid and in a saving in costs.

Formerly it has sometimes been the case when the output of the mines happened to be uniform from day to day, that the gas from the blast furnaces was also fairly uniform, never going below 5½% of $SO_2$ or over 6½% of $SO_2$ for periods of a week or more; then, however, would nearly always follow a period of ungovernable fluctuations from 3% up to 7%. An effort was always made to meet such fluctuations with special charges on the blast furnaces to tone up the gas. Sometimes good gas would result from this treatment for a shift or a day, but rarely permanently. Many periods have been encountered when ore came from certain stopes in the mines, which was of unfavorable analysis when nothing could be done to improve the gas over a 3½% $SO_2$ content, for instance. It was simply necessary to wait until the ore improved.

For the past couple of months, taking the ore good and bad just as it has come from the mines and making uniform beds of it, the gas has rarely for an hour or two at a time been below 6% of $SO_2$ and rarely over 6.8% of $SO_2$. These conditions are almost perfect and are a direct result of the uniform mixture now fed to the blast furnaces from the beds. It is possible that two months is not quite a long enough period from which to draw final conclusions. But the summer months, in a damp climate like that of Copper Hill, have always been hardest on furnace running and gas conditions, and yet it is during May and June that these striking improvements have taken place. In all previous runs of the bedding plant, during the past 18 months, intermittent and spasmodic though they have been, the same tendency toward greater steadiness, and more uniform furnace running, even gas, and low coke, has always been very marked.

The metallurgical success attending this installation, though only reasonable to expect, is nevertheless a pleasure to record.

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## Ford's Multiple-Spout Ladle Runner

The use of multiple-spout ladle runners in order to pour the contents of furnaces quickly is by no means new. Ordinarily it has been the custom to regulate the streams in the separate branches by small dams of fireclay. Edward L. Ford, of Youngstown, Ohio, attempts to avoid this by arranging a double spout, which is supported by a post and a riding ring. The relative heights of the two branches can be regulated by these supports, and, of course, the relative rapidity of flow of the metal through them will be altered likewise as the ladle tilts from one side to the other. This is covered by U. S. pat. 1,061,280.

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## The Mica Market

Harrison Watson, Canadian Trade Commissioner, at London, England, reports to the Department of Trade and Commerce, at Ottawa, that he is in receipt of frequent applications from British and Continental mica buyers, who desire to get into touch with Canadian producers and shippers who are in a position to deal with export markets. There is plenty of business offering for shippers of this product who are prepared to adopt the systematic methods to which European buyers are accustomed. Mr. Watson has been advised by a large London firm of dealers that there is an increased demand for amber splittings 1x2-in. and 1x3-in. sizes.

## Production and Use of Magnesite

California is the only one of the United States producing magnesite in commercial quantities. The 1912 output in that state was 10,512 tons of crude material, according to the U. S. Geological Survey. The consumption of California magnesite is confined to the state, as railroad freight prevents its marketing farther East in competition with foreign products. Even in California the makers of flooring, tiling, building material, artificial marble, etc., purchase their supplies of calcined magnesite from the importers at a price $15 to $25 per ton higher than that got for the native material. This is largely due to the fact that the American producers do not furnish a standard or a suitable product for these purposes. The greater part of the production mentioned for 1912 was derived from the mines of the Tulare Mining Co., in Tulare County. This product, after calcination at the mine, is shipped to the paper mill of the Willamette Pulp & Paper Co., of Oregon, where it is used as a digester in the manufacture of paper from wood pulp.

Magnesite is the normal carbonate of magnesium, $MgCO_3$, a dense, white, massive mineral rarely showing crystalline structure, or cleavage. Most of the known deposits are associated with basic intrusive igneous rock, where they occur as veins or lodes in part replacing the rock.

The uses of magnesite include: (1) Various refractory purposes, such as brick, furnace hearths, crucibles, etc.; (2) as sulphite for digesting and whitening wood-pulp paper; (3) as crude material for the manufacture of carbon dioxide; (4) in ground and calcined form, as material for oxychloride or Sorel cement; (5) miscellaneous applications in crude or calcined form; (6) miscellaneous refined salts. The refractory uses of calcined magnesite constitute perhaps its most important application. The presence of lime, silica, iron and alumina are supposed to be objectionable in magnesite thus used.

Oxychloride cement is a mixture of finely ground calcined magnesite with magnesium chloride. It is put out under many trade names, especially that of sanitary flooring. It produces a smooth, even floor, which may be laid in large areas without cracking, takes color advantageously, and is susceptible of good polish by oil or wax. It has a resilience not given by ordinary cement, and does not pulverize or grind to dust. Its extensive use in this capacity abroad is leading to an increasing adoption in this country.

Among miscellaneous applications of magnesite may be mentioned its use as a nonconducting pipe covering, as an absorbent for dynamite, as an adulterant in paint, for the prevention of scale in boilers using sulphurous waters, as a fireproof or fire retarding paint, and as a binder for briquetting coal.

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## Coppee Coke Ovens at Lubumbashi, Katanga

The Union Minière du Haut-Katanga has furnished *South African Engineering* with particulars of the coke ovens it is erecting at Lubumbashi, to provide the coke required for its copper smelting. Altogether 44 coppee ovens are being erected in two sets of 22 ovens each. The [illegible] erected is for non recovery of byproducts, the waste heat being utilized for raising steam from two 3000-sq.ft. water-tube boilers. The capacity of each oven is from five to six metric tons of coke, and the coking time is about 48 hours. The capacity of the plant when completed will be between 3000 to 3500 metric tons of coke per month. The accessory plant includes a coal-unloading device of 30 tons per hour capacity; two crushers, each of 15 tons per hour capacity; and a coal-bin of 150 tons capacity.

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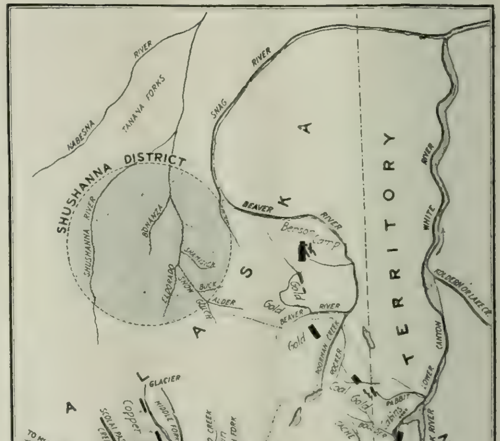
## Map of the Shushanna District

The Shushanna is now attracting more attention than any other district in Alaska. Rich gravel was found last spring not far from the international boundary, and since the richness of the washings has been widely proclaimed a stampede of no small proportions has resulted.

The most enthusiastic gold seekers have already claimed the discovery of a second Klondike, but so far little that is authentic is known of the district. The distance from Cordova along the line of the Copper River & Northwestern Ry. to McCarthy is 190 miles, and from McCarthy to the new diggings, through the Scolai Pass, is about 100 miles. The accompanying map shows the relation of the new district to the headwaters of the Tanana and White River. The trail from McCarthy, on the Copper River railroad, is shown on both the larger detail and the insert maps. In the JOURNAL of Aug. 16, and of Aug. 23, has been published what is now known outside of Alaska of the facts of the recent discoveries.



MAP OF THE SHUSHANNA DISTRICT

# Origin of the Butte Chalcocite

*SYNOPSIS—Most of the massive Butte chalcocite is primary. Old belief that it was secondary was based on insufficient evidence. Its occurrence at depth, its intimate association with other minerals, its failure to correspond with surface topography, its great age, its direct replacement of altered granite in depth, lack of evidence showing present deposition and positive evidence that it tends to alter to other minerals, all indicate a primary origin.*

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The explanation of the persistence to great depths in the Butte copper veins of the mineral chalcocite has always been an interesting problem for economic geologists. The occurrence in other districts of chalcocite of the sooty variety, which was evidently of secondary origin, and a similar occurrence in Butte, formerly led to the conclusion that all the Butte chalcocite was of secondary origin. In Butte, however, after passing through the zone of sooty chalcocite, instead of lean copper ores, rich massive chalcocite was encountered. The origin of this massive chalcocite, especially as to whether it is secondary or primary, is a matter of debate.

### CAUSES OF THE BELIEF IN SECONDARY ORIGIN

The facts which have led to the belief that the chalcocite is chiefly of secondary origin are as follows (1) The chalcocite is often of a later age than the vein minerals with which it is associated; (2) in some instances, the proportionate amount of chalcocite present decreased rapidly with depth; (3) in many instances in other camps it has been proved definitely that chalcocite is a product of descending sulphate waters; (4) in many of the veins the chalcocite enrichment bears a definite relation to the depth of the zone of oxidation.

It is the opinion of the author that most of this massive chalcocite is of primary origin, that is, deposited directly from the original uprising solutions. Probably some of the massive chalcocite is of secondary origin, and there is an overlapping of primary and secondary chalcocite in the veins, inasmuch as primary chalcocite is believed to have originally extended to an elevation higher than the present ground surface. Thus suffering the effects of surface alterations, it was made to enrich itself, as it were.

### EVIDENCE FOR A PRIMARY ORIGIN

The facts supporting the belief that primary chalcocite exists in large quantities in the Butte veins are as follows: (1) Its occurrence in great abundance at points 3000 ft. below the surface; (2) its intimate association with bornite, pyrite, and enargite in such a manner that all must be considered to have been deposited at one time; (3) the lack of relation between its occurrence and the surface topography; (4) its presence in dry veins, and in deep levels, and in situations where it is often cut by faults, which shows that, whether primary or secondary, the mineral is old, and not related to present-day ground-water circulation; (5) the direct replacement of altered granite at deep levels, a phenomenon which cold, surface waters are probably not able to bring about; (6) lack of evidence showing its deposition at the present day except as sooty chalcocite, and positive evidence that the massive chalcocite itself tends to alter to other minerals, such as bornite and chalcopyrite, when subjected to present ground-water conditions.

### MASSIVE CHALCOCITE OLDER THAN THE RARUS FAULT AND STEWARD FISSURING

The undoubted secondary chalcocite, that is, the sooty variety, is the result of downward-seeping sulphate solutions. It can be pretty well proved that the massive chalcocite existing in the deeper levels is in no way related to the present ground-water circulation, but that its formation must be referred to a relatively old period of mineralization. Thus the Rarus fault sharply cuts many of the ore veins, displacing them several hundred feet. Yet the truncated portions beneath the faults are as rich as the portions above, whereas the possibility is exceedingly remote that they could have been subjected to the influence of surface waters after the faulting in view of their position with regard to the fault. Hence it follows that the chalcocite-bearing veins in their existing form antedated the formation of the fault, especially in view of the fact that the fault itself is not mineralized. By structural relations the Rarus fault can be shown to be relatively old, so that any chalcocite deposited previous to it must have been deposited long before the present ground-water circulation was established. Similar structural relations would seem to show that chalcocite existed as a vein filling previous to the formation of the Steward fissure system. The existence in the Blue-vein fissures of great oreshoots which do not extend to the surface, and above which not only the copper minerals disappear, but the typical gangue minerals as well, is a point of importance. These minerals evidently had a common origin, and are not related in any way to subsequent crossfissuring or faulting. The intersection of these Blue-vein oreshoots, rich in chalcocite, with Steward fissures, are numerous, and from the evident lack of influence of these intersections on the mineralogical character of the ore, the conclusion must be reached that the chalcocite existed in large quantities in the Blue veins prior to the Steward faulting.

### FORMATION OF OLD CHALCOCITE BY METEORIC WATERS IMPROBABLE

If the chalcocite is older than the time of the Steward fissuring, it is extremely difficult to account for its formation by the circulation of meteoric waters. For at this time it is fair to assume that the surface was much higher than at present, needing therefore an extremely deep ground-water circulation to reach the orebodies of the Blue vein which are even now 3000 ft. from the surface. The time required for this process would be enormous, and under the conditions governing the present deposition of chalcocite, almost all the copper is taken from the surface-water solutions before a depth of 1200 ft. below the zone of oxidation is reached. Furthermore, during the time of formation of the Steward fissures, the original solutions were still rising, and it is evident that descending meteoric waters could not make head against this rising circulation. It is a reasonable assump-

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Note—An excerpt from a paper by Reno H. Sales, entitled "Ore Deposits at Butte, Mont.," A. I. M. E. Bull., August, 1913.

tion that no important downward movement of meteoric waters took place until the rising solutions ceased. There is no question but that the solutions continued to rise during the interval of the formation of the Steward veins, since the original primary minerals are found therein. Meteoric waters, therefore, could hardly have deposited deep-seated chalcocite until well after the close of the Steward period.

### No Relation Between Massive Chalcocite and Oxidized Zones

The deep, massive chalcocite bears no relation to the present surface topography, whereas the undoubtedly secondary sooty chalcocite does. Thus the tops of many rich bodies of the massive variety occur at depths varying from 100 to 1500 ft. from the surface, and the size to the orebody is in no way indicated by the depth of the zone of oxidation; in fact, many of the larger shoots are capped by several hundred feet of barren crushed granite, on top of which the oxidized zone is less than 25 ft. in vertical extent. In the quartz-pyrite veins in the Anaconda system, on the other hand, where the development of sooty chalcocite is greatest, there is apparently a close relation between the depth of oxidation and the quantity of mineral existing below. If a secondary origin is assumed for the massive orebodies capped by several hundred feet of barren crushed granite, the question as to the source of the copper entering into these orebodies is of vital interest. It does not seem possible that the source of the chalcocite could have been at a higher point, for there is no evidence of the existence or passage of copper-bearing minerals above the deposit.

In the Shannon vein of the West Colusa mine, which belongs to the Anaconda-vein system, orebodies of enormous size in the upper levels became impoverished in depth, although the vein itself continued strong and big. Other examples might be mentioned, where the old quartz-pyrite veins were broken by later faults and all conditions seemed ideal for the formation of chalcocite ores in depth, but none took place other than the sooty glance enrichment. In the Mountain Chief oreshoot of the Jessie vein, belonging to the Blue system, there is a complete transitional change from chalcopyrite ore to an ore containing chalcocite within 50 to 75 ft. It is impossible to conceive of a surface-water origin for this chalcocite underneath a chalcopyrite capping.

In most of the quartz-pyrite veins of the Anaconda system, it must be admitted, an important zone of secondary enrichment occurs, in which the massive chalcocite is found, and it is perhaps reasonable to suppose that the chalcocite below this, in which the sooty variety does not occur, also is secondary, the whole shoot having had a common origin. The early prominence of veins of this class was probably largely responsible for the former general belief in the secondary origin of the chalcocite of the Butte vein.

### Presence of Kaolin at Depth Not Conclusive Evidence

The sooty chalcocite is the result of the action of sulphate waters on pyrite. These sulphate waters also form kaolin from the granite. These downward seeping waters must become weak and inactive at any great depth below the surface, as can be seen by the relative intensity of their action on both veins and granite at surface and at depth. Apparently, the formation of the massive chalcocite on the lower levels would require much more vigorous chemical processes than the formation of the sooty chalcocite in the upper levels. After passing the chalcocite zone, therefore, the sulphate waters would not be capable of forming the massive variety, especially in view of the fact that most of the copper would have been deposited in the upper zone. The presence of the sulphate waters in depth, as shown by the formation of kaolin, does not necessarily mean that chalcocite could have been formed by the same waters, although they are responsible for its formation in the upper levels. It is impossible to conceive their retaining copper in appreciable quantities under the conditions existing. The work of Charles T. Kirk, showing the relation between the sulphate waters, the chalcocite and the kaolin, while of great value, is not to be taken as conclusive, because his samples were collected from the Pittsmont vein, which is not typical.

### Weed Attributes Enrichment to Subsequent Faulting

W. H. Weed states that the old quartz-pyrite veins were originally of low grade, and were made commercially valuable through the later addition of enargite, bornite, chalcocite, and other copper minerals. He believes that this mineralization and enrichment followed various periods of faulting, the enargite and bornite being first to appear, probably contemporaneous in a general way with the time of the formation of the Blue and Steward systems. Chalcocite he states to have been almost entirely a product of descending enrichment processes, which acted at a great depth only where the older quartz-pyrite veins were cracked and broken by subsequent faults, thus permitting the entrance of the surface waters. He cites examples of the intersections of faults and older veins, and maintains that the quartz-pyrite veins are workable only where they are fractured.

### Weed's Conclusions Not Borne Out by Facts

The observations of the author do not confirm these conclusions. Examination shows that in general the Anaconda veins are no richer at or near intersections with the Blue veins, which are faults, than at other points along the strike, unless the faulting Blue vein happens to cross the original oreshoots of the older veins. It is extremely difficult to form even an approximate idea of the extent of primary enrichment in the older veins, due to the late faults of the Steward system. Mineralization went on in the early veins after the formation of the Blue vein, as well as before, so that the influence of the subsequent faulting is indeterminable. As might be expected, the fault vein intersections are usually accompanied by a breaking or shattering of both the older vein and the country rock in the immediate vicinity, this developing favorable conditions for ore deposition at such points. In any case where chalcocite enrichment of a vein of the Anaconda system is shown to have resulted from the influence of an intersecting fissure of the Blue or Steward systems, there remains a strong probability that such enrichment is due to primary waters, if, as believed, the primary chalcocite was deposited in great quantities after the appearance of these faults, not only within the faults themselves, but in the fractured older veins.

# Calculation of Extraction in Cyanidation

By Herbert A. Megraw

*SYNOPSIS—A discussion of points previously brought out as to the means and methods of sampling and calculating extractions. Those methods based on definite sampling are believed to be most satisfactory and worth all they cost.*

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However strenuously it may be denied, there is nevertheless a straight course of reasoning leading to the conclusion that complete sampling of heads, tailings, and intermediate stages in cyanide treatment of ore is possible, practicable and of economic value. Information derived from these definite facts is likely to be of greater value than approximations, flattering though the latter may be.

After having devised a thoroughly accommodating system which gave satisfactory results regardless of all changes, the operating metallurgist is hardly to be blamed for objecting to having it taken away from him. The fact that it does not show the truth, however, justifies opposition to it. In the article on "Silver Cyanidation at Tonopah—III,"[1] I called attention to this method which is now so often used in many modern and efficient plants. I expressed the hope that the subject might receive general discussion in order that some definite knowledge of the true merits of the system might be obtained. That request did start discussion which, while not as generally argued as might have been desired, has still recorded some opinions on each side of the question.

### Difficulty of Assaying Head Samples

The argument of A. G. Cadogan[2] is that "When treating a gold ore it is possible, due to the slight mixing the samples receive in crushing from 1¼ in. to the size that will pass a 60-mesh screen, for a particle of gold the size of the screen opening to pass in excess into the final assay sample or to be retarded and thrown away with the discard, causing an appreciable error in either case." Calculating the size of screen openings and the value of the largest piece of gold which could pass it, Mr. Cadogan finds that a difference of 26% in either direction may result when handling $10 ore. On tailing samples, he believes the opportunity of error to be very much less on account of the extreme fineness of the product and the amount of mixing it has received in passing through the mill.

If the argument advanced by Mr. Cadogan is sound, it would be interesting to know why the same reasoning would not apply to ores of much higher grade than he mentions which are satisfactorily sold by producers and bought by reduction plants. Such plants are operated by intelligent, experienced and generally honest men and are conducted on business and scientific principles. It is hard to believe that either buyer or seller would allow himself to be imposed upon continuously and certainly an enormous quantity of ore changes hands each year. That these settlements are influenced by chance, or are erratic, is beyond belief. It seems to me that Mr. Cadogan's views are not generally applicable. Few ores of milling grade have coarse gold in sufficient quantity to vitiate the general run of assay results and the one or two assays which may be affected in an extraordinary way ought to be easily detected. Moreover, consideration must be given to the mines, undoubtedly constituting the majority, which furnish their reduction plants with ores in which the value is not in coarse metallic form. These may be sampled as easily and accurately as the gangue itself.

### Sampling Mortar Discharge Not Satisfactory

With ores of the latter class, it makes little difference what screen is used on the stamp battery, or other primary reducing machine, because the sample usually is, and always ought to be, taken before that machine has performed its work. Sampling mortar-discharge pulp is not satisfactory even when water is used in crushing, and when solution is used it is futile. Unless special arrangements are made to collect the mortar-discharge pulp into one solid stream, a correct sample of it cannot be taken. The head sample ought to be taken before the ore has entered the primary crushers, but after preliminary breaking, so that there will be no large boulders to interfere with the accurate cutting out of a portion of the stream. Having the material in this appropriate form, a fair sample can be taken without regard to the size of contained metallic particles. In the cutting down of this sample every care can be taken to avoid difficulties with metallics, but when these do appear, every assayer knows how to deal with them.

In considering the sampling of the product from stamp mills, George Simpson, Jr.,[3] expresses the opinion that a fair sample of the mill head can be obtained from the pulp leaving the mortar boxes, but this I cannot altogether agree with, as has already been mentioned. Experience with trying to get a fair sample from mortars has discouraged such attempts even when water is used in crushing. A good sample cannot be taken from the lip of the mortar because the pulp is too widely spread and a cut of the entire stream cannot be had at one time, a prime requisite for a fair sample. In mills making use of plate amalgamation, the stream before beneficiation is not gathered into a compact body which can be sampled with any reasonable degree of accuracy. In other cases where water is used in the batteries and there is facility for gathering the whole stream from all batteries into one body, a sample may be taken with some claim to accuracy, exactly how much depending on the character of the ore and the sampling device. It is true that most of the mechanical sampling appliances in use are not accurate because only a portion of the stream is taken at any one time, the cutter or entry slot of the sampler often being excessively narrow. In sampling a stream of pulp, as well as with a stream of dry ore, the requirement is that the sample must take the whole stream for part of the time, and not a part of the stream part or all of the time. It would be comparatively simple to make a machine to comply with all the requirements but it is seldom done. Satisfactory accuracy is not obtainable over long periods of time by hand sampling. The average employee of the class usually available for such work does not have the necessary interest and cannot be depended upon to carry it out intelligently.

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[1] "Eng. and Min. Journ.," Mar. 8, 1913.

[2] "Eng. and Min. Journ.," May 31, 1912.

Note—This is the first of a new series of articles by Mr. Megraw, which will deal with comparative details of cyanide practice. The next will be "Ores Amenable to Cyanidation," and will appear in the issue of Oct. 4, 1912.

[3] "Eng. and Min. Journ.," June 21, 1913.

### Solution Crushing Prevents Mortar Sampling

When solution is used for crushing, the amount of [illegible] dissolved during the crushing period and the amount introduced with the formerly-used solution, presents an obstacle to accurate sampling that I have found unsurmountable. The argument of Mr. Simpson that the erratic extraction results appearing from month to month will be equalized and corrected in the yearly summary, is correct in instances when samples are correctly taken, but it is doubtful if a mortar-discharge sample would ever show correct results, especially when solution is used for crushing. Much complication might result from the attempt to assay a pregnant cyanide solution entering the mortars, determine its proportion to the dry ore crushed, assay both the pulp and solution issuing from the mortars, and calculate the correct content of the dry ore treated. Opportunities for error are so many that it seems most unwise to make an attempt which will almost surely result in error.

### Tailing Said To Be Not Susceptible of Satisfactory Sampling

Having given consideration to Mr. Cadogan's argument that the head sample is not to be had accurately, one is confused by the argument of W. S. Welton,[4] who shows that by reason of loss of floating material containing value, a tailing assay is not to be depended upon. Mr. Welton's argument is likely to prove groundless, however, where no overflow is discharged, such as is the case in any cyanide plant using solution for crushing. Whatever may be the condition in concentration plants or other mills where the entire product is not beneficiated, loss by overflow does not occur in the modern cyanide plant. When separate treatment is followed, sand is settled and the whole slime is treated, the residue is usually subjected to filtration before being discharged. It is the same in the total-sliming plant, the only liquid waste being in each case the precipitated and exhausted solution resulting from accumulation. However fine any portion of the ore may be, it is not likely to escape without being subjected to treatment. The very fact that the solids are collected in a compact body necessitates avoidance of the objection urged by Mr. Welton.

### Formula for Extraction Percentages without Ore Weights

For estimation of percentage extractions it is necessary to know the weight of the ore and the content of both feed and tailing. Under some circumstances, the weight of ore milled may be omitted but in those cases the content of feed, tailing and product must be known with accuracy. Having this information, the formula quoted by Mr. Welton,

$$\textit{Per cent. extraction} = \frac{\dfrac{A - B}{C - B} \times 100\,C}{A}$$

where $A$ is the assay of the feed; $B$, that of the tailing, and $C$, that of the concentrate or product, is applicable and can be used with advantage.

It is not improbable that this formula might be applied with good effect in such cases where weights of ore handed are not to be easily secured. By no means should it be forgotten, though, that in making such calculations the content, or assay value of all the factors used must be accurate if correct results are expected. Sampling of the head, tailing and product must be as nearly exact as it is possible to make it.

### Many Ways of Sampling and Weighing

Consideration of the possible ways of sampling coarse ore, such as is usually fed into mills, brings us rather forcibly to the conclusion that it can be sampled. It is being done every day in numberless cases, such as smelting plants, custom mills, ore-buying and sampling plants. However true it may be that particular ores carrying coarse, metallic particles present some difficulty in sampling, it is nevertheless a fact that most milling ores may be satisfactorily sampled provided sufficient care accompanies the operation of proved mechanical devices. Tailing should be as easy to sample as feed, if not more so, particularly in plants where the whole is treated as one product, such as sand-leaching plants or slime-agitation mills. When the latter operate continuously and discharge a dewatered or partly dried material, sampling is reduced to the simplest possible operation: taking a representative cut from finely-ground, thoroughly-mixed material. Sampling does not present so much difficulty as proper weighing of ore milled, and even this latter is more a difficulty of expense than anything else.

There are automatic weighing devices which will return accurately the weight of material passed over them and moisture may readily be estimated in the sample taken. In view of the ease of weighing the ore, it is remarkable that guesswork is usually resorted to and accuracy disregarded. Probably not one-tenth of the mills operating in this country are equipped with satisfactory weighing devices. Most statements of ore weight are based upon estimates; weighing a car or two every week or so and counting the number of cars emptied into the mill bin, or some similar process; methods which may easily be remote from the true weight. If such methods are to be the basis for percentage calculations, it is clear that refinements in other directions are futile. To know the truth, all the factors must be exact.

### Percentage Calculations Made by Many Methods

All possible precautions as to weighing and sampling having been taken, there is still room for some difference of opinion about the method of calculating extractions. When simple, continuous processes are followed, this difficulty does not arise. Thus in concentration, amalgamation, and in a great measure the process of continuous slime agitation, the ore is not retained in process of treatment for great lengths of time and, only one treatment being given, tailing samples taken on a certain day will approximately correspond with head samples taken the same day. Calculated extraction percentages over monthly periods, in such cases, may be considered reasonably accurate. Dealing with combination processes, however, the solution is not so easy. Consider, for example, the system followed by so many mills treating silver-bearing ore, where concentration followed by separate sand and slime treatment is practiced. Concentration is quickly completed, the head, tailing and production checking up each day. Then follows slime treatment, the feed of which is part of the tailing from the concentrators. Three to 10 days are occupied in carrying out the details of the process, consequently the daily percentage calculations cannot be correct and even over a month they are likely to be erratic. When, however, one considers the sand treatment, lasting from 10 to 40 days, it will be readily comprehended that over a monthly period extraction percentages must be calculated by some other method than the simple use of mill-feed and tailing assays, which cannot have any definite relation to each other. There are, however, methods which may be applied under such circumstances which will give an idea, and a close one, of what is actually going on in such a plant. Such estimates are usually required in monthly reports, but their most important use is to the metallurgist in charge of operations. He must know what he is doing at all times so that he may be ready to correct any error or change his treatment to suit a changing ore. This situation has already been discussed,[5] and a proposed solution is to use the mill feed as 100% and the feed to the cyanide plant as a different head. If concentration extracts 20%, then 80% goes to the cyanide plant. If the latter extracts 80% of what it receives, it amounts to 64% of the mill feed, and 64% plus the 20% extracted by cyanidation gives 84% as total extraction.

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[4] Eng. and Min. Journ., July 12, 1913.

### PERCENTAGE EXTRACTED IN COMBINATION PROCESSES WITHOUT WEIGHTS

Dividing the concentrate tailing into the proper portions treated as sand and slime, the extraction of each can be figured and its relation to the mill feed readily determined. Should it be required to estimate the percentage extraction in such a combination process, a formula may be derived, similar to the one previously mentioned, by the use of which the percentage extraction may be ascertained without the necessity of weighing anything and provided only that certain assays be accurately obtained. In a process using concentration and separate treatment of sand and slime, the following formula for percentage extraction will be found of use:

Let $X$ = Per cent. extraction;
$A$ = Assay of feed, and $a$, its weight;
$B$ = Assay of concentrate tailing, and $b$, its weight;
$C$ = Assay of concentrate, and $c$, its weight;
$D$ = Assay of sand head, and $d$, its weight;
$E$ = Assay of slime head, and $e$, its weight;
$D_t$ = Assay of sand tailing, and $d$, its weight;
$E_t$ = Assay of slime tailing, and $e$, its weight.

Then:

$$a = b + c;$$
$$b = d + e;$$
$$Aa = Bb + Cc;$$
$$Bb = Dd + Ee.$$
$$\frac{X}{100} = \frac{Cc + d\,(D - D_t) + e\,(E - E_t)}{Aa}$$

eliminating all the weight factors from this equation and substituting their equivalents, the following formula is derived:

$$\frac{X}{100} = \frac{C\frac{(A-B)}{(C-B)} + \frac{(B-E)\,(C-A)}{(D-E)\,(C-B)}(D-D_t) + \frac{(C-A)\,(B-D)}{(C-B)\,(E-D)}(E-E_t)}{A}$$

It is of interest to note that this formula can be broken up into three units, each representing a percentage extraction in one section of the process. Thus:

$$\frac{X_1}{100} = \frac{C\frac{(A-B)}{(C-B)}}{A}$$

gives percentage in concentration,

$$\frac{X_2}{100} = \frac{\frac{(B-E)\,(C-A)}{(D-E)\,(C-B)}\,(D-D_t)}{A}$$

gives percentage in sand treatment, and,

$$\frac{X_3}{100} = \frac{\frac{(C-A)\,(B-D)}{(C-B)\,(E-D)}\,(E-E_t)}{A}$$

gives the percentage extraction in slime treatment, the sum of percentages being the total extraction percentage. In view of the comparative ease of obtaining these assays with accuracy, it should not be difficult to approximate a percentage extraction over short periods of time, and over operations of a year or more percentages derived in this way ought to be a great deal more accurate than those obtained by the product-plus-tailing-equal-to-head method.

That it is not possible to secure accurate samples of either feed or tailing is a theory in which I cannot place confidence. If the proper mechanical appliances are installed to take samples in the right way, and these mechanical means receive vigilant supervision from persons conversant with their objects and requirements, a good and accurate sample may be obtained. Believing that it can be done and knowing that many operators do not do it, it is natural to wonder why. There are plenty of examples of mills which installed sampling and weighing apparatus and then discontinued their use. The sampling plant of the Goldfield Consolidated mill was not rebuilt after having been destroyed by fire, and it is to be supposed that the operators did not consider it essential.

### DOES CORRECT SAMPLING PAY?

The question, then, is not "can it be done?" but, "does it pay?" I believe that the question of cost of installation and operation and the problematic return upon it is what has resulted in the present practice. It is hard to convince operators that it is worth while to spend real money to find out the true extraction, when a much higher and better looking one can be obtained at no cost and with little labor.

Is it then, worth while to spend large amounts of money for sampling plants and their operation, or shall operators continue to use the "graphite and cellulose method," at much less cost?

I believe that actual sampling and correct extraction calculations pay—in real money. I believe that the losses accompanying the other method are more costly than proper sampling would be. By the calculation method, losses inside the mill cannot be determined. Stealing may occur without detection. Leaks may be in the tanks and pregnant solution may be lost without suspicion.

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[5] "Eng. and Min. Journ.," Apr. 2, 1910.

Precipitate may fall on the floor and be rubbed into it, or may be washed away, and no intimation of such loss will come through the figures. Careless operators may let tanks [illegible] and waste the solution; it will never show any [illegible] know of it except those who actually [illegible]. It puts a premium on carelessness. Whenever [illegible] can be used in all kinds of cases and always [illegible] up correctly, even with bad work, there is something serious the matter with it. Beside these facts, I [illegible] believe that correct percentages are obtained by the calculation method even where serious direct losses do not occur. I believe that extractions of silver from sulphide and other complex ores rarely run high in the nineties, and that the average extraction would be much nearer to 80 to 85%. That accurate sampling and calculation of extractions, recognition of losses and earnest endeavors to avoid them and strong efforts actually to raise extractions to the point now said to have been reached, would be a wise and economical course to pursue, I fully believe. I realize that there may be other views, however, and hope they may be presented for discussion.

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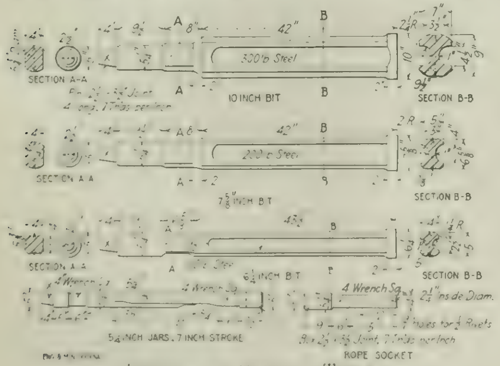
# Itemized Equipment for Churn Drill

By H. P. Bowen*

Churn-drill practice varies according to a number of conditions: The character of the rock to be drilled; depth of holes; the purpose for which the holes are drilled; etc. The machine that does the most satisfactory work in hard rock and stands up under the bad roads and high grades of a mountainous section, may show up poorly against another machine when drilling through softer formations. Tools and other equipment vary likewise.



Details of Certain Tools

Following is a list of equipment that was found most satisfactory under the conditions encountered at the Miami property, in Arizona, where most of the holes have been put down in a silicified schist to an average depth of [illegible] ft. The ground stands well until water is encountered at about 400 ft., when it is usually necessary to case. The spare parts listed are those that may give out [illegible] without previously showing sufficient evidence of [illegible] to enable their replacement from a distance. Under [illegible] conditions 8¼-in. casing will be small

FROM STAR DRILLING MACHINE CO., F. O. B. AKRON, OHIO

| | | |
|---|---|---|
| 1 | No. 23 traction machine with No. 24 boiler, derrick and crown pulley (boiler with asbestos jacket) | $2010.00 |
| 1 | Temper screw with pulley and ball bearings; screw to be 1¾x5 in; swivel to be opened so rings can be changed | 35.00 |
| 1 | No. 3 Star blower with forge connections | 13.50 |
| 1 | Crane and carriage to handle bits, arranged to fasten to derrick | 35.00 |
| 1 | No. 2 Barret floor jack and circle iron | 46.50 |
| 2 | No. 4 Barret lever jacks | 36.00 |
| 2 | 2x14-in. screw jacks | 5.50 |
| 2 | 50-ton hydraulic jacks, forged steel, broad base | 260.00 |
| 1 | Rope clamp with handle to turn tools | 1.50 |
| 1 | Flue cleaner | 1.15 |
| 1 | Funnel for filling boiler | 1.50 |
| 1 | Set of belt clamps | 0.60 |
| 1 | Belt punch | 0.40 |
| 30½ ft | five-ply 12-in. belt | 23.18 |
| | Repair parts— | |
| 1 | No. 593 guide pulley block | 6.50 |
| 1 | No. 595 guide pulley wrist pin | 4.50 |
| 1 | No. 603 pipe drum for bull wheel with three cast supports | 17.00 |
| 1 | No. 604 gear bull wheel | 18.00 |
| 1 | No. 605 wood brake wheel for gear wheel | 10.50 |
| 1 | No. 641 pinion for friction shaft for yoke | 5.50 |
| 1 | No. 644 yoke for friction shaft pinion | 1.75 |
| 1 | No. 653 sand reel eccentric | 4.50 |
| 2 | No. 667 sand reel flanges with drum | 9.00 |
| 1 | No. 683 wrist pin for upright arm | 4.50 |
| 1 | No. 684 deep groove pulley | 11.00 |
| 1 | No. 692 wrist pin for slide arm | 4.50 |
| 1 | No. 710 band wheel shaft | 13.00 |
| 1 | No. 711 band wheel | 37.00 |
| 1 | No. 712 band wheel key | 1.10 |
| 1 | No. 722 crank arm for band wheel shaft | 10.00 |
| 2 | No. 723 wrist pins for crank arm | 9.50 |
| 1 | No. 739 walking beam saddle | 4.75 |
| 1 | No. 757 crown pulley for No. 24 derrick | 11.00 |
| | Total | $2653.43 |

OIL WELL SUPPLY CO., F.O.B. LOS ANGELES, CALIF.

| | | |
|---|---|---|
| 1 | Henderson trip casing spear to catch 8¼-in. casing | $137.00 |
| 1 | Henderson trip casing spear to catch 6¼-in. casing | 112.00 |
| | Total | $249.00 |

TUBBS CORDAGE CO., F.O.B. SAN FRANCISCO, CALIF.

| | |
|---|---|
| 1000 ft. of 2-in. Philadelphia right-laid line drilling cable | $188.16 |

LESCHEN & SONS ROPE CO., CHICAGO, DENVER AND ST. LOUIS

| | |
|---|---|
| 1000 ft. of ¾-in. patent flattened strand drilling cable | $122.00 |
| 1000 ft. of ⅜-in. or $\frac{7}{16}$-in. sand line | 18.50 |
| Total | $140.50 |

UNION TOOL CO., LOS ANGELES, CALIF.

| | | |
|---|---|---|
| 2 | Connections for 2-in. rope to ¾-in. cable | $10.00 |
| 2 | Extra connections for 2-in. rope | 10.00 |
| | Total | $20.00 |

LARKIN & CO., F.O.B. BUTLER, PENN., WEIGHT 16,000 LB. 2% DISCOUNT FOR 30 DAYS

| | | |
|---|---|---|
| 2 | 3½-7 rope sockets | $22.00 |
| 1 | 3½ 7 rope sockets, 5-in. box | 11.00 |
| 2 | 4½-in. o.d. by 20 ft. stem 3½ 7 jt., 5½-in. o.d. box | 91.94 |
| 1 | 4½-in. o.d. by 20 ft. stem 3½ 7 jt., 5-in. o.d. box | 45.97 |
| 2 | Sets 5½-in. o.d. by 7-in. stroke jars 3½ 7 jt | 105.00 |
| 1 | Set 5½-in. o.d. by 7-in. stroke jars 3½ 7 jt | 52.50 |
| 4 | 10-in. bits 300-lb. steel 3½ 7 jt | 230.00 |
| 6 | 7⅝-in. bits 200 lb. 3½ 7 jt | 222.00 |
| 4 | 6¼-in. bits 120 lb. 3½-7 jt. | 104.00 |
| 1 | 4½-in. o.d. by 8 ft. sinker 3½ 7 jt | 28.00 |
| 1 | Set 5½-in. o.d. by 24-in. stroke jars 3½ 7 jt | 60.00 |
| 1 | 7⅝-in. hole slip socket with bole for 10-in. hole with 3½ jt., two sets of slips steel-lined, one set of medium and one set of heavy | 92.00 |
| 1 | 6¼-in. hole slip socket with two sets of slips, one set of medium and one set of heavy 3½ 7 jt | 60.00 |
| 1 | 10-in. hole horn socket 3½ 7 jt | 36.00 |
| 1 | 7⅝-in. hole horn socket 3½ 7 jt | 29.00 |
| 1 | 6¼-in. hole horn socket 3½ 7 jt | 21.00 |
| 1 | 6¼-in. hole center rope spear with rings for 7⅝-in. and 10-in. hole 3½ 7 jt | 34.00 |
| 1 | Horseshoe trip rope knife outfit complete, which includes one swivel top, one set of pipe jars, two sinkers and one knife | 29.00 |
| 1 | 6¼-in. hole jar bumper with ball bearing swivel top and concaved on back like a spud, front and back | 27.00 |
| 1 | 6¼-in. hole latch jack, 3½ 7 jt | 16.00 |
| 2 | 7-in. o.d. by 12 ft. wrought iron bailers | 38.00 |
| 2 | 5-in. o.d. by 14 ft. wrought iron bailers | 28.00 |
| 2 | 4-in. o.d. by 16 ft. wrought iron bailers | 20.00 |
| 1 | Pulling ring for 8¼-in. casing with one set of slips for pulling 8¼-in. casing and one set of slips for pulling 6¼-in. casing | 90.00 |
| 1 | Pair 4-in. square tool wrenches, 175 lb. each | 28.00 |
| 1 | Set of 8¼-in. Fairs patent wrought-iron elevators | 42.70 |
| 1 | Set of 6¼-in. Fairs patent wrought-iron elevators | 35.00 |
| 1 | 10-in. bit gage | 1.25 |
| 1 | 7⅝-in. gage | 1.00 |
| 1 | 6¼-in. gage | 0.85 |
| 1 | 6¼-in. hole spud, by 10 ft. in clear 3½ 7 jt | 45.00 |
| 1 | 7⅝-in. hole spud, by 10 ft. in clear 3½ 7 jt | 50.00 |
| 1 | 7⅝-in. wall hook 3½ 7 jt | 33.00 |
| 1 | 6¼-in. wall hook 3½ 7 jt | 29.00 |
| 1 | Set of 4-in. square drive clamps with wrench | 32.30 |
| | Total | $1790.51 |

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*Miami Copper Co., Miami, Ariz.

enough for a 10-in. hole, but if necessary, the 10-in. bit can be spread ½ in. When casing must be driven, it will pay to use 6⅝-in. drive pipe, but otherwise the extra weight and cost will prove a detriment.

In making the list, it has been taken for granted that the drill will be at work at least part of the time at some distance from shops and supplies, and, therefore, tools and supplies for all ordinary repairs have been included. In the matter of lubricating and lighting oils, coal and coke, pipe and fittings for the water supply, tools and supplies for road building, amounts have been omitted, as they depend entirely upon the conditions under which each special job of drilling is to be done.

Prices given on small tools are f.o.b. Miami, except in the case of estimated prices, which are f.o.b. St. Louis.

### CASING BOUGHT IN PITTSBURGH AND DELIVERED TO BUTLER, PA., TO SHIP IN SAME CAR WITH LARKIN & CO. TOOLS

| | |
|---|---|
| 600 ft. of 8¼-in. steel casing, 11½ threads, 20-lb. @ 63c | $378.00 |
| 800 ft. of 6¼-in. steel casing, 11½ threads, 13-lb. @ 36¾c | 294.00 |
| 5 ft. of 11⅝-in. casing, for conductors, no threads, estimated<br>10 ft. of 11⅝-in. casing, for conductors, no threads, estimated<br>15 ft. of 11⅝-in. casing, for conductors, no threads, estimated | 35.25 |
| 2 6¼-in. casing nipples, 11½ threads.. | 31.50 |
| 2 8¼-in. casing nipples, 11½ threads, estimated. | 36.00 |
| 6 6¼-in. recessed couplings, list price | 8.10 |
| 8 8¼-in. recessed couplings, list price | 13.50 |
| Total.. | $796.35 |

### FOR POSSIBLE USE OF DRIVE PIPE

| | |
|---|---|
| 600 ft. of 8-in. drive pipe, eight threads per in., estimated. | $588.00 |
| 800 ft. of 6-in. drive pipe, eight threads per in., estimated. | 536.00 |
| 6 extra couplings 8-in., eight threads per in., recessed, list price | 16.80 |
| 6 extra couplings 6-in., eight threads per in., recessed, list price | 24.00 |
| 2 6-in. casing nipples eight threads per in., recessed, estimated | 15.75 |
| 2 8-in. casing nipples eight threads per in., recessed, estimated | 36.00 |
| 1 Drive head 8-in. drive pipe, list price. | 24.25 |
| 1 Drive head 6-in. drive pipe, list price | 15.00 |
| 2 Drive shoes 8-in. drive pipe | 16.00 |
| 2 Drive shoes 6-in. drive pipe | 22.00 |
| Total.. | $1293.80 |

Casing spear must be made to fit casing.

### SAMPLING SUPPLIES

| | |
|---|---|
| 1 Panning disk, estimated.... | $0.50 |
| 1 Sampling trough (can be made on job) | |
| 1 Sampling cutter, light weight jute, estimated | 30.00 |
| 500 Sample sacks 14x24-in. (Colo. Tent & Awning Co. Denver) | 41.13 |
| 1 Funnel for sample sacks, estimated | 2.00 |
| 1 Wire brush for cleaning tubs, estimated. | 0.50 |
| 6 24-in. or 26-in. tubs, estimated | 6.00 |
| 2 Old track rails for drying samples | |
| Sample record sheets | |
| Books for samplers, estimated...... | 1.00 |
| 500 copper tags to mark sacks | 2.50 |
| 1 Set of 1⅛-in. steel numbers to stamp tags, estimated | 2.70 |
| Total. | $86.33 |

### MISCELLANEOUS

| | |
|---|---|
| 2 Gasoline torches | $2.51 |
| 4 Lanterns. | 2.60 |
| 3 600-gal. water tanks, estimated. | 50.00 |
| 1 Large iron pulley block for 2-in. rope, list price | 19.50 |
| 1 Double swivel hook, 2-in. rope, list price | 6.00 |
| 12 ⅜-in. black cable clamps | 2.40 |
| 6 ¾-in. black cable clamps... | 2.13 |
| 2 ½-in. check valves | 1.30 |
| 2 1½-in. Lunkenheimer globe valves | 3.22 |
| 1 Set ½-in. water gage | 2.00 |
| 6 Gage glasses ⅝x12-in. | 0.48 |
| 1 Heavy chain tongs No. 35. | 11.69 |
| 1 Medium chain tongs No. 33.. | 4.27 |
| 50 ft. of rubber garden hose ¾-in. | 8.50 |
| 25 ft. of ¾-in. suction hose for injector, list price | 17.50 |
| 2 Empty distillate tanks or barrels | |
| 2 12x½-in. bastard files | 0.52 |
| 2 10-in. round rat-tail files | 0.26 |
| 1 Post drill to drill holes up to 1 in., estimated. | 9.60 |
| 1 Ratchet drill to drill holes up to 1 in., estimated | 4.56 |
| 1 6-in. monkey wrench | 0.38 |
| 1 8-in. monkey wrench | 0.42 |
| 1 10-in. monkey wrench | 0.51 |
| 1 12-in. monkey wrench | 0.62 |
| 1 15-in. monkey wrench | 1.07 |
| 1 8-in. Stillson wrench | 0.51 |
| 1 10-in. Stillson wrench. | 0.53 |
| 1 14-in. Stillson wrench. | 0.83 |
| 1 ¼x⅜-in. open end wrench | 0.20 |
| 1 ½x⅝-in. open end wrench | 0.25 |
| 1 ¾x⅞-in. open end wrench | 0.30 |
| 1 Axe | 1.14 |
| 1 Hand axe | 0.69 |
| 1 Hand saw 28-in. | 1.32 |
| 1 Square | $1.09 |
| 1 15-in. jack plane, estimated. | 2.00 |
| 1 Claw hammer, estimated | 0.40 |
| 1 ½-in. wood chisel, estimated. | 0.35 |
| 1 1½-in. wood chisel, estimated. | 0.55 |
| 1 10-in. screw driver, estimated | 0.50 |
| 1 12-in. brace | 1.52 |
| 1 Bit, ¼-in. | 0.22 |
| 1 Bit, ⅜-in | 0.22 |
| 1 Bit, ½-in | 0.26 |
| 1 Bit, ⅝-in | 0.31 |
| 1 Bit, ¾-in | 0.37 |
| 1 Bit, ⅞-in | 0.43 |
| 1 Bit, 1-in | 0.48 |
| 1 Draw knife. | 2.25 |
| 1 Combination pipe vise, ⅛-in. to 2 in., estimated | 9.60 |
| 1 Hack saw. | 0.88 |
| 12 12-in. hack saw blades | 0.42 |
| 2 10-in. flat mill files | 0.26 |
| 2 12-in. flat mill files | 0.27 |
| 2 10-in. cant. saw files | 0.36 |
| 2 8-in. triangular files | 0.22 |
| 2 12-in. flat bastard files | 0.42 |
| 1 8-in. flat bastard files | 0.45 |
| Drills to fit both ratchet and post drill. | |
| 1 $\frac{4}{16}$-in., estimated | 0.30 |
| 1 $\frac{5}{16}$-in., estimated | 0.33 |
| 1 $\frac{6}{16}$-in., estimated | 0.36 |
| 1 $\frac{7}{16}$-in., estimated. | 0.39 |
| 1 $\frac{8}{16}$-in., estimated | 0.42 |
| 1 $\frac{9}{16}$-in., estimated | 0.44 |
| 1 $\frac{10}{16}$-in., estimated. | 0.51 |
| 1 $\frac{11}{16}$-in., estimated. | 0.55 |
| 1 $\frac{12}{16}$-in., estimated | 0.60 |
| 1 $\frac{13}{16}$-in., estimated | 0.66 |
| 1 $\frac{14}{16}$-in., estimated | 0.72 |
| 1 $\frac{15}{16}$-in., estimated | 0.78 |
| 1 $\frac{16}{16}$-in., estimated | 0.84 |
| Total | $188.64 |

### BLACKSMITH OUTFIT

| | |
|---|---|
| 1 200-lb. anvil, estimated | $25.00 |
| 1 Pair 20-in. straight lipped tongs, estimated | 0.25 |
| 1 Pair 22-in. straight lipped tongs, estimated | 0.30 |
| 1 Pair bolt tongs, ½-in., estimated | 0.35 |
| 1 Pair bolt tongs, ⅝-in., estimated | 0.40 |
| 1 Pair bolt tongs, ¾-in., estimated | 0.40 |
| 1 Ball peen hammer, 2-lb., estimated | 0.50 |
| 1 Riveting hammer, estimated | 0.35 |
| 1 8-lb. sledge, estimated | 0.50 |
| 1 Pair 20-in. gad tongs, estimated | 0.35 |
| 1 Pair 24-in. gad tongs, estimated. | 0.40 |
| 1 Pair 22-in. pick up tongs, estimated | 0.50 |
| 1 Top swage, ⅜-in., estimated | 0.31 |
| 1 Top swage, ½-in., estimated | 0.31 |
| 1 Top swage, ⅝-in., estimated | 0.40 |
| 1 Top swage, ¾-in., estimated.. | 0.45 |
| 1 Top swage, ⅞-in., estimated.. | 0.45 |
| 1 Bottom swage, ⅜-in., estimated | 0.30 |
| 1 Bottom swage, ½-in., estimated. | 0.30 |
| 1 Bottom swage, ⅝-in., estimated. | 0.35 |
| 1 Bottom swage, ¾-in., estimated | 0.40 |
| 1 Bottom swage, ⅞-in., estimated | 0.40 |
| 1 Hot chisel, 1¼-in., estimated. | 0.25 |
| 1 Hot chisel, 1½-in., estimated | 0.30 |
| 1 Hot chisel, 2-in., estimated. | 0.50 |
| 1 Wire thread brush, estimated | 0.25 |
| 1 2-in. flatter, estimated | 0.30 |
| 1 3-in. flatter, estimated | 0.60 |
| 1 2-lb. set hammer, estimated. | 0.30 |
| 1 3-lb. set hammer.. | 0.45 |
| 1 1½-in. hardy | 0.75 |
| 1 2-in. hardy. | 0.75 |
| Total | $37.27 |

### GENERAL SUPPLIES

| | |
|---|---|
| 20 ft. of ⅜-in. pipe | $0.40 |
| 80 ft. of ½-in. pipe.. | 2.00 |
| 40 ft. of ¾-in. pipe.. | 1.20 |
| 12 ⅜-in. couplings | 0.18 |
| 12 ½-in. couplings | 0.24 |
| 12 ¾-in. couplings.. | 0.36 |
| 12 ⅜-in. ells... | 0.24 |
| 12 ½-in. ells.. | 0.24 |
| 12 ¾-in. ells | 0.36 |
| 12 ⅜-in. tees... | 0.24 |
| 12 ½-in. tees.... | 0.42 |
| 12 ¾-in. tees... | 0.42 |
| 12 ⅜-in. nipples, estimated | 0.24 |
| 12 ½-in. nipples, estimated | 0.24 |
| 12 ¾-in. nipples, estimated | 0.36 |
| 12 ⅜-in. plugs, estimated | 0.18 |
| 12 ½-in. plugs, estimated. | 0.24 |
| 12 ¾-in. plugs, estimated. | 0.36 |
| 12 ⅜-in. unions, estimated | 0.50 |
| 12 ½-in. unions, estimated | 0.60 |
| 12 ¾-in. unions, estimated | 0.70 |
| 12 ¼-in. nipples, estimated | 0.15 |
| 12 ¼-in. ells, estimated | 0.15 |
| 12 ¼-in. to ⅜-in. bushings, estimated | 0.24 |
| 12 ⅜-in. to ½-in. bushings, estimated | 0.30 |
| 12 ½-in. to ¾-in. bushings, estimated | 0.36 |
| Total | $10.92 |

### MACHINE BOLTS

| | |
|---|---|
| 12 ⅜x4-in. | $0.12 |
| 12 ⅜x5-in.... | 0.12 |
| 12 ⅜x6-in... | 0.18 |
| 12 ⅜x7-in.. | 0.18 |
| 12 ⅜x8-in.. | 0.24 |
| 12 ⅜x9-in.. | 0.24 |
| 12 ⅜x10-in. | 0.24 |
| 12 ½x4-in.. | 0.18 |
| 12 ½x5-in.. | 0.24 |
| 12 ½x6-in. | 0.24 |
| 12 ½x7-in. | 0.24 |
| 12 ½x8-in.. | 0.36 |
| 12 ½x9-in... | 0.36 |
| 12 ½x10-in. | 0.48 |
| 12 ½x11-in., estimated. | 0.48 |
| 12 ½x12-in., estimated. | 0.60 |
| 12 ⅝x4-in | 0.36 |
| 12 ⅝x5-in | 0.36 |
| 12 ⅝x6-in | 0.42 |
| 12 ⅝x7-in. | 0.48 |
| 12 ⅝x8-in. | 0.54 |
| 12 ⅝x9-in.. | 0.54 |
| 12 ⅝x10-in. | 0.54 |
| 12 ⅝x11-in., estimated. | 0.60 |
| 12 ⅝x12-in., estimated. | 0.60 |
| 12 ¾x4-in.. | 0.48 |
| 12 ¾x5-in. | 0.48 |
| 12 ¾x6-in. | 0.48 |
| 12 ¾x7-in. | 0.60 |
| 12 ¾x8-in. | 0.78 |
| 12 ¾x9-in. | 0.90 |
| 12 ¾x10-in.... | 0.90 |
| 12 ⅞x4-in..... | 0.66 |
| 12 ⅞x5-in..... | 0.72 |
| 12 ⅞x6-in | 0.96 |
| 12 ⅞x7-in | 0.96 |
| 12 ⅞x8-in | 0.96 |
| 25 lb. of assorted threaded square nuts ⅜-in., ½-in., ⅝-in., ¾-in. and ⅞-in., estimated | 2.25 |
| 25 lb. of assorted cut washers... | 1.25 |
| 25 lb. of assorted bridge washers | 1.25 |
| 25 lb. of rivets ¾-in., up to 1½-in. length, ⅜-in. to ¾-in. length... | 1.50 |
| Total | $22.75 |

### SUNDRIES

| | |
|---|---|
| 100 lb. of 30d nails | $4.00 |
| 100 lb. of 20d nails.. | 4.00 |
| 50 lb. of 10d nails.. | 2.00 |
| 50 lb. of 8d nails.. | 2.00 |
| 25 lb. of 6d | 1.00 |
| 25 lb. of tin roofing nails, estimated | 2.50 |
| 2 Bars, ½-in. round iron @ $2.54 | 0.68 |
| 1 Bar, ¼x1½-in. flat iron @ $3 | 0.77 |
| 2 Bars, 1⅛-in. octagon drill steel $5 per 100 lb., estimated | 7.00 |
| 1 Bar, ¾-in. octagon tool steel, estimated | 1.50 |
| 1 Bar, ⅝-in. octagon tool steel, estimated | 1.00 |
| 25 lb. of waste... | 2.75 |
| 6 Strings belt lacing | 0.50 |
| 50 lb. of babbitt metal | 25.00 |
| 1 Soldering outfit | 1.00 |
| Total | $55.20 |

### LUMBER, ETC.

| | | |
|---|---|---|
| 1200 ft. of 2x12-in. by 12 ft. | 3372 ft., b.m @ $40 | $134.88 |
| 8 Pieces 6x6-in. by 20 ft. | | |
| 10 Pieces 8x8-in. by 20 ft. | | |
| 20 Pieces 2x4-in. by 20 ft | | |
| 10 Pieces 2x6-in. by 20 ft | | |
| 10 Pieces 4x4-in. by 12 ft | | |
| 60 Pieces 7 ft. galvanized corrugated iron, @ 84c f.o.b. Miami | | 50.40 |
| Total | | $185.28 |

### SUNDRIES, AMOUNTS NOT SPECIFIED

Gasoline, coal oil, engine oil, cylinder oil, cup grease, coal, coke, pipe and fitting for water supply, picks, shovels, single jacks, double jacks, powder, caps, fuse.

### PIPE-FITTING OUTFIT

| | |
|---|---|
| 1 Stock | $14.51 |
| 1 Pipe die, ¼-in.. | 0.25 |
| 1 Pipe die, ⅜-in. | 0.27 |
| 1 Pipe die, ½-in. | 0.74 |
| 1 Pipe die, ¾-in. | 1.05 |
| 1 Pipe die, 1-in. | 1.43 |
| 1 Pipe die, 1½-in.. | 1.43 |
| 1 Pipe die, 2-in.. | 1.43 |
| 1 Bolt die, ¼-in. | 0.67 |
| 1 Bolt die, ⅜-in. | 0.80 |
| 1 Bolt die, ½-in. | 1.08 |
| 1 Bolt die, ⅝-in. | 1.27 |
| 1 Bolt die, ¾-in. | 1.45 |
| 1 Bolt die, ⅞-in... | 1.80 |
| 1 Bolt die, 1-in. | 2.15 |
| 1 Coal shovel... | 0.63 |
| 2 Oil cans... | 0.42 |
| 1 Hoe for sample trough, estimated | 0.50 |
| 1 Pipe cutter 1-in. to 2-in. pipe | 1.50 |
| Total. | $33.38 |

In churn drilling, as in many other things, the cost of the machine itself will be found to be only a small part of the cost of the total equipment, so that to purchase a churn drill and thoroughly equip it for work in this section of the country, will cost from $8000 to $10,000.

⁂

## Developments on the Cuyuna Range

SPECIAL CORRESPONDENCE

[illegible] thousands of dollars are being expended this season in exploratory work on the Cuyuna iron range, in Minnesota. So far as operations of this character are concerned, the Cuyuna is the most active of all the Lake Superior iron ranges. Many drills are in commission. Development work is in progress at several properties not yet on the shipping list and it is evident that next year the range will be prepared to produce a tonnage not inconsiderable for a district still in the early years of its exploitation. The Cuyuna output this season probably will approximate 1,000,000 tons. Next season the district doubtless will surpass the much older Vermilion range. The biggest shipper in 1914, it would appear from present indications, will be the Pennington mine of Tod, Stambaugh & Co. This property is being developed as an open pit and, if deemed advisable, could be put on the producing list almost any time now. The property which the Pittsburgh Steel Ore Co. is stripping at Riverton by hydraulic process also will be prepared to produce heavily next season.

It appeared formerly that the Cuyuna would be a range of underground mines exclusively. The openpit system has now been found to have advantages in various places and in several instances the overburden is to be removed where it first was believed only shaft mining was feasible. Both the Thompson mine of the Inland Steel Co. and the Armour No. 2 property of the Rogers-Brown interests are to be transformed from underground mines to openpits. The matter of concentration to raise the grade of the product also is being given attention. The installation of plants for this purpose is in contemplation at various mines. Large quantities of ore on the Cuyuna are unprofitable to ship as found in the ground but by washing much of this material doubtless will be made merchantable. A test with Cuyuna ore recently was made in a concentration works at Joplin, Missouri.

⁂

## Gypsum in 1912

There was mined in 1912 in the United States 2,500,747 tons of raw gypsum, an increase of about 177,000 tons over 1911. Of this material, 141,608 short tons was sold without calcining, for use principally as land plaster and as an ingredient of portland cement and paint, according to the U. S. Geological Survey. The production was obtained in 17 states and in Alaska, the largest producer being New York, with Iowa second and Michigan third. Gypsum has a great variety of uses, such as plaster, including plaster of paris, dental plaster and Keene's cement; as a retarder for portland cement; as a land plaster or fertilizer, for which it is ground, but not burned; as an ingredient of paints, tints, crayons, paper, imitation meerschaum, ivory, etc., and as an adulterant. The pure massive white form known as alabaster, is a material used by sculptors.

## La Mazata Mine, Jalisco, Mexico

By Thomas C. Myers*

Documents on file in the municipal offices of Etzatlán, and in the mining agency at Hostotopaquillo prove that La Mazata mine was an exceptionally important one and was actively worked by Spaniards during the period from 1650 to 1700 A. D. It is said to have paid a tax of more than ten million pesos to the church. This tax was supposed to be 10% of the output but was often considerably more.

The mine was abandoned after having been worked down to the level where water entered in such quantities that it could not be handled by the primitive methods in use at that time. Apparently, these conditions were reached at a depth of about 100 ft. below the neighboring valley, due probably to the fact that the now nearly extinct lake of Magdalena reached almost to the mine. In the nearby hacienda called La Estancia de Ayllones, there are at present numerous relics of mining machinery used at this old mine. There are also a number of interesting documents referring to early workings. It was a perusal of some of these documents which led to the reopening and working of the mine in the present era.

In October, 1911, a small company of Mexicans of Etzatlán formed a company and began the work of unwatering La Mazata mine. In April, 1913, they succeeded in getting to the bottom of the old mine and found some drifts still containing ore. Some of the narrow streaks of this ore, about 8 in. wide, assayed as much as 44 kg. of silver and 560 grams of gold per ton. The vein was found to be about 12 ft. wide between the standing walls, and to have an average value of more than 300 pesos across its entire width. A legend among the Mexicans is that at the time of the abandoning of the mine by the Spaniards they were working on ore about 600 ft. further south, which was very much richer than the ore in that part of the mine at present opened. These legends exist about all inaccessible workings, and usually have little basis on fact. They increase with the years and depth of submersion.

About 2000 ft. south of the La Mazata mine is La Proveedora mine, also an old one, apparently located on the junction of the Santa Cruz vein with that part of the Mazata vein owned by La Proveedora Mining Co. A short tunnel which was driven to explore the veins on this property, cut them about 30 ft. from the surface and found ore in a 5-ft. vein, some streaks of which were sold to smelting plants for about 500 pesos per ton. The average of ore in the vein is said to be about 40 pesos per ton exclusive of the high-grade material.

The district may be called a newly discovered old one and is well situated between two railroad lines, not over 10 miles from either. There are good wagon roads to railroad points and the average elevation is about 5250 ft.

The Mazata vein strikes N.W. about 45° and dips about the same number of degrees N. E. It averages from 2 to 9 m. in width, has well defined walls and contains a banded filling of quartz with black silver minerals, sulphides and sulphide combinations. The country rock near the outcrop is principally green andesite containing augite and olivine gabbro. Beds of lava cover many parts of the district, obscuring the vein outcrops.

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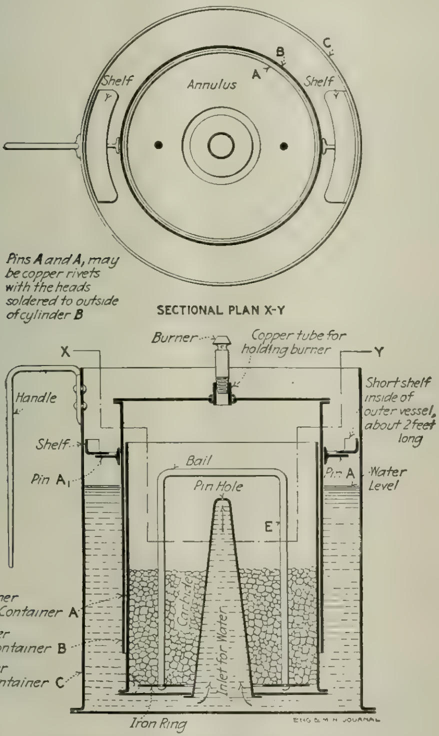
*Etzatlán, Jalisco, Mexico.

# DETAILS OF PRACTICAL MINING

## A Home-Made Acetylene Lamp

By A. Livingstone Oke*

The accompanying drawing illustrates an acetylene lamp which can be readily made in the mine shop and is suitable for use underground. I have had this type of lamp in use for several years in a mine in the Argentine Republic, and found it to be more durable in the hands of native miners than the usual type sold for underground work. The lamp consists of four parts: An inner cylinder, or container *A*, open at the top and with a tapering tube for the inlet of water, soldered in the bottom; an iron ring lying at the bottom of this cylinder and fitting loosely round the tapering tube, to which is riveted a piece of stout iron wire in the form of a bail. A second closed cylinder *B* is inverted over the inner cylinder *A*, and the two make an easy, sliding fit. An outer water can is provided, having a hook attached to one side for carrying and hanging up, and a couple of little strips of tinned iron soldered on opposite sides about 2 in. below the top edge, as shown. The action is as follows: The ring is first placed in the cylinder *A*, and the can then half filled with carbide. The bail riveted to the ring projects above the surface of the carbide, over the top of the tapering inlet tube. The cylinder *B* is now placed on as a cover to the carbide chamber and pressed down nearly as far as it will go. The two are placed in the outer can, which has water in it. Cylinder *B* has two pins projecting about an inch below the top, on each side, and these fit under the two little projecting shelves soldered to the outer can. Without this arrangement, the inner cylinders would float.



Home-Made Acetylene Mine Lamp

The water level in the can should be sufficiently high to make the water flow in on the carbide from the inner tapering tube, according to the size of the flame desired; by adding more water, more light is obtained. The object of the annulus and bail is to allow the spent carbide to be pulled out and obviate digging it out with some pointed instrument. This little attachment enormously increases the life of the lamp, as it is in removing this carbide by the miners that its worst treatment is received. The lamp may be made of zinc, brass or tinned iron and the stouter the material the better.

A charge of 300 grams of carbide, using a 28-liter burner and a small head of water, will last 3 hr. In drifts and workings for one or two miners only, the one-point 12½-liter burner is more economical. To stop generation of the gas, the water is poured off or the inner two cylinders taken out of the water can.

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## Compressed-Air Locomotives for Inspiration Company

The Inspiration Consolidated Copper Co. has placed an order for six compressed-air locomotives with the H. K. Porter Co. A high-pressure Ingersoll-Rand compressor has also been purchased with sufficient capacity to serve 14 of the locomotives, which is the number it is expected eventually to employ. The locomotives are 10-ton machines of the two-stage type. The main storage tank is charged with air at a pressure of 800 lb. from charging stations conveniently located about the mine and connected by pipe line with the compressors. The air in the pipe line is carried at 1000 lb. in order to provide a reserve supply available for charging the locomotives immediately and rapidly. It is estimated that with the design of charging station used, the locomotive will be able to come to rest, receive a charge of air, and be in motion again in 90 seconds.

The air from the engine reservoir is dropped by means of a reducing valve to 250 lb. before it enters the high-pressure cylinder. In this cylinder it expands from 250 lb. to 50 lb., and performs approximately one-half of its work. By this expansion the temperature is dropped to about 140° below that of the surrounding atmosphere, and to restore it approximately to atmospheric temperature before entering the low-pressure cylinder, it is passed through an intercooler, which consists of an elongated cylinder filled with small tubes through which atmospheric air [illegible] high velocity by means of a draft induced by the [illegible]-pressure cylinder exhaust. The low-pressure cylinder has about four times the volume of the high-pressure [illegible] exhausts the air at atmospheric pressure. It is stated that numerous tests have demonstrated that the [illegible] of compressed-air locomotive under average conditions is 50% more efficient than the old-type [illegible]-expansion machine.

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*Naraguta, North Nigeria.

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## Three-Stage Hoisting System

At the time of forming the Crown Mines, Ltd., on the Witwatersrand, there were, on the seven properties taken into the consolidation, 11 principal shafts of various types. The scheme of centralization of operations, which was applied, involved the concentration of hoisting in two main shafts, of which No. 5 was a seven-compartment, vertical shaft; No. 7, a turned-vertical, four-compartment shaft.

Previous experience on the Rand has shown the inefficiency of the turned vertical type of shaft. The methods of transportation installed by the new company rendered the straight vertical type with long crosscuts most available, but it was deemed wise to use the existing incline portion of No. 7 shaft. The vertical portion was [illegible] ft. deep, the inclined portion 2004 ft., reaching to the 13 level. In remodeling the shaft, says R. C. War[illegible] (*Journ.* So. Afr. Inst. of Eng., April, 1913), the vertical portion was deepened 120 ft. and the pumpway [illegible] into a fourth hoisting compartment. At the [illegible] second set of hoists was put in to operate the skips on [illegible] incline only. A large 1000-ton orebin was [illegible] at the turn into which the four inclined skips dump and from which the four vertical skips pick up their loads. This conversion into a stage-hoisting system was accomplished with difficulty, as hoisting operations could not be greatly interfered with. Fig. 1 shows the general arrangement at the turn.

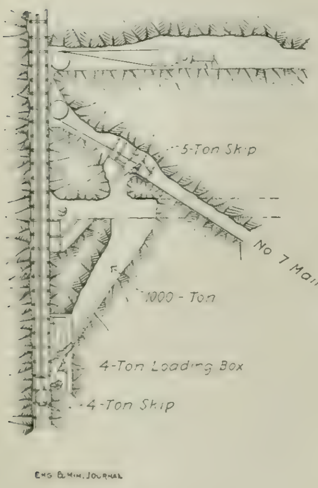

FIG. 1. TRANSFER POINT AT BOTTOM OF VERTICAL SHAFT

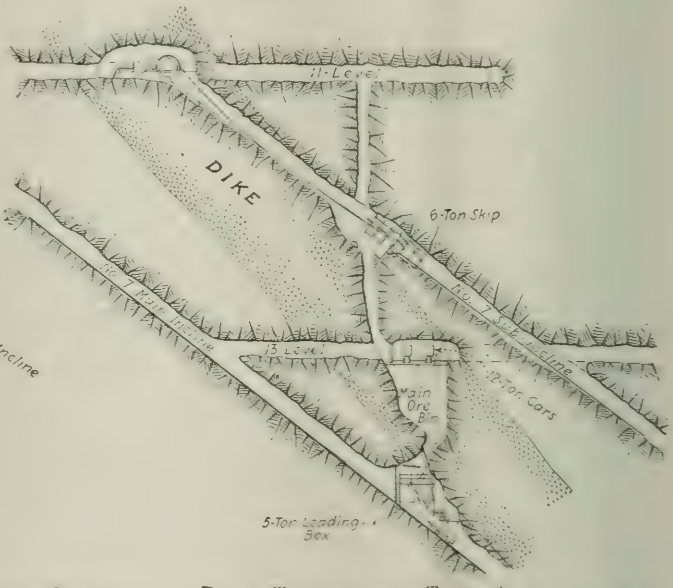

FIG. 2. TRANSFER FROM THIRD STAGE TO SECOND STAGE

Below the 13 level, a second inclined hoisting system is being installed. The object of breaking up the incline hoisting thus into two stages is to maintain the capacity of the shaft at the present figure. Fig. 2 outlines the manner of installing the third-stage hoists and the mode of transferring the ore to the second-stage skips.

⁂

## Safety Rules—Handling Explosives*

(1) No one shall be allowed to handle or assist in handling high explosives in any way until he has received instructions satisfactory to the superintendent or mining captain.

(2) Great care should be taken in handling and opening boxes of dynamite. Use a wooden mallet and a wooden wedge. Avoid friction and blows as much as possible and never open the box in a storage house or magazine.

(3) Suitable carrying boxes to hold not over 50 lb. of dynamite, and to have a self-closing cover should be provided for all men handling dynamite. The words, "For Dynamite Only" should be stenciled on each box.

(4) Dynamite carrying boxes for open-pit work should be made as near frost proof as possible.

(5) No explosive should be taken into any mine except in a securely covered case. Explosives and caps should not be transported together.

(6) No explosives should be carried in electrically operated cars.

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*From Inland Steel Co.'s book of rules

(7) Dynamite, fuse or caps should not be left in a wet place, or permitted to lie around loose in working places.

(8) Do not smoke or carry a lighted candle in your hat when handling dynamite or caps, or when making up cartridges, as hot grease may drop on the caps or powder and cause an explosion. Place your candle 2 or 3 ft. to one side.

(9) Skewers are furnished for the use of all miners handling explosives and no other instrument should be used for inserting the fuse.

(10) Caps are extremely sensitive to heat, friction or blows. Do not drop them or strike them against any hard body. Do not lay them where they may be stepped on and do not carry them in your pocket.

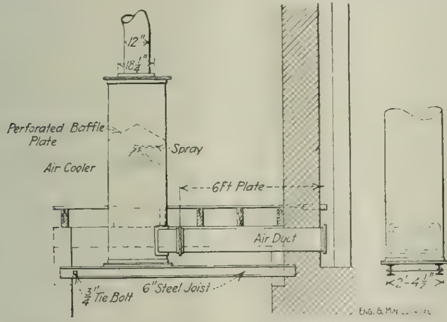
(11) Place caps on fuse at the place where they are stored, and never near dynamite or powder.

(12) When crimping caps the greatest care should be taken not to squeeze the explosive composition and they shall never be crimped with the teeth; there is enough composition in one of these small capsules to blow off a man's head. Cap crimpers must be used in all cases.

⁂

## Compressor Precooler and Scrubber

The advantages of cold and clean air for compressing purposes are well recognized. When cold, a larger weight of air can be taken in for each stroke and the fact that air is clean reduces the wear on the valves and other parts of the machine. The illustration shows a device employed by the Broken Hill South Silver Mining Co., in Australia. It consists of a cylindrical upright cooling shell with a horizontal duct leading from the outside air; the duct is made of sheet steel and has a rectangular section. Rising through the cooler, the air is met with a downwardly directed spray of water from a cooling tower. The effect of this is to reduce the temperature of the air to the lowest possible point under existing atmospheric conditions, and at the same time to wash out all dust and foreign material.



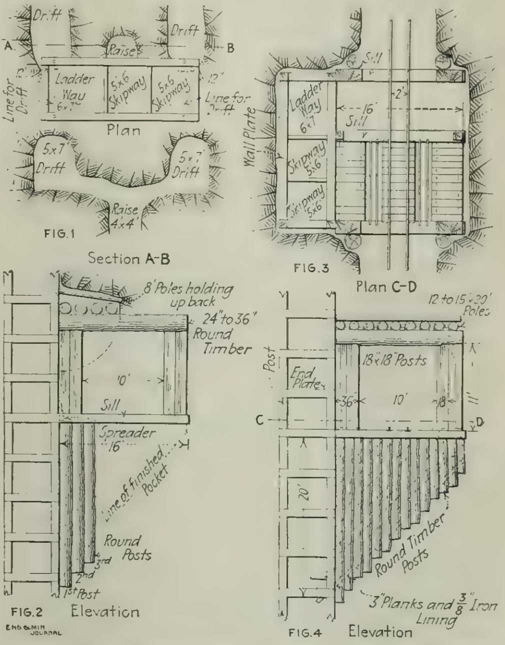
Spraying Arrangement for Compressor Inlet

[It would seem as if the effect of the spray described would be to load the incoming air with almost a maximum of moisture, and it is recognized that such saturated air is more likely to give trouble from freezing when used afterward in machines. The cooling and cleaning, however, are excellent features and are points too often neglected in mining practice.—Editor.]

## Mesabi Station Cutting

Mesabi conditions render it expedient to install relatively simple and inexpensive shaft stations and loading pockets. The method of driving and timbering these, as given by Charles E. van Barneveld, in "Iron Mining in Minnesota," is interesting. It should be borne in mind that the formations cut are likely to be soft.

After selecting the level at which it is desired to cut the station, lines are given for two 5x7-ft. drifts out from the side of the shaft near the ends. These lines are 12 in. inside the corner posts. At the same time a 4x4-ft. raise is started in the center of the shaft at a point 20 ft. below. The relation of these workings is shown in Fig. 1. The raise runs up along the shaft, and as blocking and wedges are encountered they are removed, the lagging being nailed to the wall plates. The raise is holed through to both drifts and is used as a chute and pocket for material excavated thereafter.



Opening and Timbering a Typical Mesabi Station

The drifts are run for a length of 16 ft. A sill is laid along the length of each drift, at right angles to the wall plate, the sill tops being flush with the tops of the wall plate, against which they abut. The drift backs are then taken down for a total height of 15 ft. Caps are set to correspond to the sills, being of heavy 24- to 30-in. round timbers, 16 ft. long, framed to 10 ft. between the shoulders. Four posts, 18 in. square, support each cap, two at each end. This timbering is shown by Figs. 2 and 4, in side elevation.

The block between the drifts must be taken out with care. A top cut is taken out first. This is begun at the shaft side and is cut out for about 2 ft. above the station set, the portion removed being that included in the dotted line of Fig. 2. The back over this is caught up with 8-ft. posts from the shaft sets as shown. When the excavation allows room, 12- to 15-in. round poles, reaching across the two drift sets and parallel to the shaft, are put in. These would be about 20 ft. long. A small drift is generally started along the station side to make room for handling these long sticks. The poles are spaced as shown, being held apart by small blocks and covered with a double layer of boards with their joints broken, as shown in Fig. 4, an elevation of the finished station. The remainder of the top of the block is taken down in similar fashion and then the bottom section is removed. With the station thus opened, a third main set, similar to those first placed in the side drifts, is put in as shown in the plan of the station, Fig. 3, opposite the divider of the ladderway. The wall plates between the bottom and top of the station and opposite it are cut off against the shaft-set posts, raised and fastened.

The pocket is cut under the station opposite to the hoisting compartments. As it is cut back from the shaft, posts are stood up next the shaft and opposite the shaft posts, so as to support the two station sills undercut by the pocket excavation. These posts extend 2 or 3 ft. below the pocket bottom. As excavating proceeds, other posts are placed against the first and tightly wedged in place. The two station sills are held apart at each end by 12-in. square timbers, as cross-sills, and four 16-in. square cross-sills are also mortised into the station sills. The pocket is lined with 3-in. plank covered with a wearing plate of ⅜-in. sheet iron. Quarter-pan gates are used for loading.

⁂

## Use of Multiple Detonators

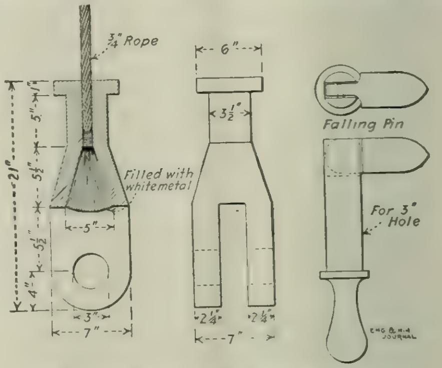
With long charges of high explosives in blasting work, it has sometimes been the custom to place detonators at intervals in the charges, in the belief that the work accomplished by the explosives would be increased. The results of an investigation of this subject are published in the U. S. Bureau of Mines, Bull. No. 59. Tests were made with insensitive dynamite, measuring the rate of detonation of different charges through which variously spaced detonators were distributed. The results indicate that extra detonators distributed 5 in. apart in the cartridge file of an insensitive explosive 40 in. long have a slight tendency to increase the propagation of the explosive wave, but that extra detonators spaced 10 in. apart offer no advantages. With an insensitive dynamite, such as that used, the influence of the detonator probably did not extend further than 5 in., and since the explosion wave and the detonation of the explosive surrounding the detonator probably precedes that of the detonator, it is evident that the latter would have no effect upon the detonation of the charge. It should be noted that these detonators were placed by themselves without fuses.

It is, however, often advantageous to fire simultaneously two or more electric detonators placed in different parts of a long charge. Under such conditions, the time of detonation is reduced and the shattering effect increased. In a 6-in. by 100-ft. churn-drill hole in a quarry, filled with explosive for 30 ft. from the bottom, it has been found that one electric detonator on top of the charge will not always produce a complete detonation throughout the charge, and two or more detonators are therefore often distributed. In such a charge, 30 ft. long, a violent effect is obtained by placing one electric detonator 5 ft. from the bottom, one 5 ft. from the top and one in the center of the charge. By this means, the time consumed in the entire explosion is reduced to one-sixth and the force of the explosion greatly increased.

⁂

## Sinking Bucket Connection

For sinking two large vertical shafts for the Brakpan mine on the Witwatersrand, according to C. B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture) it was decided to use buckets for sinking instead of skips in order to obtain greater speed. The connection between the rope and the bucket was of the form shown in the accompanying illustration. This is not an unusual connection, but its suitability and safety are often discussed, and it is interesting to note that in this case no difficulty and no accident resulted from its use. The rope is pulled through the hole, the end untwisted and the individual wires separated to form a brush, which is cleaned by washing with caustic soda and emery. The wires are dipped into zinc chloride and then into molten tin. The thinned brush is pulled back into the cone sheath and white metal of good quality poured in to fill the spaces. The clevis connection shown is called a "falling pin." It proved to be quick, safe, and satisfactory in every respect.



Rope Socket and Removable Clevis Pin

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## Butte Fuse-Cutting Method

An ingenious method of cutting fuse is employed in Butte shaft-sinking operations. It is customary to put two fuses in each shot, and in order to get the proper length of fuse, two nails or hooks are driven in wood the proper distance apart and the fuse wound tightly around them till a sufficient number of fuse lengths will be obtained (A. I. M. E Bulletin, August, 1913). They are all then cut at one nail and on all the cut ends caps are placed. The sharp bend where the fuse passed over the other nail marks the center point of each length of fuse. Both ends of each length of fuse are put in the same primer and the fuse is not cut for spitting until the last minute. This provides against accidental moistening of the powder in the cut ends. No attempt is made to time the shots by cutting the fuse of different lengths, since the operation of spitting is sufficiently slow to give the proper sequence.

# DETAILS OF METALLURGICAL PRACTICE

## Safety Rules—Fire Prevention*

(1) Maintain order and cleanliness. Many fires are due to untidy conditions. Inspect premises daily and do not allow empty boxes, barrels, waste, etc., to accumulate, but dispose of them promptly.

(2) Ashes should never be emptied into other than metal receptacles, and should be kept away from frame buildings, etc.

(3) Oily waste, etc., oxidizes rapidly and should not be allowed to lie around, as spontaneous combustion may occur.

(4) Sawdust and other combustible material should not be used to catch oil drippings, or in cuspidors. Use sand placed in metal pans.

(5) Soap solution should be used as lubrication for cutting tools, wherever practicable, instead of oil.

(6) Use safety matches instead of parlor matches, as the heads of parlor matches often fly off when igniting.

(7) Kerosene lamps, lanterns, torches, etc., should be filled by daylight only, and never filled while burning.

(8) Do not allow incandescent lights to rest on combustible material, or anything combustible to be hung on electric lights. Paper shades should not be used. Extension lights having long wires which are hooked over rails, etc., are dangerous, as insulation is liable to wear off and cause short-circuiting.

(9) Never replace blown-out fuses with wire.

(10) Stove pipes should not be run through floors or partitions. Provide a chimney. Floors and woodwork near stoves should be protected by metal, brick or cement.

(11) Inspect chimneys at regular intervals and repair defects.

(12) So far as possible fireproof materials should be used in all construction work.

(13) Lumber piles, etc., in dry summer weather should be kept wet.

## Guest Reduction Process

A patent has been granted to W. W. Guest, of Alameda, Calif., for a method of recovering precious metals from ores in which they occur in chemical or mechanical combination, the process being applicable to black and other sands.

The method consists in grinding the ore in a solution containing a combination of the nitrates, hydrates, chlorates, hyposulphites and hypochlorites of the alkaline metals. A combination of any three or more of these compounds, dissolved in water in the proportion of 20 to 80 grams per liter, depending on the character of the ore to be treated, is mixed with an equal weight of the ore and the whole ground up into a slimy pulp. The bases are changed into soluble form, chlorates, sulphates, arsenates, arsenites, nitrates and hypochlorites of the base metals. These base elements, which obstruct amalgamation, are then removed, and amalgamation may be easily and rapidly effected.

This process is claimed to be effective in a short time and to recover a high percentage of the contained precious metal. It bears patent No. 1,067,022.

## Crib Ore Bin

The ore bin illustrated is one employed for a tailing bin by the Mount Summit Ore Corporation, of Garrison, N. Y. Except for a few pieces, it is built up of 1x6-in. material only. Typically, 2x6-in. stuff would be used, and is so used in other bins of the same property. The bin is 16x16x17 ft. outside, above the foundations. These latter are of concrete, three in number, 1 ft. thick. The bin floor laid on these is of the 1x6-in. material set on edge and spiked together, covered with a ½-in. layer of concrete. The sides are built up of the timber laid on its side, two planks together, lapping alternately at the corners. The successive layers are spiked down to those below. The sides are plumbed up as they progress just as a mason plumbs a vertical wall. Two ¾-in. tie rods in each direction through the bin are carried by

TAILING BIN OF 1x6-IN. LUMBER

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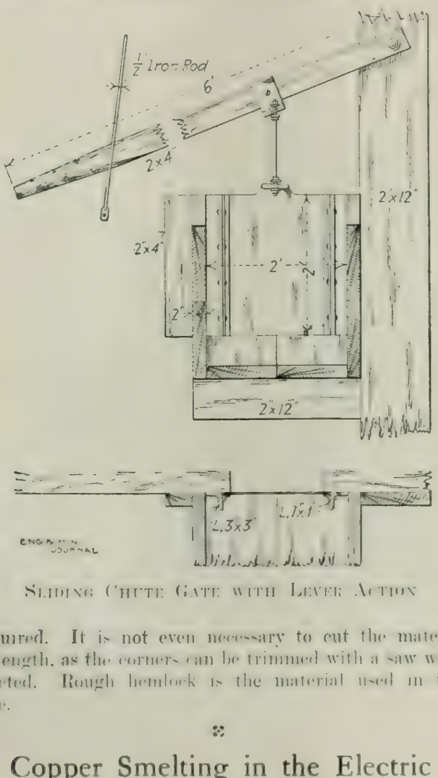
*From Inland Steel Co.'s book of rules.

vertical 2x8-in. by 12-ft. pieces on the sides as shown. The bin is covered with a sloping galvanized roof.

Two bin gates of the vertically sliding type moved by a lever are set in the two sides. The details of their construction are as shown. They are satisfactory on the fine, dry, free-flowing material which they are required to handle. The guides are made of a 3-inch angle bolted to the side of the bin and a 1-inch angle bolted to this so that the gate slides behind one flange of the latter. It is intended to keep the bin filled with tailing in the upper portion and draw it off as required down to the level of the chute bottoms. An exactly similar chute set in the bottom of the bin in a horizontal position permits the bin to be forked if desired.

The bin offers the advantage of rapid erection by relatively unskilled mechanics. No framing of timbers is required. It is not even necessary to cut the material to length, as the corners can be trimmed with a saw when erected. Rough hemlock is the material used in this case.



Sliding Chute Gate with Lever Action

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## Copper Smelting in the Electric Furnace

Smelting sulphide copper ores in the electric furnace is summed up by Messrs. Lyon and Keeney (A. I. M. E. Bull. August, 1913), as follows: (1) The process consists of melting the charge, volatilizing about 60% of the sulphur in elemental form and separating slag from matte; (2) the ratio of concentration is simply that got by separating matte and slag by the reaction of oxides and sulphates upon sulphides and by volatilizing 10%, more than one atom of sulphur, there being no formation of iron oxide to enter the slag, because there is nothing present to oxidize the iron sulphide; (3) qualitatively, some of the sulphur can be condensed; (4) copper loss, by volatilization and in the slag, is low; (5) the 1% copper matte from a 0.3% copper charge is a good collector for gold and silver if the slag separation be clean; (6) gold volatilization loss is small, silver is appreciable, but in a larger furnace with closer temperature regulation would probably not occur; (7) electrode consumption is small and in practice need not exceed 5 lb. per ton of charge; (8) in a large commercial furnace, power consumption for most ores would be about 180 kw.-hr. per ton.

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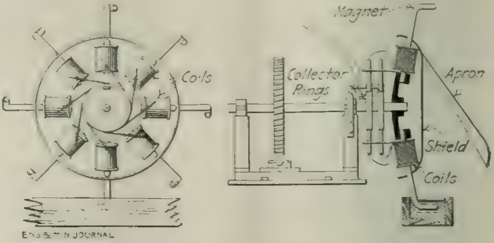
## Removing Iron from Pulp

A closed tube-mill circuit is part of the system of cyaniding concentrate at the mill of the Alaska-Treadwell Gold Mining Co., Douglas Island, Alaska. Unless some method is provided for removing iron from this circuit, it will accumulate, reaching as much as 15% of the total. To avoid this difficulty a magnetic device has been installed, which continuously removes all metallic iron from the pulp.



Magnet for Removing Iron from Pulp

In the launder which conveys the ground pulp back to the Dorr classifier for separation, a wheel, which consists of a number of magnets, is arranged, the ends of the magnets dip into the launder and remove the adhering iron, discharging it on an apron which carries it clear of the launder. Current is supplied through a simple commutator. The accompanying drawing shows the details of the arrangement.

⁂

## Precipitating Mossy Cement Copper

According to Henry M. Wilcox, of Chicago, Ill. (U. S. pat. 1,066,968), cement copper can be precipitated in a fibrous condition from sulphate solutions by the use of sufficiently large quantities of sulphur dioxide. This condition obtains when the weight of sulphur dioxide absorbed is approximately equal to the weight of metallic copper in the solution. This is done under superheat (i.e., under pressure), and may require the use of liquid sulphur dioxide, since if air is admitted with sulphur dioxide it is difficult to raise the required pressure.

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**The Attempted Dry Chlorination of Zinc-Lead Ores** at Helena, Mont., is one of several metallurgical experiments that are being considered ("Met. and Chem. Eng.," Aug., 1913). Chlorine gas is the active agent employed in attacking the ore and rendering the metals soluble, after which they are recovered by steps in precipitation which are susceptible of considerable variation. It is expected that experiments on a commercial scale will be commenced this summer, and pending the actual operation of the process, no definite information is available for publication.

# NOTES FROM CURRENT LITERATURE

## Iron Conduit for Alternating-Current Lines

In a recent paper presented to the Elektrotechnischer Verein (abstr. *Elect. Rev.*, Aug. 2, 1913), L. Bloch discusses the conditions attending the running of cables carrying alternating current in iron conduit where the return line is not included within the same iron covering. It is found that the inductance of the pipe not only causes considerable impedance in the circuit, but that the eddy currents and hysteresis produce a marked wattage loss which raises the temperature of the conduit and this limits the carrying capacity of the cable to a lower value than it would otherwise have.

The general conclusions are stated as follows: When single-phase cables are laid singly in iron conduit serious troubles are likely to arise if the currents exceed 50 amp. and even at lower limits. The most notable effect is a rise in temperature, in addition to which the dropping voltage and the loss of power may have a serious effect upon the satisfactory working of the installation.

The investigation was occasioned by a serious case which occurred in Berlin, where a large number of heavy conductors carrying polyphase current were laid singly in iron conduit.

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## Progress of Electric Steel Industry

The industry of manufacturing steel electrically is progressing rapidly and a list of the furnaces operating in the United States is given in *Iron Age,* July 10, 1913. Seven of these furnaces are of the Heroult design and includes that of the Halcomb Steel Co., Syracuse, N. Y., a five-ton furnace producing tool steel; the Firth-Sterling Steel Co.'s furnace at McKeesport, Penn., of the same size and producing the same material; another belonging to the same company and at the same place, 2½-ton size, also producing tool steel; the Illinois Steel Co., Chicago, Ill., 15-ton capacity producing rails; the American Steel & Wire Co., Worcester, Mass., 16-ton, producing wire rods; National Malleable Castings Co., Sharon, Penn., 3-ton capacity, producing castings; Treadwell Engineering Co., Easton, Penn., 2-ton capacity, also producing castings.

Of the Girod design there is the one-ton tool-steel furnace of the Simonds Manufacturing Co., Lockport, N. Y.; the Bethlehem Steel Co., South Bethlehem, Penn., a 10-ton tool-steel furnace; the 3-ton furnace, producing castings, of the Washington Iron Works, Seattle, Wash., and the 5-ton castings furnace of the Portland Bronze & Crucible Steel Foundry, Portland, Ore. The Hering design includes the ½-ton castings furnace of the Niagara Steel Castings Co., Buffalo, N. Y., and the ½-ton tool-steel furnace of the Firth-Sterling Steel Co., McKeesport, Penn. The 2-ton castings furnace of the Crucible Steel Castings Co., Lansdowne, Penn., is of the Roechling-Rodenhauser design; while the ¾-ton castings furnace of Deere & Co., of Moline, Ill., is of the Kjellin type. The 1½-ton castings furnace of the Buchanan Electric Steel Co., Buchanan, Mich., is of the modified Stassano design, and the 1½-ton furnace of the Crucible Steel Castings Co., Milwaukee, Wis., together with the 1½-ton castings furnace of the Chicago Electric Castings Co., are designed by the Metallurgical Engineering Co., Chicago, Ill. The 1-ton special steel furnace of the Harrow Spring Co., Kalamazoo, Mich., is of the Greene induction type. The accompanying table shows the installations of electric furnaces by countries.

ELECTRIC FURNACES BY COUNTRIES

| Countries | Number | Countries | Number |
|---|---|---|---|
| Germany | 34 | Spain | 1 |
| Italy | 20 | Mexico | 4 |
| England | 16 | Canada | 3 |
| France | 13 | Japan | 1 |
| Austria | 10 | Brazil | 1 |
| Sweden | 6 | | |
| Russia | 4 | Total foreign | 121 |
| Belgium | 3 | United States | 19 |
| Norway | 3 | | |
| Switzerland | 2 | Grand total | 140 |

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## Volcanic Dust and Climatic Changes

A problem which has always engaged the attention of geologists, is rationally to explain the variations in the earth's climate which permitted the occurrence of the several glacial epochs. Of the explanatory theories advanced, those based on the varying eccentricity of the earth's orbit about the sun, on the assumed varying percentage of carbon dioxide in the atmosphere, on the waxing and waning of solar radiation, and on changes of elevation of the land surface, have all contained plausible elements and have claimed many adherents. They are all, however, open to objection. Writing in the "Journal of the Franklin Institute," August, 1913, W. J. Humphreys advances a new explanation, based on the prevalence or absence of volcanic dust in the atmosphere. He finds out from the falling velocity of the dust particles that they are of a size larger than the wave lengths of the direct solar heat, and smaller than the wave lengths of the heat radiated from the earth. Hence, the solar heat is largely reflected and scattered, and the radiated heat from the earth is allowed to pass through with little interference. As a result, a blanket of dust in the upper atmosphere acts in a manner exactly opposite to that of a glass cover, such as is applied to greenhouses, and tends to cool the earth below the temperature which would result if it were not present.

Following the exposition of this theory, Mr. Humphreys examines the records to find out how it corresponds with the facts, and by plotting curves, he shows that the mean annual temperatures of the earth and the annual amounts of heat absorbed from the sun, which themselves correspond more or less closely, show marked low points corresponding with the great historical eruptions, such as that of Krakatoa, Katmai, etc. A certain correspondence is also shown between the number of sun spots and the earth's climate, the occurrence of large numbers of spots corresponding to high temperatures on the earth and *vice versa*. This is shown to be consistent with physical theory. The influence of the sun spots seems to be secondary to that of volcanic dust, but the two together have probably been the dominant, if not the sole, agencies in producing the variations of the earth's climate. A drop of only a few degrees, continued over a long period of time, would be sufficient to permit the encroachment of the polar ice sheets for long distances, and thus produce a glacial epoch. The total quantity of dust sufficient to cut down the intensity of the direct solar radiation by 20%, and if indefinitely continued, to produce an ice age, is astonishingly small, being only [illegible]00th part of a cubic mile, supposing that the particles are in large measure more or less flat. And this quantity of material would need to be distributed only about once in one or two years.

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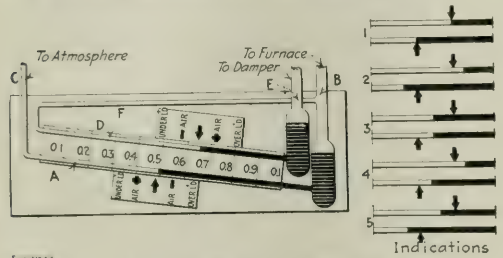
## Boiler-Efficiency Indicator

Excessive fuel consumption, smoke production and irregular steam pressure result from failure to maintain boiler efficiency. A new device, now being introduced, noted in *Engineering News,* June 12, 1913, keeps the fireman informed of varying conditions and guides him in maintaining proper ones. It combines the duties of the $CO_2$ recorder, steamflow meter and draft gage.



Eng News

A Boiler-Efficiency Meter

Characteristic Indications

1. Normal operation of boiler.
2. Too much air, fuel bed too thin, or holes in fire.
3. Too little air, fuel bed too thick, or fire choked with slag.
4. Boiler running with overload.
5. Boiler running with underload.

The operation is based upon the relation of draft conditions to the efficiency of the boiler. The $CO_2$ content of the products of combustion is a good indication of the efficiency of combustion, but it gives no indication of the capacity developed by the boiler. The draft conditions, however, afford a direct indication of both efficiency and capacity.

When a boiler is working at its normal capacity, a decrease in the normal draft resistance at the grate (due to a thin fire or to holes in the fire) will result in an increase in the drop of draft pressure through the boiler, and a consequent reduction in efficiency due to the excess supply of air. On the other hand, an increase in the normal resistance at the grate (due to heavy firing or failure to clean the grates) will result in a decrease in the drop of draft pressure through the boiler, and a consequent reduction in the capacity or rate of steaming. It results also in loss of furnace efficiency due to imperfect combustion.

The device shows the draft in the furnace and the drop in draft pressure through the boiler at the same time. It consists essentially of a pair of draft gages, the indicating portion being a pair of inclined tubes in which the movements of a body of oil show the variations in draft. The construction is shown in the accompanying drawing.

The lower gage tube *A* has a ⅛-in. pipe connection *B* to the interior of the furnace, just above the fire level, while the pipe *C,* from its upper end, is open to the atmosphere. Thus the gage *A* gives a direct reading of the draft or air pressure in the furnace, and shows variations in pressure due to heavy, light or dirty fire. The upper gage tube *D* is in a closed loop; its lower end is connected to a pipe *E* leading to a point just inside the damper at the smoke flue or uptake. Its upper end is connected by a pipe *F* with the furnace tube *B* of the other gage.

Thus the gage *D* is influenced by the pressure at the furnace and at the damper, and becomes a differential gage showing the drop in draft pressure between these points. A high reading on this gage indicates an excessive drop, while a low reading indicates too low a drop, due to an insufficient supply of air. The relations of the two gages indicate the causes of the defective conditions, some of which are indicated on the cut. In firing, the aim is to maintain the fluids in line with the respective arrows. This device is being introduced by W. A. Blonck & Co., Fisher Building, Chicago.

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## A Disease of Lead

Some metals are known to be subject to deterioration through chemical and physical agencies. From the *Ironmonger,* reprinted in *Brass World,* July, 1913, is taken the description of a disease which attacks lead.

Oxidation began in one of the objects of art, wrought in lead, at the Cluny Museum, in Paris, and it was slowly being converted into a pulverized mass. Other specimens appeared unaffected. Investigation showed traces of chloride in the lead by means of which the alteration was promoted. Professor Matignon found chloride in all the affected pieces and showed that the disease could be produced in a sound specimen by rubbing it with chloride. The first symptom is a white speck, which is rapidly followed by others. If not suppressed, the condition spreads until entire destruction of the metal is threatened.

A disease of tin was noted in the JOURNAL of Dec. 31, 1910, which was a disintegration beginning at 64° F. and reaching a maximum at —10° F. This change ceased at —172° F. and seemed to be due to low temperature alone. It began with small swellings of the metal and a change to powder with partial oxidation. The powder resulting from this change has the power to infect clean tin.

Another disease of the same general character was noted in the JOURNAL of Feb. 4, 1911. This was a disease which occurred in tinplate, changing the coating and destroying it. It is explained that the crystallized form of tin is its most stable form, and that tarnishing of the coating of tinplate is often due to the change to it. It is said that this disease may be communicated not only to other tin, but also to copper, lead or polished rolls of almost any other metal. Infection proceeds rapidly at higher temperatures, in distinctly different from the "gray-tin" disease already mentioned, which is produced by low temperatures.

# Lake Superior Institute Meeting

*SYNOPSIS—Special correspondence from our representative, covering the Lake Superior meeting day by day.*

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The eighteenth annual meeting of the Lake Superior Mining Institute, which was held on the Mesabi range, Aug. 26-30, was one of the most notable gatherings of mining men ever known to the north country. It was attended by over 300 members and guests, who thoroughly enjoyed the trip and reaped a great deal of benefit from their observations. The social features were the best ever given in connection with an Institute meeting, all of the entertainments being excellent. The Institute meeting is the annual vacation for a large part of the mining men of the region and they forget their cares for a few days. The Minnesota mining men are royal entertainers and exerted themselves to the utmost in order that their guests might go back to their homes with the best kind of an impression of the greatest iron-ore district in the world

### THE MINNESOTA STEEL PLANT

The members of the Institute assembled at Duluth on Tuesday morning, headquarters being at the Spalding Hotel, and left shortly after noon by the boat for the plant of the Minnesota Steel Co., on the St. Louis River, nine miles from the heart of the city. The company is a subsidiary of the United States Steel Corporation and was organized but a few years ago. The plant is still in the construction stage and will not be ready for manufacturing steel for another year at least. It is on a tract of 1500 acres, with two miles of water-front, and has connections with all of the railroads entering Duluth and Superior.

Some idea of the magnitude of the plant can be obtained from the present plans, which call for two blast furnaces with 500 tons daily capacity each; 90 Koppers-type byproduct coke ovens; 10 openhearth furnaces, rated capacity 75 tons each; four 4-hole soaking pits; one 40-in. reversing blooming mill, steam driven with low-pressure turbine-generator set; one 28-in. finishing mill, motor driven; one 16-in. continuous roughing train, motor driven; power house of 10,000-kw. capacity; five blowing engines, gas driven, 20,000-cu.ft. capacity each; machine, forge and structural shops; three continuous reheating furnaces, regenerating type, end discharge, designed to use 16-in. billets; established daily capacity 1000 tons ingot.

All buildings have steel frames, inclosed with two-piece concrete blocks. The company is also erecting 175 homes, containing 350 apartments for the mill employees. A cement plant with a capacity of 4000 barrels daily will also be constructed. The mill is going to be a great thing for Duluth, as it will be the means of bringing other industries associated with the steel business to that section.

### THE EASTERN MESABI

Three trains, one composed of sleepers and dining cars, the other two of private cars, left Duluth at midnight for the Eastern Mesabi range and the first stop was made at Biwabik. The Biwabik mine, the second property to ship ore from the Mesabi district, was inspected there. The mine was opened in 1891 and is about exhausted, having produced millions of tons of iron ore. A crushing plant with a daily capacity of 1000 tons is operated to take care of the hard ores.

Seventy automobiles transported the party from Biwabik to Eveleth, making a stop at the Genoa mine, which has been worked by steam shovels for the last year. The pit is a deep one and a large part of the ore is now mined by the milling system and taken to surface through shafts. The pits often are mined to such a depth that the cost of steam-shovel mining is prohibitive and other means have to be resorted to in order to get out the ore.

The Norman pit at Virginia, where the next stop was made, is the deepest pit mine in Minnesota, having reached a depth of over 300 ft. It is a mammoth hole that excited the interest of the visitors who had not seen it before. The Union and Commodore pits, which are near the Norman, were also inspected.

### A MAMMOTH SAW MILL

One of the most interesting features of the trip was a visit to the big saw mill of the Virginia & Rainy Lake Co., one of the largest lumber concerns in the country. The plant covers over 300 acres of ground and employs 1400 men. It has a capacity of 1,000,000 ft. of lumber per day. The mill is modern in every respect and it is interesting to see the way logs are taken from the water and sawed and finished. The waste is extremely small. The company has its own well equipped fire department. The trip was a novel one because few of the party had the least conception of how a modern saw mill worked, although all were familiar with the old methods, as the Lake Superior region was well supplied with small mills at one time.

The Institute members were next taken to the ball park, where a baseball game between the two Virginia teams provided amusement for almost two hours. Following, an elaborate dinner was served at the Elks club, after which there was a business session in the high school. President Pentecost Mitchell presided and a number of the papers were read and discussed, some of which will appear in the JOURNAL columns.

### THE FIRST OPEN PIT

Thursday morning an automobile trip was taken from Virginia to Hibbing, a distance of about 25 miles, making stops en route at the Mountain Iron mine, where the first ore was mined on the Mesabi, and at the Monroe. The mine is now idle, the orebody having been exhausted. A total of 17,198,871 tons of ore were shipped in the 20 years during which operations were conducted. It was at this property that steam shovels were first used in the mining of ore by John T. Jones, of Iron Mountain, one of the pioneer Mesabi miners. For years the Iron Mountain was the largest iron mine in the world, a position now held by the Hull-Rust at Hibbing. The Monroe is idle at present, but work will be commenced shortly, as the mine is on the Hill lands under lease to the Oliver Iron Mining Co. The stripping has all been done and ore can be sent out within a few days after operations are resumed.

Immediately upon arriving at Hibbing, the visitors were taken to the St. Louis County Fair to witness the horse races, which proved exciting in spite of the wet track.

In the evening there was a wrestling and boxing exhibition at the Armory, which was a real treat. A scientific boxing exhibition is always a good drawing card and every visitor was on hand early to get a seat near the ring. The pugilists were from Minneapolis and St. Paul and fought like wild cats until the referee stopped the bout because of a foul blow.

### The World's Greatest Iron Mine

Thursday morning the members were taken to the Hull-Rust, Mahoning and Buffalo & Susquehanna mine on flat cars provided with seats so that they might get a better view of the operations. The Hull-Rust is the world's greatest iron mine, having produced 20,958,235 tons since it was opened less than eight years ago. Anyone who has not visited the mine has no idea of the magnitude of the operations in that pit. Close to 4,000,000 tons will be sent out from this mine alone this season, as much as will be sent out by all the properties on the Marquette range. The Hull-Rust has about 300,000,000 tons of ore in sight and there remains about 18,000,000 cu. yd. of stripping to be done. A part of the orebody lies under the city of Hibbing and it is quite likely that a part of it will have to be moved in the near future. The pit is now 90 ft. deep at the lowest point and the orebody extends downward for 100 ft. in some places. The ore is of excellent grade, part of it running 65% iron which contains little phosphorus. The ore is mined and loaded for about 15c. per ton, a remarkably low figure. The Buffalo & Susquehanna is a new property, which shipped its first ore last year, one year ahead of expectations. The overburden was 140 ft. deep and was removed in record time. Drills have located ore at a depth of 700 ft. and if mining is carried that far, the mine will be the deepest on the Mesabi.

### The Western Mesabi

After the inspection of the mines of the Hibbing district the trains left for the Western Mesabi to visit the properties there and the washing plants at the Hawkins property and at Coleraine. Stops were made at the Crosby, Stephenson, Hill, Holman and Canisteo mines.

A large portion of the ores on the Western Mesabi occur mixed with sand, making it necessary to build washing plants to remove the worthless material and bring the ore to merchantable grade. There are plants now at Coleraine, at the Hawkins, at Nashwauk, and one will shortly be built by the Cleveland-Cliffs Co. at the Crosby.

The Coleraine plant is a large one, consisting of five units, each unit containing the following: One receiving bin; one 20-ft. revolving screen, 2-in. holes; one picking belt; two 25-ft. log washers; two 18-ft. "turbo" washers; 20 Overstrom tables and one shipping pocket, together with the necessary settling tanks, rock bins, sand pumps and driving mechanism. Each unit is operated by a 100-hp. motor. The capacity of each unit is 4000 tons of crude ore per day, or a total of 20,000 tons per day.

The power plant contains six 72-in.x18-ft. horizontal tubular boilers with tile stack; one 26x52-in. and 16x48-in. Prescott, cross-compound, condensing pumping engine; capacity 12,000,000 gallons, delivering through a 30-in. steel main to mill; one 26- and 52x48-in. cross-compound, condensing, Corliss engine, direct connected to 1250 kv.-a., 6600-volt, 60-cycle generator and the necessary exciter sets (switchboard, transformers, etc.).

Following the visit to Coleraine, where Friday night and part of Saturday was spent, the members returned to Duluth, reaching there Saturday afternoon. Most of the visitors left for their homes that evening.

W. H. Johnston, of Ishpeming, was elected president of the Institute for the coming year and the next meeting will take place on the Marquette range unless a trip be taken to some district outside of the Lake Superior field. E. W. Hopkins, of Commonwealth, and A. J. Yungbluth, of Ishpeming, were reëlected treasurer and secretary, respectively. The Mesabi meeting was the most successful of all the 18 meetings and will be remembered with a great deal of pleasure by those who attended.

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## Ore Treatment on the Mesabi

It is a mistake to suppose the Mesabi to be strictly a high-grade camp, to use gold-mining terminology. A certain amount of crushing and drying is frequently necessary and some concentrators now in use will probably be followed by others.

At the Biwabik mine, which has the distinction of being the first mine on the Mesabi range to use the steam shovel, much of the ore, a high-grade bessemer, requires crushing ("Mining Methods on the Mesabi Iron Range," a paper presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913). Recently a new crusher of the gyratory type, with a 48-in. receiving opening, has been put in operation. It has a capacity of 1000 tons per hr. and is the largest gyratory crusher that has ever been installed.

On the western end of the range, many of the orebodies contain layers of fine sand, lean ore and broken taconite, which must be separated from the ore in order to make it merchantable. After several years of experiment a large concentrator was erected on the east side of Trout Lake, at Coleraine, by the Oliver Iron Mining Co., and this has been in successful operation since 1909. The Wisconsin Steel Co. also erected a concentrator at Nashwauk, consisting of two units, which began operations in 1912.

At the Leonard, Shenango, Commodore and some other pits, low-grade material containing 35 to 49% iron is being stockpiled. This material is unmerchantable at the present time and being mostly paint rock it will probably not yield to concentration.

At the Brunt mine, Mountain Iron, a drying plant is in operation for removing the excess moisture from the ore. The moisture is being reduced from 18 or 20% down to below 8%, resulting in a considerable saving in freight charges and rendering the ore more acceptable to the furnacemen. Another drying plant is in course of erection at the Whiteside mine.

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**German Southwest African Diamond Mines**—among them the Zillertal, New Kolstal and New Phoenix—which, owing to the former prohibitive tax on diamond production, had to close, have, since the lighter taxation came into force, resumed working. At the same time the stress caused by the scarcity of native labor has been relieved by the arrival of 500 Ovambo boys. The efficient exploitation of the Northern field too is considered assured, the Koloniale Bergbaugesellschaft, a financially strong concern, having in April acquired the mining and prospecting concessions of the Diamantfelder-Verwertungsgesellschaft for $31,250 cash and 55% of the net profits to be earned.

# CORRESPONDENCE AND DISCUSSION

## Motor Trucks for Mines

Our experience with motor trucks may be of interest to other mining companies contemplating the purchase of a truck.

In October, 1912, we ordered a Mack 5-ton truck with automatic-dump body, and a 5-ton trailer with hand-dump body. These were to be delivered about Nov. 1.

Our mine is two miles from the Nevada Copper Belt R.R. and 1000 ft. higher, with a good road between. After ordering the truck, men were put to work on the road, widening it for the broad-gage of the truck, cutting off corners to eliminate sharp turns, and putting it into the best possible condition, in order to give the truck a fair trial. The grade is in favor of the load the entire way. There are a few steep pitches coming up hill, the final stretch to the ore bins averaging 14% for 2000 ft. The road is the best ore road in this district and far better than most mountain roads. There is no sand, although the dust is thick in dry weather.

The truck arrived about Nov. 25, and was immediately put to work. It had been claimed that it would make eight round trips, with the trailer, in an 8-hr. day, and haul 10 tons each trip, five on the truck and five on the trailer. After the first day with the truck alone, the trailer having not yet arrived, it was evident that if it made six trips it would be doing well. After a few days the defects began to show, and it could not keep up an average of even six trips.

Rubber tires quickly proved themselves unsuited, as the small, sharp pebbles, which could not be kept off the road, chewed off the rear tires at the rate of about one a week. It took at least a half day to change these. The brakes proved too weak to hold the truck going down hill, and it was necessary to run part of the way on compression. After the first week, the brakes needed relining every two days to get any service from them. This was done after dark, so that no hauling time was lost. The gasoline and oil consumption ran far ahead of all estimates, although the driver sent in by the selling company was an experienced man.

After running for three weeks, during which time the trailer was expected daily, the hope of hauling ore with the truck alone was given up. It could not be depended upon to haul regularly, and the costs ran considerably above $1 per ton, without figuring depreciation. As against $0.55 per ton with teams this was pretty poor.

For some time we had heard of the specially designed trailer, a cut of which appeared in the JOURNAL, Feb. 1, 1913, p. 278. It arrived in the middle of January, 1913. This trailer alone weighed three tons, and the running gear looked as if it had been designed for a 15- or 20-ton body—it would certainly carry that load without any trouble.

A trial trip was begun with the truck and trailer, but never finished. Before the truck was a quarter of the way up the hill, it had boiled most of the water from the radiator, and it was necessary to go back. The only way the trailer got to the mine was when it was hauled up with a six-horse team and loaded. It carried 4½ tons, when greatly overloaded. Needless to say, the teams are back hauling on the road now.

From our experiences, it seemed that if the trailer had been properly designed, and the braking could have been done with it alone, thus taking all strain off the engine, there would be a chance for success. This would again be dependent on finding a suitable tire for the truck, rubber certainly will not do. It would also be well if the manufacturers would study the conditions under which the truck hauling ore must operate. It is hard to conceive of our trailer operating successfully under any conditions.

O. H. SONNE, President,
McConnell Mines Co.

Mason, Nev., June 25, 1913.

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## Historical Note on Smelting Lead and Silver

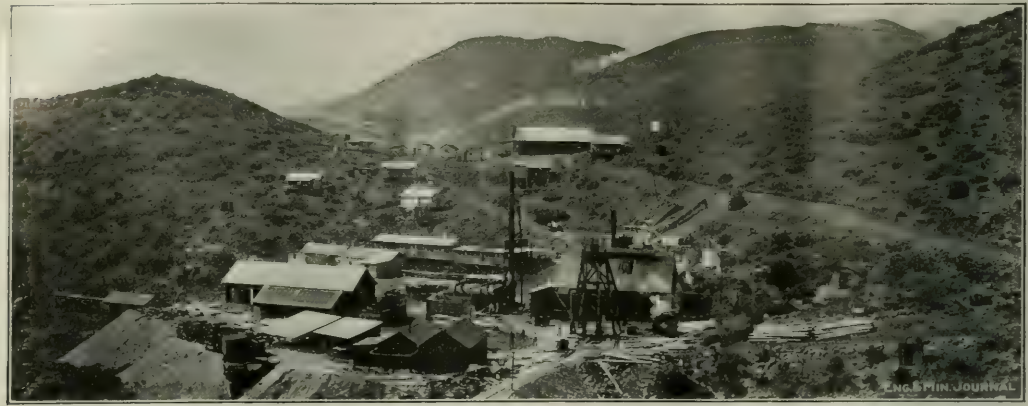
I have just read the "Historical Note on Smelting Lead and Silver," which appears in the JOURNAL of July 26, 1913, and which is apparently a reprint of a footnote from Hoover's translation of Agricola. With regard to the reference to Laurium, having some personal knowledge of the place and its conditions, I should like to correct the idea that any considerable proportion of the enormous production of silver turned out from that district from the days of the Trojan war up to near the Christian era was produced from argentiferous galena. As in the well known case of Leadville, and in others, the bulk of the surface ores which occurred in large irregular deposits in certain zones of the limestone were "carbonates," and it is undoubtedly these carbonate ores that were treated in such large quantities that the accumulations of ancient slags retreated in the smelting plants of the French and Greek Laurium companies amount to many hundreds of thousands of tons. Until up to some nine years ago, while certain proportions of galena concentrates were treated in the furnaces of the French Laurium Co., the bulk of the charge still consisted of carbonates, and it is only since that time that sulphide concentrates have predominated. The same would probably hold good as regards a majority of the ancient sources of silver and lead ores, which would, no doubt, be "carbonates" like those of Leadville, Broken Hill and Mexico.

No doubt, too, those were carbonate copper ores which, smelted direct to metal, as proved by the "prills" in the enormous slag heap which I have seen close to the ruins of his castle-palace, yielded funds sufficient to enable Achilles, poverty-stricken prince, as he was compared with some of the others, to join the brilliant throng of invaders of Troy.

HENRY F. COLLINS.

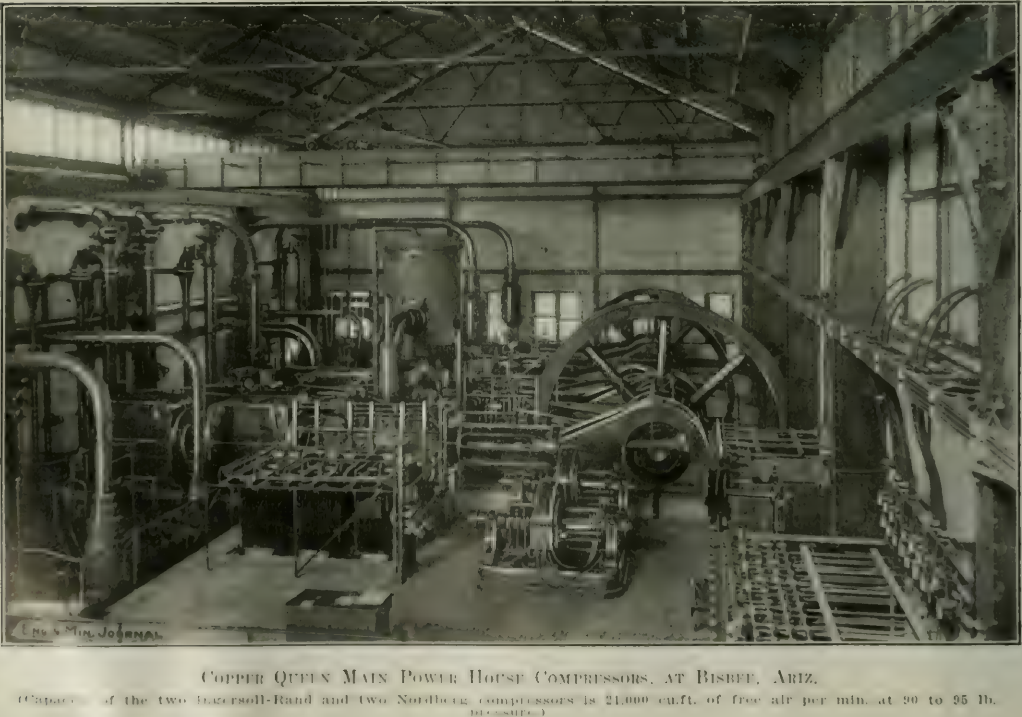
Valdelamusa, Huelva, Spain, Aug. 12, 1913.

# PHOTOGRAPHS FROM THE FIELD



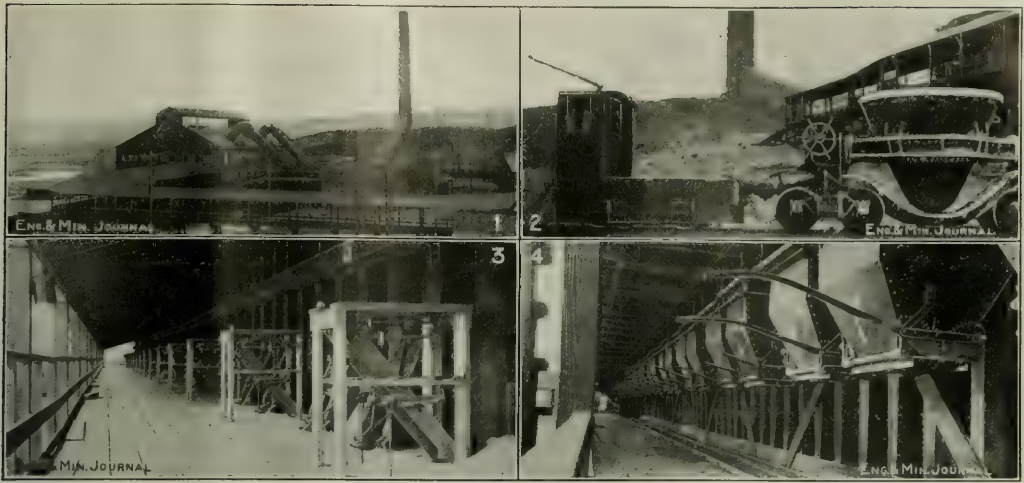
MINE OF THE ARKANSAS & ARIZONA COPPER CO., JEROME, ARIZ.

(The shaft is 1100 ft. deep, and is being raised from the 1400-ft. level. United Verde plant is on flank of hill well above the headframe in the center of the view.)



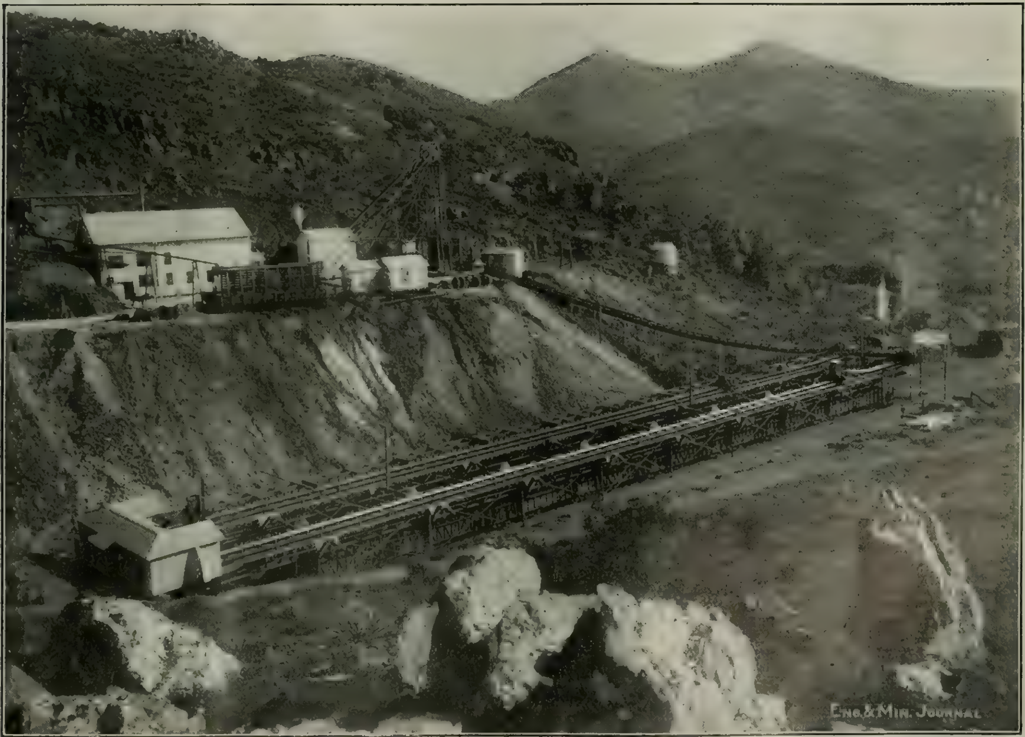
COPPER QUEEN MAIN POWER HOUSE COMPRESSORS, AT BISBEE, ARIZ.

(Capacity of the two Ingersoll-Rand and two Nordberg compressors is 21,000 cu.ft. of free air per min. at 90 to 95 lb. pressure.)



Mason Valley Smelter at Thompson, Nev.

(1, furnace building. 2, slag pot and motor. 3, weighing floor at stock bins. 4, weighing hoppers on floor below floor shown in 3.)



Copper Queen Sacramento Shaft, Bisbee, Ariz.

(Most of the Copper Queen ore is hoisted through this shaft in 3½-ton skips and taken by belt conveyor to the loading plant in foreground. The variety of ores made uniform bedding difficult, so now two belt conveyors load trains of seven railroad cars. At each journey the belt tripper passes over an eighth car dropping a sample of the lot. The plant is now under roof.)

# THE MINING INDEX

The following index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

### COPPER

22,886—ALASKA—Precious and Semiprecious Metals in Alaska in 1912. Mine Production. Alfred H. Brooks. (Advance Chapter from Mineral Resources of the U. S., 1912; 16 pp.)

22,887—ANALYSIS—Simultaneous Determination of Copper and Lead, with the Rotating Anode. Arthur J. White. (Advance Copy, Am. Electrochem. Soc., Sept., 1913; 7 pp.)

22,888—ARIZONA—New Developments at Jerome, Ariz. (Eng. and Min. Journ., July 26, 1913; 2½ pp., illus.) 20c.

22,889—BLAST-FURNACE CONSTRUCTION—The Development of Blast-Furnace Construction at the Boston & Montana Smeltery. J. A. Church, Jr. (Bull. A. I. M. E., July, 1913; 22 pp., illus.) 60c.

22,890—BLAST-FURNACE PRACTICE—Thermal Effect of Blast-Furnace Jackets. Robert P. Roberts. (Bull. A. I. M. E., July, 1913; 24 pp., illus.) 60c.

22,891—BUTTE—Recent Advances in Butte Mining Practice. Claude T. Rice. (Min. and Eng. Wld., July 26, 1913; 5¼ pp.) 20c.

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23,176—CEMENT TESTING—The Autoclave Test for Cement. (Eng. Rec., July 5, 1913; 1⅓ pp.) Discussion by H. J. Force, R. J. Wig, L. R. Ferguson and H. S. Spackman before Am. Soc. for Testing Materials. 20c.

23,177—CONCRETE—Beton als Baustoff für Dampfkesseleinmaurerungen und Schornsteine. H. Winkelmann. (Glückauf, May 31, 1913; 1¼ pp.) Concrete as building material for steam-boiler settings and smokestacks. 40c.

23,178—PORTLAND CEMENT—Depreciation and Obsolescence in Portland Cement Plants. H. Struckmann. (Journ. A. S. M. E., Feb., 1913; 14 pp.)

23,179—PORTLAND CEMENT—Proposal for Establishing a Standard $SO_3$ Content for Portland Cement. (Chem. Engr., July, 1913; 3 pp.) Paper before Internat. Assn. for Testing Materials. 40c.

23,180—TESTING MACHINE—Die 1000 t- Materialprüfmaschine, Bauart Emery, des Bureau of Standards in Washington. Kurrein. (Zeit. d. Vereines Deutsch Ing., July 19, 1913; 7 pp., illus.) The Emery 1000-ton materials testing machine of the Bureau of Standards, Washington, D. C.

### MISCELLANEOUS

23,181—ALTITUDE EFFECTS—Blood-Pressure Variations as Influenced by Rapid Changes in Altitude. A Study of 100 Normal Men Employed at Homestake Mine. F. E. Clough. (Reprinted from the Archives of Internal Medicine, June, 1913; 3 pp.)

23,182—BOLIVIA—Railroads and Transportation Problems in Bolivia. G. W. Wepfer. (Min. and Sci. Press., July 19, 1913; 2½ pp., illus.) 20c.

23,183—BRICK CHIMNEYS—The Stability of Brick Chimneys. Harold Cane. (Iron and Coal Tr. Rev., May 16, 1913; 1 p., illus.) 40c.

23,184—CHINA—Travel in Central China. E. C. Thurston. (Min. Mag., June, 1913; 5½ pp., illus.) A mining engineer's journeys in Hupeh and Hunan. 40c.

23,185—FLOW OF WATER—A Mechanism for Metering and Recording the Flow of Fluids Through Venturi Tubes, Orifices or Conduits by Integrating the Velocity Head. J. W. Ledoux. (Proc. A. S. C. E., May, 1913; 20 pp., illus.)

23,186—FLOW OF WATER in Pipes. W. L. Durand. (Power, July 1, 1913; 1 p., illus.) 20c.

23,187—FOREST SERVICE INVESTIGATIONS. Review of. Vol. I. (U. S. Dept. of Agriculture, Forest Service, Mar. 11, 1913; 68 pp., illus.)

23,188—FORESTS and Their Effect on Climate, Water Supply and Soil. J. C. Stevens. (Assn. of Eng. Socs., July, 1913; 15 pp., illus.)

23,189—MAPS—Topographic Maps for the Mining Engineer. E. G. Woodruff. (Bull. A. I. M. E., June, 1913; 10 pp., illus.)

# EDITORIALS

## Ore Transportation

One of the gravest problems of the small mining district is the matter of transportation of its ore from the shaft houses to the railway. In the case of the great mines the first thing to be done preparatory to ore extraction is to run in a railway line. If the orebody be big enough the railway line may attain extensive proportions. Thus, no great stir was made about building a railway 165 miles long to serve the Nevada Consolidated Copper Co., at Ely, Nev. The Otavi Copper Co. built a line of several hundred miles in Africa, and Robert Williams is still engaged on the Benguela railway, a transcontinental line which is primarily intended to bring out the Katanga copper.

But what of the mine or mining district that cannot afford, or justify, the capital outlay for a railway, broad-gage or narrow-gage, or even of a wire ropeway? Such mines and mining districts are in the main dependent upon the archaic ore-wagon drawn by a team of two or four horses. This is costly, not because the teamsters are exorbitant, but simply because the method is inefficient and wasteful. Consider the changes in our western mining towns, e.g., Goldfield, when consolidations have led to the extension of railway spurs to the ore houses and the elimination of the teams and teamsters. The camp never afterward looks so active and bustling, to be sure, but the mines pay bigger dividends.

In the Rocky Mountain mining regions the transportation of ore by wagon seldom costs less than 15c. per ton mile, and frequently costs as much as 30c. The railway takes it to the smelter for something like 1c. per ton mile. Thus it is likely to cost as much to carry a ton of ore 10 miles to the railway station as it does to carry it thence 250 miles to the smelter. The average charge of the smelter, including his smelting cost, freight on the products to the Eastern refineries, refining cost, and profit, is probably about $9@10 per ton. The transportation costs from the mine to the smeltery are likely to be $5 for the distances mentioned above. These figures are not cited as an example of any particular case, but merely as an illustration of the general lay of the land. It is by no means an unusual condition that transportation from mine to railway accounts for 20% of the total cost to which a ton of ore is subject from the time it leaves the mine.

How to reduce this relatively enormous cost is a problem that has for many years engaged serious attention and is well worth while even if no really satisfactory solution has yet been found. The simplest expedient is, of course, the improvement of the wagon roads, a subject that the JOURNAL used to emphasize 25 years ago. Undoubtedly most mining communities have been derelict in that respect, and have wasted great sums of money because of their dereliction. Whether a road is to be a highway for the old-fashioned team or the modern motor truck, a good road is economical. Appreciating this, the American company which operates successfully in Ecuador under the enlightened management of Mr. Mercer is now engaged in building a macadam road some 50 miles long, on which motor trucks will be used.

The conditions in many mining districts are severe and preclude the same general use of motor trucks that is obtaining in and around our Eastern cities. We have seen many roads in the gulches and along the mountain sides, over which wagons are arduously hauled, that we should not like to try to navigate with a motor truck. On the other hand, there are many upon which a motor truck might be successfully run after some improvement. Certain of the problems of this nature are graphically outlined in a letter that we received recently from Nevada, which follows:

> Transportation across sandy stretches of desert is always a problem. It is often impracticable to attempt road construction of a substantial nature on the score of cost. By the use of brush such as sage and grease wood a sandy stretch of road can be made passable for even heavy teams for a considerable time. This has been the method in use upon the road from Winnemucca to National and automobiles and heavy teams go over portions of the road which would be otherwise quite impassable. At Rochester a similar problem has given much trouble. For nine miles from the mines at Rochester to Limerick cañon the road is sufficiently good to enable teaming and motor trucking to be successfully used. From Limerick cañon the road crosses a sandy flat to Oreana, a distance of 4½ miles. Attempts to use a motor truck over this stretch were unsuccessful and teaming was slow and expensive.
>
> A. A. Codd is installing a narrow-gage railroad over this stretch and is planning to haul the ore from his lease at Rochester by team to Limerick cañon and then by train over this road to the Central Pacific at Oreana. By the use of second-hand rails and ties the cost has been kept within reasonable limits. The railroad is being constructed of 56-lb. rails fr 2½ miles and 35-lb. rails for two miles. The maximum grade is about 4%. Ten 5-ton steel ore cars and a gasoline locomotive made by the Hall-Scott Motor Co., of West Berkeley, Calif., will be the rolling stock. The gage is 36 in. The construction of the road will involve but a small cost as but little grading will be necessary. It is estimated that $2500 will cover the cost of construction. The complete cost of the 4½ miles of railroad is estimated as $15,000. It is planned to have the road in operation before the end of July.
>
> Two Knox-Martin tractors were installed and operated by the Codd Leasing Co. but their use has been discontinued. It was found that they could not cross the sandy stretch of road and the 7 to 8% grades leading up to Rochester proved too much for them. One machine was in repair about all of the time. With one machine three trips with a 10-ton load were made over the nine-mile stretch. High altitude and insufficient radiator capacity increased the difficulties with these machines. At present hauling by teams at $2½ per ton for the nine miles has been found to be less costly than motor-trucking.
>
> A recent article in "Engineering News" (May 29) is of interest in this connection. At Blythe, Calif., teaming and motor trucking is accomplished over sandy stretches by constructing a board track. Such a track has been constructed for $1500 per mile and it is said to be satisfactory and serviceable. In order of cost, the cheapest first, are the brush-covered road, the board track and the narrow-gage railroad.

This letter illustrates very clearly how some of the Nevada miners are undertaking to solve their transportation problem. The plank track for a motor truck, to which our correspondent refers, was an ingenious and interesting expedient. Something of that kind might no doubt be adopted advantageously at bad places of dirt roads, even if the whole road were not to be laid with plank, which, of course, would not be done if it were unnecessary.

The subject of light railways is one that probably has been neglected. There are no doubt many places where they might be advantageously laid, in view of their relatively low first cost, just as is being done at Rochester, N. Y. The advent of the gasoline locomotive furnishes a new and convenient motive power for such lines.

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## The Society and the Institute

The proposed union of the Mining and Metallurgical Society of America and the American Institute of Mining Engineers has finally fallen through by adverse action of the directors of the Institute. This will surprise many members who thought that the plan was agreed upon and was all but consummated. The history of the matter is as follows:

Last fall the council of the Institute asked the council of the Society if it would appoint a committee to meet a committee of the Institute to consider a union of the two organizations. The council of the Society replied that it would instruct its executive committee to meet the Institute committee for that purpose.

The joint committee (consisting of James Douglas, A. R. Ledoux, J. F. Kemp, C. F. Rand, W. L. Saunders, for the Institute, and H. M. Chance, J. Parke Channing, J. R. Finlay, H. S. Munroe, and W. R. Ingalls, for the Society) held several sessions and finally agreed unanimously upon a plan of union, which was reported to the respective councils.

In January last, the Society was informed that the council of the Institute had approved the plan. It was then approved by the council of the Society and the Institute was so notified.

Shortly afterward an active opposition developed among members of the Society, and the officers of the latter were advised by the officers of the Institute that they would await determination of the wish of the members of the Society. In due course of time, the Society held a referendum vote, which was favorable and the Institute was so notified, last May.

There were no other formal communications until this month, but in the meanwhile the Society was informed that the directors of the Institute had approved the plan with the proviso of a referendum vote among its members, and it is understood that there has been a good deal of informal discussion of the matter.

It is obvious that the Society was not kept properly informed respecting the situation in the Institute and was allowed to take a committing action, which it would not otherwise have done, or that the Institute repudiated previous action by itself at a time so late that the faith of the organization may be seriously impugned. Some harsh expressions respecting this have been uttered, even to the extent of charges that the Institute has acted intentionally in order to hurt the Society. We do not believe such to be the case, but fancy rather that the advocates of the union encountered opposition in the Institute which they could not manage. This, however, does not explain the failure to communicate promptly with the Society and give the latter an opportunity to withdraw from the project, which, no doubt, it would have done.

The proposed plan had previously met with opposition in the Society. Curiously, the opposition that later developed in the Institute in certain quarters, identified with what has been referred to as the "Old Guard," was about the same, i.e., the opponents in each organization objecting to the same things. In formulating the plan the representatives of each organization made concessions and the plan itself was probably as fair as such a thing could be. Its final rejection by the Institute is probably due to the dislike of the Society that dates back to the organization of the latter. On the part of the Society the whole plan of union was based upon the acceptance of the principles of the Society by a large number of Institute members who had not previously joined it. In the absence of such accessions to itself the Society could not contract to do the things obligatory upon it by the proposed plan of union and would assuredly have withdrawn from the project if it had had the opportunity.

The outcome of the matter leaves things as they were, plus some hard feelings. The Institute owes its reorganization to the influence of the progressive element, which formed the Society, and since its reorganization it has adopted many of the methods and practices of the Society. This has led to the remark that the Institute has stolen the Society's thunder to such an extent that the Society is superfluous. That expresses, however, a narrow and incorrect view.

The Society stands for principles and for the performance of functions which the Institute does not and can not. The Society is a strictly professional organization, which the Institute is not. The Society aims also to voice the opinion of the profession in matters of professional concern and in matters affecting the industry with which its profession is associated. The Institute cannot, either constitutionally or practically, much exceed its function of being a disseminator of knowledge. The last is, indeed, a service whereof the value is not to be underestimated, but it was precisely the recognition of that value that led the members of the Society, who with but few exceptions, are also members of the Institute, to consider union of the two organizations, which would abolish division of interest and add to the Institute an activity that would be useful to it. This is exemplified by the matter of discussions, which the Institute is eager to have but does not get. The Society has no such difficulty. In short, the Society has elements of human interest which the Institute has not.

As matters now stand, there will probably be a more pronounced division of allegiance than there has been in the past. The demands of organizations upon the attention of persons interested in mining and metallurgy become increasingly onerous; also the demands upon the purse. The latter may be regarded calmly, inasmuch as both in the cases of the Society and the Institute the dues are so moderate that combined they are less than those of other leading societies, but with respect to the demands upon time the thing is different, and no doubt many a member will now choose what he likes the better.

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## Bessemer and Basic Pig

The growth of the steel production in this country in recent years has been entirely in openhearth steel, and chiefly in basic openhearth. An evidence of this is found in the fact that in the first half of the current year the production of basic pig was greater than that of bessemer iron. The use of the openhearth furnace has also the advantage of providing a market for a large quantity of steel scrap; and it is owing to this use of scrap that the steel production last year considerably exceeded that of pig iron.

For many years bessemer pig iron has been the leader in production, and also the leader in the pig-iron market. With the present tendency it will not be long before basic iron will be the chief factor. Indeed the change is already being discussed.

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## Cyaniding on the Mother Lode

The California Mother Lode region, important as it has been in the world's mining history, is somewhat reluctant to accept the latest developments in metallurgy. Concentration and amalgamation early proved applicable to the ores, and concentration it is today, and amalgamation, just as in years gone by. Refinements of concentration came in, the canvas tailing-concentrating plant is one of them. Cyaniding was born, grew, at first slowly, then faster, until it spread over all the world, except the Mother Lode. The Mother Lode old-timers believe cyanidation will not recover the gold from their sulphide ores; they tried it—many years ago. But lately the process has been breaking into the last unoccupied stronghold. At the Black Oak mill the process has been successful. Will that success be sufficient argument to secure new trials at other mines on a modern basis? It seems likely that it will, and perhaps the Mother-Lode sulphides will soon give up more gold at less cost than ever before.

## BY THE WAY

In a recent legal address concerning expert testimony, we note among those things which are certain: "The metallurgist *knows* that certain clays contain aluminum and that it will bubble forth under certain heat." Three cheers for that metallurgist. And by the way, just send us in some nonaluminous clays for our specimen cabinet.

⁂

The great meteorite which fell near Sasayama, Japan, in 1904 ("Memoirs," College of Science and Engineering, Kyoto University, 1912), has recently been analyzed. According to *Nature*, it runs: Fe, 94.85%; Ni, 4.44; Co, 0.48; Cu, tr; P, 0.23%. Thus, nickel-iron amounts to 98.71% and phosphor-nickel-iron to 1.29%. The composition is similar to the De Sotoville meteorite.

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"Sand is any hard granular rock material finer than gravel and coarser than dust," says the Geological Survey. And what is gravel? Why, any hard granular rock material finer than cobble stones and coarser than sand, of course. And what is dust? Gross stupidity, any h. g. r. material finer than sand and coarser than zero. This comparative method of definition is rather attractive when one gets used to it. Give it a trial.

⁂

In the Annual Report for 1912 of the New South Wales Department of Mines, there is included a set of regulations to cover coal mining, promulgated by the Home Secretary of England. In one clause it is provided that "the firing cables shall not be coupled up to the fuse or detonator wires until the kettle, kibble, tub, bowk or hoppet is conveniently placed for the men in the shaft to enter." Even American metal miners probably know what a "tub" is, some have heard of "kibbles," and have some idea of a "kettle." But we hereby open a guessing contest as to what a "bowk" or "hoppet" may be. No entries from England will be accepted.

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It happens in Queensland, according to the annual report of the Under Secretary for Mines, that in many cases the installation of means for promoting cleanliness finds the miners unappreciative. It is stated that the provision of basins in change rooms and in some cases shower baths did not result in their very extensive use and in one or two mines the basins were never used. It would seem that you can lead water to a miner but you cannot make him wash. It is a fact that for an operator to present the opportunity for safety, sanitation and cleanliness is not sufficient, whether in the mining field or any other. An effective campaign of improvement requires education of the improvees, if not actual coërcion. It is likely here, though, as in many American camps, that the men prefer to return to their homes, make a good job of it and sally forth on the street again attired in their best raiment.

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According to a writer in the Los Angeles *Times*, who has been inundated with prospectuses of mining propositions, covering everything from iron to radium and Patagonia to the Pole, the first man he has found who dared lay down hard and fast rules for picking mining investments was Col. H. Engels. Colonel Engels owns a copper mine and smelting works up near Susanville, Calif. The plant is closed down because the government, in its more or less infinite wisdom, saw fit to surround the works, with a "forest reserve" just about the time that Colonel Engels had got things going to the satisfaction of his stockholders and himself. Every Western kid in kindergarten knows that every Eastern highbrow would prefer that half a gross of California miners should go hungry than that the scrubbiest scruboak should suffer potential detriment. Here follow Colonel Engels' infallible rules for telling a good mine: The ores must be of primary origin and in a primitive formation; the ores must be amenable to profitable concentration by other means than furnace smelting; the dividends should yield at least 10% on the purchase price of the stock; the blocked-out or proved ores should equal at least 60% of the value of the stock; the lowest levels and most recent developments of the mine must show increasing or sustained richness of ore. These are some rules. Colonel Engels doubtless understands them, for he formulated them and is a very intelligent man. The writer even catches a glimpse of their meaning, but, then, he has dabbled in copper mining for more than 20 years, off and on—usually off and semi-occasionally on. But how about the inexperienced investor. Why, to fit that poor innocent rightly to apply Colonel Engels' infallible rules, one would have to endow him with a four years' course in the mining college over at Berkeley and then apprentice him to a sorcerer. If there is any way of telling, short of necromancy, when a nondividend-paying mining stock is about to go permanently on a 10% dividend basis, the writer has never heard of it.

# National Promotion of Mining Education

WASHINGTON CORRESPONDENCE

Members of Congress interested in mining matters are giving a good deal of serious attention and study to the so called Foster bill, introduced some time ago for the promotion of education on mining, and it is understood that some modified plan of this sort is likely to be acted upon by the committee on mines of the House, either at the current session or early next session. The Foster bill provides:

> "That there shall be appropriated from the sale of public lands not otherwise appropriated, the sum of $5000 for the fiscal year beginning July 1, 1914; the sum of $10,000 for the fiscal year beginning July 1, 1915; the sum of $15,000 for the fiscal year beginning July 1, 1916; the sum of $20,000 for the fiscal year beginning July 1, 1917; the sum of $25,000 for the fiscal year beginning July 1, 1918, and $25,000 for each succeeding year thereafter, to each State and Territory in the United States, for the establishment and maintenance, under the control of the Secretary of the Interior of the United States, of a school or department of instruction in mines and mining.
>
> Sec. 2. That if there be already established in any State or Territory a school of mines and mining under the control of said State or Territory, or a department of instruction in mining connected with any institution of learning controlled by said State or Territory, then the moneys appropriated in section one of this Act shall go to said school or department of instruction already established. That if there are two schools or departments of mines and mining in any State or Territory under the control of said State or Territory, then the money so appropriated shall be equally divided between such schools or departments.

Sections three and four go on to prescribe the type of instruction to be given in the schools and the kind of reports to be made. Section 5 requires:

> That if at any time in the judgment of the Secretary of the Interior any school or department of instruction in mines and mining provided for in this Act shall not be faithfully carrying out the purposes of said Act as set forth in section three hereof, then all moneys herein appropriated for said school or department of instruction shall be withdrawn from said school or department of instruction until the same shall have produced evidence satisfactory to the Secretary of the Interior that said school or department of instruction is faithfully carrying out the provisions of section three of this Act.

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# Chronology of Mining for August, 1913

*Aug. 1*—Strike of workmen on the ore docks at Superior, Wis.—Lundberg, Dorr & Wilson mill, at Terry, in the Black Hills, S. D., closed down.—First gold shipped from Shushanna district, in Alaska.

*Aug. 2*—Eighteen men killed in the East Brookside mine, of the Philadelphia & Reading Coal & Iron Co., near Tower City, Penn.

*Aug. 5*—Lead miners of St. Francois County, Missouri, vote to strike for increased wages, and recognition of the Western Federation of Miners.

*Aug. 14*—Troops called out to quell rioting at Nanaimo, Ladysmith, and Extension, Vancouver Island, British Columbia.—Electrical workers at Butte, Mont., strike for higher wages.—Foreigners on the charge floor of the blast furnaces of the United States Smelting, Refining & Mining Co., at Midvale, Utah, strike for an increase in pay.

*Aug. 16*—Strike of miners in St. Francois County, Missouri, begun.

*Aug. 20*—Quartette mill, at Searchlight, Nev., destroyed by fire.

*Aug. 22*—Fifty miners killed by dropping of cage in a mine in the Mysore district, India.

*Aug. 26*—Lead miners in St. Francois County, Missouri, return to work—Judgment rendered in favor of New Keystone company, in Inspiration Consolidated vs. New Keystone suit, over right-of-way question of a connecting drift.

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# August Mining Dividends

Dividends paid for the month of August by United States mining companies making public reports, amounted to $2,089,605, those of iron-smelting, industrial and holding companies to $9,688,419; and those of Canadian and Mexican mining companies to $1,163,324. Mohawk reduced its dividend from $3 to $2, which was about the only change of note, the usual August leanness characterizing the last. Last year's August statement was $1,643,544; $11,062,887; and $763,441; corresponding respectively to the previously mentioned figures.

| Canadian, Mexican and Central American Companies | Situation | Per Share | Total |
|---|---|---|---|
| Amparo, g. s. | Mex | 0.04 | 80,000 |
| Buffalo, s. | Ont. | 0.03 | 30,000 |
| Butters-Salvador, g. s. | C. A. | 0.36 | 96,750 |
| Chontalpan, g. s. l. z. | Mex. | 0.50 | 3,500 |
| Cobalt Lake (holding company) | Ont | 0.24 | 72,900 |
| Cobalt Townsite, s. | Ont. | 0.24 | 120,000 |
| Coniagas, s. | Ont. | 0.45 | 360,000 |
| Crown Reserve, s. | Ont. | 0.05 | 88,441 |
| Hollinger, g. | Ont. | 0.15 | 90,000 |
| Lucky Tiger, g. | Mex. | 0.05 | 35,767 |
| Seneca-Superior, s. | Ont. | 0.10 | 47,683 |
| Steel Co. of Canada | Can. | 1.75 | 113,750 |
| Temiskaming & Hudson Bay, s. | Ont | 3.00 | 23,283 |
| Victoria, s. l. g. | Mex. | 0.50 | 1,250 |

| Iron, Industrial and Holding Companies | Situation | Per Share | Total |
|---|---|---|---|
| Amalgamated, c. | U. S. | 1.50 | 2,308,319 |
| Cambria | U. S. | 0.62½ | 562,500 |
| International Nickel, pfd. | U. S. | 1.50 | 133,890 |
| International Smelting | U. S. | 2.00 | 200,006 |
| National Carbon, pfd. | U. S. | 1.75 | 78,785 |
| St. Mary's Mineral Land | Mich | 1.00 | 100,000 |
| U. S. Steel, pfd. | U. S. | 1.75 | 6,304,919 |

| United States Mining Companies | Situation | Per Share | Total |
|---|---|---|---|
| Alaska Mexican, g. | Alas | 0.30 | 54,000 |
| Alaska Treadwell, g. | Alas | 1.00 | 200,000 |
| Alaska United, g. | Alas. | 0.50 | 90,100 |
| Bunker Hill & Sull., s. l. g. | Ida | 0.20 | 65,400 |
| Bunker Hill Con. g. | Calif | 0.05 | 10,000 |
| Chief Con., l. s. | Utah | 01 0 | 87,138 |
| Camp Bird, g. s. | Colo. | 0.24 | 267,300 |
| Colo. Gold Dredging, g. | Colo | 0.25 | 25,000 |
| Elkton, g. | Colo. | 0.02 | 50,000 |
| Fremont, g. | Calif | 0.02 | 4,000 |
| Frontier, z. | Wisc. | 2.00 | 2,500 |
| Golden Cycle, g. | Colo | 0.02 | 30,000 |
| Hazel, g. | Calif | 0.01 | 9,000 |
| Hecla, l. s. | Ida | 0.02 | 20,000 |
| Homestake, g. | S. D. | 0.65 | 163,254 |
| Miami, c. | Ariz | 0.50 | 372,202 |
| Mohawk, c. | Mich | 2.00 | 200,000 |
| Parrot, s. c. | Mont | 0.15 | 34,477 |
| Portland, g. | Colo | 0.02 | 60,000 |
| Round Mountain, g. | Nev | 0.04 | 34,961 |
| Tom Reed, g. | Ariz | 0.06 | 54,373 |
| United Verde, c. | Ariz | 0.75 | 225,000 |
| Wasp No. 2, g. | S. D. | 0.01 | 5,000 |
| Yellow Aster, g. | Calif. | 0.05 | 5,000 |
| Yellow Pine, z. l. s. | Nev | 0.02 | 19,000 |
| Yosemite Dredging, g. | Calif. | 0.10 | 2,400 |

Dividends paid by United States mining companies for the first eight months of the year are $47,540,327; iron-smelting, industrial and holding companies, $73,771,844; and by other North American companies, $15,042,619. The figure for the same period of last year for United States mining companies is $36,226,119.

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**Silver Consumption in the Fine Arts** in the United States amounts to about 50,000,000 oz., according to "Marquette Mining Journal," July 11, 1913. Probably the largest individual consumer is the Handy & Harman factory, at Bridgeport, Conn., where the metal is prepared for conversion into silverware. It is estimated that this plant uses 10,000,000 oz. annually. The Eastman Kodak Co. is said to use about 3,000,000 oz. yearly in photographic supplies.

## PERSONALS

J. Parke Channing has returned to Miami.

W. F. Lamoreaux has returned to Ducktown, Tennessee.

James Lindsay is making examinations in the Superior district.

Edwin J. Fowler, metallurgist of the Pacific Foundry Co., is in Denver.

E. M. Hamilton has gone to Salvador, where he expects to remain for several months.

Kirby Thomas has returned from examination of the iron deposits at Guernsey, Wyoming.

H. N. Cox, formerly assistant master mechanic at the Four C's mine in Cananea is in Miami.

John L. Malm, of the Malm-Wolf Co., Denver, Colo., is in Chicago on professional business.

Bailey Willis, Chester Washbourne, and J. R. Pemberton have returned from Argentina.

John Dern has returned to Salt Lake City after spending five months in Germany and Austria.

J. A. Flemming, operating the old Irene property near Globe, has returned from a trip to the northern part of the state.

Thomas M. McGill, of Chicago, who is interested in the United Gold Mines Co. visited the property near Congress recently.

Frank Collins was in Phoenix recently having come from Durango, Mexico, with other refugees who came out via Mazatlan.

Robert Linton, who has been examining properties in Lander County, Nev., has completed his work and returned to Los Angeles, Calif.

A. Kauffmann, formerly assistant to the president of the Link-Belt Co., has been made general manager of the company's works at Nicetown, Philadelphia.

C. S. Davis, formerly with the Juragua Iron Co., of Cuba, has accepted a position with W. R. Grace & Co., as mining engineer. His new address will be Iquique, Chile.

Henry C. Carlisle, formerly of Tonopah, Nev., has gone to Bolivia on mine examination work. His address will be care American Embassy, La Paz, Bolivia.

Alfred Martin, of Virginia, Minn., has been appointed general superintendent of the M. A. Hanna & Co. interests in the Crystal Falls-Iron River District, Mich. Formerly he was with same company at Virginia, Minn.

F. Danvers Power, of Sydney, N. S. W., who was in charge of the Great Cobar during the absence of H. C. Bellinger, is to take an extended tour, embracing Java, the Malay Peninsula, Japan, the United States, and London.

Francis P. Bray has completed a visit of inspection to Mount Lyell, Broken Hill, and other mining centers in Australia, and has left for London by way of Manila, China, Japan and across the Trans-Siberian railway.

L. G. Huntley, of the Associated Geological Engineers has returned to the Pittsburgh office after an absence of two months spent in geological examinations in the Athabasca River country in northern Alberta, Canada.

L. P. Alford, editor of the "American Machinist" returned to New York last week from a trip to Europe where he attended the joint meeting of the American Society of Mechanical Engineers and the Verein Deutscher Ingenieure.

Professor Solon Shedd of the Department of Geology of the Washington State College, is in Baker County, Oregon, looking over the situation preparatory to making a topographic map of the state for the Oregon Bureau of Mines and Geology.

Prof. A. P. Coleman, of Toronto University, who was one of the party of geologists who left for a trip through Western Canada at the close of the International Geological Congress, broke his leg while descending a mountain at Field, B. C.

Alexander Gillies, Sam. Otisse and other prospectors, who left Toronto three months ago to investigate a large area of territory in Northern Quebec, have returned after a circular tour covering 1500 miles, without having made any discoveries.

Harold C. E. Spence has returned from abroad, and with John E. Marshall Hall, of London has been examining the oil-shale areas of Newfoundland and Nova Scotia on behalf of the Royal Commission on Fuel Oil and Engines, appointed by the British Government.

F. E. Schmitt of "Engineering News" returned to New York last week after a trip to Europe visiting the following countries, Germany, Austria, Switzerland, Belgium, France and England. While in Germany he attended the meeting of the Verein Deutscher Ingenieure.

R. N. Dickman has removed his office from the Rookery Building to the Mallers Building, South Wabash Ave., Chicago, and has consolidated his laboratory with that of Thomas J. Dee & Co., under the direction of James Kilgallon, who has been chemist with Mr. Dickman for 20 years.

Professor Lewis E. Young, who for the past six years, has been director of the Missouri School of Mines, will in September take up graduate work in the Department of Economics at the University of Illinois, and will also give part of his time to teaching in the Department of Mining Engineering.

Elmer A. Holbrook, professor of Mining Engineering in the Nova Scotia Technical College, Halifax, N. S., has been appointed assistant professor of Mining Engineering at the University of Illinois to have charge of the recently equipped coal-washing and ore-dressing laboratory and the course in mine design.

Fred R. Low, editor of "Power" returned to New York on Aug. 29, from an extended trip in Europe, where he was a member of the official party of the American Society of Mechanical Engineers who attended the joint meeting with the German national engineering society, the Verein Deutscher Ingenieure.

## OBITUARY

Liberty E. Holden, owner of the Cleveland "Plain Dealer" died near Mentor, Ohio, on Tuesday, Aug. 26. He was born June 20, 1833, in Raymond, Me., and graduated from the University of Michigan in 1858. He was married in Kalamazoo, Mich. Later he became superintendent of schools in Tiffin, O., and was admitted to the bar. He came to Cleveland in 1866, and in 1872 was made manager of the Pittsburgh & Lake Angeline mines, while two years later he became interested in silver mines in Utah, which engaged his attention for almost 20 years.

Charles A. Canfield died suddenly at Los Angeles, Calif., Aug. 16, aged 65 years. It was largely through his pioneering work in conjunction with E. L. Doheny, that the fuel oil industry of California received impetus. They were jointly the discoverers of the Los Angeles City oilfield in 1892. The Coalinga oilfield is also credited to C. A. Canfield as discoverer, when he drilled the first oil well in the district under extremely trying conditions. Mr. Canfield, in conjunction with J. A. Chanslor, was also one of the pioneers in the Midway district, these two having formed what is now known as the Chanslor-Canfield Midway Oil Co., at present owned by the Santa Fé R.R. At the time of his death, Mr. Canfield was vice-president of the Mexican Petroleum Co., Ltd., and its proprietary companies; the American Petroleum Co., and the American Oilfields Co., both of which are now controlled by the California Petroleum Corporation. In addition, he had many independent oil interests, and was largely interested in industrial, banking and other enterprises in Southern California. He leaves a large fortune.

Carroll Dunham Galvin, 47 years old, killed himself in a hotel in Chicago, Aug. 13. Galvin had registered as Charles Dunham, of Pittsburgh. His home was in Oakland, Calif., where his wife and two children reside. Galvin was graduated from the Worcester, Mass., School of Technology, and began a practical, though at times erratic, career in the copper region of Shasta County, Calif., 15 years ago, when the Mammoth, the Balaklala and the Trinity copper mines were only prospects. He was associated with John Fillius and Frederick R. King, of Denver, and Frederick Grotefend, of Redding, in the prospecting, development and promotion of copper mines. He and Grotefend first attracted the attention of Fillius and King to the copper possibilities of Shasta County. Their first important work was the development and sale of the Trinity copper mine. Their last and most important operation was the sale of the Mammoth copper mine. Galvin was inclined to be visionary, but his visions were usually founded upon material mineral wealth until he separated from the men who had held him down to his possibilities, and he undertook to develop dredging ground in Trinity County. Having acquired some money, he tried also the promotion of rubber plantations in Mexico; but lost money. He then tried the promotion of an automobile tire. It is said that failure in this last venture and the loss of money in Mexican mines caused him to commit suicide.

## SOCIETIES

**American Electrochemical Society**—The twenty-fourth general meeting will be held at Denver, Colo., Sept. 9, 10 and 11, 1913.

**American Society of Civil Engineers**—The first regular business meeting of the season of 1913-14 was held at the Society House, Wednesday, Sept. 3. Two papers were presented for discussion: "The Storage of Flood-Waters for Irrigation: A Study of the Supply Available from Southern California Streams," by A. M. Strong, Assoc. M. Am. Soc. C. E. [illegible] "Modern Pier Construction in New York Harbor," by Charles W. Staniford, M. Am. Soc. C. E.

## INDUSTRIAL NEWS

The San Francisco office of the Goldschmidt Thermit Co. has been removed from Nos. 432-436 Folsom St. to 329-333 Folsom St., San Francisco.

George Best, President of Best Manufacturing Co. for 12 years, has severed his connection with that company and with his son, George H. Best, M. E., has organized the Best Pipe Engineering & Supply Co., with offices at No. 3026 Liberty Ave., Pittsburgh, Penn.

The Keystone Driller Co. Beaver Falls, Penn., on Aug. 22 was awarded the contract for the largest size Downie double stroke pump for the city of Naperville, Ill. Capacity 350 gal. per minute; 300 ft. head. Pump to be direct connected to motor.

The Pierce-Arrow Motor Car Co. announces the introduction of a new 2-ton motor truck, built on the general lines of its well known successful 5-ton truck. The machine is worm-driven by a 4-cylinder 25.6 horsepower motor, S. A. E. rating. The transmission permits three speeds forward and one reverse, the maximum forward speed being 16 miles per hr. Ignition is obtained with a Bosch magneto system. The total admissible load on the chassis is 5200 lb., this including both the body and the paying load. An effort has been made to minimize oiling and greasing trouble so far as possible by eliminating grease cups and substituting a special type of self-lubricating bearing. The bearings are ball and roller in all places except in the motor. The price of the truck is $3000 f.o.b. Buffalo, including the chassis with reasonably complete equipment, except for the body.

## TRADE CATALOGS

Sprague Electric Works of General Electric Co., 527-531 West 34th St., New York. Bulletin No. 246. Motor-driven exhaust-fan outfits, direct and alternating current. Ill., 12 pp., 10½x8¼ in.

The Electric Storage Battery Co., Allegheny Ave. and 19th St., Philadelphia, Penn., Bulletin No. 141. The Exide Stand-By Battery. Illus. 20 pp. 8x10½ in.

Power & Mining Machinery Co., Cudahy, Wis. Bulletin No. 45. Machinery for wet ore concentration processes. Ill., 64 pp., 6x9 in.

This is a short treatise on the theory of concentration, with descriptions of standard apparatus as manufactured by the company.

National Tube Co., Pittsburgh, Penn., Booklet The Whole "Kewanee" Family. Unions, union ells and tees, and coupling. Ill., 48 pp., 5½x8 in.

Northwestern Expanded Metal Co., Chicago, Ill. Expanded Metal Construction. September number of a monthly bulletin. Ill., 12 pp., 6x9 in.

Hardinge Conical Mill Co., New York. Catalog, No. 6. Ill., [illegible] 6x9 in.

[illegible] issue of the catalog of this company, giving de[illegible] of its conical ball and pebble mills together with some [illegible] on this use and a note of some successful installations.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

PROPS—Improvements in Collapsible Modern Mining Props. H. Heidkamp, Hamborn-Neumühle, Rheinland, Germany. (Brit. No. 17,557 of 1912.)

ROCK-BREAKING SHOVEL. Olin S. Proctor, New York, N. Y. 1,067,375; July 15, 1913.)

CONCENTRATION—Pneumatic Concentrating Table. Clarence Q. Payne, New York, N. Y. (U. S. Nos. 1,068,162 and 1,068,163; July 22, 1913).

MAGNETIC SEPARATOR. George Ullrich, Magdeburg, Germany. (U. S. No. 1,067,287; July 15, 1913.)

ELECTRIC FURNACES—Electrode Holder for Electric Furnaces. Dorsey A. Lyon and Edwin R. Cox, Jr., Heroult, Calif. (U. S. No. 1,068,148; July 22, 1913.)

ROASTING—Improvements in or Relating to Furnaces and Apparatus for Roasting Ores. Union des Produits Chimiques d'Hemixem, Brussels, Belgium. (Brit. No. 14,637 of 1912.)

ALLOY—Noncorrosive Metallic Alloy of Copper, Nickel, Zinc, Etc. John Coup, Marion, Ohio. (U. S. No. 1,069,113; Aug. 5, 1913.)

AMALGAMATOR. George H. Loucks, Chicago, Ill. (U. S. No. 1,070,048; Aug. 12, 1913.)

CONCENTRATING PAN. Louis Bowerman, Portland, Ore. (U. S. No. 1,070,107; Aug. 12, 1913.)

MANGANESE SULPHATE, Production of. A. G. French, Nelson, B. C. (Brit. No. 22,078 of 1912.)

TIN—Method and Apparatus for Electrolytically Recovering and Refining Tin. G. Michaud and E. Delasson, Seine, France. (Brit. No. 20,557 of 1912.)

ZINC—An Improved Method of and Apparatus for Roasting Zinc Blende. A. L. J. Queneau, Philadelphia, Penn. (Brit. No. 15,460 of 1912.)

ZINC—Metallurgical Apparatus for Condensing Metallic Vapors. Woolsey McA. Johnson, Hartford, Conn. (U. S. No. 1,069,260; Aug. 5, 1913.)

DETONATING DEVICE. Sidney John Hibon, New York, N. Y., assignor of one-half to Asher Kleinman, New York, N. Y. (U. S. No. 1,068,431; July 29, 1913.)

DRILLS—Chuck for Rock Drills. James C. H. Vaught, San Francisco, Calif. (U. S. No. 1,068,612; July 29, 1913.)

DRILLS—Fluid-Pressure-Operated Tool. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,069,289; Aug. 5, 1913.)

EXCAVATING—Dipper for Excavating Machines. Walter S. McKee, Clencoe, Ill., and Percival M. Vilas, Minneapolis, Minn., assignors to Edgar Allen American Manganese Steel Co., Augusta, Maine. (U. S. No. 1,069,889; Aug. 12, 1913.)

CONCENTRATION—Improvements in or Relating to Apparatus for Ore Concentration. J. Hebbard, Broken Hill, N. S. W., and Minerals Separation, Ltd., London, Eng. (Brit. No. 15,546 of 1912.)

COMBUSTION—Method of Producing a Retarded Combustion of a Gas Flame. Henry L. Doherty, New York, N. Y. (U. S. No. 1,069,867; Aug. 12, 1913.)

ELECTRIC FURNACE. Alois Helfenstein, Vienna, Austria-Hungary. (U. S. No. 1,069,252; Aug. 5, 1913.)

FURNACE GAS—Process of Treating Combustible Metallurgical-Furnace Gas to Increase Its Calorific Value. Henry L. Doherty, New York, N. Y. (U. S. No. 1,069,865; Aug. 12, 1913.)

GLASS FURNACE AND PROCESS. Paul L. T. Héroult, La Praz, France. (U. S. No. 1,069,255; Aug. 5, 1913.)

HYDROCARBON FURNACE. Miles Connor, Pueblo, Colo. (U. S. No. 1,069,230; Aug. 5, 1913.)

ROASTING—Process and Apparatus for Roasting ores and Recovering the Gases Therefrom. Felix von Schlippenbach, Stolberg, Germany. (U. S. No. 1,069,191, Aug. 5, 1913.)

COPPER-ORE TREATMENT—Method of Recovering Copper from Its Ores. Edward Schaaf, St. Marys, Mo., and Stephen G. Martin, Chicago, Ill., assignors of one-third to William O. Bartholomew, St. Louis, Mo. (U. S. No. 1,069,981; Aug. 12, 1913.)

GOLD SEPARATOR. John F. Kellogg, Guthrie, Okla. (U. S. No. 1,070,695; Aug. 19, 1913.)

BLAST FURNACES—Ejector for the Smoking Gases of Blast Furnaces and the Like. Ernst Ritter Schikich von Vellebit, Vienna, Austria-Hungary. (U. S. No. 1,071,596; Aug. 26, 1913.)

CORROSION—Treatment of Iron or Steel for Preventing Oxidation or Rusting. Frank R. G. Richards, Coventry, England. (U. S. No. 1,069,903; Aug. 12, 1913.)

INGOT MOLD. William R. Bossinger, Marion, Ohio. (U. S. No. 1,070,106; Aug 12, 1913.)

REGENERATIVE FURNACE. Luther L. Knox, Avalon, Penn., assignor to the Knox Pressed & Welded Steel Co., Niles, Ohio. (U. S No 1,070,486; Aug 19, 1913.)

STEEL TREATMENT—Process of Treating Melted Metals Alloys, and Steels for Removal of Gas. L. M. V. H. Baraduc-Muller, Paris, France. (U S No. 1,071,632; Aug. 26, 1913.)

SUBLIMED LEAD—Apparatus for Producing Sublimed Lead. Louis S. Hughes, Chicago, Ill. (U. S. No. 1,070,688; Aug. 19, 1913.)

THORIUM—Process of Obtaining Thorium. Morduch Koss, Oranienburg, near Berlin, Germany, assignor to Chemische Fabrik Germania Gesellschaft mit Geschrankter Haftung, Oranienburg, near Berlin, Germany. (U. S. No. 1,069,959, Aug. 12, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Aug. 28

**Four New Laws Directly and Exclusively Affect the Mining Industry.** Two others while not directed especially to the mining industry have a direct effect upon mining. These mining bills provide: (1) For the reconstruction of the state mining bureau; (2) for making oil pipe-lines common carriers; (3) for the investigation of injury done by waste from smelting plants; (4) for the establishment and maintenance of telephone systems in mines 500 ft. deep. The two laws which affect the mining industry and are not classed as mining bills provide: (1) For the regulation of the use of water and the creation of a state water commission; (2) for workmens' compensation and the establishment of a state compensation insurance fund. The act known as the "blue sky" law will also affect the mining industry so far as the mining-investment companies are concerned. This law vests in the commissioner of corporations sole authority to regulate and sanction any investment company. The law amending the corporation license tax law is another that affects the mining industry. This law provides for the reinstatement of corporations which forfeited their charters for nonpayment of the license tax. It is probable that the workmen's compensation law and the law for reinstatement of corporations will be met by a demand for a referendum. The law providing for the establishment and maintenance of telephone systems in mines is one that is necessary for the mining companies which heretofore have been dilatory in providing underground communication. It is considered by proponents of the law reconstructing the state mining bureau that the section granting to the state mineralogist or his qualified assistant the right to examine mines will enable him to make investigations in case of accidents or irregular or unlawful operation of mines. But this matter is wholly covered by the workmen's compensation law and there is nothing in the law reconstructing the state mining bureau which gives to the state mineralogist any power or authority to investigate accidents or the improper or unlawful operation of mines. The section regarding power and authority to enter and examine mines, quarries, wells, mills, reduction works, refining works and other properties and buildings, relates merely to the gathering of data to comply with the provisions of the act. The antidiscriminatory law which forbids the sale of a product at a less price in one section of the state than in another is particularly beneficial to the oil industry. Governor Johnson did not sign the act providing for the protection of oil wells for the infiltration of water from other wells. Only a few of the oil men had any hope or expectation that this act would become a law.

### DENVER—AUG. 30

**The Building of the Moffat Tunnel** seems now in a fair way to be commenced. The tunnel is on the Denver & Salt Lake R.R., and will cut through the main Rocky Mountain range about 50 miles west of Denver at an elevation of approximately 9000 ft. above sea level, will be 6 miles long, and penetrate the mountain half a mile vertically below the summit. The bond election is expected to be held about Oct. 15. Meantime, an agreement upon the terms by which the tunnel may be built has been reached by the tunnel commission and City Attorney, I. N. Stevens, and will be submitted to Newman Erb, president of the Denver & Salt Lake R.R., at once. It conforms, except in minor and unimportant details, to the draft of an agreement submitted several weeks ago by Erb to the commission, and it is believed that the instrument, as amended by the commission, will be acceptable to both the city and the road. The commission states that it desires to provide a tunnel for the purpose of supplying the city and county of Denver with water and electricity for use by the inhabitants thereof, and is of the opinion that such a tunnel can be most economically constructed by subjecting it to railroad transportation purposes. For this reason the tunnel commission believes it advisable to grasp the present opportunity to construct a tunnel, which shall be useful for transportation, water and electricity alike. The general plan in a few words is as follows: Three experienced engineers to go to work, within 30 days, to select final site; city's share of cost must not exceed $3,000,000; any excess cost to be paid by railroad; city must have perpetual easement for transmission of electric current and water; title to tunnel site and its approaches must be vested in the city and county of Denver; company agrees to provide trackage rights for other roads 30 miles east of tunnel and 72 miles west, and railroad is to furnish electric current necessary for operating through the tunnel. It is expected that the tunnel will intersect many metalliferous veins, which are indicated on the surface, and the city is to be given title to all mineral veins or deposits. The cost will be probably $6,000,000 and the time required at least six years.

### BUTTE—AUG. 27

**The Introduction of the Mono-Rail** system of transportation in Montana has been undertaken by the Industrial Transportation Co., a Montana corporation having its headquarters at Butte, capitalized for $100,000, in shares of stock of $1 par value. The officers of the company are: H. H. Edwards, president; D. Van Buskirk, secretary; and F. Smazel, treasurer. The object of the company is to invest the money from the sale of stock in building a system of roads in Montana. There are a number of mining districts in the state which are prevented from being large producers of precious metals only by the prohibitive cost of constructing railroads for transporting the ore to market. The reason for this is, of course, the great expense incurred in grading roads in the uneven, mountainous country surrounding these locations. With the single-rail system, however, the necessity of grading is done away with, as the road is built upon uprights so placed as to maintain an even grade. The company has on exhibition a working model of the motor used in hauling. The motor is situated midway between the two swivel trucks, and power action is direct on the drive wheels, which have a 10-in. face. If the grade is not too steep, the friction grip between the drive wheels and the rail is sufficient to prevent slipping, but with a steeper grade a cog rail may be employed. When electricity is available for operating the motor, the current may be conducted by trolley, or by heavy wire running along the sides of the track. The car which is designed to carry a minimum of about 20 tons of ore, is placed over the motor, the entire weight of car and motor being on the drive wheels. Trailers may be used.

### CALUMET—Aug. 30

**Conditions Throughout the Strike Zone** of the Lake Superior copper district were during the last week devoid of serious disturbances. The strikers held several parades early in the mornings at Calumet, at the time when the men were going to work at the Calumet & Hecla property. These demonstrations consisted of 300 to 500 men in line, accompanied by several women. The women throughout the district are doing picket duty, and are becoming a disquieting factor in the situation. They become bolder on each successive appearance and some of them have become abusive in their language. At the South Range, several non-union men have been attacked by parties of these women, who have thrown stones, and used brooms as weapons. Several arrests have been made, and it is becoming evident that the next outbreak will be the result of the women pickets. At the Mohawk mine, union men have been operating the underground pumps and the boilers for the pumps, but the union officials have called these men from their posts and the property is again flooding. The Calumet & Hecla is operating at 11 of its shafts and is shipping about 1800 tons of rock to the mill daily. Superior is shipping about 300 tons of rock daily and the No. 2 shaft of the Isle Royale is also shipping ore to the mills. The Quincy is operating on a limited scale as is the Champion and Baltic of the Copper Range. Additional men are reporting for work daily at several of the properties. Some of these men are those who have left the union ranks and others are those who had been intimidated and have been afraid to go to work. The military forces have been further reduced, but more men have been added to the mounted patrol.

The mines will be months in getting back to normal working conditions. It is slow work. In all cases where work has been resumed the English, Scotch, Irish and Welsh miners were the first to return to work while the Scandinavians have been quite as loyal. The Victoria never suspended. The White Pine too has been operating two shafts right along, none of the miners at either of these properties having affiliated with the federation. It is generally understood that neither the Franklin, nor the Winona are in any hurry to resume operations, being content to wait until there is no sign of trouble of any kind and the labor market straightens out. There have been rumors to the effect that the Winona would suspend operations indefinitely. These stories are untrue. The Winona recently installed a machine in the stamp [illegible] is doing satisfacory work. In fact it is confidently [illegible] that at last the concentration and extraction problem which has been keeping Winona out of the paying class for a good many years has been solved. Winona rock shows up fine in assays but not in mill results, the copper being flaky and getting away in the washing in the mill. The new process aims to recover this flaky copper. It was working out very satisfactorily when the strike came along and caused suspension of operations.

The failure of the strike can be laid to the crude methods pursued by the officials of the Western Federation of Miners. In the first place they practically turned the management of the strike over to the Socialists and that means the Finnish Socialists for the others are few. The Socialists made the mistake of thinking that the strike offered them an opportunity for the spread of their doctrines. Instead of that it has resulted in awakening among the entire people of the copper country a feeling of resentment against them. Up to this time the public here had been prone to look upon the Socialist movement, more noticeable among the Finns than any others, with tolerance. Now they believe that the strike is an outgrowth of the development of this movement. It is pretty generally understood that the majority of the Socialists will hold out for a long time. In fact it is known that they will not return to work, for one most important reason, that the mine managers will not take them back, even when they do desire to get on the pay roll again. Then, in bringing in speakers like Mother Jones, John Walker, Miller, Cannon and others the leaders misjudged their people. Mother Jones gave the usual vituperative harangues, cursing and swearing and abusing religion, workmen and everything else. It was pitiable. It reacted dangerously for the strike leaders. Then Walker, Cannon and Miller abused the soldiers of the Michigan National Guard, charging them with all manner of offenses known to be untrue. The agitators overdid the game. They made their charges and their addresses too strong, so ridiculous in fact that they lost whatever good effect they might have secured by the very exaggeration of their detail. John Mitchell was here for two addresses. He made fair labor talks and while he promised the local federation members pleasure if they won and sadness if they lost he assured them it was their fight and not his. Incidentally he didn't promise any financial assistance. That was something of a disappointment too. Mitchell did not have as large audiences as did Mother Jones. Most of the crowds that heard Mitchell could not understand him, as they had a rather limited knowledge of English. Another thing that has worked to the detriment of the strike leaders was the failure to make good on the promises of strike benefits. While it was not put down in writing the fact is that the organizers for the federation working before the strike started and immediately afterward promised members that they would receive $1 per day strike benefit, from the day the strike started, the money to be paid after the strike had been in operation for 30 days, this money to come from the national organization. No outside money has as yet come into the district to help the strike, excepting funds from the Butte federation men. That money came, accompanied by a couple of Butte federation members who are here to see that it goes to needy strikers, not to agitators. The only benefits that have been paid have come out of the local treasuries, and the sick fund has been drawn on for most of this money. Fat fees to lawyers, large expense accounts to agitators have eaten into the funds materially and all the talk of hundreds of thousands of dollars from other sources, seems so far to be founded on hopes and nothing more material

### MIAMI, ARIZ.—Aug. 27

**The Inspiration Consolidated, vs. New Keystone** suit, was argued in the Superior Court, Aug. 26. Judgment was in favor of New Keystone. The legal issue was whether or not a connecting drift or tunnel right-of-way constituted a public use. The importance of the case and novelty of the issue led to the employment of eminent counsel on both sides. Curtis H. Lindley, author of "Lindley on Mining Law," [illegible] Inspiration Consolidated that the court accept the view entertained in Nevada and Utah, that mining is the [illegible] industry and that economical progress of industry is [illegible] benefit in which the public participates, and therefore a public use in a liberal sense. R. L. Alderman of Alderman, & Elliott, attorneys for the Miami Copper Co. contended for the New Keystone, that the provisions of the constitution of the State of Arizona show adoption of the view entertained in Washington, that no private industry should be habilitated with exceptional powers of eminent domain granted mining companies in Nevada and Utah. Inspiration Consolidated has announced the intention of carrying the case to the highest court.

### CORDOVA, ALASKA—Aug. 10

**An Adverse Report on Bering River Coal** is expected by Alaskans. It is thought that such a report will be submitted to the authorities in Washington on the test of the 700 tons of coal mined from the Bering River coalfield which is now aboard the U. S. cruiser "Maryland" on the way to San Francisco. The test of the Bering River coal has not been a success. It has been repeatedly charged that the government officials, either intentionally or otherwise, mined coal of an inferior quality. The better grade was available but it was not brought to light. The "Maryland" did not get far along with its harbor tests. In starting to make the test the engineer of the "Maryland" soon realized that the coal had been exposed to the elements to such an extent that it was so broken and wet that the coal would cake and almost put out the fire. The coal will be dried before making the test in San Francisco harbor but even then little is hoped for in the ultimate result for the reason that most of the coal brought out has been found to be largely mixed with slate and crushed coal which has cost the Government to date over $100,000. It is hard or almost impossible to convince an Alaskan that in regard to the country's coal fields, a little "job" is not being "put over" by those on the "inside."

### McCARTHY, ALASKA—Aug. 7

**A Shushanna Report** by Dr. Charles Cairnes, the Dominion geologist who has just returned from the scene of the latest Alaskan gold discovery states that the strike is undoubtedly rich, but the known area is as yet necessarily limited. He reports that he found good gravel on four creeks. The claims extend to the Canadian side. He and all his party staked placer ground. Cairnes' report is particularly gratifying and bears out the reports brought out from the new diggings by several prospectors who have come out to replenish their stores. Andy Taylor one of the three discoverers who brought out 190 oz. of gold "dust," July 25 has received an assay report from the Canadian Bank of Commerce that it contains gold worth $3185 and silver worth $17. The dust was the result of four days work by two men and the area from which it was taken was about 25 ft. square. The depth of gravel is from 18 in. to 3 ft. on Taylors claims. The largest nuggets found were worth about $20, but many have been found ranging in value from $2.50 to $8. Chief of Police Henneke of Cordova who arrived at McCarthy, Aug. 5, states that practically all the claims have been staked on Johnson Creek and its tributaries, Bonanza and Little Eldorado, and on Wilson with its tributaries, including Alder Gulch, Snow Gulch, Glacier Gulch, Big Eldorado and Gold Run. About 300 claims have been staked so far. He further states that Guando Creek about 12 miles long and just east of the new diggings has a few stakes at its mouth and that there are numerous other large creeks on which good holdings may be developed. Most of the best known creeks are held and those men who are coming in have not brought sufficient provisions to prospect extensively. The Hamshaw expedition which came in upon the first news of the discovery has bonded the claims of Billy James and his partners at Discovery for $150,000. At the mouth of the Eldorado there is a good quantity of red porphyry, rough and decomposed, which goes 35 to 50c. per pan. The Hamshaw people are preparing to hydraulic this as their rights give them 1000 miners inches of water. There are stakes at the mouth of this creek showing that quartz claims had been located on it in 1903. Carl Whitham, who has been seven years in the Copper River country has located a rich claim on Little Eldorado, No. 1 Above. He has taken out $1.25 per pan and is now whipsawing lumber to put up sluices. United States Commissioner and Recorder Morgan has established an office at the mouth of the Bonanza. He has received several hundred location filings and a few powers of attorney. Some of these powers were filed after the claims had been located, and a few are signed by Canadians, as a consequence of which there have been instances where Americans have relocated claiming that unless a man is a citizen of the United States or has declared his intention to become such, that he has no rights. About 150 gold seekers came in Aug. 6 from Cordova. Falcon Joslin, a Fairbanks railroad man and well known Alaskan states that he will put in a wireless outfit at the new diggings. The collector of customs at Whitehorse has sent out word that he has received notice from Ottawa that goods can be transported over the border without paying customs duty.

# THE MINING NEWS

## ALASKA

ALASKA TREADWELL (Douglas)—In July 77,973 tons of ore milled yielded bullion and concentrate worth $192,435 or $2.49 per ton, $87,165 being estimated net profit.

ALASKA MEXICAN (Douglas)—In July 17,493 tons of ore treated yielded bullion and concentrate worth $37,066 or $2.14 per ton, $9923 being estimated net profit.

ENSTROM BROS. (Fairbanks)—These Ester Creek placer operators have been forced to close their plant because of an excess of water in the drifts and an undersupply at surface for sluicing.

HUDSON BROS. MINING CO. (Fairbanks)—J. B. and N. R. Jesson have sold to Michael Beegler their one-fourth interest in seven lode claims on the left limit of Ester Creek, a one-fourth interest in the stamp mill erected last autumn, and half interest in the Louis association placer claim. The consideration was $6000. The claims are now being developed by the Hudson company.

J. GIUS (Fairbanks)—Two Bagley bottomless scrapers of 2½ cu.yd. capacity each have arrived for use in opencut work on Pedro Creek. All wearing parts are of manganese steel. A 50-hp., three-drum, double-cylinder engine has been installed for the scrapers. For night work a De Laval electric-lighting set with a capacity of five arc lights has been purchased. Charles Gius has ordered two Bagley scrapers of 1½ cu.yd. capacity, and a De Laval steam turbine-driven, direct-connected centrifugal pump for his operations.

## ARIZONA

### Gila County

A SMELTERY NEAR MIAMI, states the "Arizona Record," is to be built by the International Smelting & Refining Co. The site is at Burch between the pumping station of the Miami Copper Co. and the Fuller ranch where the Miami Wash converges with Pinal Creek.

### Maricopa County

A MILL IS TO BE BUILT on the property of Dan Ainsworth at Morristown. A shipment of lead-silver ore from one claim was made a short time ago.

SUNFLOWER CINNABAR MINING CO. (Phoenix)—A 4-ton pipe retort has been hauled to the property on Sycamore Creek in the Mazatzal Mountains near the old Sunflower ranch.

MONTEZUMA (Morristown)—It is reported that an option has been taken on this old lead mine. The mine was worked many years ago by the Indians, probably for the various oxides which they used for paint.

### Mohave County

NEW JERSEY—The concentrator is reported to be nearing completion and will soon be in operation.

COPPER GIANT (Hackberry)—A compressor has been installed and machine drills are now in use. This mine was recently purchased by representatives of W. A. Clark. Development work is showing unexpected richness in copper.

CHESTER (Chloride)—Much ore has been shipped during the last few months; some of it assayed $100 per ton in silver and lead. At present there is a large shoot of good shipping ore in sight, opened in recent development work.

### Pima County

IN THE OLD HAT DISTRICT in Santa Catalina Mountains, Copper Queen engineers are examining copper prospects.

CALUMET & ARIZONA (Warren)—The preliminary survey of a railway from Tucson to the properties of the company in the Ajo district is being made.

### Pinal County

REYMERT (Superior)—Development work is confined to the shaft and as soon as it is finished extensive development will be done.

AJAX—The shaft is now down 180 ft. It is out of the ore but where it left the vein there was 15 ft. of ore assaying well in copper lead and zinc with small amounts of silver and gold. The owners, Benedict Brothers, are working 10 men.

KELVIN-SULTANA (Kelvin)—The raise from the 300-ft. level is up 25 ft. and the first intermediate level has been started. At this place the vein shows 20 in. of clean chalcopyrite and more than 2 ft. of concentrating ore. Work has been resumed in the No. 1 west drift at the 300-ft. level.

### Yavapai County

SENATOR (Prescott)—The first Monell slimer to be used in Arizona has been introduced at this mine.

POLAND (Prescott)—The mill on Big Bug Creek will be started for a test run: 100 tons of ore from the Fortuna mine, owned by Stukey brothers will be treated. This property is on Lynx Creek only a few miles from the mill and was formerly a producer. If results of the test are satisfactory the development work will be continued and regular shipments made.

## CALIFORNIA

### Amador County

HARDENBERG (Jackson)—The shaft will be deepened and another station will be opened. The ore from the drift has up to this time provided the mill.

GOOD HOPE (Jackson)—A suit has been filed in the superior court in San Francisco by George van de Mark and Charles Peters, owners of this property, against E. A. Freeman for the recovery of stock shares, which they claimed he had held in trust while promoting a sale of the mine.

VOORHIES (Sutter Creek)—The cyanidation of the sulphide dumps at the old reduction works has been begun. The indications are that the venture will be commercially successful. The tailing accumulated during several years of operation of the mine when chlorination was largely practiced. Benjamin Hall, of Nevada City, purchased the dump and built the cyanide mill.

EAST EUREKA (Sutter Creek)—The pumps, tracks and tools are reported to have been removed since the mine was closed down. It is said the company failed to exercise its purchase option, and that L. R. Poundstone, the owner, is again in occupancy. A 20-stamp mill was built early last year, but before the orebodies were sufficiently developed to assure the necessary ore supply. The mining has been well done and the equipment is modern.

### Merced County

POCAHONTAS (Le Grand)—This copper mine is reported closed down.

### Nevada County

OSCEOLA (Grass Valley)—This is one of the old mines in the Rough and Ready district, which is being reopened under the management of E. W. Tarr. The old tunnel has been cleaned out and a 150-ft. raise to the surface has been made, to be used as a working shaft.

BIRCHVILLE MINING CO. (Nevada City)—It is reported that permission has been obtained from the state water commission to use the waters of Weaver Lake for supplying the mine with power for generating electricity. The outlet of the lake is said to be owned by the Northern Water & Power Co., which may make a judicial test of the right of the commission to grant the permission.

### Placer County

PROGRESSIVE MINING CO. (Iowa Hill)—The installation of a plant for working the old tailing dumps of the hydraulic mines on the north fork of American River is contemplated. The plant was tried out on the Bumpus hydraulic mine in Indian cañon. The method is an elaboration of the old sluice and riffle. The gravel is passed through a revolving screen, the fines going to a hopper and thence to the riffles.

### Plumas County

A RECONNAISSANCE OF THE MINING INDUSTRY in Plumas County, has been begun by the State Mining Bureau; the report of the field assistant, Errol MacBoyle, is to be incorporated in the general report for 1913 to be issued by the bureau. This county was well represented in the thirteenth report of the bureau, which was the last of the general reports issued. That was in 1896. The large number of mines represented in the report indicated that Plumas was then one of the important mining counties of California. There were then 22 mills in operation. In most districts the mining seasons are short because of high altitudes and heavy snowfall. The industry has progressed, but not as rapidly as it would had there been more general publicity from official sources. Within the last two years the attention of mining investors has been drawn to the possibilities of the county through reliable news in the technical press.

### San Benito County

PACIFIC QUICKSILVER MINING CO. (Dos Palos)—Seventy flasks of quicksilver were shipped from the mine in the Little Panoche district in July. Additional furnaces are contemplated, and a compressor and power drills will be installed.

### San Diego County

MONTEZUMA (Warner Hot Springs)—Development is progressing at this mine in the northeastern part of the Mesa Grande district, or rather in a practically new district now known as the Warner Springs district, about 45 miles northeast of San Diego. There are 18 claims in the holding. The development is confined to two claims. The 200-ft. shaft will be deepened to 250 ft. and the second drift will be driven at that point. The drift at the 150-ft. level has disclosed good ore in stringers or shoots. The vein matter is irregular in width. The surface equipment consists of a 5-stamp mill, concentrating tables, hoist, compressor, power drills, ore bins and other equipment. The mill is being used for development and is operating full 24 hr. per day. Water for milling is taken from the shaft, which yields 75,000 gal. per day. There are springs at an elevation of 1500 ft. above the millsite that will furnish water for a large mill, which will be built if development warrants.

### Shasta County

BALAKLALA (Coram)—James Doyle, for five years foreman of the Midas mine, has been engaged as foreman of construction in preparation for the testing of the Hall desulphurizing process to be installed by H. F. Wierum for the First National Copper Co.

## COLORADO

### Clear Creek County

WORKING TEST OF THE NEW EDISON PROCESS of ore dressing is at last to be made. Two carloads of machinery were shipped to the Waldorf Consolidated company in the East Argentine district which will be used at the mill near the portal of the Wilcox tunnel of that company. This mill which has been a failure to date, is to be equipped now with the Edison machinery under the personal supervision of J. B. Ballantine, chief engineer for Thomas A. Edison.

GILT EDGE MINES & SMELTING CO. (Alice)—The Aurora group of lode claims is being developed. An electrically driven compressor plant at the portal of the Aurora tunnel is being completed. The 20-stamp mill will probably be started in the near future.

### Lake County

CORE DRILLING AT LEADVILLE is to be done by James [illegible] of Denver, on a large undeveloped territory extending from the south side of Big Evans Gulch down and over the east end of Fryer and Yankee Hills, through which it is believed that the oreshoots of Carbonate, Breece and Iron Hills have their course. A bond and lease of 40 claims has been obtained from the several owners and a contract has been let to put down drill holes to a depth of 1000 ft. if necessary, to locate the oreshoots. When this is accomplished a main working shaft will be sunk. Three drills will be kept going steadily.

### Larimer County

. A GOLD DISCOVERY has been made on the Rustic property by Norman Haskins. Thirty years ago, there was a gold excitement 65 miles northwest of Fort Collins, which drew hundreds of prospectors to the foot of the Medicine Bow range at that place. They sought the mother vein from which came the rich pockets of free gold; but they never found it. It is reported that Haskins was making an excavation for a waterwheel on the banks of the Poudre River and that he uncovered the vein, the ore of which assays $100 in gold per ton. Haskins is a wealthy man and will sink a shaft on the ore at once and use the water in the Poudre River to generate electricity to operate the mine.

### San Juan Region

A TAILINGS TREAMENT PLANT is to be built by A. R. Wilfley and Otto Mears, of Denver, who have visited Silverton for the purpose of looking into the matter of treating the tailings of the old Silver Lake mine in Arrastre Basin on which a lease has been taken. The tailings are estimated at 300,000 tons, which it has been proved can be treated at a profit. A 500-ton mill will be built, and a system of concentration invented by Wilfley will be followed. The mill will be built near the North Star bridge and close to the Silverton Northern R.R.

### Teller County

RAVEN & BEACON HILL CO. (Cripple Creek)—This property is operated by the Elkton company and the main workings connect with the Elkton by a crosscut at the 700-ft. level. The oreshoot now under development is producing 200 tons per month.

EL ORO (Cripple Creek)—The strike in the Eclipse tunnel on Battle Mountain is increasing in size and value. The ore is said to be 20 ft. wide. A shipment of 12 tons has just returned $450 net after deducting cost of freight and treatment. A 500-ton cyanide mill is being built by the company.

ELKTON (Cripple Creek)—Checks for the quarterly dividend were mailed Aug. 23. The dividend at the rate of 2c. per share will amount to $50,000 and will bring the total amount paid in dividends to date to $3,229,460. The gross production of the company as certified to the Colorado Springs mining stock association to Jan. 1, 1913, had amounted to $10,930,086. The property has produced approximately $11,250,000 gross.

## IDAHO

### Bonner County

IDAHO-CONTINENTAL (Port Hill)—The 14-mile transmission line being built from the power plant at Boundary Creek to the mine is nearing completion. Work at the powersite and at the mine is progressing satisfactorily, and there is little doubt but that the buildings will be completed and the equipment ready to operate by Christmas. The concentrator, office buildings, boarding and bunk houses are already under construction and soon will be ready for the roofs, and the power-plant building foundations are in shape to begin erection of the superstructure immediately. The sawmill will finish preparing the timbers for the different buildings soon and the last of the concentrator, compressor and electric machinery has been delivered and is ready to be installed. From 125 to 150 men are employed and this force will be increased if necessary to insure the completion of the work before winter.

### Coeur d'Alene District

JACK WAITE (Union)—Important strikes in both the upper and lower tunnels have been made and it is said that the ground at the mouth of Tributary Creek, 2 miles from the property, will be prepared for a 300-ton concentrator. An aerial tramway will be built to connect the mine and mill and both are expected to be ready to operate by Jan. 1, 1914. Plans have been outlined for extensive development of both of the orebodies, and a 50-hp. steam engine and boiler have been ordered for operating the compressor plant when the [illegible] power is inadequate. The most important strike was [illegible] the lower or 700-ft. level. The first oreshoot that [illegible] in the upper workings was encountered. Extensive [illegible]ts of high-grade ore were made several months ago [illegible] shoot in the No. 1 tunnel. The strike was made [illegible] from the tunnel portal 800 ft. vertically below the [illegible] and 1200 ft. on the dip of the vein. The vein has been crosscut 3½ ft. from the foot wall and the hanging wall has not been reached. About 32 in. is high-class [illegible] ore; the remaining 10 in. is clean shipping ore.

## MINNESOTA

### Cuyuna Range

ON THE JAMISON & PEACOCK TRACT near Crosby, active drilling operations have been commenced. The ground was recently optioned to a subsidiary of the Northern Pacific Ry. Four drills are at work. The property adjoins the town of Crosby. A peculiar feature, indicated by former drilling, is that this 40-acre tract contains two separate parallel ore lenses, one of Bessemer and the other non-Bessemer grade.

DULUTH-BRAINERD IRON CO. (Iron Mountain)—Sinking has been started in the 3-compartment shaft. The overburden is but 60 ft. deep. The ore is manganiferous.

BRAINERD-CUYUNA CO. (Brainerd)—This company has commenced to sink a shaft on lands one mile south of the village work having started on Aug. 11. The shaft will be sunk to a depth of 200 ft., when crosscuts will be driven to the ore. The company hopes to be shipping ore next season.

DELL DEVELOPMENT CO. (Manganese)—An exploration shaft is being sunk on the Harker-Hammel property under the direction of John T. Jones. Clearing and preliminary construction work has also been commenced at the site of the company's new furnace plant at Aitkin. The site is on the Mississippi River, enabling the rafting of firewood which forms a large proportion of the fuel used in the Jones reduction process.

PENNINGTON (Crosby)—Regular shipments are now being made from this mine, which shipped its first ore a few weeks ago. The work of stripping the property was started last February, and in the period of six months the company moved 1,100,000 cu.yd. of dirt. The ground was ideal for digging, not a large boulder being encountered. The overburden was sand for a depth of 75 ft. The little water that was encountered was easily taken care of. The property is under lease to Todd-Stambaugh & Co.

### Mesabi Range

THE MINNESOTA STATE TAX COMMISSION toured the Cuyuna, Mesabi and Vermilion ranges recently, obtaining data on which to base valuations of the iron ore deposits for taxation purposes. Last year the ore land valuation was $260,000,000 or 22.55% of the total real property assessment in the state.

DRAINING OF CARSON LAKE is planned by the Oliver Iron Mining Co., which owns the ore under the lake, two miles west of Hibbing. Work is to be started at once and stripping operations will be begun preparatory to shipping ore next season. This property is well known because of the fact that the Oliver company for the past several years has exhibited at the Minnesota State Fair a model of the property, showing the lake,, overburden, ore, taconite, etc., in sections.

SUSQUEHANNA (Hibbing)—This pit, within a block of Hibbing's business center, is shipping 200 cars of ore per day. Steam shovels are now at work making a new cut around the pit, which is extremely narrow, in order to reduce the grades and permit greater production.

## MISSOURI

### Joplin District

PORTLAND (Carterville)—A modern concentrator is being built on the lease and the company expects to have it in operation within six weeks.

OLD EMPIRE (Galena, Kan.)—A second pumping plart is now being installed and plans are being made for the development of the ground which showed ore in eight drill holes. Drainage is the problem of prospecting.

BLUEBELL (Wentworth)—Twenty-two tons of blende and 15 tons of silicate were produced this week. The company has a large tract of land yet to be prospected. Some smaller properties near the Bluebell are taking out calamine and galena.

WEBB CITY-LEHIGH (Carl Junction)—After a month's shutdown this company has resumed operation. Operations ceased for a time in order that some repairs on the plant could be made. At that time a carload of ore per week was being turned out.

NILSON LAND (Carl Junction)—A. J. Shockley and associates, of Joplin, have taken a lease on 40 acres of this land and will sink two shafts. The tract has been well drilled and the operators plan to build a mill as soon as the shafts have reached the ore. The fifth drill hole just completed showed good ore at 170 to 190 ft.

BLOOMINGTON LAND (Galena, Kan.)—Holden & Boice have just opened up a rich shallow deposit of lead and zinc on this ground at a depth of but 9 ft. from the surface. Being in the heart of the old Galena camp it is one of the few spots overlooked in the years when the camp was first discovered and all the mining done was at a shallow level.

ISHERWOOD LAND (Carl Junction)—Prospecting by McClain & Gaines, of Galena, Kan., has revealed some promising deposits of blende. The work will be continued during the remainder of the summer and autumn. While the drill prospecting is going on, shaft sinking and underground development work is also being rapidly forwarded and another mill will be in operation soon. Hand jigs are now being used to clean the ore taken from the development drifts.

### St. Francois County

LEAD MINERS RECEIVE INCREASED PAY but the union will not be recognized in the Flat River lead country. The miners agreed to accept a wage increase of 25c. per day. The plan of settlement was that submitted by the state board of mediation and arbitration. It provides that if any miner feels at any time that he has been unjustly treated he may submit his grievance to the state board of arbitration. The mine owners agree to abide by the decision of the board. The board of mediation, at the conference Aug. 26 at first proposed a wage increase of 20c. This was rejected by the strikers. The 25c. increase then was proposed and accepted by both sides.

## MONTANA

### Butte District

BUTTE ELECTRICIANS PLAN ANOTHER STRIKE to be started just as soon as sufficient time intervenes to admit of its being ordered in the regular way. If the men do not make their demand for another month, the electrification of the Butte, Anaconda & Pacific R.R. will be completed, and a large number of the linemen will be out of work.

CORBIN COPPER CO. (Butte)—Sinking on the Gambrinus is continuing at a record rate. The work is being done by contract.

PILOT-BUTTE (Butte)—The south crosscut on the 1800 level shows 9 ft. of 9% copper ore, from which the company will begin shipments. There are rumors that there is some doubt as to the apex ownership of this vein.

BUTTE & SUPERIOR (Butte)—Official statements are that the company is now earning good profits and has done so for some time. Both sections of the reconstructed mill are in satisfactory operation. The mill is treating about 1000 tons of ore daily.

BUTTE & MINNESOTA (Butte)—The company, which owns property about five miles southwest of Butte, has stopped operations, after having sunk a shaft a short distance. Options, secured several months ago, on a number of claims in the Wolf Creek district, between Helena and Great Falls have been taken up and development work will be done on them.

ANACONDA (Butte)—A runaway cage in the Berkeley mine so badly damaged the shaft that it has been decided to close the property. While repairs are under way, a change from steam to compressed-air hoisting will be made, and the Berkeley will be the twelfth mine of the company to be so changed. A change of hoisting power is being made in the Badger State mine, which is closed for the purpose.

### Broadwater County

A TUNGSTEN DEPOSIT in the southwestern portion of the Radersburg district, in a belt of quartzite, will be investigated. It has been known for some time that tungsten ore occurs there, but whether or not of commercial value has not been ascertained. A tunnel will be driven into the formation.

### Granite County

HICKEY HILL (Philipsburg)—Scherr Brothers have succeeded in trenching across the vein. A number of attempts to locate the vein in the past have proved unsuccessful.

ROYAL BASIN (Philipsburg)—The crosscut tunnel is now 750 ft. long and is expected to cut the vein at about 800 ft. On No. 3 level, a drift is being driven on copper-sulphide ore of good grade carrying 10½ oz. of silver per ton. Edwin Kirk, of the U. S. Geological Survey, recently made an examination of the mine and the surrounding district.

### Lewis & Clark County

DRUMLUMMON (Marysville)—The St. Louis Mining Co. recently closed down this mine because of lack of funds to continue the necessary development work. The cost of repairing the old 60-stamp mill, which was much greater than estimated, is the chief reason for the cessation of operations.

SPRINGHILL (Helena)—During the last two months a force of men has been employed at this property, five miles south of Helena, and some ore rich in gold was recently encountered. A large tonnage of low-grade ore was blocked out several years ago, but on account of inadequate shipping facilities, it could not be made to pay. The company is contemplating the erection of a mill.

VALLEY FORGE (Rimini)—The lower crosscut tunnel on this property, situated 16 miles from Helena, recently cut the main vein at a distance of about 2200 ft. from the portal, tapping it at a depth of 900 ft. on the dip of the vein. The vein where encountered is well mineralized and contains low-grade ore, but the oreshoot opened on the upper levels has not yet been found. The company will drift 200 ft. on the lead, after which a crosscut will be run to the foot wall, and a raise driven from 500 to 600 ft. to connect with the winze above. After this connection is made all ore will be conveyed out of the mine through the tunnel.

### Lincoln County

MONTANA PLACER MINING CO. (Libby)—A complete sawmill outfit is being taken to the plant on Big Cherry Creek, where it will be installed. The mill will be used to saw lumber for camp buildings and for about 1500 ft. of flume. Other improvements will also be made to put the plant in first-class condition for steady operation.

### Madison County

PROSPECT (Virginia City)—It is probable that this mine will be reopened soon. It has been learned from tests that a profit can be made by cyaniding the dump ore and stope fillings. The advisability of erecting a mill is being considered by the owners.

MISSOURI—A suit brought by Charles F. Simon, owner of this lode claim, against John D. Hatfield and others, owners of the Tucker lode claim, and which was being tried at Virginia City, was recently settled out of court by the purchase of both claims by the Ellings of Virginia City. The claims were in conflict, the plaintiff claiming ownership of certain disputed orebodies by reason of previous location; and the defendants alleged that a side line crossing of the Tucker Apex gave them the ore under the rulings of the extralateral rights laws.

### Missoula County

IRON MOUNTAIN (Missoula)—A force of 90 men is working at this property, and the company expects to increase the number this autumn. Regular shipments of ore are being made to the East Helena reduction works, the first-class ore assaying 35% lead and 70 oz. silver per ton. The shaft is down to the 2000-ft. level.

## NEVADA

### Humboldt County

CAUSTEN (Rochester)—A shoot of good-grade ore has been cut at a depth of 430 ft. This is of interest, as it demonstrates the depth so far known of oreshoots in Rochester.

ROCHESTER MINES CO. (Rochester)—A suit has been filed by John F. Cowan, for himself and other minority stockholders of the company, against Joseph F. Nenzel, president, to restrain him from selling 424,000 shares of the treasury stock at a price which, it is claimed, will mean a loss of $42,400 to the company. An injunction has been issued. It is claimed that the sale is not necessary, as the royalties from leases exceed expenses.

### Lyon County

WHEELER—The cyanide plant, which will treat tailings from the mill, will soon be in operation.

McCONNELL (Mason)—Development on the oreshoot recently discovered on the 200-ft. level, is progressing with satisfactory results. The ore is sulphide, while that on the 100-ft. level was in the oxidized zone.

NEVADA-DOUGLAS (Ludwig)—Plans and specifications are being made for the erection of a leaching plant. Construction work on the first unit will be begun within the next 60 or 90 days; plant to consist of five units, each of 100 tons capacity.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Aug. 21, 1913, were as follows: From Mason Valley mine, 2043 tons; from Nevada-Douglas, 850 tons; from other mines, 1403 tons; total, 4296, or a daily average of 614 tons. During the same week four cars of matte were shipped.

### Mineral County

BLACK HAWK GOLD MINING CO. (Rawhide)—The two car loads of machinery for the new mill and cyanide plant are being freighted in from Fallon.

ANDERSON PROPERTY (Luning)—A raise has been driven from the glory-hole level to the upper-tunnel level, and this level has been connected, by a second raise, with the surface, where a second glory hole has been started. The drift on the glory-hole level has passed through 40 ft. of 5% copper ore. A shaft is being sunk at a point 50 ft. south of the main glory hole, and is now down 75 ft. A drift has been started north from the shaft to connect with the 50-ft. winze level. In the shaft, 15 ft. of wash was first passed through, then 20 ft. of ore, and this in turn was followed by iron-stained lime with good indications of another orebody at depth. Work on the Finney tunnel has been discontinued for the present. The mine is shipping 60 tons per day.

### Nye County

PRODUCTION OF TONOPAH MINES FOR JULY totaled 48,227 tons of ore valued at $961,440, distributed as follows: Tonopah Mining, 14,250 tons; Tonopah-Belmont, 13,558; Montana-Tonopah, 4365; Tonopah Extension, 5016; West End, 4045; MacNamara, 2439; Jim Butler, 1603; Midway, 150; North, 2028, and Merger, 773 tons. Owing to the holidays there was a falling off of 340 tons compared with June.

LITTLE GREY (Manhattan)—The shaft has been sunk by lessees to the 260-ft. level, and development on this level is being done.

GOLD CRATER (Manhattan)—Crosscuts are being driven from the shaft, on the 160-ft. level, and two glory holes will be opened into them.

### White Pine County

IN THE GRANITE DISTRICT, 25 miles north of Ely, W. D. Campbell and the Bairds have opened up a new deposit of lead ore, which appears to be a continuation of the Cuba mine, which has been worked the last two years by Vanderhoef and associates. From the Cuba mine several cars of ore, assaying about 70% lead, have been taken out in the last year. The ore from the new find will probably have to be milled, as it appears to be a large body of lower-grade ore.

## NEW MEXICO

### Socorro County

PACIFIC MINES CO. (Mogollon)—The 50-hp. motor for driving the compressor has been delivered. Drifts from the third level in the mine are being extended north and south; cut samples have been assaying $36 per ton.

MAUD MINING CO. (Mogollon)—The new shaft has reached a depth of 485 ft. and has been in good ore the greater part of the distance. The company is sending 10 tons per day to one of the custom mills, all coming from shaft development.

SOCORRO MINING & MILLING CO. (Mogollon)—Good progress is being made in the Clifton tunnel, which will intersect the Consolidated mine workings and drain the large flow of water encountered last year, on account of which the 500-ft. level into the Queen was abandoned and bulkheaded.

THE OAKS MINING CO. (Mogollon)—The main drainage and transportation tunnel on Mineral Creek, which will tap the orebodies of the district at depths of from 1400 to 1800 ft., is advancing steadily. In the east end tunnel group, Tunnel "A" has been driven 300 ft. and a contract was recently let for sinking a winze. Work is also going on in Tunnels "B" and "C." Ore from these developments is shipped regularly to custom mills.

ERNESTINE MINING CO. (Mogollon)—A contract was recently let for sinking the main shaft. Considerable water was encountered, necessitating the installation of a pump. A large amount of other development is constantly adding to the already large ore reserves. The mill is treating 150 tons daily with a battery of 30 stamps. Ten stamps additional are in reserve for emergencies. The new oil engines installed several months ago are giving satisfaction and the company now has surplus power.

## OREGON

### Grant County

MORRIS—The silver property near the summit of the Greenhorn [illegible] is being worked by lessees, and the first shipment [illegible] has been made. The mine was discovered [illegible] Morris, a prospector, in the early days, and a patent [illegible] obtained from the Government in 1878. In the days when silver was worth $1 or more per oz., this mine was [illegible] but has been idle for 20 years.

### Josephine County

A GOLD STRIKE of considerable importance is causing excitement on Sucker Creek in the southern part of the county.

AN OFFICIAL REPORT will soon be issued covering the mines and mining business of Josephine County. Dr. Alexander [illegible]ell has the work in charge for the state Bureau of M[illegible] and Geology.

## SOUTH DAKOTA

### Lawrence County

DEADWOOD BUSINESS CLUB (Deadwood)—Trustees to administer the funds in connection with the Heidelberg property, recently taken over by the club, are as follows: George V. Ayres, John Treber, A. T. Roos, J. Goldberg and N. J. Thompson. The first monthly installment has been collected from the subscribers to the proposition, and by Sept. 1 work will have been started.

NEW RELIANCE (Trojan)—After a year's work with a continuous decantation and counter-current solution system of slime treatment, followed by dewatering on a Portland filter, Manager Bowman states that he is well pleased with the operation of the process. An extraction of from 85% to 87% is regularly made, and total milling costs are less than $1.25 per ton. The plant is treating 100 tons daily. During July the total cost of mining and milling was $2.48 per ton, a highly gratifying figure.

HOMESTAKE (Lead)—Connections have been made between workings from the De Smet shaft of the Homestake and the deep shaft of the Columbus, which was recently acquired by the Homestake. The De Smet is the most northerly shaft of the Homestake. Prior to breaking through, the Columbus shaft was drained by water skips and pumping. It is understood that this work in this ground is largely of exploratory nature, and future operations will depend upon the results of development work to be undertaken at once.

TROJAN (Trojan)—Among recent changes at this mill has been the installation of an Ingersoll-Rand single-stage compressor, with cylinder 14½x10 in., belt driven by a 30-hp. motor. This machine furnishes air for agitation of slime, at a pressure of 22 lb.; Superintendent Ellis hopes to reduce this to below 20 lb. The old compressor, which was a smaller machine, was removed to the blacksmith shop, where a Leyner drill sharpener and Leyner drill temperer have recently been added to the equipment. Grading is completed for the new addition to the mill which will house thickeners solution storage tanks and a tube mill, as well as some additional agitation tanks.

## TEXAS

### Cass and Marion Counties

A CARGO OF IRON ORE has been mined and loaded into the steamship "Ogeechee," at Port Bolivar. The cargo is the first shipment of Texas iron ore to be made from Port Bolivar to Philadelphia. The lot weighs 3300 tons and is consigned to Nicoll & Co.

## UTAH

### Juab County

GRAND CENTRAL (Robinson)—Ten cars were shipped the week ended Aug. 9, much of the ore coming from the 2300-ft. level.

GEMINI (Eureka)—Lessees are jigging low-grade ore from upper workings at the rate of 5 tons daily, producing one car of concentrates from three cars of ore. Later on it is planned to enlarge the plant.

AJAX LEASING CO. (Eureka)—This company, capitalized at 1000 shares, par value $10, with A. G. E. Hanke as president, has been organized to carry on prospecting in Tintic. A block of Gemini ground has already been secured.

### Summit County

C. C. CONSOLIDATED (Park City)—Arrangements are being made to finance this company, and if successful it is proposed to carry the main shaft 1000 ft. deeper, from the 450 to the 1450 level. The property is in Thaynes Cañon.

DALY JUDGE (Park City)—Work is progressing on the Arvis slime plant at the mill. Practically all the machinery is on the ground awaiting installation. The work is in charge of Orson Allen, of Salt Lake. The report for the first six months of the year, issued Aug. 15, shows that the company suffered somewhat through the lower market prices for spelter. Mine conditions are good, and much development work is in progress especially toward the Bonanza Flat section of the property.

SILVER KING CONSOLIDATED (Park City)—A dividend of 25c. per share has been declared payable Sept. 16, thus adding another dividend payer to the state. The total distribution will be approximately $155,000. Of the 700,000 [illegible] there are 620,000 shares outstanding with 80,000 shares [illegible] in the treasury. After this dividend is paid there will [illegible] more than $500,000 still in the treasury from the re[illegible]dgment which was paid by the Silver King Coalition. [illegible] compartment shaft which is being sunk under con[illegible] nearing the 1700-ft. level, and will be continued to [illegible] before work is begun on the ore which was cut in

### Tooele County

INTERNATIONAL SMELTING (Tooele)—The usual quarterly dividend of 2% has been declared

### Utah County

THE WAGON ROAD IN AMERICAN FORK cañon has been improved, and kept in repair, since the county took the matter in hand. Throughout the summer there has been considerable activity here, shipments are being made, and development and mining are in progress. Lessees at the Mineral Flat, in working on one of several fissures cut in the main tunnel, opened 14 to 18 in. of first-class lead-carbonate ore, carrying some galena. Prospecting on another promising fissure nearby will be undertaken. One car of ore has been shipped from this property, and another is on the way to the railroad. Work is being done at the Dutchman, Whirlwind, Live Yankee and others

MILLER—Kruse & Wingenfield, lessees on this property, are sacking ore for shipment.

MOUNTAIN DELL (Carbonate)—At a recent sale, Judge Baskin, a creditor to the amount of $6687, acquired the holdings of this company in American Fork Cañon.

PACIFIC (American Fork)—Lessees working this property are reported to be doing well, the company having apparently done the hardest part of the work before turning the ground over to the lessees.
sinking.

## WASHINGTON

### Ferry County

GWINN (Meteor)—A dam is being built which will generate power, and a concentrator is being erected.

POMEROY (Orient)—This mine which has been closed for a long time is to be reopened and operated on an extensive scale.

PARAGON (Northport)—This property has been leased to G. H. Safford, of Spokane, who is making a successful effort to concentrate the ore in the mine dump. Good copper ore is found.

LAME FOOT GROUP (Republic)—The Grandby Consolidated Mining, Smelting & Power Co. has taken an option on the 15 claims of this group and will improve them in the near future.

### Okonogan County

OWASCO (Oroville)—A 100-hp. motor has been installed, and operations are to be resumed in a short time.

## CANADA

### British Columbia

SILVER STANDARD (Hazelton)—A shipment of 280 tons of silver-lead ore to the Trail smeltery is reported to have netted $30,000.

UNION (Gloster)—Shipments of ore from this group, 46 miles up the north fork of Kettle River from Grand Forks, commenced in July. The group comprises the Union, Union Fraction, Idaho and Paper Dollar. The ore is rich in gold and silver, assays giving returns of from $35 to $230 per ton. The paystreak is 16 ft. wide. The ore is being treated at the Granby smeltery, the treatment charges being $6 per ton. This is the first property in either Franklin or Gloster camps to undertake the shipment of ore on a commercial scale.

JINGLE POT (Nanaimo)—At this colliery where the coal miners have been on strike, an agreement was made with the United Mine Workers of America and operations will be resumed immediately with a force of 300 men, which will be added to as soon as conditions at the mine will allow. The settlement gives the miners an increase of about 10% in wages and recognition of the union, which has been the principal point at issue. The Western Fuel Co. is expected to make a similar settlement with its employees. The Canadian Collieries Co. (Mackenzie & Mann) are operating their Cumberland mine with Asiatics and nonunionists. As a consequence of the trouble at Extension, Ladysmith and Nanaimo between the strikers and nonunionists, which resulted in the sending of the milita to those points, about 200 of the nonunionists at Cumberland have left, which will reduce still further the limited output which the Mackenzie & Mann mine at that place has been making.

### Ontario

DR. REDDICK (Larder Lake)—This mine is to be unwatered for an inspection, as negotiations have been opened for its sale.

NORTHERN CUSTOMS CONCENTRATOR (Cobalt)—An order has been placed by this company with the Power & Mining Machinery Co., for 80 stamps, to be delivered at Cobalt within 60 days.

JUPITER (South Porcupine)—This mine has been temporarily closed down, owing to the inadvisability of attempting to market treasury shares at present. The question of financing operations will be considered later.

REA (South Porcupine)—Stoping is being done on the 200-ft. level and the winze is being sunk deeper. The mill-run of the 5-stamp mill, which has been treating ore on the dump accumulated in sinking, has proved so satisfactory that an addition of 5 more stamps will be made.

DOME (South Porcupine)—All machinery for the proposed extension of the stamp-mill has been ordered, and it is expected that the 10 additional stamps will be in operation early next year, increasing the capacity from 370 tons daily to 650 tons or more. Six sand-leaching tanks will also be installed.

DOME LAKE (South Porcupine)—At a special meeting, held in Toronto, Aug. 25, the bylaw increasing the capitalization from $500,000 to $750,000, was ratified by the shareholders. They refused to sanction another proposal of the directors to offer 100,000 shares for sale at a discount of 65%, until fuller information as to the condition of the company had been furnished, and another meeting will be called.

# THE MARKET REPORT

## METAL MARKETS

### Copper, Tin, Lead and Zinc

**Copper**—The market is strong and advancing. The situation is determined fundamentally by the remarkable statistical position. Whenever copper is wanted in any quantity, the price advances. Up to the end of August electrolytic copper was to be had at about 15¾c., delivered, usual terms, and some millions of pounds were disposed of on that basis, going both to European and American consumers. These transactions, although not very large, appear to have absorbed all the copper remaining in second hands, and as producers generally view the copper position with great confidence they readily advanced their prices as the demand developed. However, some of the producers seem to have anticipated the market in their asking prices.

Consumers generally are now well covered for September, although there is still some inquiry for this month's delivery. Refiners are still in arrears with their shipments and early copper is scarce. There is still a good deal of copper that must be bought for October, both by the home trade as well as by the European buyers. The bulk of the business now being done is in contracts for this delivery. Europe appeared as an active buyer on Sept. 2 and prices advanced sharply.

The Lake copper that was in the hands of dealers and the smaller producers for sale now appears to have been wholly absorbed. The only interest that can now supply Lake copper, so far as we know, is the Calumet & Hecla, which is asking 16½c. for its special brand and 16⅜c. for the Buffalo electrolytic.

At the close we quote Lake copper at 16⅜@16½c.; and electrolytic in cakes, wirebars, or ingots at 15.80@16c. Casting copper is quoted nominally at 15.40@15.50c. as an average for the week.

There was a clerical error in our quotation for casting copper last week. The figure should have been 15⅛@15⅜c.

The London standard market has advanced steadily from £71 for spot and £70 18s. 9d. for three months on Aug. 28, to £72 12s. 6d. and £72 7s. 6d., respectively on Sept. 3. The stock of copper in Europe is steadily decreasing, and there is decidedly more speculative interest shown than for some time past.

Base price of copper sheets is now 21c. per lb. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17@17¼c. per lb., carload lots at mill.

Copper exports from New York for the week were 5380 long tons. Our special correspondent gives the exports from Baltimore at 2371 tons for the week.

**Tin**—The London market on Thursday of last week became exceedingly strong, due to large orders which were placed from this side and reported covering of bear sales which were due the beginning of September. This advance, however, was not maintained during the balance of the week, and prices receded, due to the fact that buying from this side ceased and that bear buying seemingly was completed. The favorable statistics published at the beginning of this week again imparted a firmer tone to the market, which has now risen rapidly. Consumers' buying in this market is not of great moment, but active trading has taken place between dealers and speculators. The close is strong at £197½ for spot and £196¾ for three months, and 43½c. for September tin here.

**Spelter**—There seem to be cross-currents in this market. Consumers generally do not appear to be well covered, but they have been holding back. On the other hand, some of the producers have evinced a desire to market some metal. Some moderate tonnages have been sold at considerable variation in price. In the early part of the week the tone of the market was rather soft, but since then demand has improved and at the close the market appears strong. We quote St. Louis at 5.60@5.65c., and New York at 5.75@5.80c.

The London market is higher, good ordinaries being quoted £21⅝; specials £22⅛.

On Aug. 29 the base price of zinc sheets in carload lots was advanced 25c. per 100 lb., to $8 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill. Extras and discounts unchanged.

**Lead**—The strike in southeast Missouri having terminated about the middle of last week, supplies from that direction are again coming into the market and the price for lead at St. Louis has receded somewhat. We quote 4.65@4.70c., St. Louis, 4.75c., New York, market firm.

The London market is strong at £21 for Spanish and £21⅜ for English lead.

### Other Metals

**Aluminum**—The market is quiet, and still waiting on the tariff. Domestic No. 1 ingots are selling for 22@22½c. per lb., and foreign, in bond, at 18¼ cents.

**Antimony**—The market is good, with no change in prices, which stand at 8.35@8.40c. for Cookson's; 7.75@8c. for Hal-

DAILY PRICES OF METALS

NEW YORK

| Aug.-Sept. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 4.8595 | 59⅝ | 16<br>@16⅛ | 15.55<br>@15.60 | 43⅝ | 4.75 | 4.65<br>@4.70 | 5.75<br>@5.80 | 5.60<br>@5.65 |
| 29 | 4.8585 | 59⅝ | 16⅜<br>@16½ | 15.55<br>@15.65 | 42¾ | 4.75 | 4.65<br>@4.70 | 5.75<br>@5.80 | 5.60<br>@5.65 |
| 30 | 4.8575 | 59½ | 16⅜<br>@16½ | 15.55<br>@15.65 | 42¾ | 4.75 | 4.65<br>@4.70 | 5.75<br>@5.80 | 5.60<br>@5.65 |
| 1 | ...... | . | .. | ..... | ... | .... | ... | ....... | ...... |
| 2 | 4.8575 | 59⅝ | 16⅜<br>@16½ | 15.70<br>@15.80 | 43 | 4.75 | 4.65<br>@4.70 | 5.75<br>@5.80 | 5.60<br>@5.65 |
| 3 | 4.8565 | 59⅝ | 16⅜<br>@16½ | 15.80<br>@16.00 | 43½ | 4.75 | 4.65<br>@4.70 | 5.75<br>@5.80 | 5.60<br>@5.65 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.25c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Aug. Sept. | Silver | Copper: Spot | Copper: 3 Mos | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| 28 | 27½ | 71 | 70$\frac{15}{16}$ | 75¾ | 197¼ | 196¾ | 20½ | 21 |
| 29 | 27½ | 71⅛ | 71 | 76¼ | 194 | 193½ | 20¼ | 21⅜ |
| 30 | 27½ | .... | .... | .... | . . | .... | .... | .... |
| 1 | 27½ | 71$\frac{5}{16}$ | 71$\frac{5}{16}$ | 76¼ | 193¾ | 193¼ | 20¼ | 21⅝ |
| 2 | 27$\frac{9}{16}$ | 71⅝ | 71$\frac{7}{16}$ | 76½ | 195¼ | 194¾ | 20⅝ | 21⅝ |
| 3 | 27$\frac{9}{16}$ | 72⅝ | 72⅜ | 77 | 197½ | 196¾ | 21 | 21⅝ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅛c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

lett's; and 7.25@7.50c. for Chinese, Hungarian and outside brands.

**Quicksilver**—The market is fair and steady. New York quotations [illegible] $40 per flask of 75 lb., with 60c. for small lots. San Francisco, $40 for both domestic and export. London is £7 5s per flask, and £7 quoted from second hands.

**Selenium**—For large lots, 100 lb. or over, $2.75@3.50 per lb. is quoted [illegible] 50@5.50 is paid for retail orders.

## Gold, Silver and Platinum

**Gold** remains on the open market at 77s. 9d. per oz. for bars and [illegible] 4d. per oz. for American gold. The receipts are [illegible] from the Cape and South America, with engagements [illegible] Bombay.

**Iridium**—The trade in this metal is dull, with $83@85 asked.

**Platinum**—The market has begun to steady somewhat, and $43.50@45 per oz. is being paid. For hard metal, $47.50@50 is being quoted.

**Silver**—The market has remained quiet but steady during the past week, buying for the Indian Bazaars causing firmness. China banks have also been buyers for forward delivery and the market closes steady at 27⅜d. in London.

Exports of silver from London to the East, Jan. 1 to Aug. 21, reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £5,087,700 | £4,639,000 | D. £448,700 |
| China | 933,500 | 542,000 | D 391,300 |
| Total | £6,021,200 | £5,181,000 | D. £840,000 |

Imports of silver at New York and Perth Amboy, week ended Aug. 16, $360,979 from Mexico and Central America. Exports were $705,983, to London and Paris. Last week's report should have shown $196,215 more than was given.

**The United States Mint** makes the following report of coinage for the fiscal year ended June 30, 1913:

| Gold. | Coins | Face Value |
|---|---|---|
| Double eagles | 462,091 | $9,241,820 00 |
| Eagles | 809,050 | 8,090,500 00 |
| Half eagles | 2,140,099 | 10,700,495 00 |
| Quarter eagles | 810,165 | 2,025,412 50 |
| Total gold | 4,221,405 | $30,058,227.50 |
| Silver: | | |
| Half dollars | 3,982,235 | $1,991,117 50 |
| Quarter dollars | 4,144,235 | 1,036,058.75 |
| Dimes | 4,210,235 | 421,023.50 |
| Total silver | 12,336,705 | $3,448,199.75 |
| Nickel, five cent pieces | 57,235,371 | $2,861,768.55 |
| Copper cents | 112,833,390 | 1,128,333.90 |
| Total | 186,626,871 | $37,496,529.70 |

In addition the mint coined 385,000 silver pesos, 743,565 silver 20-centavo pieces, 1,510,255 silver 10-centavos and 5,001,000 copper centavos for the Philippines. There were also made small silver coins to the value of $42,845 for Costa Rica.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Aug. 30

The base price paid this week for 60% zinc ore was $48 to $49 per ton. The base price paid for 80% lead ore was $58 per ton.

SHIPMENTS WEEK ENDED AUG 30

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,657,270 | ...... | 1,076,720 |
| Year to date | 99,210,430 | 4,587,990 | 40,432,950 |

Shipped during week to separating plants, 3,454,590 lb. zinc ore.

### JOPLIN, MO.—Aug. 30

SHIPMENTS WEEK ENDED AUG 30

| | Blende | Calamine | Lead | Values |
|---|---|---|---|---|
| Totals this week | 10,631,330 | 807,720 | 1,675,770 | $313,420 |
| Totals, 8 months | 376,583,840 | 27,358,370 | 61,651,990 | $10,412,859 |

Blende value, the week, $253,055; 8 months, $8,433,919.

Calamine value, the week, $11,880; 8 months, $349,401.

Lead value, the week, $48,485; 8 months, $1,629,539.

[illegible] price of blende is $53, the base per ton of 60% zinc [illegible] from $48 to $50 for choice grades and $47 to $48 [illegible] blende carrying an excess of 8% iron. Calamine sold on [illegible] of $21 to $24 per ton of 40% zinc. The average of all grades of zinc is $46.16 per ton. Lead remained throughout the week unchanged from the last week, $58 per ton of 80% metal contents, and the average of all grades $57.86 per ton.

## IRON TRADE REVIEW

No material change in the iron and steel situation is thus far apparent, though the market enters September under improved auspices, due to the fact that actual consumption of steel has continued at practically the best rate ever reached, through a summer in which the market has been practically stagnant. The normal trend at this time would be toward more activity, and such activity would easily ensure the mills operating full throughout the year. For months they have been running out of orders, and yet they are still operating practically full.

Some large structural contracts are coming on the market which will require a great quantity of material. Most of these, however, are not yet closed. Many smaller orders are reported, and business in that line is pretty active.

### PITTSBURGH—Sept. 2

There is a wide open market as to finished steel prices, no semblance existing of the control which has formerly been exerted so often. There are hardly any recognized quotations, as mills freely cut prices to obtain very desirable orders, while they adhere to higher figures in case of less desirable business. Structural shapes are now shaded enough to make 1.40c. fairly quotable as the ordinary market, against 1.45c. formerly held. A similar recession occurred a week or more ago in plates. Bars are firm at 1.40c., really firmer at that figure than are plates and shapes at 1.40c. Hoops are held at 1.60c., except in rare instances. In tubular goods the irregularities are somewhat more frequent. In wire products, on the other hand, no further declining tendency is observed. Sheets have yielded no further. Tin plate is between seasons, and not a factor. Unfinished steel has not declined further as to minimum quotations, but there are more sellers at the reduced level lately quoted.

**Pig Iron**—W. P. Snyder & Co. announce its August averages for bessemer and basic pig iron, computed from the actual sales reported in the trade. The bessemer average is $15.657, Valley, against $15.4085 for July, an advance of 25c., while the basic average is $14.045, against $14.227 for July, a drop of 18c. These averages are fairly representative of the market as openly quoted, basic having sold at $14.25 early in July, but lately at $14, while bessemer grew stronger during August, advancing from $15.50 to $15.75 about the middle of the month, and now showing a tendency to go to $16, on account of scarcity. There is little prospect of the steel corporation buying any bessemer iron, as reported in some quarters. The market for all grades has been extremely dull, but with quotations very well maintained. We quote: Bessemer, $15.75@16; basic, $14, No 2 foundry, $14; malleable, $14.25; forge, $13.50, all at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The regular sellers continue to quote prompt and forward at $56, Baltimore, freight to Pittsburgh being $2.16, but there are sellers willing to shade these figures, at least on prompt, by about a dollar a ton. The market continues very quiet.

**Steel**—The declining tendency in unfinished steel continues to be seen, but rather through more sellers quoting reduced prices than by the lowest quotation found coming down any more. Buyers are holding aloof from the market, expecting to see more attractive prices within a week or two. There are a very few sellers at $24 for billets and $25 for sheet bars, f.o.b. maker's mill, Pittsburgh or Youngstown, but the highest quotation seriously made is only a dollar a ton above these figures, all mills having abandoned the idea of getting $26.50 for billets and $27.50 for sheet bars, the figures well maintained for several months.

**Sheets**—Mills continue to operate at 75 to 85% of full capacity. New business is fairly good, but only for prompt shipment, there being little contracting. Prices have shown no further declines in the past fortnight, and are well held. We quote: Blue-annealed, 10-gage, 1.65c.; black, 28-gage, 2.15c.; galvanized, 28-gage, 3.20c., painted corrugated, 2.35c.; galvanized corrugated, 3.25c., per lb. Some mills are quoting about $2 per ton higher than these figures.

**Pig Iron Production in Germany** in July is reported by the German Iron & Steel Union at 1,646,882 tons. For the seven months ended July 31, the total make was, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Foundry iron | 1,872,486 | 2,135,669 | I. 263,183 |
| Forge iron | 310,342 | 301,011 | D. 9,331 |
| Steel pig | 1,224,841 | 1,487,499 | I. 262,658 |
| Bessemer pig | 227,668 | 209,847 | D. 17,821 |
| Thomas (basic) pig | 6,435,011 | 7,080,522 | I. 645,511 |
| Total | 10,070,348 | 11,214,548 | I. 1,144,200 |

The total increase this year was 11.3%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

### IRON ORE

**The Question of Ore Rates** is being again investigated by the Interstate Commerce Commission on new complaints that the rates from Lake Erie ports to the Columbus, Jackson and other districts are unequal and discriminatory as compared with those to the Pittsburgh and Wheeling districts. Meantime the rates recently filed are suspended.

**Imports of Iron Ore via Baltimore** amounted to 35,500 tons in the week ended Sept. 2, according to our correspondent.

### COKE

**Connellsville Coke**—Recent rumors of irregularities in furnace-coke prices when traced to their source seem to hinge partly upon the offering of coke under standard at slight cuts from the regular figure of $2.50, and to the desire of a merchant house, so it is alleged, to break the market. The test of actual buying has brought out actual contracts for September at the full price of $2.50, for standard grade coke, and a fair volume of prompt business has also been done at this figure. Negotiations have been on in the past few days which, when concluded, will probably cover all furnace coke needed for September in addition to regular contracts, and at full prices for standard grade. The output of furnace coke, some 25,000 to 30,000 tons monthly, of the Hostetter-Connellsville Coke Co., controlled by the United States Steel Corporation, is temporarily on the market. The August tonnage was quietly disposed of at the full price, and a large part of the September output has already been closed, with negotiations on for the balance, all at the full figure. There are prospects that the coke will not be offered for October, being required by the Steel Corporation, and the absorption of this extra tonnage for August and September is taken as a clear indication of the strength of the market. We continue to quote: Prompt furnace, $2.50; contract furnace, $2.50; prompt fouridry, $3, per ton at ovens.

**Norfolk & Western Coal Tonnage** for July, 1913, and for the seven months ending July 31, as compared with corresponding periods of 1912 in short tons shows as follows:

| Destination | July 1912 | July 1913 | Seven Months 1912 | Seven Months 1913 |
|---|---|---|---|---|
| *Coal* | | | | |
| Tidewater, foreign | 116,339 | 155,762 | 950,893 | 1,032,082 |
| Tidewater, coastwise | 305,515 | 321,340 | 2,119,813 | 2,224,658 |
| Domestic | 1,577,396 | 1,666,790 | 5,994,907 | 10,318,604 |
| *Coke* | | | | |
| Tidewater, foreign | 9,197 | 4,358 | 50,101 | 27,199 |
| Domestic | 88,030 | 106,351 | 789,338 | 924,152 |
| Total | 2,096,477 | 2,254,601 | 13,905,052 | 14,526,695 |

**Fuel Production of the German Empire,** half-year ended June 30, in metric tons:

| | 1912 | 1913 | | Changes |
|---|---|---|---|---|
| Coal | 84,706,380 | 93,577,987 | I | 8,871,607 |
| Brown coal | 39,430,142 | 41,900,158 | I | 2,470,010 |
| Total mined | 124,136,522 | 135,478,145 | I | 11,341,623 |
| Coke made | 13,754,682 | 15,944,237 | I | 2,189,555 |
| Briquettes made | 11,612,454 | 13,182,282 | I | 1,569,828 |

Of the briquettes reported this year, 10,303,617 tons were made of brown coal or lignite.

## CHEMICALS

### NEW YORK—Sept. 3

The general markets are showing signs of improvement and the outlook is encouraging.

**Arsenic**—Trade is very dull, and prices are nominally at $3 per cwt., with perhaps $3.12½ for small lots. Most of that on the market is coming from Wales, Germany, Belgium, and Spain.

**Copper Sulphate**—August trade was rather better than usual for this month. Prices remain unchanged at $5 per cwt. for carload lots, and $5.25 for smaller parcels.

**Nitrate of Soda**—The market is steady. Quotations for the remainder of 1913 stand at 2.35c.; first five months of 1914, at 2.40c.; and last seven months at 2.35c. The nitrate producers have agreed to restrict their output by 10%, and it seems impossible that the lands to be auctioned shortly by the Chilean government can affect next year's output.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | April | May | June | July | August |
|---|---|---|---|---|---|
| Alaska shipments | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 | ... |
| Anaconda | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 |
| Arizona, Ltd. | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 | ... |
| Copper Queen | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 |
| Calumet & Ariz. | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 | ... |
| Chino | 3,925,409 | 3,883,611 | 3,682,706 | 4,686,250 | ... |
| Detroit | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 |
| East Butte | 1,400,000 | 1,268,595 | 1,055,646 | ... | ... |
| Mammoth | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 610,000 | 610,000 | ... |
| Mason Valley | 1,264,304 | 1,186,560 | 1,097,014 | 908,892 | ... |
| Miami | ... | 1,943,900 | 2,612,000 | ... | ... |
| Nevada Con. | 5,650,000 | 5,933,275 | 6,344,863 | 5,403,919 | ... |
| Ohio | 690,001 | 650,071 | 537,400 | 601,700 | ... |
| Old Dominion | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 | ... |
| Ray | 4,379,128 | 4,384,400 | 4,392,612 | 4,097,000 | ... |
| Shannon | 1,238,000 | 1,080,000 | 924,000 | 880,000 | 1,248,000 |
| South Utah | 132,267 | 200,000 | 185,000 | 140,000 | ... |
| Tennessee | 1,718,188 | §1,037,115 | 1,379,220 | 1,247,804 | ... |
| United Verde* | 3,000,000 | 3,000,000 | 2,900,000 | ... | ... |
| Utah Copper Co. | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 | ... |
| Lake Superior* | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 | ... |
| Non-rep. mines* | 6,000,000 | 6,300,000 | 6,000,000 | 6,200,000 | ... |
| Total prod. | 104,224,079 | 109,824,500 | 104,051,138 | ... | ... |
| Imports, bars, etc. | 25,578,297 | 22,205,942 | 18,255,267 | ... | ... |
| Total blister | 129,802,376 | 132,030,442 | 122,306,405 | ... | ... |
| Imp. ore & matte. | 7,177,363 | 10,528,562 | 7,497,002 | ... | ... |
| Total Amer. | 136,979,739 | 142,559,004 | 129,803,407 | ... | |
| Miami† | 2,312,900 | ... | ... | 2,890,000 | ... |
| Shattuck-Arizona | 1,158,326 | 1,026,170 | 1,059,625 | 1,019,388 | ... |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 794,000 | ... | ... | ... | ... |
| Granby | 1,857,452 | 1,782,570 | 1,789,000 | ... | ... |
| Mexican Cos.: | | | | | |
| Boleo† | 2,811,200 | 2,424,800 | 1,984,640 | 2,240,720 | ... |
| Cananea | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 | |
| Moctezuma | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 | ... |
| Cape Cop., S. Af. | 586,880 | 387,520 | 414,400 | ... | ... |
| Kyshtim, Russia. | 2,544,640 | 1,490,000 | ... | ... | ... |
| Spassky, Russia. | 974,400 | 721,280 | 835,520 | ... | ... |
| Exports from | | | | | |
| Chile | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 | ... |
| Australia | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 | ... |
| Arrivals–Europe† | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 | ... |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VII, '12 | 137,161,129 | 71,094,381 | 60,121,331 | 44,335,004 | 108,186,000 | 152,521,003 |
| VIII | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ... | ... | ... |
| I. 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | ... | ... | | 53,594,945 | 66,420,480 | 120,015,385 |

Note—From Jan. 1. 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Caledonia, Nev. | Aug. 14 | Sept. 12 | $0.025 |
| [illegible] | Aug. 14 | Sept. 14 | 0.025 |
| [illegible] | Aug. 28 | Sept. 19 | 0.01 |
| [illegible] | Aug. 30 | Sept. 20 | .005 |
| [illegible] Nev. | Aug. 25 | Sept. 22 | 0.003 |
| Emerald [illegible] | ...... | Sept. 13 | 0.005 |
| [illegible] | Aug. 12 | Sept. 12 | 0.002 |
| [illegible] | Aug. 11 | Sept. 11 | 0.001 |
| [illegible] | Aug. 28 | Sept. 17 | 0.02 |
| [illegible] | Aug. 16 | Sept. 16 | 0.001 |
| [illegible] Ida. | Sept. 8 | Sept. 29 | 0.000½ |
| [illegible] | Aug. 15 | Sept. 9 | 0.003 |
| [illegible] | Aug. 16 | Sept. 13 | 0.0025 |
| [illegible] | Sept. 8 | Sept. 30 | 0.02 |
| [illegible] Mich | ...... | Sept. 9 | 2.00 |
| [illegible] Ida | Aug. 11 | Sept. 10 | 0.005 |
| [illegible]entine, Utah | Sept. 1 | Sept. 16 | 0.005 |
| [illegible] Ida | Aug. 25 | Sept. 22 | 0.005 |
| [illegible] Hope, Ida | Aug. 19 | Sept. 19 | 0.002 |
| [illegible], Ida | Sept. 1 | Oct. 1 | 0.0015 |
| Potosi, Nev | Sept. 4 | Sept. 26 | 0.02 |
| Slavonian, Ida | Sept. 10 | Sept. 30 | 0.002 |
| Sonora, Ida | Aug. 30 | Sept. 16 | 0.002 |
| St. Louis, Calif | Sept. 22 | Oct. 4 | 0.01 |
| Sunshine, Ida | July 1 | Oct. 15 | 0.001 |
| Tuscumbia, Ida | Aug. 23 | Sept. 23 | 0.003 |
| Yellow Jacket, Nev | ........ | ........ | 0.10 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | ...... | 24.209 | 29.088 | ...... |
| October | 53.340 | 63.471 | ...... | 24.594 | 29.299 | ...... |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ...... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| | NEW YORK | | | | London, Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | ...... | 17.698 | ...... | 78.762 | ...... |
| October | 17.314 | ...... | 17.661 | ...... | 76.389 | ...... |
| November | 17.326 | ...... | 17.617 | ...... | 76.890 | ...... |
| December | 17.376 | ...... | 17.600 | ...... | 75.516 | ...... |
| Year | 16.341 | ...... | 16.560 | ...... | 72.942 | ...... |

New York, cents per pound, London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.119 |
| May | 46.063 | 49.0[illegible]8 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | | 223.762 | |
| October | 50.077 | | 228.353 | |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Year | 46.096 | | 209.322 | |

New York in cents per pound, London in pounds sterling per long ton.

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | ...... | 4.924 | ...... | 22.292 | ...... |
| October | 5.071 | ...... | 4.894 | ...... | 20.630 | ...... |
| November | 4.615 | ...... | 4.463 | ...... | 18.193 | ...... |
| December | 4.303 | ...... | 4.152 | ...... | 18.069 | ...... |
| Year | 4.471 | ...... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | ...... | 7.313 | ...... | 27.048 | ...... |
| October | 7.426 | ...... | 7.276 | ...... | 27.543 | ...... |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | ...... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURG

| | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | ...... | 16.03 | ...... | 15.63 | ...... |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | ...... |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | ...... |
| December | 18.15 | ...... | 17.45 | ...... | 18.73 | ...... |
| Year | $16.01 | ...... | $14.93 | ...... | $15.28 | ...... |

# STOCK QUOTATIONS

| COLO. SPRINGS Sept. 2 | | SALT LAKE Sept. 2 | |
|---|---|---|---|
| Name of Comp. | Bid. | Name of Comp. | Bid. |
| Acacia | .02¼ | Beck Tunnel | .05½ |
| Cripple Cr'k Con. | .01 | Black Jack | .08 |
| C K & N | .10¼ | Cedar Talisman | .00¾ |
| Doctor Jack Pot | .05½ | Colorado Mining | .12½ |
| Elkton Con | .58 | Columbus Con | .05 |
| El Paso | 3.10 | Crown Point | .01½ |
| Findlay | .02 | Daly-Judge | 6.35 |
| Gold Dollar | .06 | Grand Central | .55 |
| Gold Sovereign | .02 | Iron Blossom | 1.20 |
| Isabella | .10 | Little Bell | ‡.10 |
| Jack Pot | .04 | Lower Mammoth | .01 |
| Jennie Sample | .05 | Mason Valley | 6.00 |
| Lexington | ‡.005 | May Day | .05½ |
| Moon Anchor | .009 | Nevada Hills | .50 |
| Old Gold | .02 | New York | .02½ |
| Mary McKinney | .60 | Prince Con | .43 |
| Pharmacist | .01 | Silver King Coal'n | 3.15 |
| Portland | .95 | Sioux Con | .02 |
| Vindicator | .87 | Uncle Sam | .03½ |
| Work | ‡.005 | Yankee | ‡.08 |

TORONTO Sept. 2

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .06 | Foley O'Brien | .15 |
| Coniagas | 7.00 | Hollinger | 15.35 |
| T. & Hudson Bay | 70.00 | Imperial | .02 |
| Timiskaming | .24 | Jupiter | .18 |
| Wettlaufer-Lor | .16 | Pearl Lake | .30 |
| Apex | .01 | Porcu. Gold | .07 |
| Big Dome | 12.00 | Preston E. D. | .01 |
| Crown Chartered | .003 | Rea | .15 |
| Dobie | .10 | Swastika | .04 |
| Dome Exten | .07 | West Dome | .10 |

SAN FRANCISCO Sept. 2

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| COMSTOCK STOCKS | | MISC. NEV. & CAL. | |
| Alta | .05 | Belmont | 7.05 |
| Belcher | .23 | Jim Butler | .52 |
| Best & Belcher | .07 | MacNamara | .12 |
| Caledonia | 1.35 | Midway | .43 |
| Challenge Con | .07 | Mont.-Tonopah | 1.10 |
| Chollar | .01 | North Star | .66 |
| Confidence | .10 | West End Con | 1.32½ |
| Con. Virginia | .08 | Atlanta | .14 |
| Crown Point | .20 | Booth | .01 |
| Gould & Curry | .03 | C.O.D. Con | .03 |
| Hale & Norcross | .07 | Comb. Frac | .04 |
| Mexican | 1.05 | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | .45 |
| Ophir | .21 | Round Mountain | .43 |
| Overman | .35 | Silver Pick | .02 |
| Potosi | .02 | Tramp Con | ‡.01 |
| Savage | .11 | Argonaut | 2.00 |
| Sierra Nevada | .05 | Bunker Hill | 1.75 |
| Union Con | .10 | Central Eureka | 16 |
| Yellow Jacket | .12 | So. Eureka | 2.50 |

N. Y. EXCH. Sept. 2

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 77 |
| Am. Agri. Chem | 44⅛ |
| Am.Sm.&Ref.,com | 67½ |
| Am. Sm. & Ref., pf. | 101⅝ |
| Am. Sm. Sec., pf B | 84 |
| Anaconda | 37½ |
| Batopilas Min | 1¼ |
| BethlehemSteelpf | 71¾ |
| Chino | 42⅝ |
| FederalM.&S.,pf. | 37 |
| GreatNor.,ore.,ctf | 34¼ |
| Guggen. Exp | 46¼ |
| Homestake | 103½ |
| Inspiration Con | 15⅝ |
| Miami Copper | 23¼ |
| Nat'nalLead,com | 48¾ |
| National Lead, pf | 105½ |
| Nev. Consol | 16⅛ |
| Phelps Dodge | 192½ |
| Pittsburg Coal, pf. | 84⅛ |
| Quicksilver, pf. | 3⅝ |
| Ray Con | 19⅞ |
| RepublicI&S,com. | 24 |
| Republic I & S, pf | 88 |
| SlossSheffi'd,com | 31 |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper | 32 |
| Utah Copper | 55 |
| U. S. Steel, com | 63¼ |
| U. S. Steel, pf. | 108⅝ |
| Va.Car.Chem.,pf | 98 |

N. Y. CURB Sept. 2

| Name of Comp. | Clg. |
|---|---|
| Barnes King | ‡1⅝ |
| Beaver Con | .20 |
| Big Four | .30 |
| Braden Copper | 6¾ |
| B. C. Copper | 2¼ |
| Buffalo Mines | 2⅝ |
| Can. G. & S. | .22 |
| Con. Ariz. Sm. | ¼ |
| Davis-Daly | 1⅞ |
| Diam'field-Daisy | .02 |
| Ely Con | .07 |
| Florence | .24 |
| Giroux | 1⅛ |
| Gold Hill Con. | ⅜ |
| Goldfield Con. | 1 9/16 |
| Greene Cananea | 34½ |
| Greenwater | .04 |
| Internat S. & R | ‡115 |
| Kerr Lake | 3½ |
| Keystone | ‡2 |
| La Rose | 2 5/16 |
| McKinley-Dar-Sa. | 1 11/16 |
| Min. Co. of A. new | 2¼ |
| Motherlode Gold | ‡.60 |
| Nipissing Mines | 8¾ |
| Ohio Copper | 7/16 |
| Pacific Sm. & M | 1/16 |
| Puebla S. & R. | 2⅛ |
| South Live Oak | ‡2 |
| South Utah M.&S. | ¼ |
| Stand'd Oil of N.J | 373 |
| Stewart | 1⅝ |
| Tonopah | 4⅝ |
| Tonopah Ex | 2 1/16 |
| Tonopah Merger | .68 |
| Tri-Bullion | ⅛ |
| Tularosa | ⅜ |
| Union Mines | .07 |
| United Cop., pfd. | 3 |
| Yukon Gold | 2 |

LONDON Aug. 26

| Name of Com. | Clg. |
|---|---|
| Camp Bird | £0 18s 0d |
| El Oro | 0 15 0 |
| Esperanza | 1 2 6 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 6 6 |
| Santa Gert'dis | 1 0 0 |
| Stratton's | 0 1 9 |
| Tomboy | 1 6 3 |

BOSTON EXCH. Sept. 2

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1½ |
| Ahmeek | 280 |
| Alaska Gold M. | 18⅝ |
| Algomah | 1⅛ |
| Allouez | 36¼ |
| Am. Zinc | 21¾ |
| Ariz. Com., ctfs. | 2⅞ |
| Bonanza | .32 |
| Boston & Corbin | 1⅛ |
| Butte & Balak | 1⅝ |
| Calumet & Ariz | 66 |
| Calumet & Hecla | 410 |
| Centennial | 13½ |
| Cliff | 1⅝ |
| Copper Range | 40 |
| Daly West | 2 |
| East Butte | 12½ |
| Franklin | 4½ |
| Granby | 68½ |
| Hancock | 18 |
| Hedley Gold | 30 |
| Helvetia | ¼ |
| Indiana | 5 |
| Island Cr'k, com. | 53¾ |
| Island Cr'k, pfd. | 84 |
| Isle Royale | 19¼ |
| Keweenaw | 1⅜ |
| Lake | 7 |
| La Salle | 3⅞ |
| Mass | 2¾ |
| Michigan | 1⅛ |
| Mohawk | 43 |
| New Arcadian | 1¾ |
| New Idria Quick. | ‡3⅞ |
| North Butte | 28½ |
| North Lake | 1⅛ |
| Ojibway | .90 |
| Old Dominion | 51¼ |
| Osceola | 82 |
| Quincy | 61 |
| Shannon | 6¾ |
| Shattuck-Ariz. | ‡25¼ |
| Superior | 25¾ |
| Superior & Bost. | 2¼ |
| Tamarack | 29 |
| Trinity | 4¼ |
| Tuolumne | 65 |
| U. S. Smelting | 36½ |
| U. S. Smelt'g, pf. | 47½ |
| Utah Apex | 1⅞ |
| Utah Con | 9¼ |
| Victoria | 1 |
| Winona | 1 |
| Wolverine | 44 |
| Wyandot | 80 |

BOSTON CURB Sept. 2

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 4 |
| Boston Ely | .51 |
| Butte & Lon'nDev. | 37 |
| Butte Central | .01 |
| Cactus | .02 |
| Calaveras | 2 |
| Chief Cons | 1¾ |
| Corbin | 1 |
| Cortez | .20 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | 95 |
| First Nat Cop. | 2⅜ |
| Houghton Copper | 3¾ |
| Majestic | 31 |
| Mexican Metals | 27 |
| Moneta Porc. | ‡07 |
| Nevada-Douglas. | 2⅜ |
| New Baltic | 60 |
| Oneco | 80 |
| Raven Copper | 13 |
| Rhode Island Coal | .01 |
| Smokey Dev. | 1 |
| S. W. Miami | 2 |
| South Lake | 4 |
| Trethewey | 24 |
| United Verde Ext. | .55 |

‡Last quotation.

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# No. 2 Crushing Plant of Natomas Consolidated

By Richard H. Vail

*SYNOPSIS—Natomas Consolidated of California operates three rock-crushing plants of which the No. 2 or Fair Oaks crusher is the largest. The product is a crushed rock for road making, railroad ballast, etc. The rock will be washed and the silt conveyed back to the dredged land, which it is hoped to resurface for cultivation.*

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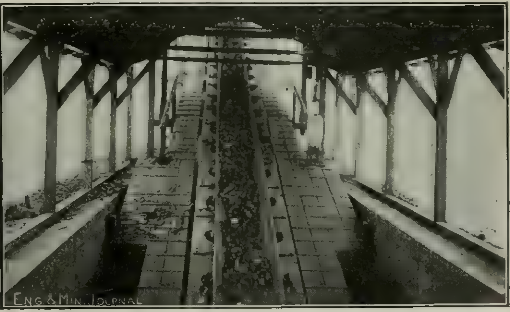
Besides operating a fleet of 13 gold dredges, three of which are all-steel boats, Natomas Consolidated of California has three crushing plants at work reducing coarse dredge tailing to various sizes of crushed rock. Important changes are now in progress at its No. 2 or Fair Oaks crusher whereby the capacity and range of products will be increased. With an auxiliary washing plant, the company will be able to utilize completely the coarse dredge tailing, returning to the dredged ground the silt removed in the washing plant, thus giving the land a surface that will lend itself to almost any sort of cultivation—an achievement long cherished by this company, which is also engaged in an extensive irrigation and reclamation project in Sacramento County.

Conveyor to Storage Piles



Rock Going from Cars to Crusher

### Natomas Becoming a Great Land Company

Few except those directly connected with the California dredging fields, realize the extent of the land interests of this company. Indeed Natomas Consolidated of California is evolving from a great dredging company into a great land company. For several years it has applied the profits of its gold-dredging industry to the acquisition and reclamation of large tracts of land in Sacramento Valley, its holdings now approximating 90,000 acres. Some idea of the extent of its work in this connection will be appreciated when it is stated over 60 miles of levee have already been built and that the present plans call for a total of 83 miles of levee to reclaim to cultivation lands that have in the past been subject to overflow from the Sacramento, Feather and Bear Rivers. The irrigated-land project of the company embraces 20,000 acres of higher land, suitable for olives, almonds, oranges and other citrus fruits; this area is in the neighborhood of the company's dredging lands in the Folsom or American River district. Part of this land will be retained by the company but a portion is being divided up for sale in 10- and 20-acre plots, which will be planted, tended and harvested by the Natomas land department, if the purchasers so desire. To the mining engineer familiar with the standing and methods of the Natomas organization, a proposal of this sort by Natomas Consolidated would certainly mean much more than the guarantee of the ordinary orchard or land company. While this irrigated-land project is not on dredged land, the company also has in mind eventually restoring its dredged lands to cultivation. In fact, some experimentation has been done in this connection and a small grove of eucalyptus and olive trees is already growing on some dredged land that was leveled off for the purpose of this experiment. It is planned, however, with the improvements now being made at the Fair Oaks crushing plant, to wash the coarse tailing and return to the surface of the land the fine soil or silt, restoring the ground to cultivation of any sort. Thus in time, the scar left on the country by the gold fleets of this company may be completely eradicated; indeed, it may be that these areas will be more productive than the adjoining lands by reason of the remarkable "plowing" or aeration accomplished in the dredging.

### CAPACITY OF CRUSHING PLANTS

Two of the Natomas crushing plants are in the American River dredging field, at Natoma and at Fair Oaks, the No. 3 plant being in the Oroville dredging field. The plants are similar in general design and operation, and are in charge of E. J. Goodpastor; the nominal capacities are: For the No. 1 or Natoma plant, 1200 tons in 10 hr.; for the No. 2 or Fair Oaks, 1500 tons; the No. 3 plant at Oroville has a capacity of about 1000 tons in 10 hr. Production at the various plants is regulated more or less by the demand for road-making material. As the plants are similar in general arrangement only the No. 2 or Fair Oaks crusher will be described. While an auxiliary washing plant is being added at this works, it is so arranged that by merely moving a gate the washery may be cut out if desired and the crushing plant operated as before.

The No. 2 crushing plant is situated at Fair Oaks at the southwestern end of the Folsom district. It is about four miles from the No. 1 crushing plant at Natoma. The Fair Oaks plant was built after the plans of the Western Engineering & Construction Co. of San Francisco and was placed in operation in July, 1909. It is worthy of note that after nearly four years of operation, the plant during the last month had an operating record of 91% of the possible running time.

### COBBLES LOADED BY STEAM SHOVEL

The plant is at present crushing from the coarse tailing produced by Natoma No. 4 dredge. The cobbles are loaded by a 45-ton Bucyrus oil-burning steam shovel into 4-cu.yd. side-dump Koppel cars, handled in trains of 10 on a narrow-gage track by an oil-burning dinky engine. The steam shovel can load about 2500 tons of cobbles in 10 hr. and the present practice is to dig down to within about one foot of the underlying bed of fine tailing. When the new washery is in operation it will be possible to dig closer to the fine tailing without danger of fouling the crushed-rock product, as any fines will be sluiced back over the "cleared land" making a layer of top soil which, it is estimated, will be from 1½ to 2 feet in depth. The steam-shovel crew comprises five men, an engineer, a trainman and three trackmen who assist in various work as well as attending to the extensions of the narrow-gage track leading to the crushing plant. This track, which is of 3-ft. gage, is now nearly a quarter of a mile long; it passes a receiving hopper and is arranged in a loop so that no switching of cars is necessary. The engine bringing in the loaded train leaves it at the hopper, and pushes out around the loop a similar train of 10 cars that have just been emptied.

The loaded cobble cars are emptied into the receiving hopper by two men who break with sledges any boulders too large to pass through the grizzly. The hopper opening is 20 ft. square at the top and is covered by a timber grizzly, the 6x8-in. bars of which are spaced eight inches apart and covered with ½x6-in. steel wearing plates. The hopper is lined with ⅜-in. steel and delivers to the No. 1 conveyor belt, which is 36 in. wide and seven-ply. This is a Robins conveyor, 166 ft. between centers, and operates at a speed of 125 ft. per min. and at an angle of 16°, which is the maximum angle for handling rounded material of the character crushed at this plant. The flow of material from the hopper is regulated by a gate controlled by hand and a man is stationed here to look after the general hopper operations; a boy is also employed at this point to pick off the belt any pieces of steel or wood that might damage or clog the crushing machinery. This boy also picks out any round pebbles from two to four inches in size; when there is a sufficient accumulation of these, they are shipped to cement plants for use in tube-mill grinding.

When the new washing plant now in process of construction is completed, all material from this first belt will be taken by a cross belt to the washing plant. After washing and sizing, the graded material is returned to the crushing plant, being delivered to the different equipment best suited to the particular sizes. Only washed cobbles, three inches or larger in size, will then enter the first trommel *A*, thus increasing greatly its capacity for finished product, and effecting a corresponding increase in the capacity of the various crushers that follow. The washed material, from 1½ to 3 inches in size, will be delivered to the crushing section containing the Symons disk crusher and the first set of corrugated rolls; the washed gravel from ⅜ to 1½ in. will be delivered to screen *C* and the washed material finer than ⅜ in. will be conveyed to any of the three easterly storage piles, or any portion may be delivered directly to make up rock mixtures.

### THE CRUSHING EQUIPMENT

The details of the crushing system will be readily understood by reference to the accompanying plan and section, so that a detailed description of the operations is unnecessary. It may be remarked in general that there have recently been a number of changes made in conveyor belts and chutes to increase the flexibility of the operations and to permit the making of special crushed-rock mixtures containing any desired proportion of the various components. The principal items of equipment in the No. 2 crushing plant comprise:

One 42x26-in. Farrell jaw crusher, handling boulders over 6 in. in size.

Four 36x10-in. Farrell jaw crushers; three of these breakers crush 3- to 6-in. cobbles, the fourth handles oversize from screens "E" and "F," over 2½ in. in size.

Two 40x20-in. Allis-Chalmers corrugated rolls; one set, with the Symons disk crusher, handles 1½- to 3-in. material, the other set of rolls crushing reject from screen "D"; i.e., over 1 in.

Six revolving screens; "A," 6x20 ft.; "B," "C," 4x14 ft.; "D," 5x15 ft.; "E" and "F," 5x24 ft

Thirty-three Robins Conveying Belt Co. conveyors, having a total length of about 5000 ft. and varying in width from 20 to 36 in.

Four 100-hp. motors for driving 36x10-in. crushers.

One 150-hp. motor driving the 42x26-in. crusher.

One 150-hp. motor driving the two sets of corrugated rolls and the disk crusher.

One 50-hp. motor driving the No. 1 conveyor.

One 50-hp. motor driving screen "A."

Two 50-hp. motors driving loading conveyors from tunnels.

One 75-hp. motor driving loading conveyors from tunnels

One 100-hp. motor driving screens "B" and "D" and four conveyors.

One 100-hp. motor driving screens "E" and "F" and three conveyors.

The principal equipment of the new washing plant includes:

One 5x30-ft. cylindrical revolving screen

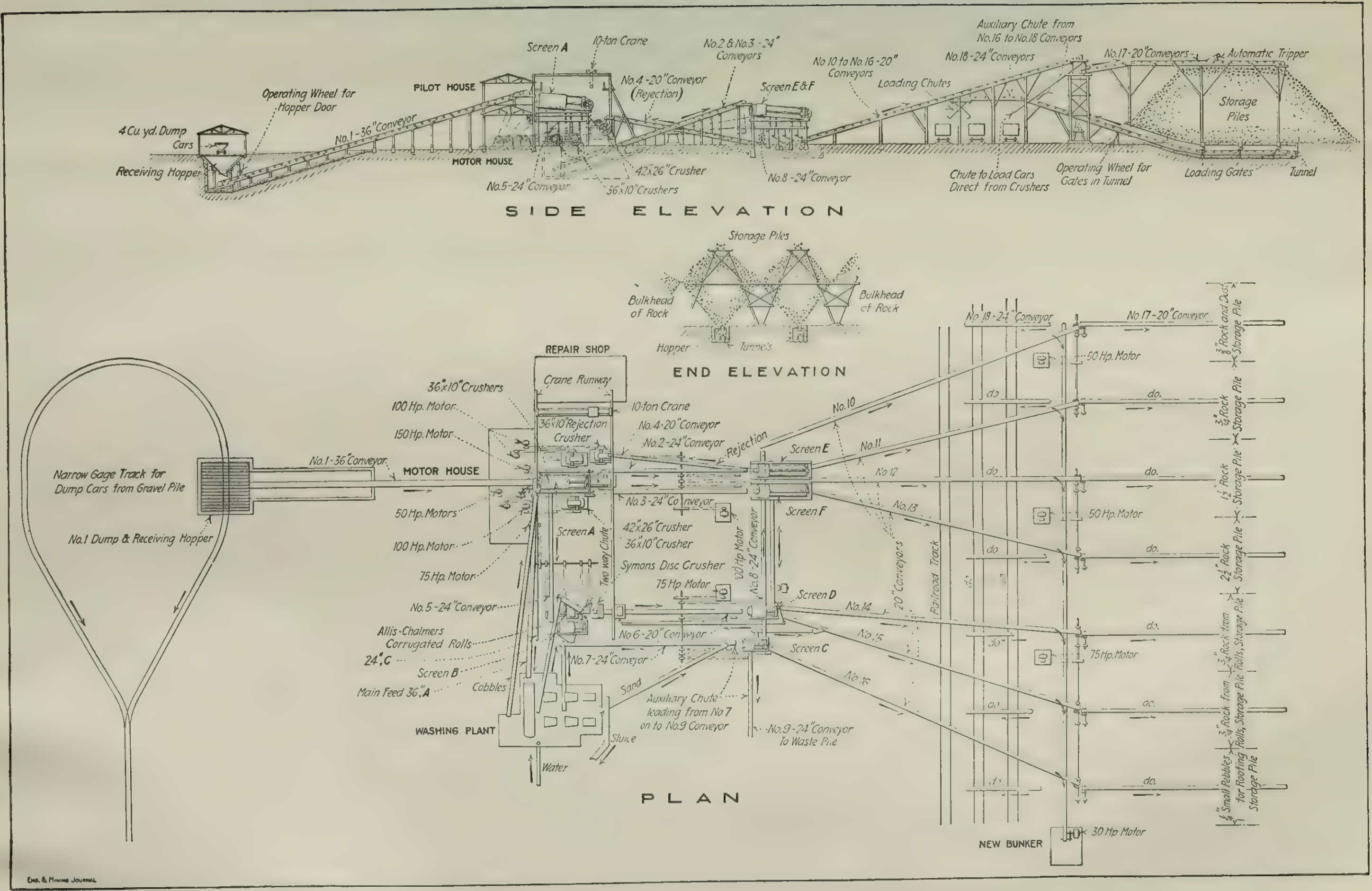
Four conical revolving screens, 48 and 66x84 in. long.

Nine washing nozzles for the various screens.

Two tilting settling tanks.

Five conveying belts varying from 20 to 36 in. in width.

One 100-hp. motor.



No. 2. Rock-Crushing Plant of Natomas Consolidated, Fair Oaks, Calif.

### A Central Operating Room

As the crushing plant may be operated independently of the washing plant, its general features will be separately discussed. The washing system, being a new operation, will be described more in detail later. The crushing plant is operated by about 35 men and all important machines are controlled from a switchboard in what is known as the pilot house or operating room, situated in an elevated position near the top of the No. 1 conveyor. Here 13 switches enable the operator to start or stop any of the important equipment whenever a signal is received from any part of the plant. Red and white lights at each switch indicate the conditions and these signals are supplemented by a bell signal so that there is little opportunity to fail to stop or start a machine as desired. From the pilot house the operator has a view of all of the important conveying belts and in this way frequently detects any interruption of the operation before the local attendant gives him the signal.

The motors of the crushing plant are grouped in one room, where the dust may be more effectively excluded; however, there are a few individual motors at other points in the plant driving conveyors for loading, etc. Most of the motors are of General Electric make, mounted on a sub-base, thus providing a third bearing. Superintendent N. F. Patterson of this plant reports that before the sub-bases were employed, about $24 were spent in repairs at each motor every three months, mainly for rebabbiting bearings. The time for such repairs has been extended to once in three years, since the use of the sub-bases and additional outboard bearings. Electric power is obtained from the high-potential lines of the Great Western Power Co., being stepped down to 2300 volts at which pressure it is supplied to the motors of the crushing and washing plants. The transformers at this works have been placed in a concrete tank, which is below the ground level and completely covered.

All material entering the crushing plant is delivered by the No. 1 conveyor belt to screen *A* which is six ft. in diameter by 20 ft. long. When the washing plant is not in use, this trommel has a screen with 3-, 5- and 6-in. openings; the 3-in. section has a length of 12 ft. When receiving washed cobbles over three inches in size, the screen will have 5-in. and 6-in. perforations. The trommel is driven by bevel gear, and is made of soft steel spiders and a framework of 6x6x1-in. angles covered with ¾-in. tank steel, perforated as above mentioned. It is stated that manganese steel was tried on the screens but that the expense was not considered warranted.

### Jaw Crushers for Coarse Cobbles

Boulders over six inches in size rejected by screen *A* pass to the 42x26-in. Farrell crusher, while cobbles from three to six inches in size are handled in three 36x10-in. Farrell crushers. The products from these crushers pass to screens *E* and *F* which have 1-in., 1⅞-in. and 2½-in. perforations, and ⅜-in. dust jackets to eliminate the fines. Any material over 2½ in. is returned to the fourth 36x10-in. Farrell crusher which is known as the rejection crusher.

Recently a hopper has been installed to receive the oversize from screens *E* and *F* and thus provide a steady feed for the rejection crusher. If a mixed product is desired, the oversize from these screens may pass out with the 2½-in. material, instead of going through the rejection crusher. There are cross conveyors between the screens of the coarse- and "fine-crushing" divisions of the plant so that a free transference of products may be made when desired.

The "fine-crushing" division of the plant receives the 3-in. reject from screen *A*, or when the washing plant is in operation, the washed products finer than three inches are sent directly to this portion of the plant. Screen *B*, which has 1½-in. perforations, will receive material varying from 1½ to 3 in. in size. Material coarser than 1½ in. will be sent to the 48-in. Symons disk crusher and the No. 1 set of 40x20-in. Anaconda-type corrugated rolls. These deliver their product to screen *D* which has 1-in. perforations and a ⅜-in. dust jacket. The so called ¾-in. and ⅜-in. dust products from screen *D* join the similar products from the coarse-crushing department.

The oversize from screen *D* is crushed in the second set of 40x20-in. corrugated rolls and returned to the same screen. Screen *C* is not now used, but with the washing plant in operation it may be utilized to screen the ⅜-in. to 1½-in. gravel, the oversize being crushed in the No. 2 rolls. The ⅜- to 1½-in. washed gravel may also be taken directly to storage when a mixture of this type is desired.

### A 10-Ton Overhead Crane for Repairs

To facilitate repairs, there is installed over the crushing machinery a hand-operated 10-ton crane that runs on a timber structure, 100 ft. long, extending into the repair house, 24x48 ft., where are extra parts and such tools and machinery as are required to carry out the usual repairs of the plant.

Manganese steel is used for all crusher wearing parts and the roll shells are also of manganese steel. The use of the Symons disk crusher is in the nature of an experiment to determine whether the same work cannot be accomplished by this machine as is done by the 40x20-in. corrugated rolls, with less expense for repairs.

The belt conveyors in the plant vary in size from 20 to 36 in., the various sizes used being 20, 24, 30 and 36 in. On most of them, Robins belts are used and have given good service. The main 36-in., seven-ply belt leading from the receiving hopper has been in service for four years; it is still in fair condition and the superintendent considers it good for at least another year's wear.

### Seven Stockpiles for Finished Products

The finished products of the crushing plant are taken to seven storage piles, each 100 ft. long by 40 ft. wide, and capable of being built up to a height of 40 ft. by means of trestles and overhead conveyors. Beneath each of the storage piles is a drawoff tunnel, 6x6 ft. in section and 100 ft. long, built of reinforced concrete 12 in. thick. The tunnels are each served by a 24-in. conveyor, 185 ft between centers. These conveyors are fed by four arc gates connected by chain wheel and levers so that three of them may be operated in synchronism, the fourth being operated independently thus regulating the feed to the conveyors.

The conveyors discharge at a height of 25 ft. above the railroad loading tracks into a double, swinging chute so that the crushed products may be delivered into cars on either of the two tracks. Cars may be loaded on a third track directly from the crusher conveyors.

A recent improvement is a 600-ft., 24-in. cross conveyor that has been placed at the head of the crusher conveyors so that a mixed product containing any proportion of the various sizes may be delivered into a new 200-ton loading bunker erected at the east end of the storage piles. This bunker has two chutes which permit rapid loading directly into a railroad car. The maximum shipping capacity of the plant in the past has been 50 cars per 10 hr. This will be slightly augmented by the present improvements.

A Fairbanks iron-frame track scale, with 50-ft. platform and a capacity of 200,000 lb., is installed a few hundred yards down the track for weighing the cars of crushed rock. The cars come down by gravity from the loading tracks to the scale platform.

Water for the crushing plant is supplied by a 6-in. Goulds deep-well pump driven by a belt from a 50-hp. motor. The water is delivered to two steel tanks, 11 ft. 6 in. diam. by 10 ft. deep, capacity 7500 gal. each, mounted on a timber superstructure 37 ft. above the ground. These supply water to the steam shovel and the railroad engines, and also to a complete fire-protection system. Two steel oil-storage tanks of similar size are mounted on a 25-ft. superstructure, placed midway between the railroad tracks and the steam-shovel tracks. The pipeline from the oil tanks is laid underground and is provided with ground cocks spaced every 80 ft. up to the steam-shovel site. This pipeline supplies fuel oil to the dinky engine and to the steam shovel.

Eucalyptus on Dredged Land

Steam Shovel Loading Tailings

### The Washing Plant

The new washing plant at Fair Oaks is designed to be operated in conjunction with the rock-crushing plant and to augment the capacity of the latter by eliminating the clayey portion of the feed which has heretofore reduced the capacity of the screens and crushing machines. The old crushing plant, however, may be operated independently of the washing plant when desired. The washing plant was designed, and the equipment supplied, by the Meese & Gottfried Co., 55 Main St., San Francisco. The principal equipment includes: A large cylindrical screen, four conical screens, washing nozzles for all screens, two tilting settling tanks, five conveying belts and a 100-hp. electric motor.

### Heavy All-Steel Trommel for Preliminary Washing

All material entering the main receiving hopper at the crushing plant is delivered by the No. 1 conveyor to a 36-in. cross belt that transports the material to the washing plant. Here it is delivered into a hopper where two 5-in. nozzles, using about 1250 gal. of water per minute, force the gravel and water down the hopper into a 5x30-ft. cylindrical revolving screen. This is an all-steel trommel, most of the parts being of cast steel. It has spur-gear drive at each end and is supported on four trunnion wheels, 30x9 in., set in special one-piece bearings. As the screen is unusually heavy, weighing about 50,000 lb., it is equipped with heavy cast-steel tread rings in order to avoid the flattening and stretching that results with rolled-steel tires. The screen is run at 13 r.p.m., giving a peripheral speed of 195 ft. per min.; it is set on a pitch of one inch to the foot and the thrust is taken by a heavy cast-steel bracket and thrust roller, 15 in. in diameter with 5-in. face that bears against the tread ring. The screen is tied together on the outside by five 6x6x¾-in. angles and on the inside there are 1½x2-in. steel bars running the length of the screen to assist in disintegrating the material.

The first four feet of the screen are blank to permit the water and gravel to mix; the next eight feet have 1-in. perforations; the next 14 ft. have 3-in. holes; the last four feet of the screen are blank and here is accomplished the final washing of the boulders by three 3-in. nozzles. The oversize product from this screen (cobbles over three inches in size) are returned by a 30-in. conveying belt to the head screen in the main crushing plant. This conveyor is set at an angle of 10°; the boulders now being washed clean, there is no sand or clay to keep them from rolling as was the case on the receiving belt which operates at an angle of 18°. Conveying belts removing the finer washed sizes are set at an angle of 12 degrees.

### The Conical Screens

All the water so far used passes with the undersize—clay and gravel, under three inches in size—to a hopper that serves two series of "conical" screens. There are four of these screens, the shells of which are really not cones but frustums of cones; the screens are 84 in. long, and 66 in. and 48 in. in diameter at the respective ends. At the small end the screen is fastened to a cast-iron head into which a 1$\frac{15}{16}$-in. driving shaft is pressed and keyed. The head casting is protected by a steel disk, ½ in. thick by 48 in. diameter. The feed to these screens is delivered by a chute on the inside at a point near the 48-in. end; the end of the feed chute is cut off at an angle so that all of the feed is not delivered at one spot on the screen plate, thus distributing the wear. The screens are run at a speed of 12 r.p.m. On account of the conical shape and the force of gravity, the oversize passes backward and out of the screen against the action of a washing nozzle.

The first two of these conical screens have 1½-in. perforations. The oversize in consequence varies from 1½ to 3 in.; this is taken by conveyor *C* to the conveyor feeding the first corrugated rolls and Symons disk crusher in the main crushing plant, and from that point follows the normal course for such a product. The undersize from the first two conical screens passes to the last two screens which have ⅜-in. perforations; the material larger than this size is transported by conveyor *D* to the main crushing system, or when desired, may be sent directly to stockpile.

### The Washed Gravel and Silt

The undersize from the last two conical screens together with the accumulated water passes to two automatic-tilting settling boxes, the washed sand from which is conveyed to the stockpile. The overflow from the settling boxes containing the wash water and silt will flow back to the dredged land from which the cobbles were removed. As the water drains off it will be pumped to the irrigating system serving the adjacent orchard lands of the company. The discharge of the water and silt from the settling boxes of the washing plant will be carried away by a 2-ft. semicircular steel flume made of No. 16 galvanized sheets in 16-ft. sections. It will be strengthened by side angles, 1½x1½x$\frac{3}{16}$ in., and tied with 3-in. channels at every eight feet.

Water for the washing plant will be supplied by a 10-in. Advance, two-stage, vertical, centrifugal pump operating at 150-ft. head—directly into the washing-plant system, through a 14-in. riveted pipe 1600 ft. long. The capacity of the pump is 2500 gal. per min. at 600 r.p.m., though it is expected that only about 2000 gal. will be required at this plant.

It is expected that the washing plant will be capable of washing about 3000 tons of cobbles in 10 hr. and that by the removal of the clay and fine gravel, it will increase the capacity of the screening and crushing machinery in the main crushing plant at least 40 tons per hr., and possibly a much greater amount.

### Products Mainly Used for Road Building

The products from the crushing plants are chiefly used for making concrete and road building, the latter being the most important market. They are also used by the railroads for ballasting and filling and for "top dressing" around stations. Natomas last year secured a contract from the State of California for 500,000 tons of macadam to be used on the new state roads, two of which are to be built from north to south through the state. These new state highways involve the construction of about 2700 miles of road, one of the highways running near the coast and the other in the valleys farther to the east. The crushing plants of Natomas Consolidated are favorably situated for supplying crushed material for the new roads in the Sacramento and San Joaquin Valleys. It is understood that feeders to the state roads will be built by the various counties so that these road projects, together with the normal increase from ordinary channels of business, offer a market for crushed dredged cobbles for many years to come, and incidentally will provide California with a system of roads that should rival or excel the old Roman highways.

The product of the Natomas crushing plants has been passed upon by the Office of Public Roads of the U. S. Department of Agriculture as an excellent road-making material having been designated as "a hard and tough rock with high resistance to wear and fair cementing value . . . . . a good road material for heavy traffic." With the new washing plant in operation, an even superior product should be produced at the Fair Oaks crusher, and the capacity of the works augmented.

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## Mineralization in Ungava

Valuable iron deposits and indications of other metals exist in the district of Ungava, recently added to the Province of Quebec as the Territory of New Quebec, according to a report published by the Quebec Department of Colonization, Mines and Fisheries. Gold has not been actually observed, although numerous quartz veins occur. Silver has been found only associated with lead in the limestones of the Cambrian area on the east coast of Hudson Bay. A few occurrences of copper pyrites were observed. Large and promising deposits of magnetite, hematite and siderite occur in various localities. They are always associated with a cherty limestone, the latter being found on the east coast of Hudson Bay, at Lake Mistassini and along the Koksoak and Hamilton Rivers. Analyses of samples taken along the Koksoak River run from 20 to 55% metallic iron, the deposits being extremely variable in quality and large areas of high-grade ore apparently existing. The deposits along the Hamilton River are of similar grade and nature. In the Hudson Bay areas most of the ore is of the carbonate variety but high percentages of manganese are found there. Large deposits of titaniferous ore are found in many localities.

Pyrite occurs in various places in different manners. A bituminous mineral called anthraxolite, which has the lustre and color of anthracite and analyzes approximately 5½% water, 2½ additional loss on ignition in a closed vessel, 87% fixed carbon and 7% ash, is found rather widely distributed and is supposed to be the hardened product of a liquid bitumen. Deposits of mica, agate, jasper and labradorite, together with building stones, cement rocks, grindstones and flagstones are also found.

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## Burkey's Treatment of Brass Scrap

The production of zinc oxide from brass scrap, is described by Harvey M. Burkey, of Newark, N. J., in U. S. pat. No. 1,061,447, assigned to the Metallurgical Co. of America. Brass turnings or brass waste, mixed with fine fuel preferably fine anthracite coal, are charged in on a fire in a converter, of the Huntington-Heberlein type, either working by pressure or by suction. The zinc is volatilized and passes as zinc oxide into flues, where it is recovered by baghouse or similar means. At the close of the operation a cake of copper agglomerate or sinter, suitable for blast-furnace or reverberatory treatment, is discharged from the pot.

# Canvas Plant of the Federal Lead Company

By Claude T. Rice

*SYNOPSIS—Description of an installation of canvas tables for concentrating the tailing from other concentrating machines. A substantial additional saving is made. The process is intermittent, collected concentrate being washed off the table with a hose. Low cost of maintenance is a prominent feature of the plant.*

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In the accompanying drawings are shown the details of the canvas plant of the Federal Lead Co., at Flat River, Mo. Formerly canvas and blanket plants were much used in treating fine sizes of ore, but gradually the vanner and other slime-treating devices have supplanted them to a large extent until only those in California exist, together with a few other scattered installations. Most modern millmen seem to think that canvas tables and buddles are outgrown. But Mr. Guess finds that after he has sent his pulp over fine tables, and much of it twice over vanners, he is still able to make a 40% saving on the 3% lead material fed to the canvas tables. Of course on a galena ore, such as is treated in this mill, a canvas plant possibly will make a better saving than on some of the lighter minerals, such as pyrite or chalcopyrite. The canvas plant, however, is a cheap method for final treatment of slime before it is thrown away.

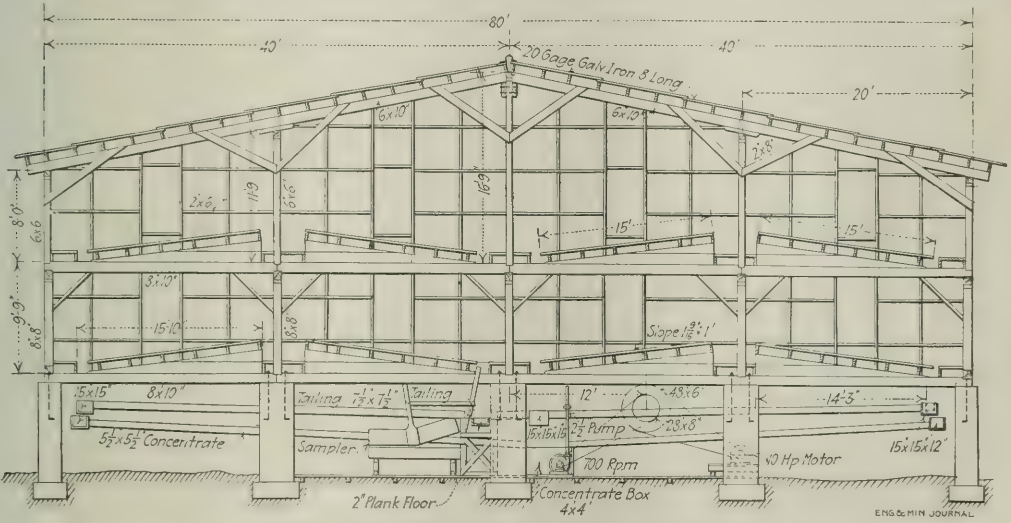

Fig. 1. End View of Canvas-Plant Building

On a canvas table a fairly clean concentrate can be made, but it is generally better to make one that is not so clean and then re-treat it on tables and vanners. This is the present practice at the Federal plant as it has been found better than making a concentrate running as high as 35% lead and shipping that, after drying, directly to the smelter. The higher the grade of concentrate made on a canvas table, the smaller the saving and the greater the expense, for canvas-plant concentrate is cleaned by washing it free from gangue slime with a hose on the table before sluicing it into the concentrate box.

The Federal canvas plant has 48 tables. The accompanying drawings show the details of the two-story frame building, which is 80x80 ft. in area. The cost of the building with board sides and corrugated-iron roof, fully equipped as shown in the drawings, was only about $8000 with lumber at $22 per M. and carpenters' wages $2.55 per eight-hour shift. The cost of operation is not high, as one boy will wash off 36 canvas tables an hour when making rough concentrate and 24 tables when washing off clean concentrate. A table has to be washed off about once in 20 minutes, the interval depending upon how fast the tables are making concentrate. As soon as the canvas becomes well covered with concentrate, the table ceases to be efficient and must be washed. Boys do this washing easier and better than men.

The accompanying drawing, Fig. 2, shows the arrangement of the feed, the tailing and the concentrate launders *A*, *I* and *J*, respectively. The feed for each canvas table is drawn off from the launder *A*, through two pipes *B* that bring it down into the feed box of that table. These feed pipes are shut off best by means of wooden plugs while washing the table, although valves can be used as shown in the drawing. Valves are slower and less convenient.

From the feed box *D*, the feed issues through ½-in. holes bored at 6-in. centers to the distributor *E*. By means of the finger arrangement of the lower lip, as shown in the enlarged view, the pulp is spread out in an even film on the deck *F* of the canvas table. This top is 11 ft. 8 in. wide and 14 ft. long and has a slope of $1\frac{9}{16}$ in. per ft. In covering the table two-ply tar paper is first fastened to the wooden deck with 8-oz. copper tacks. Over this is stretched 18-oz. canvas, two pieces 6 ft. wide being used. In applying both paper and canvas, butt joints only are used. First the strips are tacked down with 8-oz. copper tacks along the center butt joint, then the canvas is stretched by hand and tacked down on the other three edges. Wooden strips are then nailed over the middle joint, across the top and along the edges. The shrinkage of the canvas when it becomes wet removes all wrinkles.

From the table the pulp flows down to the tailing-box *G*. This has two compartments, one for tailing and the other for concentrate. It is provided with a tilting board, *H*, hinged on the middle partition, by tilting which the pulp is conducted into either of the two compartments desired. When the table is being washed this tilt board is set so as to let the concentrate go into the concentrate launder. By means of cleats it is possible to arrange the tilt board so that no hinges are required.

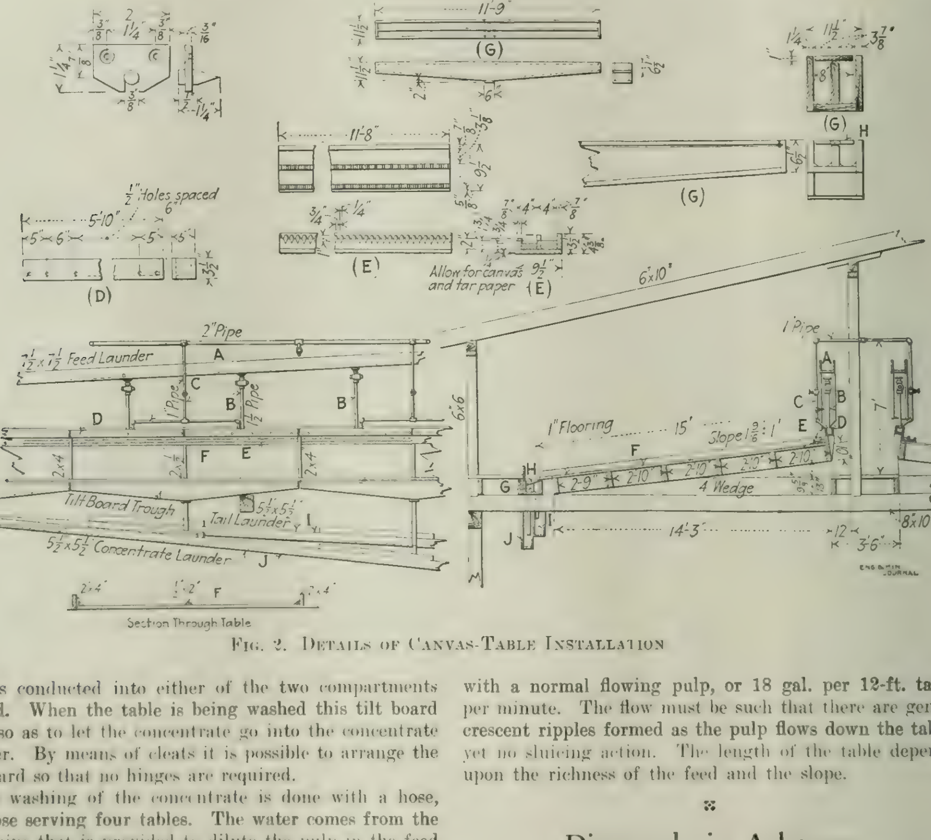

Fig. 2. Details of Canvas-Table Installation

The washing of the concentrate is done with a hose, one hose serving four tables. The water comes from the same pipe that is provided to dilute the pulp in the feed box. Mr. Guess has found the proper consistency of pulp to be 15 parts of water to one of dry slime by weight. The hose may be fitted with an appropriate nozzle when the concentrate is to be dried for shipment as in this way it can be discharged with a minimum of water, but when the concentrate from the canvas tables is re-treated on Wilfleys and vanners, no sluicing nozzle is required, as the attendant gets his sluicing jet by pinching the end of the hose between his fingers.

About the only upkeep on the tables is the canvas, as the rest of the material lasts several years. At the Federal mill the canvas on the tables has a life of about eight months. During the first few weeks, when the fuzz is on the fibers, the canvas is more efficient than later in its life. It was this consideration that led to the use of concrete "planillas" at the Pinguico mill at Guanajuato in Mexico instead of canvas tables. But this falling off in efficiency is not marked, and a canvas surface is probably better for doing close work, in a plant built primarily for concentration, and not just for roughly catching the sulphide particles to keep them from interfering later in the cyanide treatment of the pulp. One of these canvas tables, 12 ft. wide will treat in 24 hours about 100 to 120 tons of pulp containing about 81% moisture. A good general rule for estimating the capacity of canvas tables is 1½ gal. per min. per ft. of width of canvas with a normal flowing pulp, or 18 gal. per 12-ft. table per minute. The flow must be such that there are gentle crescent ripples formed as the pulp flows down the table, yet no sluicing action. The length of the table depends upon the richness of the feed and the slope.

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## Diamonds in Arkansas

Diamonds were first discovered in Arkansas Aug. 1, 1906, near the mouth of Prairie Creek, in the vicinity of Murfreesboro, Pike County, and since that time approximately 1375 stones, aggregating 550 carats, are reported to have been found in this locality. The diamonds in Arkansas occur in peridotite, and search for further areas of the rock has been made. Three new areas have been found, the known extent of which is much smaller than that near Murfreesboro. They lie within an area of one square mile, about 3 miles from Murfreesboro. These localities were visited by **Hugh D. Miser**, of the U. S. Geological Survey.

At this time the Kimberlite Diamond Mining & Washing Co. was erecting at Kimberley a plant to wash the diamond-bearing earth to be hauled on a tramway from its peridotite area and from another tract near the mouth of Prairie Creek. Four diamonds of good quality are said to have been picked up on the surface, the largest weighing 4 carats. Further development work to ascertain the extent of the peridotite is now under way. On another tract, where a little washing for diamonds has been done in a crude way without machinery, 20 diamonds have been recovered.

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## New Mogul Mill in Black Hills

By Jesse Simmons*

Gratifying progress is being made by the Mogul Mining Co. of Terry, S. D., in the construction of its new plant in Nevada Gulch, and it is within expectation that the mill will be crushing ore by the end of the year; its capacity will be 150 to 200 tons per day. For more than one year the Mogul has been without milling facilities, a fire having so severely damaged the plant at Pluma in March, 1912, that the company took no steps to rebuild on that site. After considerable research work it was decided to rebuild at a place more convenient to the mine, and the site near the Snowstorm mine was selected. Low-grade ore which could not profitably be shipped to Pluma can be treated when milling is resumed.

Practically all of the crushing and grinding machinery for the new mill will be salvaged from the Pluma plant. The Pluma plant also contained tanks which can be utilized, and the warehouse and machine shop, which were not reached by the fire, contain much uninjured machinery, repair parts, supplies and the usual supply of tools found in a small machine shop. With these, the engineers estimate that the new plant will cost $46,000. It is also planned to spend $8500 for mine development and equipment in order to make the mine workings convenient to the mill. The trustees for the bondholders have collected $73,280 fire insurance, and have agreed that current expenditures may be made from this money.

Ore supplies for the new plant will be drawn from the North Lode, Carstreet and Black Moon, in which it is stated 48,000 tons of ore are in sight, the Mark Twain, Sunnyside No. 1, Ben Hur, White Pine, Hardscrabble and others. Gyratory crushers, rolls, chilean mills and Dorr classifiers will be installed. Continuous decantation and counter-current treatment of slime, using Dorr thickeners, and eliminating the filters used in the old plant, will be practiced. As the first plant in the Black Hills to use this process without a filter, its operations will be closely watched.

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## Chilean Government to Control Mineral Deposits

A new law has just been passed by both branches of the Chilean Congress which suspends the old mining code indefinitely, according to *Daily Consular and Trade Reports,* Aug. 30, 1913. It is said to be the result of heavy American investments in copper and iron mines during 1912 and 1913, which represent an investment of $15,000,000 to $20,000,000 when the plants have been completed. The important provisions of the new law are included in the following abstract:

(1) During the time the right of individuals to denounce iron mines is suspended, the State shall be authorized to make the necessary declaration and inscription of such deposits. (2) Such claims to have the superficial dimensions decreed by the President of the Republic, and possession to be taken in the usual way provided in case of individuals by the mining code, though the State shall not be obliged to start work within the term laid down in such cases. (3) The rights thus acquired by the State shall be in perpetuity, and no license or other rates shall be paid. (4) The mensuration and establishment of titles to be undertaken by the mining section of the Direction of Public Works. (5) All iron mines the property of individuals the rights to which shall lapse through nonpayment of the necessary taxes shall revert directly to the State and shall not be sold by auction as provided in the mining code. (6) The President of the Republic is authorized to establish the regulations necessary for carrying out this law.

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## Rock-Drill Lubrication

It is essential for the satisfactory working of a rock drill that it be well lubricated. This is particularly true of the rapid-stroke hammer drills. It is a fact sufficiently well recognized by both manufacturers and managers, but it is a fact exceedingly hard to impress on the consciousness of the average miner. The Journal has been engaged in correspondence to ascertain what are the most acceptable and successful methods of lubricating air-actuated rock drills, with results which we present herewith.

The main problem in most cases seems to be getting the miner to lubricate his machine at all. Economy in the use of lubricants is a matter of consideration by some companies, but not by all. To induce the miner to attend to lubrication, it is customary to supply him with an oil flask, usually a pocket-flask and to maintain sufficient supplies of oil at convenient points so that he will have no excuse for not oiling his machine.

The miner who does oil his machine usually prefers to put in a large amount of oil at rather infrequent intervals. He does this by disconnecting his hose, and oiling through the hose connection. It is probably not bad practice to put in an extra charge thus at the beginning of the shift, as the machine may have lain idle for some time, possibly rusting slightly or gumming so as to stick. It is, however, a wasteful method of lubrication. One practice which sometimes obtains is to be condemned in the strongest terms, that of putting the charge of oil in the hose where it is attached to the air pipe. This is done to distribute the feeding of the oil over a considerable period of time, as it has to be carried through the hose before reaching the drill. It is questionable whether this result is obtained; the injurious effects on the rubber hose are unquestionable. The mineral oil disintegrates the lining, ruins the hose and allows small pieces of rubber to get loose and lodge in the drill valves so as to cause trouble.

Most modern machine drills come equipped with some sort of lubricating device. There are also numerous automatic and semi-automatic lubricators on the market which can be applied to the connection between the hose and the machine. When the miner can be induced to use these, there is a substantial saving in oil consumption and a much more satisfactory lubrication of the drill.

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*Deadwood, S. D.

The most commonly employed principle involves an attachment to the throttle valve, which injects a certain amount of oil every time the machine is stopped and started. Usually this is done by arranging ports in the throttle so that when the machine is stopped, a small amount of oil is forced into an auxiliary chamber of the device and when it is started, the main air flow is directed through this chamber and shoots the oil into the machine. The system is correct in furnishing a small quantity of oil at frequent intervals and it is reported by many companies as proving most satisfactory in practice. The proof of the pudding is chewing the strings; nevertheless, the method is incorrect in theory, inasmuch as the quantity of oil fed varies inversely more or less as the time that the drill is running. That is, the greater the number of stops, the greater the amount of oil fed and yet, at the same time, intermittent running usually means a smaller total of actual running time.

A system absolutely correct in principle is employed by at least two large manufacturing concerns on most or all of their drills and is reported by one mine as being satisfactory except for feeding too rapidly. It consists of inserting in some convenient and otherwise unoccupied portion of the machine an oil chamber feeding into the valve chest and so arranged usually that the oil traverses a plug of porous material which filters it. The oil in the chamber is alternately under pressure and suction caused by the pulsations of the air and for each stroke a minute quantity of lubricant is pulled through the valve.

## VARIOUS DEVICES USED TO COMPEL OILING

A variation of this system involves the use of a number of cartridges of porous material capable of absorbing oil. The cartridge is placed in a special lubricating chamber and gives up its oil under the effect of the air pulsations. The miner, on going on shift, is given a sufficient number of such cartridges to oil his machine for a shift and on quitting, returns them dry as evidence of the machine's being oiled, there being no other way of extracting the absorbed oil except in the machine. Such a scheme, if proved practicable in use, offers the great advantage of compelling the miner to attend to lubrication.

A somewhat similar system suggested by the mechanical engineer of one large mine is to use the combined throttle and oiler previously mentioned, giving it filled with oil to the miner when he goes underground, and requiring its return when he comes up. Since it could be made impossible to operate the machine without the throttle, lubrication would take care of itself unless the miner deliberately emptied the oiler before connecting up. An objection might arise when it became necessary to change machines and take a spare one from underground, which might have its throttle-oiler empty. This could be met by making the throttle part of the miner's equipment so that when he changed machines he could put his own throttle on the new machine.

It has been suggested that the question of lubricating be taken out of the hands of the miner entirely by feeding the proper amount of lubricant to the air main as soon as it is sufficiently cooled after leaving the compressor. This would be entirely feasible; its results can not be prognosticated. Undoubtedly for most of the time the machines would receive their oil slowly and the quantity would be proportioned to the work done. However, the increase in oil consumption might be considerable, a rather large amount would be necessary to coat all the air pipes in the first place and the oil in the air used for blowing smoke would be wasted. If it were attempted to prevent this by shutting off the oil feed at the proper time before blowing began, the drills would not be supplied immediately with lubricant at the time of starting on the next shift. The proper times to stop and renew the oil feed would be hard to determine. Furthermore, the oil being atomized might be capable of forming an explosive mixture with the air of which the introduction underground would be as dangerous as that of gasoline.

The question of the kind of lubricant used is of equal interest with that of its means of application. The testimony of most operators seems to favor a red engine oil as giving the best combination of quality and price. Air-cylinder oil is recommended but is considerably more expensive. The most important point is to avoid gumming the machine. For this reason, heavy oils are not suitable. Nevertheless, in one case, a black oil is used in tappet-valve piston machines. The same company uses the automatic device mentioned, which feeds by the air pulsations and in this device uses an oil of rather high viscosity, No. 2 Castor, which, however, appears to contain much fish oil and no castor oil. Special oils for rock drills are also on the market.

## NO ECONOMY TO SAVE ON OIL

At many mines, as before stated, effort has been made to encourage the use of lubricant rather than to reduce consumption. Where record of consumption is kept, the figures check rather well. One property reports 0.3 pint per machine shift, another 0.5 pint, the latter figure being a reduction of 50% following the introduction of a throttle-oiler, and corresponding to a saving of 3c. per machine shift, beside large indirect savings in repairs and replacements. Another property reports a consumption of slightly over a pint per drill-shift, except in the case of Water Leyner machines, which consumed about a quart. It is current comment among miners that the Water Leyner requires an unusual amount of lubrication, attributed to the tendency of the water connection to leak and wash out the lubricant. The clothes of the Leyner drill runner, judging by appearances, absorb a large amount of the surplus.

It seems to be the general consensus of opinion of mine managers and drill manufacturers that satisfactory lubrication of rock drills is difficult to obtain, highly important and too much neglected. Some automatic or semi-automatic oiling devices effect both direct saving in lubricants and indirect economy in promoting steady operations and low repairs. A red engine oil is the accepted lubricant. Consumption can be kept to 0.5 pint per drill shift or less.

For the information in this article, the JOURNAL is indebted to the Ingersoll-Rand, Sullivan and Cleveland drill companies, and to the North Star, the Goldfield Consolidated, the Calumet & Arizona, the Hollinger and the Cleveland-Cliffs mines.

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**European Phosphate Production**, as given by the president of the Gafsa Phosphate Co., is as follows: In 1900, 1,645,000 tons, of which Gafsa supplied 171,000 and America 600,000. In 1905, 2,560,000 tons, Gafsa contributing 624,000 and America about 950,000 tons, in 1910, 3,400,000 tons (Gafsa 950,000 and America 1,100,000 tons), 1912, 4,183,000 tons (Gafsa 1,312,000 tons). It is, however, improbable that this rate of growth will be maintained in the future.

# The Magistral District, Jalisco, Mexico

By Ezequiel Ordoñez*

*SYNOPSIS—Description of an old Mexican district, the copper ores of which were used to manufacture a crude copper sulphate. This chemical was necessary in the patio process of amalgamating gold and silver ores. The district is named for the chemical. It is now undergoing systematic development.*

Magistral, a well known copper district, is situated a few miles southwest of Ameca, Jalisco, Mexico. It is connected with Guadalajara by a branch of the National Railways of Mexico. Although its copper-bearing veins have been known for a long time, no large mines have been developed. Small mines of varying importance and a great number of prospect pits are scattered throughout the supposed mineral territory. The first work done on these deposits was to get, either through the weathering of crude ore, or of previously roasted ore, the copper sulphate so necessary in the treatment of silver ores by the patio process. These impure sulphates were called *magistral,* from which the name of the district has been derived. It is said that *magistral* from this district was packed on animals as far as Guanajuato.

Outcroppings in the district show large quantities of iron oxides, but they show but very little copper carbonate, and at slight depth both pyrite and chalcopyrite are found. These conditions facilitated the operations of the makers of *magistral* in that they were not compelled to go far underground for ores suitable for their purpose.

## MAGISTRAL DISTRICT THE CORNER OF A LARGE COPPER BELT

Considered individually, the Magistral district, as known to date, is not extensive. The six or seven principal veins are more or less parallel and strike in a northwesterly direction for a distance of two or three kilometers. All lie within a strip not more than two kilometers wide. It is apparently the northeastern extremity of an extensive copper belt which extends to the southwest as far as the Pacific Coast range of the Sierra Madre, and upon which the Ayutla, San Martin, Union de Tula and Cacoma districts lie. These districts have been mentioned recently as showing copper ore in small bunches as well as in broad gossans of distinct prospective value. Little is known about this long copper belt, as no important development has been undertaken as yet, and the belt will be handicapped for a long time on account of lack of transportation facilities through mountainous country.

The district lies in a hilly, though widely opened, eroded depression between two ridges, which, starting from near the summit of the lofty peak called La Tetilla (2800 meters above sea level), lead to the east. The flanks of this mountain are covered with a thick sheet of basaltic lava, patches of which are also seen within the eroded depression, as remnants of an original inclined plateau which previous to erosion uniformly surrounded the peak. Its copper deposits may be compared in general geological outline to those occurring entirely in intrusive rocks. Such deposits occur in the Sierra Nevada range of California, in Idaho, and in some parts of New Mexico, while those of Butte, Montana, are typical of the class. The predominant country rock of the Magistral district is a large body of diorite, showing a wide variation in physical structure and character. This variation is from a coarsely grained diorite on one end, to an evenly grained micro-diorite, with frequent changes to porphyrites, on the other.

This varied country rock is cut in several places by thick dikes of quartz-porphyry. The veins occur on or near the contact of these dikes with the diorite and almost parallel to them in strike. The veins show in several places, especially near the surface, indications of their being fractures filled with quartz and rock fragments.

The deposits are generally closely connected with ancient fault-planes, along which quartz, with pyrite and varying amounts of chalcopyrite, seems to have impregnated the brecciated zone of the fault, replacing the country rock on one or both sides. Due to intense silicification, the original rock may be identified in ores of all grades, from a purely quartzose mass to hard fragments. It is not uncommon to find pyrite occurring in small masses or grains in the comparatively soft, altered, greenish rock of frequent occurrence in a number of copper districts. In so far as is at present known, the dikes have exerted no apparent influence on the veins and the mineralization has not been found to extend through the dike rock.

Outcrops of the Magistral veins, well marked and in some cases prominent, consist of silicified diorite, occasional quartz stringers and specular hematite. No true gossan exists, but in several instances iron oxides are abundant, these being accompanied with more or less copper ore. The old workings are naturally located on these outcrops, for instance, the mines of Magistral, Cerritos, Zapote, etc. However, even at these places the copper ore has never been sufficient for large production. Small lenses containing scattered bunches or small masses are the common form of ore occurrence, even to depths of 200 to 300 ft. below the surface. Near the surface the ores were so scattered that the makers of the *magistral* were compelled to resort to a careful and painstaking sorting in order to obtain ores clean enough to warrant the necessary roasting.

Copper veins of the district vary from 4 to 25 ft. in width, the bodies always being lenticular in shape, and sometimes many feet apart. Between the lenses the vein can be followed only by the fault-planes or by narrow stringers of quartz with altered rock containing pyrite and disseminated grains of chalcopyrite. Vein junctions seem in general to be favorable to ore deposition. One of the best examples observed is in the Magistral mine, where a junction of three veins has caused the formation of a series of ore lenses. Similar instances occur in the Cerritos open-cuts and in the old Timones mine. There are six principal veins in the district, known as the Magistral veins. They are composed of several subsidiary veins close to a large dike. Following to the southeast, there is the Hondo and another vein near it, then the Timones, Monterrey and La Union veins.

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*Mining geologist, 2a General Prim 43, Mexico City.

In addition to the Magistral, which is the principal mine of the district, there are three other small mines, the Timonas, Zapote and Cerritos; this last at present being worked on a small scale. The Zapote and Cerritos mines are about 300 ft. deep, and the Magistral 400 ft. None of them has been extensively worked. A new lens has been recently found in the Magistral, which is now being exploited. The Magistral company is operating a concentrator with a capacity of 50 tons per day, which is to be increased to 100 tons in the near future. The company erected, some time ago, an involved plant for concentration by jigging as well as a small flotation unit, but the results were disappointing and it was considered that concentration was difficult if not impossible. Recently, however, changes were made in using the original crushing plant. The ore is crushed through three-stage rolls to 14 mesh and the entire pulp passed over Isbell concentrators. The middling from the Isbell tables is recrushed in a small tube mill and passed over Wilfley tables, which effect a further saving. This plant has demonstrated that concentration gives excellent results.

A study of the Magistral district is of broader interest than is indicated by the limited territory covered, for the reason that it is representative of most of the districts included in the long copper belt of which it forms a part. Further development may disclose important deposits.

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## United States Asbestos Production

Domestic production of asbestos in 1912 came from three states: Georgia, Vermont and Wyoming. The Georgia production was of the amphibole variety and that of Vermont and Wyoming, serpentine. The quantity was 1403 short tons in total. The United States production is insignificant compared with that of Canada, which amounted in 1911 to about 127,000 tons, according to information published by the U. S. Geological Survey. Canada is the most important producer of asbestos used in the United States.

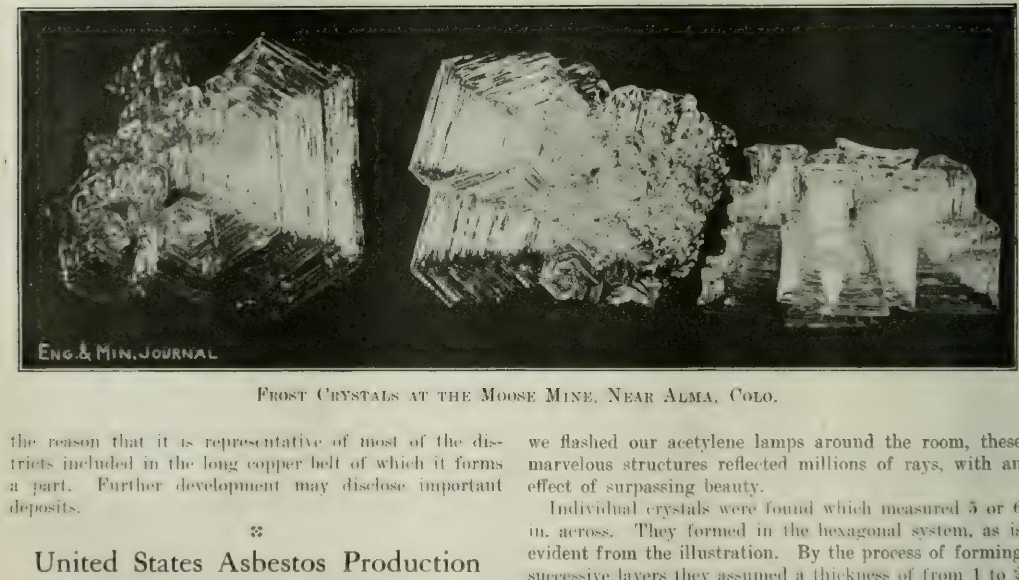
In Vermont there is a large quarry and mill production of cross-fiber chrysotile. Virginia deposits are mainly slip-fiber amphibole, idle at present. The Georgia deposits are also amphibole, as are those of Texas and the prospects of Arizona, Idaho and California.

## Frost Crystals Formed Underground

By C. B. Neiswender*

The Moose mine is situated in the Alma mining district of Colorado on Mount Bross, at an elevation of 11,700 ft. At this lofty altitude snow covers the ground for 10 months of the year, and during the remaining two months intermittent snow storms keep the temperature extremely low. For this reason the mine workings were all in frozen ground and stopes of large proportions were excavated with no supporting timbers. Several adits were driven from the surface at different levels in rather a blind search for orebodies, and these openings are connected by means of stopes. Ore was discovered in 1871 and mining was active until 1880.

In the summer of 1911 a party of which I was a member made an examination of the mine for the Colorado Geological Survey. In measuring the extent of the old orebodies our work took us into the abandoned stopes in the extreme bottom of the mine. In the deepest accessible stope a truly wonderful sight was presented, the walls, roof and floor of the large stope being completely covered with a growth of enormous frost crystals. As we flashed our acetylene lamps around the room, these marvelous structures reflected millions of rays, with an effect of surpassing beauty.



Frost Crystals at the Moose Mine, Near Alma, Colo.

Individual crystals were found which measured 5 or 6 in. across. They formed in the hexagonal system, as is evident from the illustration. By the process of forming successive layers they assumed a thickness of from 1 to 2 ft. They had been forming for over 20 years, since the stope in which they were found was abandoned when the mine closed down some time in the '80s. When the aggregations of crystals became of such weight as to be unable to support themselves from the roof, they fell to the floor of the stope and there formed a deposit at least 3 ft. in depth.

The Moose mine is essentially a dry one, the only water present being the small amount which runs in through the adits in summer time. Since the mine is in permanently frozen ground the precipitation of snow and rain is disposed of either by surface run-off or by shallow absorption, and does not reach to any considerable depth. It is, therefore, obvious that the crystals found are of the frost variety and were formed from atmospheric moisture drawn into the old stopes through the different openings.

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*Mining engineer, 1445 Downing St., Denver, Colo.

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# Hardinge Mills vs. Chilean Mills*

The Hardinge conical pebble mill made its appearance shortly after the plant of the Miami Copper Co. was designed in 1909. Its possibility as a suitable crushing device for the plant was recognized, but in view of the lack of demonstration of its capacity, efficiency for the product desired, and the still more uncertain factors of cost of maintenance and power consumption, it was considered that its immediate adoption throughout the plant would be dangerous.

It was decided to equip the majority of the immediately required units of the plant with chilean mills, the fine-crushing qualities of which were better known, and one section with Hardinge mills, to serve as a test unit for the guidance of future installations and replacements. After 1.5 years' operation with both types, a test of metallurgical efficiency and cost economy has been obtained.

### High-Speed Chilean Mills Used

The conical mill used in the test is the 8-ft. Hardinge pebble mill having a cylinder 22 in. in length. The cylindrical portion is lined with cast-iron plates, and the conical extension with silex brick, bound together by cement. Each liner plate carries a projecting lifter, the function of which is to increase the height of drop of the lifted material. Danish No. 5 coast pebbles are used for grinding. The chilean mill is a fast-running three-roller, 6-ft. Saturn mill with screens of 0.037-in. opening. The feed to these mills is the oversize of Callow screens having 0.029-in. openings, which follow rolls crushing to 0.5 in. The ore is a moderately hard but very fissile schist, impregnated with finely disseminated granular chalcocite. It may be regarded as a readily-sliming ore.

### Hardinge Mill Believed Better

For the purposes of this plant the Hardinge mill has shown itself more satisfactory than the chilean. With the chilean mills the delays amounted to 0.57% of the time for screen changes and 1.54% for repairs. Corresponding delays with the Hardinge mill are 0.71% for relining and 0.58% for repairs.

It will be seen that most of the delays of the Hardinge mill are due to relining, a point which is susceptible of reduction by having on hand extra shells already lined, which can be swung into place of the worn-out ones by a crane, reducing to about 2 hr. the operation, which in lining the mill in place, would take about 48 hr. It is said that less actual attendance is also required for the Hardinge mill, making it possible to reduce the operating cost in plants where the duty of the attendants can be distributed so as to include the supervision of other apparatus. Occasional pebble feed, lubrication and a lookout for obstructed discharge boxes are the only services required.

Because of the granular character of the chalcocite of this ore, it is the object to make a product of such size as to liberate the maximum mineral content with as little slime as possible. It has been found that that a product which contains a maximum percentage between the sizes of —60 and +200 mesh is the best. In Table I is given a typical screen analysis of feed and product for both types of mills. From this it is seen that the Hardinge mill yields 37% of the desired size of the material, or about 50% more than the chilean mill, accompanied by less slime. The Hardinge mill is said to consume less power. At this plant a 150-hp. induction motor operates three 8-ft. Hardinge mills or two 6-ft. chilean mills, and the power consumption is, on the actual feed tonnage, for the chilean mill, 10.7 hp.-hr. per ton, and for the Hardinge mill, 9.6 hp.-hr. per ton. An important feature brought out by the comparative operation of these mills is the difference in duty exacted of the cone tanks. The sections of the plant operated with Hardinge mills have shown an average reduction of nearly 75% in the solid feed and 40% reduction in the water feed to these tanks as compared with the chilean mills. This is to be attributed to the combined results of the smaller quantity of water fed to the grinding mill and of the smaller production of slime.

TABLE I. COMPARISON OF WORK OF CHILEAN AND HARDINGE MILLS

| | Chilean | | Hardinge | |
|---|---|---|---|---|
| Mesh | Feed | Product | Feed | Product |
| +4 | 13.9 | 0.0 | 12.9 | 0.0 |
| +10 | 47.5 | 0.0 | 47.3 | 0.0 |
| +20 | 22.9 | 2.3 | 26.8 | 0.2 |
| +30 | 5.2 | 11.8 | 5.0 | 3.2 |
| +40 | 0.9 | 6.7 | 0.8 | 4.9 |
| +60 | 1.0 | 11.4 | 0.8 | 13.8 |
| +80 | 0.5 | 6.7 | 0.4 | 10.4 |
| +100 | 0.4 | 5.4 | 0.3 | 8.6 |
| +150 | 0.5 | 6.3 | 0.3 | 8.0 |
| +200 | 0.7 | 7.2 | 0.5 | 10.0 |
| —200 sand | 1.2 | 10.6 | 0.8 | 10.0 |
| +200 slime | 5.3 | 31.6 | 4.1 | 30.9 |

### Low Maintenance Cost of Hardinge Mills

The maintenance costs of chilean and Hardinge mills are shown in Table II. The cost for each mill is based on crude-ore tonnage, so that the cost per ton of actual feed would be 40% greater than that shown. In the reduction practice of this plant about 70% of the crude-ore tonnage passes through the fine-grinding mills. From the figures shown in Table II it will be seen that the Hardinge mill, for the practice of this plant, shows a net cost of about 0.05c. per ton less than the Chilean mill. It is to be noted that pebble consumption constitutes 70% of its cost, and the freight on pebbles comprises approximately 50% of their expense in this locality.

TABLE II—MAINTENANCE COST OF HARDINGE AND CHILEAN MILLS

| Chilean Mill<br>Tons Milled 826,000 | | | Hardinge Mill | | |
|---|---|---|---|---|---|
| Driving mechanism | Cost per ton | | | | |
| Shafts, pinions and gears | $0.00230 | | | $0.00036 | $0.00036 |
| Spindles, muller bushings, etc. | 0.00275 | | | | |
| Miscellaneous | 0.00042 | | | | |
| Crushing mechanism | | $0.00547 | | | |
| Dies (12,910 tons per die) | 0.01079 | | Liner plates and lifters | $0.00403 | |
| Tires (7310 tons per tire) | 0.00987 | | Silex | 0.00300 | |
| Screens (183 tons per screen) | 0.00176 | 0.03135 | Cement | 0.00050 | 0.00753 |
| | | | Pebbles (2.51 lb. @ $0.013) | | 0.03262 |
| | | | Miscellaneous | | 0.00012 |
| Total supplies | | $0.03682 | | | $0.04063 |
| Repair labor | | 0.00841 | | | 0.00268 |
| Shop expense | | 0.00543 | | | 0.00214 |
| Total maintenance cost | | $0.05066 | | | $0.04545 |

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*Abstract of a paper by Robert Franke, Miami, Ariz. Bull. A. I. M. E., July, 1913.

The item of shafts, gears and pinions is probably somewhat low, in that these mills have not been operated sufficiently long to obtain a true average. Nevertheless, this part of the cost is small since the gears have a long life and constitute but a small percentage of the total.

The most important factor of the lower cost of the Hardinge mill is its low rate of depreciation. The wear on its shell, if proper care is taken and the lining is not allowed to wear through to it, seems negligible. Six chilean mills have shown an efficient life of 826,000 tons, making the rate of depreciation, inclusive of transportation and installation costs about 3c. per ton. Allowing a length of 10 years for the Hardinge mill, its depreciation cost would be less than 0.5c. per ton. Summarizing these factors, the net gain in cost by operating with the Hardinge mill for the practice of this plant shows, labor, 0.5c., and power (0.6 kw.-hr.), 0.75c., or a total of 1.25c. Adding to this maintenance, 0.5c., and depreciation, 2.5c., the total saving would be 4.25c. Other advantages which may be mentioned are the greater capacity by reason of low power consumption and fewer delays, superior product, enabling a better extraction to be made; smaller water consumption; and for minimum slime practice requires less dewatering equipment.

It is said that this mill is not out of the experimental stage, and there are possibilities of still better performances. For instance, by lengthening the cylinder of a 6-ft. middling recrushing mill from 22 to 38 in., it was found that the capacity of the mill was doubled, power consumption lessened and the pebble cost decreased to nearly one-half. It would seem, however, that this idea can be carried too far, for the more the cylinder of the mill is lengthened the more it tends to approach a tube mill and so become a slimer. For regrinding middling, however, this variation mentioned is a step in the right direction in that liberation of occluded mineral necessitates a fine product. Large percentage variation in the sizes of feed seems to have a considerable influence on the consumption of pebbles, as it was found in a test in which all the feed was sized to 2.5 mm. that the pebble consumption was 1.85 lb. per ton of actual feed as against the consumption of 3.60 lb. with the oversize feed shown in Table I. Experimental variations in the speed, in dilution of the feed and in size of pebble charge may lead to further economies.

### CRUSHING EFFICIENCIES BY DEL MAR'S METHOD

An interesting comparison, which, while based on rather ideal assumptions, is so decisive in result as to be given credit, is the mechanical crushing efficiency of the machines determined by the method of calculation discussed by Algernon Del Mar in his article on "The Mechanical Efficiency of Crushing."[1] These calculations as shown in Tables III and IV are based on Rittinger's law that "the work done in crushing is proportional to the reduction in diameter." This assumes that all surfaces exposed give the same unit resistance to crushing, whereas it is to be inferred that there are some surfaces which, by reason of inherent fissility of the ore, offer a lower unit resistance than surfaces not so favored. In view of the large number of surfaces produced, it would seem reasonable to assume that an average unit resistance to crushing will prevail in a not unduly long test. Furthermore, since in these calculations both machines are treated equitably with regard to the practical variations which do not enter into the law, the comparative results can be considered fairly reliable.

Table III shows the crushing efficiency without regard to quality of product made, from which it is seen that the units of reduction performed by the Hardinge mill exceed those of the Chilean mill by from 18 to 23%, depending on the degree of accuracy obtained in the assumptions made in the calculations, and considering 5% as a safe limit. This indicates that the Hardinge mill converts more of the power consumed into reduction of the charge than does the chilean mill. Table IV shows the comparative crushing efficiency with regard to size of product.

TABLE III. MECHANICAL CRUSHING EFFICIENCY—HARDINGE VS. CHILEAN MILLS

| | Hardinge | | | | | Chilean | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mesh | Reciprocal of Average Size | Feed % | Relative Surface in Feed | Product % | Relative Surface in Product | Feed % | Relative Surface in Feed | Product % | Relative Surface in Product |
| +4 | 4 1 | 12 9 | 53 | 0 0 | . | 13.9 | 57 | 0 0 | . . . |
| +10 | 7.2 | 47.3 | 341 | 0.0 | .... | 47.5 | 342 | 0.0 | .... |
| +20 | 18.3 | 26.8 | 490 | 0.2 | 4 | 22.9 | 419 | 2.3 | 42 |
| +30 | 37.7 | 5 0 | 189 | 3 2 | 121 | 5.2 | 196 | 11 8 | 445 |
| +40 | 58 4 | 0 8 | 47 | 4 9 | 286 | 0 9 | 53 | 6 7 | 391 |
| +60 | 83 6 | 0 8 | 67 | 13.8 | 1154 | 1.0 | 84 | 11.4 | 953 |
| +80 | 138.0 | 0.4 | 55 | 10.4 | 1435 | 0.5 | 69 | 6.7 | 925 |
| +100 | 163.0 | 0.3 | 49 | 8.6 | 1402 | 0.4 | 65 | 5.4 | 880 |
| +150 | 220.0 | 0.3 | 66 | 8.0 | 1760 | 0.5 | 110 | 6.3 | 1386 |
| +200 | 303 0 | 0 5 | 151 | 10.0 | 3030 | 0 7 | 212 | 7 2 | 2182 |
| —200 | 400 0 | 4 9 | 1960 | 40.9 | 16350 | 6 5 | 2600 | 42 2 | 16880 |

SUMMARY

| | Hardinge | Chilean |
|---|---|---|
| Units of work in product... | 25,552 | 24,084 |
| Units of work in feed.... | 3,468 | 4,207 |
| Units of work done by mill for uncorrected capacity | 22,084 | 19,877 |
| Units of capacities of 2.50 and 2.25 tons per h.p.-day respectively. | 55,210 | 44,723 |
| Excess unit of work done by Hardinge mill | | 108 47 |
| Excess efficiency, assuming method correct. | | 23 45% |
| Excess efficiency, assuming 5% as limit of error | | 18 45% |

TABLE IV SCREEN SIZE CRUSHING EFFICIENCY—HARDINGE MILLS

| Mesh | Reciprocal of Aperture | Feed Cumulative per cent | Relative Surface in Feed | Product Cumulative per cent. | Relative Surface in Product | Relative Surface Produced |
|---|---|---|---|---|---|---|
| 4 | 4 9 | 87 1 | 427 | 100 0 | 490 | 63 |
| 10 | 13 3 | 39 8 | 529 | 100.0 | 1330 | 801 |
| 20 | 29 4 | 13 0 | 382 | 99.8 | 2934 | 2552 |
| 30 | 50 5 | 8 0 | 404 | 96 6 | 4878 | 4474 |
| 40 | 66 7 | 7 2 | 480 | 91 7 | 6116 | 5636 |
| 60 | 115 0 | 6 4 | 736 | 76 9 | 8844 | 8108 |
| 80 | 147 0 | 6 0 | 882 | 66.5 | 9776 | 8894 |
| 100 | 182.0 | 5.7 | 1037 | 57.9 | 10538 | 9501 |
| 150 | 272 0 | 5 4 | 1472 | 49 9 | 13598 | 12126 |
| 200 | 333 0 | 4 9 | 1632 | 40 9 | 13620 | 11988 |
| | | | Chilean Mill | | | |
| 4 | 4 9 | 86 1 | 422 | 100 0 | 490 | 68 |
| 10 | 13 3 | 38 6 | 513 | 100 0 | 1330 | 817 |
| 20 | 29 4 | 15 7 | 462 | 97 7 | 2872 | 2410 |
| 30 | 50 5 | 10 5 | 530 | 85 9 | 4338 | 3808 |
| 40 | 66 7 | 9 6 | 640 | 79 2 | 5283 | 4643 |
| 60 | 115 0 | 8 6 | 989 | 67 8 | 7797 | 6808 |
| 80 | 147 0 | 8 1 | 1191 | 61 1 | 8982 | 7791 |
| 100 | 182 0 | 7 7 | 1401 | 55 7 | 10137 | 8736 |
| 150 | 272 0 | 7 2 | 1962 | 49 2 | 13462 | 11500 |
| 200 | 333 0 | 6 5 | 2165 | 42 2 | 14053 | 11888 |

Comparison of Efficiency with Units Corrected for Capacity

| Mesh | Energy Units Hardinge | Energy Units Chilean | Difference in Favor of Hardinge | Distribution % |
|---|---|---|---|---|
| 4 | 158 | 153 | 5 | 0 02 |
| 10 | 2002 | 1838 | 164 | 0 57 |
| 20 | 6380 | 5423 | 957 | 3 32 |
| 30 | 11185 | 8568 | 2617 | 9 08 |
| 40 | 14090 | 10447 | 3643 | 12 64 |
| 60 | 20270 | 15318 | 4952 | 17 18 |
| 80 | 22235 | 17530 | 4705 | 16 32 |
| 100 | 23752 | 19636 | 4116 | 14 28 |
| 150 | 30315 | 25875 | 4440 | 15 41 |
| 200 | 29970 | 26748 | 3222 | 11 18 |

⁂

**Queensland's Sapphire Production for 1912** was of considerable consequence, according to the annual report of the Under Secretary for Mines. In the Anakie field, the men have been doing remarkably well. A careful estimate of the year's production of gem stones gives it a value of about $161,000, increased by industrial corundum production to about $200,000. This is approximately a 40% increase over the production of the previous year.

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[1] "Eng. and Min. Journ.," Dec. 14, 1912.

# Historical Note on Tin Smelting

*SYNOPSIS—That tin was well known to the ancients is attested by its occurrence in bronzes, but the source of supply is unknown. There is but little to be found concerning its metallurgy before Agricola, and his description almost fits present Saxon tin smelting.*

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The first appearance of tin lies in the ancient bronzes. And while much is written upon the "Bronze Age" by archæologists, we seriously doubt whether or not a large part of so called bronze is not copper. In any event, this period varied with each race, and, for instance, in Britain may have been much later than Egyptian historic times. The bronze articles of the IV Dynasty (from 3800 to 4700 B.C., depending on the authority) place us on certain ground of antiquity. Professor Gowland (Presidential Address, Inst. of Metals, London, 1912) maintains that the early bronzes were the result of direct smelting of stanniferous copper ores, and while this may be partially true for Western Europe, the distribution and nature of the copper deposits do not warrant this assumption for the earlier scenes of human activity—Asia Minor, Egypt, and India. Further, the lumps of rough tin and also of copper found by Borlase ("Tin Mining in Spain, Past and Present," London, 1897, p. 25) in Cornwall, mixed with bronze celts under conditions certainly indicating the Bronze Age, is in itself of considerable evidence of independent melting.

To our mind the vast majority of ancient bronzes must have been made from copper and tin mined and smelted independently. As to the source of supply of ancient tin, we are on clear ground only with the advent of the Phœnicians, 1500-1000 B.C., who, as is well known, distributed to the ancient world a supply from Spain and Britain. What the source may have been prior to this time has been subject to much discussion, and while some slender threads indicate the East, we believe that a more local supply to Egypt, etc., is not impossible. The discovery of large tin fields in Central Africa and the native-made tin ornaments in circulation among the negroes, made possible the entrance of the metal into Egypt along the trade routes. Further, we see no reason why alluvial tin may not have existed within easy reach and have become exhausted. How quickly such a source of metal supply can be forgotten and no evidence remain, is indicated by the seldom remembered alluvial gold supply from Ireland. However, be these conjectures as they may, the East has long been the scene of tin production and of transportation activity. Among the slender evidences that point in this direction is that the Sanskrit term for tin is *kastira,* a term also employed by the Chaldeans, and represented in Arabic by *kasdir,* and it may have been the progenitor of the Greek *cassiteros.* There can be no doubt that the Phœnicians also traded with Malacca, etc., but beyond these threads there is little to prove the pre-western source.

The strained argument of Beckmann ("History of Inventions," Vol. II, p. 207) that the *cassiteros* of Homer and the *bedil* of the Hebrews was possibly not tin, and that tin was unknown at this time, falls to the ground in the face of the vast amount of tin which must have been in circulation to account for the bronze used over a period 2000 years prior to those peoples. Tin is early mentioned in the Scriptures (Numbers xxxi, 22), being enumerated among the spoil of the Midianites (1200 B.C.?), also Ezekiel (600 B.C., xxvii, 12) speaks of tin from Tarshish (the Phœnician settlement on the coast of Spain). According to Homer, tin played considerable part in Vulcan's metallurgical stores. Even approximately at what period the Phœnicians began their distribution from Spain and Britain cannot be determined. They apparently established their settlements at Gades (Cadiz) in Tarshish, beyond Gibraltar, about 1100 B.C. The remains of tin mining in the Spanish peninsula prior to the Christian Era indicate most extensive production by the Phœnicians, but there is little evidence as to either mining or smelting methods. Generally as to the technical methods of mining and smelting tin, we are practically without any satisfactory statement down to Agricola. However, such scraps of information as are available are those in Homer, Diodorus and Pliny.

Diodorus says (v, 2) regarding tin in Spain: "They dig it up, and melt it down in the same way as they do gold and silver"; and again, speaking of the tin in Britain, he says: "These people make tin, which they dig up with a great deal of care and labor; being rocky, the metal is mixed with earth, out of which they melt the metal, and then refine it." Pliny (xxxiv, 47), in the well known and much-disputed passage: "Next to be considered are the characteristics of lead, which is of two kinds, black and white. The most valuable is the white; the Greeks called it *cassiteros,* and there is a fabulous story of its being searched for and carried from the islands of Atlantis in barks covered with hides. Certainly it is obtained in Lusitania and Gallæcia on the surface of the earth from black-colored sand. It is discovered by its great weight, and it is mixed with small pebbles in the dried beds of torrents. The miners wash these sands, and that which settles they heat in the furnace. It is also found in gold mines, which are called *alutiae.* A stream of water passing through detaches small black pebbles variegated with white spots, the weight of which is the same as gold. Hence it is that they remain in the baskets of the gold collectors with the gold; afterward, they are separated in a *camillum* and when melted become white lead."

There is practically no reference to the methods of Cornish tin-working over the whole period of 2000 years that mining operations were carried on there prior to the Norman occupation. From then until Agricola's time, a period of some four centuries, there are occasional references in Stannary Court proceedings, charters, and such-like official documents which give little metallurgical insight. From a letter of William de Wrotham, Lord Warden of the Stannaries, in 1198, setting out the regulations for the impost on tin, it is evident that the black tin was smelted once at the mines and that a second smelting or refining was carried out in specified towns under the observation of the Crown Officials. In many other official documents there are repeated references to the right to dig turfs and cut wood for smelting the tin. Biringuccio (1540) gives very little informa-

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Note—This is one of the foot-notes from Book IX of Hoover's translation of Agricola.

tion on tin metallurgy, and we are brought to *De Re Metallica* for the first clear exposition.

As to the description on these pages it must be remembered that the tin-stone has been already roasted, thus removing some volatile impurities and oxidizing others. The furnaces and the methods of working the tin, here described, are almost identical with those in use in Saxony today. In general, since Agricola's time tin has not seen the mechanical and metallurgical development of the other metals. The comparatively small quantities to be dealt with; the necessity of maintaining a strong reducing atmosphere, and consequently a mild cold blast; and the comparatively low temperature demanded, gave little impetus to other than crude appliances until very modern times.

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## New Mine and Metallurgical Construction

*Wakota Development Co.,* at Congress, Ariz., a reorganization of the Coronada Gold Mining Co., is building a 5-stamp mill on the Grasshopper property.

*Copper Queen Consolidated Mining Co.*, Bisbee, Ariz., will build a new cement-copper plant for precipitation of copper from mine waters, and a small test mill for experimental concentration will soon be built.

*Balaklala Consolidated Copper Co.,* Coram, Calif. The hollow-tile stack at this company's reduction works has been torn down. Construction and repair work is in progress, including the installation of machinery for the Hall smoke-eliminating plant.

*Ohio Group of Mines,* Breckenridge, Colo., is now equipped with a mill, in which Dixon tables are used for concentrating the carbonate ores of the district. Work is now in progress also on the New York group of mines, and a mill will probably be built there later. W. C. Tracy, manager.

*El Oro Mining & Milling Co.*, Elkton, Colo., is in the market for crushing and cyanide machinery, it being reported that a mill will be built.

*Co-Operative Mining & Development Co.,* Reynolds, Idaho, has decided to build a mill of not less than 100 tons daily capacity, at the company's property, Owyhee County.

*Harry Butler,* East Cambridge, Mass., is to build a new scrap-metal refining plant, at Dorchester, Mass.

*Hazel T. Mine,* Libby, Mont., is to build a 100-ton concentrator, and has leased a plot of ground to Benjamin A. Blakley, who is also going to build a 50-ton concentrator this autumn.

*Nevada Cinnabar Co.*, Salt Lake City, Utah, is building a 50-ton furnace at its property, at Ione, Nev.

*Kinkead Milling Co.*, Virginia City, Nev., will build a 50-ton mill on the Geiger grade, near Virginia City, to treat low-grade surface ore. The ground has been leased by Walter Techow, from the Sierra Nevada company, for three years. The mill will be built and the enterprise will be managed by W. Techow.

*Tonopah Extension Mining Co.*, Tonopah, Nev., is contemplating the installation of a crusher plant at the new shaft, the installation of a conveyor belt to the mill, and adding 10 stamps and 2 tube mills to the mill, although definite action has not been decided upon.

*Elko Mining Co.*, Jarbidge, Nev., in which Honore Palmer, of Chicago, is interested, will build a mill at the Alpha mine.

*John Tilford,* Garrison, Utah, will build a small experimental plant for the treatment of tungsten ore at his property, 35 miles east of Osceola, Nev., in the Bonita Mining district.

*Nellie Wright,* Gold Hill, Josephine County, Ore. This mine is to be equipped with a new mill.

*May Day,* Eureka, Utah, has completed a mill for the treatment of the accumulation of dump ore, the capacity being 40 tons per day.

*British Columbia Copper Co., Ltd.,* Greenwood, B. C., intends to build a small experimental mill at Boundary Falls, to treat ores from the Lone Star and Washington mines, as well as the ores from other properties now under development. Should the experiments on Lone Star and Washington ores prove successful, the capacity of the experimental unit will be increased to treat the ores on a commercial scale.

*Northern Customs Concentrator,* Cobalt, Ont., will build a new mill of a capacity of 250 tons per day, to replace the mill recently sold to the Cobalt Townsite company. The new concentrator will be built north of the La Rose Extension property, near Mile 104 on the Timiskaming & Northern Ontario Ry., and will cost approximately $110,000.

*Goldfields, Ltd.,* Larder City, Ont., will probably build a cyanide annex to its mill next winter, the present state of the roads prohibiting transportation of heavy machinery.

*Teziutlan Copper Co.,* Aire Libre, Puebla, Mexico, is building a 500-ton concentrator under the direction of Franz Cazin, chief engineer.

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## The Patagonia District, Arizona

By A. P. MacCallum*

The Patagonia district comprises within itself several "mining districts," as the term is used in making locations, etc., and consists of two separate ranges of mountains, the Patagonias and the Santa Ritas. These were formerly one range, but a great fault, which now forms the Sonoita valley, cuts the range in two. The entire district was buried under the great porphyry flows of the late Tertiary.

Mining operations were started at probably as early a date as anywhere in the state, the old Mowry mine having been worked for lead by the Confederates during the Civil War. It takes its name from Lieutenant Mowry, a Confederate officer who was in charge of the work.

Before 1873, before the demonetization of silver, the district was a scene of great activity, but afterward the majority of the mines had to close down as the fall in prices necessitated economy and closer extraction, which the experience and equipment of the time were incapable of putting into practice. The ground-water level is not deep and fuel for power purposes was scarce, but with the present-day perfection of the internal-combustion engine, this source of trouble has been eliminated. Today the copper and silver deposits are receiving greater attention, but the district needs capital directed by men of experience and technical training.

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*Mining engineer, Patagonia, Ariz.

# DETAILS OF PRACTICAL MINING

## Openpit Mining under Difficulties

Openpit, steam-shovel mining on the Mesabi range of Minnesota, is unquestionably the cheapest method and is adopted wherever it appears practicable ("Mining Methods on the Mesabi Range," a paper presented at the Minnesota meeting of the Lake Superior Mining Institute. August, 1913). Recent practice shows its availability for deposits that were formerly considered underground propositions, and some mines that were opened by underground methods have been changed to the openpit system, notwithstanding the fact that a considerable tonnage of ore had already been removed and that stripping and mining both presented conditions less favorable than before underground mining was undertaken. Among these is the Commodore mine, at Virginia. It consists of one 40-acre tract and is surrounded by the Lincoln, Union, Lone Jack and Missabe Mountain properties. A tonnage of 700,000 had been mined by underground methods, when it was decided to change to openpit mining. Adequate and suitable dumping grounds were difficult to obtain and to complete the stripping, necessitated dumping 800,000 yd. on the Commodore 40, over one-half of which composed the stripping area of the openpit. The waste dump finally reached a height of 87 ft. and the height from top of ore at the deepest stripping point to the top of the dump was 201 ft., showing that some of this stripping material was elevated in its transportation 201 ft., which was accomplished without going off the mine 40, except at the ends of two tail tracks where they ran over adjoining land. The tracks from shovel to dump consisted of four switch-backs on a 5% grade.

The equipment was standard-gage dump cars and Shay geared locomotives of 80 tons weight on the drivers. These locomotives are slower than the rod engines, but have more tractive power, particularly for starting their loads on heavy grades and curves. In mining at this property both the rod type and Shay locomotives are used and a comparison of the two types under similar conditions shows the rod engines more satisfactory on good tracks and low grades, but on grades over 3% and particularly where necessary to start the loads on heavy grade the geared locomotives have the advantage.

Limited area, depth and shape of ore deposit, yard facilities, etc., have made conditions at this property for steam-shovel mining more severe than at most openpits on the range. The approach is laid out on a 3% grade, which is equalized to allow for resistance on curves. During one season considerable loading was done on a 7% grade, the Shay locomotives being able to start and haul three loaded cars of 40 tons each, and the rod engines two. A few years ago it was the practice to lay out openpits with grades not over 2½%, and with curves not exceeding 20°. While it is desirable to keep within these limits of grades and curves, nearly every mine has found it possible and necessary to exceed practical railroad conditions.

The actual loading of the ore by steam shovels is practically the same all over the range. At some mines all the ore must be blasted in order to loosen it for better loading, while at other mines the shovels are able to handle the ore without any blasting. Rails of 60 to 80 lb. are used for mine tracks, the heavier steel being favored. The temporary loading tracks have to be changed for each succeeding shovel cut. At some mines, and especially where the loading tracks are straight and of the lighter rail section, it is the practice to jack up the track to be moved and then line or heave it over with bars. At other mines new track is laid behind the shovel and in place for the next cut, the previous track being taken up.

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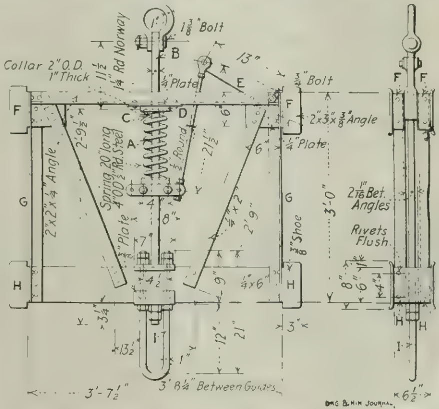
## Light Safety Crosshead

By Roy Marcellus*

The drawing shows a light crosshead used extensively in the Cœur d'Alene district, Idaho. It conforms with the state laws regarding safety attachments for use in sinking. The spring *A* is compressed when the load is freely suspended; when tension is removed, as by the ropes breaking, the spring extends and pulls the dogs *E* into the face of the guides.



Steel Bucket-Crosshead with Safety Dogs

The drawbar *B* has a collar *C* welded on it to rest against the spring cup *D*; this, with the nuts at the bottom, carries the load. The dogs are made entirely of steel and have teeth forged across their 2-in. faces. The upper shoes *F* are made of angle iron riveted to the vertical angles *G*, having clearance in the center for the operation of the dogs; the lower shoes *H* are made of plate, as usual. The bucket is attached by a chain to the U-bolt *I*. The crosshead can be built as light as 300 lb.

[It should be noted that the crosshead must ride with the bucket, since the rope does not pass through, as in the ordinary type of wooden crosshead. This means that the bucket must be swung from a long chain when sinking, in order to extend to the shaft bottom when the crosshead is stopped at the end of the guides. A long connection such as this means considerable extra height in the headframe to permit dumping. A safety crosshead, which will operate similarly to the ordinary loose crosshead, is rather a complicated device mechanically.—E[illegible].

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*Wallace, Idaho.

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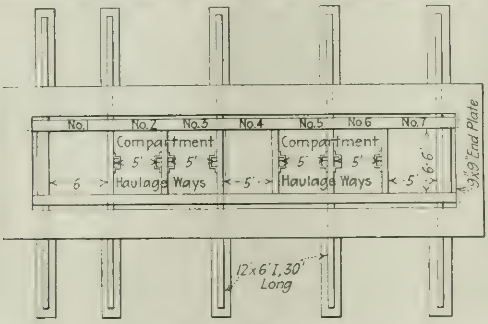
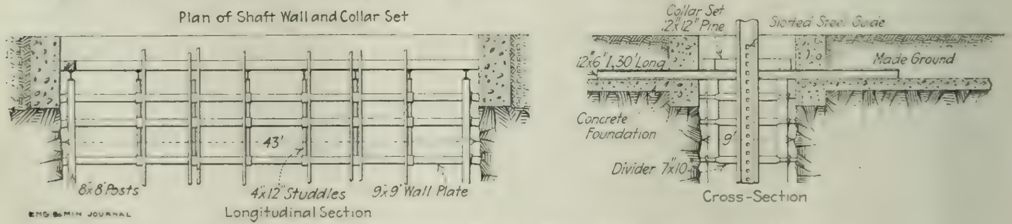
## I-Beam Supports for Collar Set

The illustration shows the method of supporting the collar sets employed for two shafts of the Brakpan mine on the Witwatersrand. The large rectangular shafts had seven compartments of the dimensions shown. Within 6 ft. of the surface, says Charles B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture), a relatively hard rock was found, on which the shaft collar was supported. Five trenches were excavated at right angles to the long dimensions of the shaft; one of these was at each end of the shaft, and the other three were under the first, third and fifth dividers, as shown. This excavation was conducted in connection with that for the concrete wall, which inclosed the collar. Concrete was placed in both the trenches and the collar, and upon the concrete in the trenches were laid 6x12-in. by 30-ft. steel I-beams. These were filled around and partly covered with concrete, which was allowed to set thoroughly. The collar set of 12x12-in. timber was built up on this steel frame, being bolted to it. Since this was the reference set for the rest of the shaft plumbing, it was laid with care by the use of surveying instruments.



Plan of Shaft Wall and Collar Set



Longitudinal Section

Cross-Section

Manner of Supporting Collar Sets with Steel I-Beams

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**There is a Three-fold Advantage in Electric Lights for Shaft Sinking.** They give a superior light, they relieve the [illegible] of the necessity of handling candlesticks and keeping the candles burning against the exhaust of the machines ([illegible] "Bulletin," August, 1913), and when electric hoists are used any failure of the power is at once indicated to the men in the shaft by the extinguishing of the lights. Their use in [illegible] is considered good practice.

## Shaft Timbering in Swelling Ground

By W. H. Storms*

One method of timbering a shaft through swelling ground consists of using timbers of large dimensions, and reinforcing these when the ground is so heavy that it cannot be held back by one set. The Keystone shaft, at Amador City, on the Mother Lode, in California, is an example of this method. The first 400 ft. of that shaft is a solid crib of heavy timbers, as large as could be put in place, yet the timbering is unsatisfactory, and replacements have to be made every few months. Timbering of this character has almost universally failed to give satisfaction for the reason that the force of the slowly swelling ground is irresistible, and such ground cannot be held by solid timbers, no matter how arranged. The swelling ground must be cut away as it comes into the shaft. For the same reason close lagging is inadvisable, as the swelling ground will push the lagging inward causing it to bend and eventually to break, and if relief is not afforded the timbers of the main set must inevitably be displaced and even broken.

Experience has demonstrated that the best way, if not the only way, to meet such conditions and keep the main timbers of the shaft sets in place, and the shaft in proper alignment, is to place additional timber sets outside those constituting the main members, thus forming a crib about the main sets. The illustration on the next page shows a plan and end-section of timber sets so arranged. The idea is merely suggestive. The extra timbers need be inserted only on the side where the ground will or is expected to swell. It often happens that one wall only is of such a character that it will swell upon exposure to the atmosphere, the other side remaining firm. Occasionally, not only the walls, but the material filling the fissure, as well, swells, though the ore itself seldom swells, and for this reason the extra timbers may not be required at the ends adjoining the ore. Where the pay streak is small, however, and the walls swell, then it may be advisable to place the extra timbers at the ends, as well as against the walls of the shaft. The illustration shows one end timbered to resist swelling ground, the other end being without the additional timbers.

Where this method of timbering is introduced, the shaft must be cut much larger than would otherwise be necessary, and this, together with the extra timber and labor required, adds to the first cost of the shaft.

Economy will develop later, when the swelling ground begins to exert its influence on the sets. When this occurs the ground, being accessible, can easily be relieved, the shaft be kept in alignment, and much expense be saved. In the vertical section the general relation of the main shaft sets to the outside extra timbers is shown. An important feature of this method is that shoveling platforms are placed at intervals on the sprags, which separate the main wall plates from the outside plates. The distance between these shoveling platforms will be determined largely by the angle of inclination at which the shaft is sunk. A shaft sunk at a high angle permits a greater distance between these floors than where the angle is comparatively flat.

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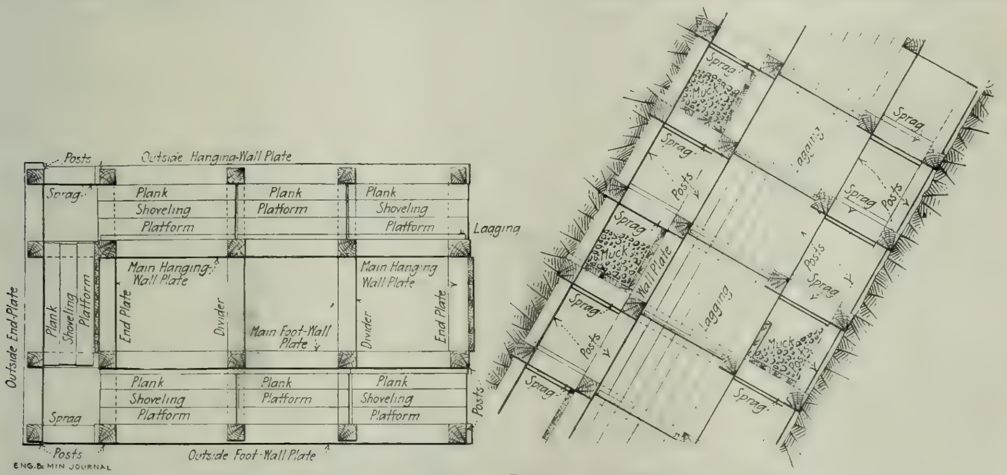
*Mining engineer, 2437 Hilgard Ave., Berkeley, Calif.

It is obvious that any rock dropping from the hanging wall must not be permitted to fall into the main compartments of the shaft, therefore, the side lagging is placed horizontally, contrary to the usual custom, although the end lagging is placed vertically as usual. The shoveling platforms on the foot-wall side of the shaft need not be placed at frequent intervals, as there will be comparatively little danger of rock falling down the shaft from that side, unless the shaft be quite steep and the shoveling platforms are allowed to become full. In this case any rock becoming loosened from the foot wall might slide over the pile of muck lying on the platform next below it and go bounding down the shaft.



Plan and Elevation of Shaft Timbering for Swelling Ground

The illustration shows the outside plates lying solidly against the rock. In some cases it may be desirable to place blocking back of these timbers. When this is advisable, suitable blocks may be built up from pieces of 2x12-in. plank to the desired thickness. This will afford a better opportunity to keep the shaft alignment. Such blocks would be placed at the corners and opposite the dividers of the main sets. The posts of the outside plates may be held in place by the use of temporary sprags, consisting of pieces of 2-in. plank of suitable width, which shall reach from the outside post to that opposite it in the main set. These planks are shown in the vertical section. It cannot be hoped that this expedient will dispense with the employment of men in the shaft, for it does not, but it gives the repair gang a chance to get at the main cause of the trouble and at the same time permits hoisting in the main compartments of the shaft to continue practically without interruption.

# Safety Rules—Open Pits and Abandoned Openings*

(1) Gopher holes should be of such size that it will not be possible for a man to enter them except where the material is of such a nature that a small hole cannot be dug.

(2) Before exploding a blast, care should be taken to warn men working underground in dangerous proximity to where the blasting is to be done.

(3) In using the wrecker on stripping or lean-ore dumps, foremen and wrecker engineers should see that the track is lined back from the edge of the dump far enough to be perfectly safe, and in every case, before taking a lift, the machine should be securely blocked or clamped to rails underneath.

(4) Be careful not to roll down chunks on men at work below you and keep the banks picked down so that they will not cave in on you.

(5) Special men in charge of competent foremen should be employed in each open pit to keep the banks picked down.

(6) Employment of regular track cleaners should be confined to day shift, and they should be instructed to face the danger of approaching trains when at work.

(7) All parts of operating open pits or quarries where there is a steep bank higher than 6 ft. should be guarded by a suitable fence.

(8) All steep footpaths leading into an open pit or quarry should be provided with suitable handrails.

(9) Walks or thoroughfares in regular use leading into an open pit or quarry should be kept free from obstructions which would make their passage dangerous, especially if not well lighted.

(10) When excavation is being done it should be protected by barriers and at night by lights.

(11) All excavations liable to cave in should be shored up.

(12) All shafts, open pits, caves and abandoned work-

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*From Inland Steel Co.'s book of rules.

ings should be carefully fenced or otherwise protected.

(13) Abandoned shafts and test pits should be blasted in; if it is necessary to leave an opening for air, a covering of rails should be placed over the opening and a fence provided.

BLASTING OPERATIONS

(14) Shelter houses constructed of steel frame and lined with tiles, or circular houses built entirely of steel, should be used in each open pit at a convenient and safe distance from where the blasting is taking place.

(15) Bulldozing should be eliminated and block holes used wherever possible.

(16) When bulldozing is to be done directly in front of a shovel, no one should remain on or under the shovel for protection.

(17) Black-powder cans should not be rolled down the bank.

(18) Black-powder cans should not be opened near a light or fire.

(19) Black powder should be removed from the bunghole only, and care should be exercised in removing the seal. The can should not be cut open or torn in any manner.

(20) In charging vertical holes with black powder, an approved shield, with funnel and spout parts made of copper, should be used at all mines.

(21) In loading gopher holes some method that makes it impossible to leave a train of powder throughout the hole should be used.

(22) In firing black powder duplicate means of firing should be used, one of which should be electric.

(23) The foreman should see that every one is in the shelter house before allowing shots to be fired.

(24) Drilling concerns operating on the property of the company should comply with these rules and regulations.

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## Disadvantage of Sprays in Drilling

The existing Queensland laws in general require the use of water for the prevention of dust in underground drilling. It is stated, however, in the annual report for 1912 of the Under-Secretary for Mines that the rule is so framed as to permit variations to some extent, at the discretion of the inspector. The necessity of this provision became apparent in several of the deep mines during the last year. It was found that the increased humidity produced uncomfortable conditions and even in some cases increased the danger of accidents. For instance, the excessive use of water at the drills caused the filling in one of the Mount Morgan stopes to become saturated with water and this was shown by inquiry to have been the chief cause of an extensive collapse of timber.

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**An Exhaust Into the Water Column for Sinking Pumps** is usually provided in Butte shaft sinking operations (A. I. M. E. Bulletin, August, 1913). An example of this method of exhaust on a station pump was mentioned in the "Journal" [illegible] 16, 1913. Pumps run in this way are noiseless and will not freeze in a cold shaft. The column is not under so heavy pressure, being thus less liable to breakage, and less trouble with the pump packing. A drain cock must be provided so that the exhaust will not have to start against a column of water, and an arrangement to provide for atmospheric exhaust when desirable should also be included, as well as a check valve to keep the water from running back into the cylinder of the pump when the latter is shut down.

## Automatic Link Car Coupler

The coupling device illustrated, is one described by J. E. Jones in *Coal Age*, July 26, 1913. It consists of six parts: the head *A*, the hook *B*, the dog or latch *C*, and the three links *D*, *E*, *F*. In Fig. 1 the device is shown ready for coupling. In Fig. 2 the hook has struck the bottom of the dog so that the large link *F* has been thrown on the hook. In Fig. 3 the cars have separated enough to bring the links taut and settle *F* in its proper position in the hook. The link *D* is slipped into its place from the side and is not removed until broken or worn; the link *E* is made small, serving only to bring *F* into the proper plane; the link *F* has an inside diameter of about 6 inches.

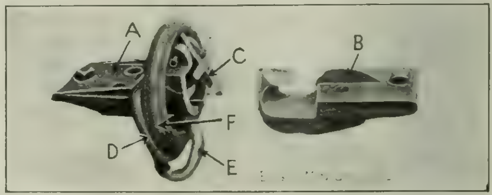

FIG. 1. COUPLER SET FOR AUTOMATIC ATTACHMENT

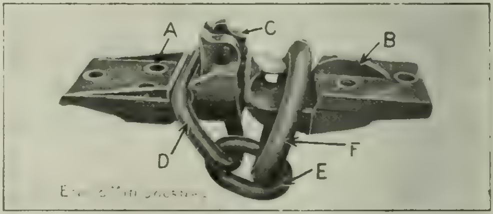

FIG. 2. COUPLING RING FALLEN INTO POSITION

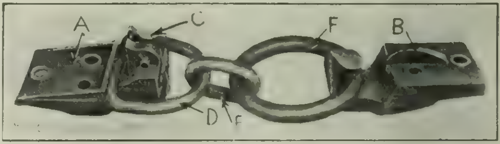

FIG. 3. COUPLER DRAWN TIGHT

All the links are of high-grade iron or steel. The head and hook are malleable castings, bolted to the drawbars of the cars, and the dog is also a malleable casting designed with a notch on the top to carry the link *F*. Its lower striking surface is increased by the four side projections.

The object of an automatic coupler is chiefly to reduce the number of accidents from men being caught between cars and also to some extent to save time. One objection to the one here described is that it is not symmetrical, necessitating that the proper ends of the cars be brought together for coupling; this might often be a cause of delay and annoyance. A further objection is that the link is not always in position for coupling, but must be set by hand. The device, however, gives sufficient play between the cars to allow easy starting to compensate for this.

# DETAILS OF METALLURGICAL PRACTICE

## Launder Data of the Washoe Concentrator

In the accompanying table is given information concerning the launder system installed in the concentrator of the Anaconda Copper Mining Co., at Anaconda, Mont. The grades shown are not necessarily the minimum at which the given pulps will flow, but are all safe slopes. Where extra headroom was available, it was utilized in steeper launders. There are a great many factors which effect the flow of pulp in launders which must be taken into consideration in laying out a launder system. The more important of these factors are: The sizes and specific gravities of the grains of solid matter to be transported, the shape of the grains, the sharpness of the fractures, the density of the pulp, the depth of the stream, the presence or absence of slime and the character of the launder material in contact with the pulp. All of the launders in the Anaconda mill are constructed of wood and are rectangular in cross-section.

LAUNDER DATA OF THE WASHOE CONCENTRATOR, ANACONDA COPPER MINING CO.

| Material Handled | Size of Launder Inches Depth | Size of Launder Inches Width | Grade, Ins. per Ft. | Lining | Ratio Solids to Water | Diameter Largest Particle mm | Depth of Stream in Launder, In. | % of Solids on 60 Mesh | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Undersize ⅝-in. round-hole trommels.. | 15 | 10 | 2.0 | Cast iron | 1 : 3.5 | 21.0 | 1.25 | 82.0 | Contains slime |
| Undersize 5 mm. round-hole trommels........ | 7 | 8½ | 3.0 | Cast iron | 1 : 5.2 | 5.0 | 1.25 | 75.0 | Contains slime |
| Undersize 4 mm. round-hole trommels..... | 9½ | 10½ | 1.75 | Cast iron | 1 : 5.0 | 4.0 | 1.50 | 50.0 | Contains slime |
| Undersize 2½ mm. round-hole trommels..... | 7 | 8½ | 2.5 | Cast iron | 1 : 8.2 | 2.5 | 0.50 | 62.0 | Contains slime |
| Hutch product of harz jigs.... | 7 | 6½ | 1.0 | Cast iron | 1 : 22.7 | 6.0 | 1.00 | 95.0 | No slime |
| Feed to Huntington mill..... | 7 | 6 | 1.9 | Cast iron | 1 : 3.6 | 2.0 | 1.25 | 81.0 | No slime |
| ¾-in. concentrate...... | 10 | 9 | 1.3 | Cast iron | 1 : 12.8 | 7.0 | 1.00 | 100.0 | No slime |
| Evans jig concentrate. | 9½ | 9½ | 1.2 | Cast iron | 1 : 27.8 | 2.0 | 1.50 | 72.5 | No slime |
| Coarse table feed.......................... | 7½ | 7 | 1.2 | No lining | 1 : 14.2 | 0.3 | 0.50 | 7.0 | Contains slime |
| Fine table feed.......................... | 5½ | 4½ | 1.2 | No lining | 1 : 13.0 | 0.2 | 0.75 | 0.0 | Contains slime |
| Table concentrate......................... | 11 | 8¼ | 0.75 | No lining | 1 : 15.6 | 0.2 | 0.75 | 0.0 | No slime |
| Table middling.. | 4½ | 5 | 0.75 | No lining | 1 : 15.6 | 0.2 | 0.75 | 0.0 | No slime |
| Table tailing.. | 7 | 7½ | 0.75 | No lining | 1 : 10.0 | 0.3 | 0.50 | 10.0 | A little slime |
| Secondary table feed, remodeled section | 7 | 7½ | 1.20 | No lining | 1 : 7.4 | 0.9 | 0.50 | 44.0 | No slime |
| Fine primary table feed, remodeled section.. .. | 7 | 7½ | 1.20 | No lining | 1 : 14.0 | 0.35 | 0.50 | 2.0 | No slime |
| Coarse primary table feed, remodeled section.. | 7 | 7½ | 1.20 | No lining | 1 : 4.4 | 0.9 | 0.50 | 46.5 | No slime |

The gangue material in the ore treated at Anaconda is quartz and highly altered granite. The principal minerals are chalcocite, enargite and pyrite.

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## Safety Rules—Engine Rooms*

(1) Keep out of engine rooms and power houses unless your duties take you there.

(2) Do not place any material, tools, etc., on platforms or stairs where they will fall off and injure someone below.

(3) When shutting down an engine use the safety switch or safety valve.

(4) Under no circumstances should circuit breakers, governors, engine stops or other safety devices be blocked or otherwise made ineffective. If such apparatus gets out of order report it to your foreman at once.

(5) Engines should be blocked so that no parts can move wherever men are working on flywheels, commutators or any part where there is danger of accident in case the engine should turn over or move. This is best accomplished by putting blocks between the crossheads and the ends of the slide.

(6) Power-engine revolutions should be taken every day in order to make sure the engine is not running over the speed limit.

(7) Keep away from in front of cylinder heads of engines.

(8) Do not fool with compressed air. Never blow it on anyone. It may enter his body and injure or kill him.

(9) Floors should be kept free from oil and grease to prevent slipping and falling against moving parts of machinery.

(10) Stairs and platforms of engines should have a rough or checkered surface.

(11) Flywheels should be guarded. This guard may consist of railing, wire net or metal casing. If located within 18 in. of the wheel it should be at least 3½ ft. high; wheels not over 5 ft. high should be encased whenever practicable. Railing guards should be provided with toe boards.

(12) Tail rods should be fenced or encased.

(13) Governor balls should be guarded whenever they are so placed as to be dangerous.

(14) Covering should be provided on all steam lines, wherever practicable, when pipes are so placed that persons are liable to be burned by coming in contact with them.

(15) Exhaust pipes from machinery should be run outside of the building and extended above the roof eave.

(16) Exhaust from temporary machinery should be run up so high that steam will not obscure the vision of workmen in the vicinity.

(17) All exhaust pipes should be provided with drains.

(18) Drains or exhaust pipes from heaters should be run outside of buildings to sewers or pits.

(19) Where exhaust pipes or drains lead into a pit it should be provided with a metal cover.

(20) Where valves are located more than 6 ft. above the floor, and it is necessary to use them frequently, platform, stairs, or stationary steel ladder shall provide means of access thereto.

(21) To prevent valve wheels from slipping off valve stems a locknut or cotter pin should be provided at the stem end.

(22) A locking device should be provided on levers and chains operating steam valves.

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*From Inland Steel Co.'s book of rules.

## Electrodeposition of Zinc

An invention relating to improvements in zinc refining has been patented by U. C. Tainton and J. N. Pring, of Manchester, England, under U. S. patent No. 1,059,233. According to this invention a process for the electrolytic deposition of metallic zinc from its salts consists of adding to the solution of the salt a large proportion of acid, as, for example, 10 to 30% and a small proportion of an "addition agent," preferably a colloid such as gum tragacanth, and electrolyzing the solution with current of high density. A saturated solution of zinc sulphate with sulphuric acid is used. The addition agent or colloid, must fulfill the following conditions: First, it must be soluble in the electrolyte, that is, it must not be precipitated by the zinc salt or by the acid; and, second, that it must increase the overvoltage or electrical potential necessary for the separation of hydrogen, thus giving preference to the electrolytic deposition of the zinc.

The process may be used for extracting zinc from its ores by forming a solution of a salt of zinc, as, for example, zinc sulphate, and adding a large proportion of acid and a small proportion of the addition or colloid agent to the solution and electrolyzing for the deposition of the metal, with a current of high density.

In the practice of this system, a solution for depositing zinc consists of zinc sulphate dissolved in water to which is added 10 to 11% by weight of sulphuric acid, sufficient zinc sulphate being used to give the acid solution a specific gravity of 1.38 to 1.4. About 0.1 to 1% of gum tragacanth is added. A solution of the gum is prepared by first adding alcohol to form a paste and then water. The addition of alcohol prevents the gum forming into lumps when water is added.

If it is required to deposit the zinc on a metal article, the article is placed in the solution as cathode, the anode being formed of either zinc or a substance which does not go into solution, for example, lead peroxide or manganese dioxide.

Current may be used at a higher density than is usually employed in electrolytic deposition of zinc, 500 amp. per sq.ft. of cathode being a suitable density. A density of one-fifth of this amount may be used with success, but by using high density a great amount of time is saved.

The novel features of the process are first, the high current density that is employed and consequent saving of time, and, second, the deposits obtained are of especially fine quality, smooth and lustrous. A third advantage is that commercial materials may be used in preparing solutions, as it is found that most impurities have no effect in the presence of the colloid and a large quantity of acid. The solution does not require so much attention as has usually been required, as it is not necessary to regenerate it frequently, owing to the wide limits of concentration between which the deposition is successful. The process is well adapted for plating of aluminum which has usually been found difficult. In the case of zinc refining, the electrolyte may be used without moving or rotating the cathode or agitating the solution. Owing to the high concentration of the acid and the wide limits between which the concentrations may be varied, it is especially easy to make up solutions, zinc and zinc oxide being readily soluble.

The invention is found useful for galvanizing wire electrically, a process which has hitherto been impossible, owing to the low current densities which it has been necessary to use. While primarily designed for zinc deposition on metal surfaces, the electrolyte may be employed in accumulators and for secondary batteries in which a zinc cathode is used.

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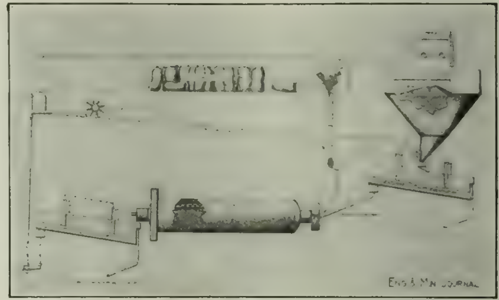
## Tube-Mill Circuit at the Alaska Treadwell Mill

Concentrate is cyanided at the mill of the Alaska Treadwell Gold Mining Co., at Douglas Island, Alaska. The material is brought to the plant in cars running by gravity into revolving tipples which invert them and drop the contents into round, conical-bottom steel bins. The bins are 15 ft. in diameter and the bottoms have a 55° angle. The concentrate is sampled while in the car, using a long ship-auger. Unslaked lime is added to each of the cars after leaving the tipple, forming a bed for the concentrate and also aiding in discharge of the material. The concentrate in the bin is kept covered with water which prevents its oxidation.



Outline of Tube Mill Circuit at Alaska Treadwell Mill

Tightly fitting gates control the bottom of the bin, the contents of which are sluiced directly into a Dorr classifier, the sluicing medium being the oversize return. The classifier makes 24 strokes per minute. Slime from the classifier is led to the Pachuca tanks for treatment and the coarse material is delivered into a 5-x22-ft. Abbé-type tube mill which is equipped with a spiral feeder. Corrugated sectional lining is used in the tube, which makes 27 r.p.m. The finely ground product from the tube mill is delivered into another Dorr classifier from which the slime is taken to treatment in the Pachuca tanks and the sand delivered into the foot of an air lift. The sand is lifted to a point high enough to enable it to flow back to the first classifier by gravity, and is delivered into an open launder.

Accumulated iron is removed from the coarse pulp passing through the launder by means of a magnetic device which has already been described[1]. The return of this coarse oversize is used to sluice the concentrate from the bin into the initial classifier.

Pebbles are automatically fed into the spiral feeder through a pipe leading from the pebble bin. The pebbles are fed, a few at a time, into the feeder and are controlled by the movement of the first Dorr classifier. The whole circuit is illustrated above.

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[1] "Eng. and Min. Journ.," Sept. 6, 1913.

# THE ASSAYER AND CHEMIST

## Magnesite Crucibles

By Donald M. Liddell*

The need for a crucible which shall be more inert to its charge than either fireclay or silica, and without reducing action, such as the graphite has, is probably one which sooner or later arises in every assay office. Theoretically the need is met by magnesite, and the following is merely a brief account of the search for data on this subject.

Crucibles made according to a description in the *Wisconsin Engineer*, November, 1912, were satisfactory for work in the electric furnace of the resistance type. The directions are, to moisten the calcined magnesia with water, and tamp it around a wooden core set in a crucible turned from a bar of Acheson graphite. The core is withdrawn and the crucible set in an oven heated by gas, until thoroughly dry. It is then covered with a thin graphite cap, buried in a granular carbon resistor, and heated to a temperature a little above that required in the worked proposed. After so baking, the magnesia linings are readily removed from the crucibles. For use, they are replaced in the graphite crucibles, charged as desired, covered with a magnesia disk, and are then ready for the furnace.

Commercial calcined magnesite was found by O. P. Watts, author of the paper referred to, to vary greatly in the amount of iron oxide contained.[1] This is detrimental, because in baking the linings, it distills out, is reduced to iron in contact with the inner wall of the crucibles, and this iron is then likely to corrode both the crucible and the lining by carrying carbon from one to the other.[2] Any considerable amount of carbon dioxide indicates insufficient calcining, and such material will show excessive shrinkage in baking.[3] If the shrinkage is excessive, the magnesite may be fused before using in the electric arc. This calcined magnesite will probably not shrink enough, so a little (2 to 10%) raw material may be mixed with it to give it suitable working qualities.

The extreme temperature at which such magnesia linings may be used in graphite crucibles in a resistance furnace is fixed, not by the fusing point of magnesia, but its decomposition by the graphite. On account of this action, the granular resistor should never be allowed to come in contact with the magnesia linings.

I have been informed that magnesite apparatus is made to order by the Royal Berlin Porcelain Co., and that it can be obtained through the Wilson-Maeulen company, of New York (presumably from other agents for the Royal Berlin crucibles, etc., also). I have not used any personally, but am told it is entirely satisfactory, except for the time consumed in getting it. The magnesite crucibles are said to be rather more porous than are the fire-clay crucibles, resembling in texture the sand crucibles. This is hearsay only, however.

For muffle use, where a basic crucible is required for a basic charge, I have made satisfactory crucibles by machining magnesite bricks. These work well under drill press or on the lathe, although the material must be handled far more tenderly than iron or steel, so use slow speeds and light cuts. These machined crucibles must be set down in a clay or silica crucible and protected by magnesite powder or some similar material, so as to take the strain of the tongs off the magnesite. Wet charges cannot be used in them except with the utmost care in heating. It is better to avoid them altogether. Chrome brick, the alternative to magnesite, which naturally comes to mind, is not a feasible proposition, because of the hardness of the material, which immediately puts the tools out of business.

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*Associate editor, "Engineering and Mining Journal."

[1] Analyses of commercial magnesite clay and magnesite bricks are:

| | MgO | $SiO_2$ | $Fe_2O_3$ | $Al_2O_3$ | CaO |
|---|---|---|---|---|---|
| Clay | 82.96 | 1.18 | 8.18 | 1.20 | 2.89 |
| Clay * | 75.10 | 8.44 | 5.17 | 0.14 | 6.23 |
| Brick | 86.54 | 1.08 | 8.00 | 0.26 | 4.10 |
| Brick | 91.71 | 1.29 | 4.95 | 1.63 | tr. |

*Very poor quality.

[2] "Trans.," Am. Electrochem. Soc., Vol. 11, p. 279.

[3] Watts gives the average shrinkage as 12% along the diameter, and 17% along the length, for the temperatures with which he worked. The linear expansion of dead-burned clay is given by other experimenters as about 0.000008 per degree Fahrenheit, which is a wide range.

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## Determination of Lithium

As a result of an investigation of various methods which have been proposed for the determination of lithium in mineral waters, that recommended by Gooch, modified slightly in some of the details of manipulation, was found by the Bureau of Chemistry, U. S. Department of Agriculture, to be satisfactory when weighable amounts of the metal are present, according to an abstract in *Journ. Soc. Chem. Ind.*, Feb. 28, 1913. The method is carried out as follows: The water is acidified with hydrochloric acid, barium chloride is added, and the whole is evaporated to dryness; the residue is dissolved in a small quantity of water and hydrochloric acid, the barium sulphate is removed by filtration, and the filtrate is evaporated. After ignition to remove ammonium salts, the residue is dissolved in water, the magnesium salts are precipitated by the addition of milk of lime (a double precipitation is necessary if the water contains a large quantity of alkalis), and the excess of calcium hydroxide, together with barium salts, is removed by treatment with ammonium carbonate in ammoniacal solution. The filtrate from the calcium precipitate is evaporated, the residue is ignited, and any remaining traces of calcium salts are removed as oxalate.

The solution is then evaporated in a weighed platinum basin, the residue is treated with a small quantity of hydrochloric acid, again evaporated to dryness, ignited, and weighed. The mixed chlorides thus obtained are dissolved in a few c.c. of water and the solution is transferred to a flask (any insoluble matter is filtered off, ignited, and its weight deducted from that of the mixed chlorides); the solution is now boiled until the salts begin to crystallize out, and about 40 c.c. of amyl alcohol are added. The contents of the flask are next distilled until a thermometer in the neck of the flask indicates 130—132° C. (the boiling point of amyl alcohol), a drop or two of dilute hydrochloric acid being then added and the distillation continued until the boiling point of amyl alcohol is again reached. The mixture is cooled slightly and filtered, note being made of the volume of the filtrate, and, after the insoluble portion has been washed with a little anhydrous amyl alcohol, the filtrate is evaporated to dryness.

The residue, consisting of lithium chloride with small amounts of potassium and sodium chlorides, is treated with sulphuric acid, ignited and weighed. The sulphates are then dissolved in water and treated with ammonium phosphate and ammonia; if any precipitate forms within about 15 hours, it is collected and weighed as magnesium pyrophosphate, an equivalent weight of magnesium sulphate being subtracted from the weight of the mixed sulphates. To correct for the solubility of potassium and sodium chlorides in amyl alcohol, there must be subtracted from the weight of the sulphates, 0.00109 gram for every 10 c.c. of the amyl alcohol filtrate (exclusive of the amount used for washing). In many cases the corrections amount to the total weight obtained within the limit of the weighing error of the work, and the amount of lithium present may then be determined by means of the spectroscope. For this purpose the residue of sulphates is dissolved in water and and spectroscopic observations are made, until, with increasing dilution of the solution, the lithium line is no longer visible. Knowing the extent of the dilution, the amount of lithium is ascertained by comparative observations with solutions containing known quantities of lithium under the same conditions as to dilution, etc. The limit of visibility of the red line of the lithium spectrum is reached with 0.00002 mg. of lithium per c.c. of solution.

A preliminary and approximate spectroscopic determination of lithium in the mixed chlorides obtained in water analysis saves much time by indicating whether it is worth while to extract the lithium for weighing. A similar test may be used to determine whether much strontium is present in the calcium precipitate obtained in the usual way.

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## Determination of Nitrates by Ferrous Sulphate

The best method for the determination of nitrates in natural deposits of Chile saltpeter constitutes a problem of great interest to those working deposits of the kind. There are in existence a great number of methods, but the one here given is probably best adapted for field work, as it does not require large quantities of reagents nor clumsy, fragile apparatus. It is one of the number described by Guillermo Garcia Latorre, published in the Chilean *Boletin de la Sociedad Nacional de Mineria*, for March and April, 1913.

The method is based on a qualitative reaction of nitrates and consists of adding ferrous sulphate to the solution in which the presence of nitrate is suspected, in the presence of sulphuric acid. The method is not extremely accurate, but has been widely adopted on account of its simplicity and rapidity. The ferrous sulphate is oxidized by the nitric acid liberated by sulphuric acid in solution and is transformed into ferric sulphate. The nitric acid, having been reduced to nitric oxide, dissolves in ferrous sulphate. When all the nitric acid has been reduced by ferrous sulphate, remaining quantities of the latter dissolve the nitric oxide formed, which gives a solution of dark brownish-gray color. This color increases in intensity until all the gas is dissolved. The end of the reaction is noted by the cessation of change in color of the solution. The test is best made at a temperature of 60° to 80° C.

The equation is as follows:

$$6\,FeSO_4 + 2\,HNO_3 + 3\,H_2SO_4 = 3\,Fe_2(SO_4)_3 + NO + 4\,H_2O$$

The nitric oxide is oxidized by the action of air into nitric and nitrous acids, according to the following reactions:

$$2\,NO + O + H_2O = 2\,HNO_2$$

$$2\,NO + 2\,O + H_2O = HNO_2 + HNO_3$$

$$2\,NO + 3\,O + H_2O = 2\,HNO_3$$

These acids act upon new quantities of ferrous sulphate as follows:

$$2\,FeSO_4 + 2\,HNO_2 + H_2SO_4 = Fe_2(SO_4)_3 + 2\,NO + 2\,H_2O$$

so that the longer the time occupied in the analysis the greater are the qualities of nitric and nitrous acids formed and consequently the greater the quantity of ferrous sulphate used, making it appear that there is a larger quantity of nitrate present than is actually the case. This is the principal cause of error in this analysis and may be avoided, in a measure, by exceedingly rapid work. There are also other factors which influence the accuracy of the method, such as temperature, dilution, etc.

Standard solution of ferrous sulphate must be prepared previous to the analysis. To standardize this, dissolve 10 grams c.p. nitrate of sodium in a liter of water; take 25 c.c. of this solution and add 10 c.c. of sulphuric acid to it. Heat to 70° C., and add the ferrous-sulphate solution, drop by drop from a burette, continuously stirring the liquid. When the gray color remains constant the titration is complete, but the standardization should be made three or four times and the average of titrations used as the standard. The titer is expressed in milligrams of sodium nitrate and is obtained by dividing the quantity of nitrate contained in the 25 c.c. used by the number of cubic centimeters of ferrous sulphate solution added from the burette. The analysis is performed in exactly the same way. The method is accurate to 3 or 4 per cent.

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## Estimation of Zinc as Phosphate

The phosphate method for the estimation of zinc has been investigated in order to find the reason for occasional unsatisfactory results, by T. M. Findley and A. C. Cumming ("Chem. Soc. Proc." p. 153, 1913). It was found that the results were inaccurate (1) if the solution contained more than a trace of acetic acid; (2) if the solution, after precipitation, was alkaline; or (3) if the solution contained sodium or potassium salts. The method can be modified to give correct results in the presence of sodium and potassium.

# Some Close Work in Iron Mining

*SYNOPSIS—High concentrating ratio in Alabama brown ores. Extensive brown-ore reserves of the United States. Low costs and interesting installations in Birmingham Clinton ore mines. Alabama Clinton reserves must be considered as more extensive than heretofore. Changed conditions in Maryland smelting and in New York Clinton ores. New York magnetites are concentrated to a bessemer grade.*

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It is well not to forget that there are in the United States other places than the Mesabi range where iron is mined, and where records are made. I should like to call attention to a few items from my notebooks, gathered recently in work for the government, as consulting engineer of the Bureau of Mines.

### ALABAMA BROWN-ORE COSTS

I found in the brown-ore regions of Alabama that they are mining an average of 7 or 8 cu.yd. of material for every ton of 50 to 52% ore, dry analysis, that they save. The Weems mine, of brown ore, in the Rock Run district, has mined 2,200,000 yd., and has secured 300,000 tons of ore; one ton to every 7 cu.yd., plus. A company in that vicinity was mining, at the time of my visit, 15 yd. to get 1 ton. All this material has to be mined from the ore bank, transported to the washery, washed and loaded on cars, and the cost figure for this operation of 15 yd. to the ton was about $1. Companies like the Republic Iron & Steel Co. are buying brown ore of a guarantee of 45%, dry, at $1.35 per ton, f.o.b. cars. The Roane Iron Co., of Chattanooga, contracts for brown ore at $1 per ton when No. 2 foundry iron is selling at Birmingham at $7, and a 5c. premium for every dollar added to the price of pig iron until it has reached a maximum cost of $1.50. That would make the Roane company's brown ore cost it, now, about $1.20. This is for a ton of 2268 lb., which is a weight used, I believe, nowhere else. The Woodward Iron Co. figures its brown-ore costs at about $0.821, at the mine.

### BROWN-ORE RESERVES

The distribution of brown-ore banks, throughout the United States, is far wider than that of any other type of iron-bearing material. These banks occur in the States of Vermont, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, Georgia, Tennessee, Alabama, Kentucky, Missouri, Texas, Iowa and Wisconsin. They are mined in Pennsylvania, Virginia, Tennessee, Georgia, Alabama, Texas, Iowa and Missouri; chiefly in Alabama and Georgia. That they are a factor to be reckoned with in the future, may be gathered when I say that there are areas of these banks in Alabama alone, covering 7000 square miles. No estimates of tonnages that are worthy of credence have ever been made, and it is impossible to make such estimates, on account of the uncertainty of the deposits. It is a common saying in the South that no man can see into a brown-ore bank farther than the end of his pick. But it is not unlikely that the deposits of these ores in the Southern states of Virginia, Tennessee, Georgia and Alabama, will be found ultimately to be of enormous extent.

### ALABAMA CLINTON ORE COSTS

In the Clinton ore mines of Birmingham some of the mining companies pay their miners on the basis of 30c. per ton for ore. This means breaking, loading in tramcars, and the delivery of the cars to the main heading, where they are picked up by the company and pulled to the tipple at the surface. In these cases, the company furnishes drills, air and steel; the contractor, usually a negro, supplies labor and powder. Some companies pay less than 30c. per ton. The pig-iron costs of one of the large mining and iron-making companies of the district, with the elimination of all intermediate profits, and by the use of byproduct coke, have been under $6.50 per ton, and can now be figured at about $7. Possibly there are others that cannot do so well.

In the case of one of the operating companies of the district, the assemblage of materials is on the following basis: It owns a strip of land 4 miles long and about a mile wide; at one end of this strip are its ore mines, as good as can be found on Red Mountain; at the other end are its coal entries; in the center are its furnaces; connecting all is a standard-gage railway laid with 100-lb. steel, and using cars of 140,000-lb. capacity. This road connects at points less than a mile from the furnaces, with 10 trunk lines of railway. Another operating company starts the incline track carrying ore to its furnace mouths in a limestone quarry, suitable for flux. The advantage of this condition is neutralized, however, by the fact that none of these companies uses any flux to speak of. Another company has five great blast furnaces in a row, some of them of 500 tons per day capacity. I think it is a fact that nowhere in the world outside of Birmingham can five great blast furnaces be found under single ownership and in one line.

An underground mine in Etowah County, Alabama, on the Clinton formation, is successfully producing a 45% ore from a seam that averaged, at the time of my visit, 25.5 in. thick. Ore is successfully mined in this property to a thinness of 14 in. Miners get 55c. per ton for ore in faces 36 in. thick, with a premium on thinner seams and a penalty on thicker. At this mine the ore is trammed underground in main galleries 48 in. high by "jennies," whose ears seem to have been cropped to fit the openings, is hoisted up an incline on platforms to the main tunnel level, is trammed out to the surface by mules and is run through a crusher and over a picking belt to remove slate; the picked ore is then let down a long incline to the railroad track. The cost of all these operations was averaging, at the time I saw the mine, about $1.40 per ton of picked ore, this figure including all overhead costs, as well as transportation to the furnace and amortization.

### ALABAMA CLINTON RESERVES

Generally accepted figures on the tonnage of Clinton ores available in that part of Alabama between Birmingham and the suburb of Bessemer, have been for about 800,000,000 tons of the better grade, or "self-fluxing" ore. But by virtue of a drill hole, sunk last year by Cole

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Note—Reprinted from a paper entitled, "What Our Neighbors Can Do in Mining Iron Ore," prepared by Dwight E. Woodbridge, consulting engineer, Duluth, Minn., for the Minnesota meeting of the Lake Superior Mining Institute, Aug. 26, 1913.

& McDonald, of Duluth, this figure should be doubled, as to probable ore. This drill hole went vertically 1902 ft. to the top of the "big seam" of Clinton ore, that outcrops 11,500 ft. away. At the outcrop of the "big seam" it shows a thickness of some 12 ft., but at this point, some [illegible] miles back from the outcrop and 1900 ft. deep, the ore shows a combined thickness of 15 ft. in two seams parted by 2 ft. of slate. It is probable that there is as much good ore between Birmingham and Bessemer, an extreme length of about 20 miles, as there is on the Mesabi range, and that there is about as much merchantable ore of the Clinton hematites in Alabama as of all merchantable ores in the Lake Superior region. And lest we forget the comparative value of these ores, let us bear in mind that a 40% hard Clinton hematite of Alabama is as good for furnace use as a 50% Mesabi hematite, on account of its comparative freedom from moisture and its high percentage of carbonate of lime.

### Maryland Furnaces

There are in the state of Maryland four blast furnaces of a daily capacity of about 350 tons of pig iron each. All the iron produced in that state is made in these stacks. Sixty years ago, Maryland had no less than 31 active furnaces and their combined capacity was 70,000 tons a year, or as much as the four now in blast can make in two months. All those old stacks, which averaged about six tons of iron per day, and whose ruins now dot the state, produced iron from brown-ore banks that were then active, and all of which lay within a few miles of the stacks. In those days there were many stacks in the city of Baltimore and the ore to run them was mined within 30 miles of the city. Now those ore banks are deserted, and the four great furnaces of Baltimore receive their ore supplies from foreign mines, situated more than 1000 miles away on the Caribbean sea. The Lake Superior district is largely responsible for this and other similar changes in the iron trade.

### New York Clinton Ores

In the Clinton ore district of New York state, where the iron content of the ore is about 40 to 45% dry, they are removing an overburden that is from 10 to 20 ft. thick, half of it consisting of a hard limestone which must be blasted before removal by the shovels, in order to get at a thickness of about 2 ft. of ore. This ore dips flatly into the earth, and they are now trying to figure out how they will be able to follow the ore to a depth of 500 ft. vertically, underground. This will mean a distance of four or five miles from the outcropping. This Clinton ore district of New York State, about which we hear little, and from which but a trifling quantity of ore is now taken, is estimated to contain not less than 500,000,000 tons of merchantable ore.

### Eliminating Phosphorus in Concentrating New York Magnetites

In New York state there are large deposits of low-grade magnetites, running, say, 40% iron and up to 2% phosphorus, that are being made into high-grade bessemer ores by the elimination of the contained apatite, which is the mineral carrying the phosphorus. They have produced so far, of New York magnetic ores from this Appalachian field, more than 35,000,000 tons of ore, showing it to be a most important field. At Mineville they are now concentrating these 2% phosphorus ores at the rate of 1,000,000 tons per year, which is the capacity of their mills when working one shift per day. In these mills they are bringing their 40% ore up to 65%, and their 2% of phosphorus they are reducing to 0.03%, and they are making a product that does not vary from one month to another more than four or five one-thousandths of 1% in its phosphorus content. Such close work seems almost uncanny. When one considers the vast probabilities of low-grade magnetic ores on Lake Superior, now unused, he appreciates the possibilities of such applications to the reserves of this region.

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## Developments in the Black Hills

Special Correspondence

Promotion of a mine in the Black Hills of South Dakota has been undertaken by the Deadwood Business Club, after more than two months spent investigating many properties. Upon the final report of the investigating committee it was decided to accept the offer of the owners of the Heidelberg group, which was to give to the club one-half interest in the property, provided $5000 was raised for development. Fifty members agreed to advance $100 each, in monthly payments. To raise the money among a few men was not the desire, but to give many an opportunity to contribute. Work was scheduled to commence Sept. 1 and continue through the winter. The property is regarded as one of the best prospects in the Black Hills, having shown up well in the meager developments which have thus far been made. Sampling shows the ore to be of excellent milling grade, while some could be profitably shipped to smelters. It is the intention of the club to develop the mine to such a degree that it can readily be sold, and it is believed that this can be done in six months.

The property is in a rough part of the country, and the first work will be the construction of a wagon road, expected to cost about $700. Toward this work the county commissioners have appropriated $250. The property consists of 185 acres, including some timber and a good millsite. It is traversed by Two Bit Creek, which carries enough water to supply a large mill. Administration of the affairs will be left to a board of five trustees, of which the owners, John Treber and A. T. Roos, will be members. The club will select two members and these four will select the fifth man.

### Preparing for Winter Work

At the Titanic property, in Carbonate camp, a steam hoist is being installed, which, with the air compressor, will be run by steam from the Iron Hill plant, 150 ft. distant. The shaft is 100 ft. deep, and water has commenced to show in the shaft. It is proposed to unwater the Iron Hill shaft to the 300-ft. level, believing that this will drain the Titanic workings, and as soon as a skip is completed and coal delivered, draining will be commenced.

Lessees on the Ironsides property, on Squaw Creek, are preparing for an all-winter siege in the snow. Ore-bins are being built in which the ore mined during the winter will be stored. This work will be completed before snow falls and until then shipments will continue until the roads become impassable. Three cars of smelting ore, the poorest of which was worth $30 per ton, were shipped in August, and two cars of milling ore were to be loaded for shipment to the Golden Reward mill, in Deadwood.

Wasp No. 2, at Lead, paid its regular dividend of 1c. per share Aug. 14. The mine is being operated regularly at full capacity, 500 tons per day, and a good surplus fund is being accumulated. The New Reliance, at Trojan, is dropping 30 stamps on milling ore of good grade. The ore is quite hard, and is crushed fine, so that the daily capacity is a little under 100 tons. Lately diaphragm pumps have been installed to replace the air-lifts for moving pulp from tank to tank in the continuous decantation of slime. Manager Bowman states that this change resulted in saving electricity; the pumps do not require as close supervision as the air-lifts. The ore supply is being drawn from workings near the top of the hill, and will come from there until cold weather sets in, when the scene of operations will be changed to the tunnel workings directly at the rear of the mill.

### Cheap Milling at the Bismarck

The Bismarck mill, at Flatiron, is operating at full capacity, 300 tons daily, and is making a profit. The ore is mined by gloryholing and is trammed to the mill, where, after coarse crushing, it is leached with cyanide solutions. The costs of mining and milling, including general expenses, averaged only 95c. per ton during one month this summer. This figure did not include repairs, for which item expenditures will increase as the mill gets older, but, on the other hand, some economies may be effected which will offset them; for instance, a mechanical-haulage system eliminating horses to haul the ore between the mine and the mill. On the basis of present operations the property is earning a good profit.

The Golden Gate property, at the head of Blacktail Gulch, is being sampled by W. T. Boley, representing the Chicago owners. The old workings have been unwatered and carefully sampled. Mr. Boley is also making a thorough examination of a bed of quartzite which outcrops at the south end of the ground, believing that it will be possible to mine on a large scale. The bed is 20 ft. thick. It is quite probable that a mill will be built.

Exploratory work at the Elliptic, which is under bond to the Strattan Venture Corporation, headed by Frank S. Strattan, consists of reaming out the diamond-drill hole which is claimed to have produced high-grade cores in the past. The hole was drilled to a depth of 800 ft. from the bottom of a 600-ft. shaft, and it was from the bottom of the hole that the good cores were produced. At present the reaming has been completed to a depth of a little more than 600 ft. below the collar, progress having been slower than was anticipated.

The Homestake Mining Co. declared monthly dividend No. 416, Aug. 15, constituting a record in the annals of gold mining. Starting its dividend disbursements in October, 1878, they have been continued each month with the exception of two short periods, when, from extraneous causes, the mine was closed. September included, the company will have completed 35 years of dividend payments. It is interesting to note that the present dividend is one of the biggest ever declared, amounting to 65c. per share on 251,160 shares issued. The Homestake probably has greater ore reserves than any other gold mine in the world, approximating 30,000,000 tons, or enough to operate at the present capacity for 20 years. All this ore is above the 1900-ft. level. From the lowest levels some of the richest ore ever found in the mine has been produced.

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## Lime Production in 1912

Although the production of lime in the United States, in 1911, was considerably less than in the two preceding years, the increase in 1912, as reported to the U. S. Geological Survey, was more than sufficient to counterbalance the reaction of 1911. The total production for the year was 3,529,462 short tons, as compared with 3,392,915 short tons in 1911, which represents an increase of 136,547 short tons.

The total number of plants operating in 1912 was 1017, as compared with 1139 in 1911. This decrease in the number of producers was due, in large part, to the inactivity of small kilns operated by farmers for burning lime for local use in soil treatment, and in part to the tendency of the industry toward concentrating plants into fewer and larger units. The heaviest decrease in the number of producers was in Pennsylvania, where 561 were reported operating in 1911 and 474 in 1912, a decrease of 87. The five leading lime-producing states in 1912 were, in the order of production, Pennsylvania, Ohio, Wisconsin, West Virginia and Maine. Maine has supplanted Missouri, which occupied the fifth place in 1911, in the quantity of lime produced, but ranks seventh in the value of production, which is one place lower than Missouri.

The hydrated-lime business exhibited a marked advance in 1912. The quantity of hydrated lime produced was 416,890 short tons, as compared with 304,593 short tons in 1911. This increase of 37% in a single year, in spite of a decrease in the average price per ton, speaks well for the strength of the hydrated-lime business. The number of lime-hydrating plants in operation, in 1912, was 64, an increase of four from 1911. The operating plants are located in 20 states, and there are idle plants in a number of other states.

Lime imports into the United States, in 1912, were 4268 short tons, as compared with 5232 short tons in 1911, a decrease of 964 tons. Exports were 260,669 bbl. of lime, as compared with 207,232 bbl. in 1911.

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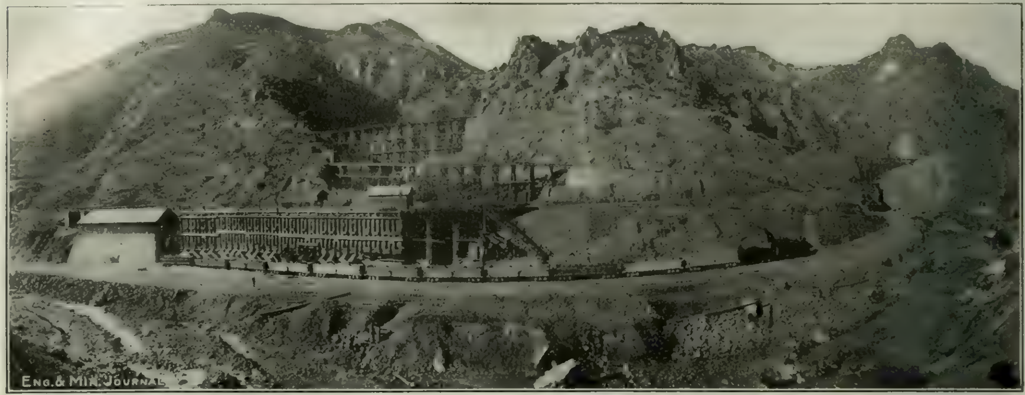
## Swedish 1912 Mineral Output

The official report of the Swedish mineral output for 1912 shows the following: Iron ore, 6,700,565 metric tons; zinc ore, 50,036; silver-lead ore, 2877; iron pyrites, 31,835; manganese ore, 5101; copper ore, 3059 metric tons. Of the iron ore produced, 4,521,460 metric tons carried between 60 and 70% of Fe, and 1,247,626 tons more carried between 50 and 60% Fe.

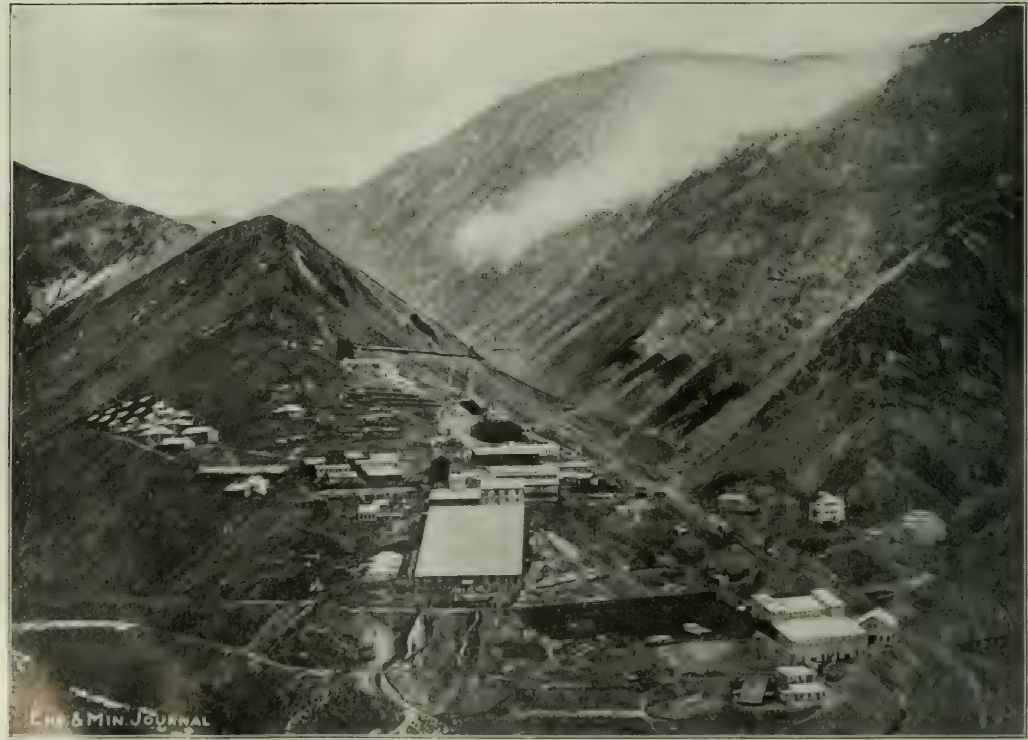
The metal production, excluding iron, was: Copper, 3957 metric tons; zinc, 3228; lead, 1072 metric tons; silver, 961 kg.; gold, 30 kg. Other products and byproducts of the mineral industry were: Zinc sulphide, 33,522 metric tons; copper sulphate, 870; feldspar, 34,305; quartz, 22,365; alum, 144; ferrous sulphate, 335; graphite, 79; powdered pyrolusite, 62 metric tons. All figures are arranged in order of descending value.

# PHOTOGRAPHS FROM THE FIELD



LONGFELLOW TRANSFER BETWEEN CLIFTON AND MORENCI, ARIZ.

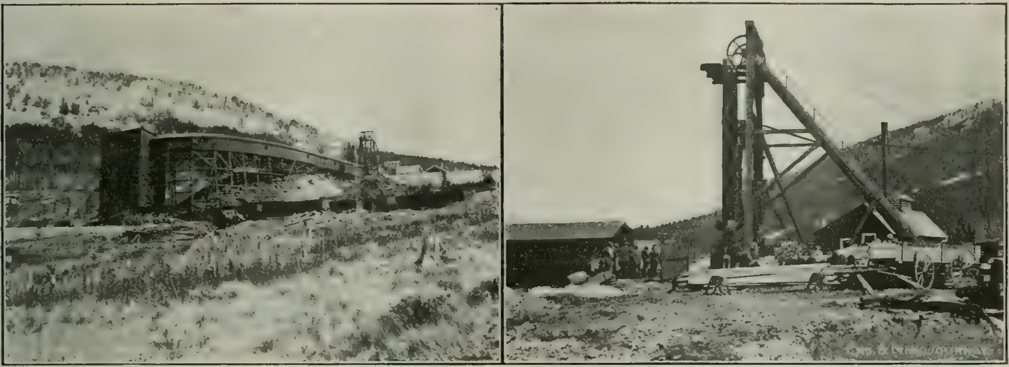
The transfer is at the foot of the Longfellow incline on the Shannon-Arizona and Coronado railroads. The Longfellow mine is in the background at the right.



THE BRADEN COPPER CO. PROPERTY IN CHILE

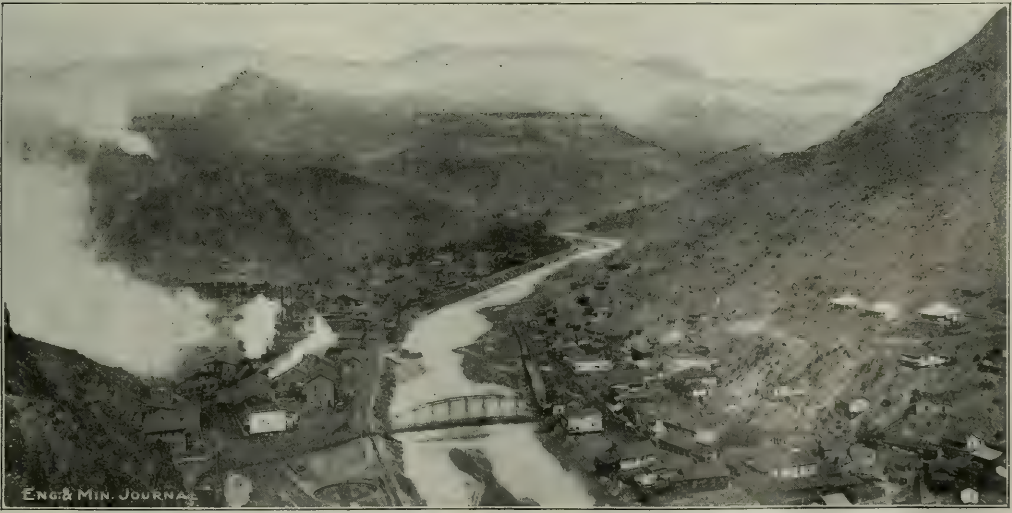
General view of Molino, formerly Graneros, site of town, concentrator and smelter, in the immediate vicinity of the mines.

The Engineers' Special and View from Southern Cross Mine



Orebins and Headframe, Southern Cross Mine of Anaconda Company

The Southern Cross mine, 20 miles west of Anaconda, was visited Aug. 21, by members attending the Butte meeting of the American Institute of Mining Engineers.



Clifton, Ariz., Copper King and Polaris Mines in Distance

The old smeltery of the Arizona Copper Co. is to the left

## Proposed New Land Law

Los Angeles Correspondence

Senator Smoot, of Utah, has introduced in the United States Senate the following bill, which has aroused apprehension and discussion among some miners, who affect to see danger in certain provisions:

> Be it enacted by the Senate and House of Representatives that where a grant of lands in place has heretofore been made, or may hereafter be made, to any state in aid of public schools, the governor of any such state may cause to be listed with the Secretary of the Interior any sections, or parts of sections so granted, and it shall be the duty of the Secretary of the Interior to examine such lists, and if the lands are found to be of the character so granted, and free from valid adverse claim, initiated prior to the survey of the township in which they are situated, to certify the same to the state entitled thereto in further assurance of title. Provided, that no such list shall be certified until the state shall have published for a period of 30 days, in a newspaper of general circulation in the vicinity of the land, a notice of the filing thereof, and that as the lands hereafter surveyed such publication shall not be made until after the expiration of three months from the filing of the township plat of survey in the district land office; provided, further, that nothing herein contained shall be so construed as to postpone the time of the attachment of the grant of such lands under existing law.

On its face the act appears to have been designed to help states in perfecting title to the lands that have come to them from the federal government for school purposes, but men eminent in the law, attorneys who have had extensive practice and experience in the land courts, profess to see a "joker" that might result disastrously to the mining industry. The miners and attorneys interested in mining law do not blame Senator Smoot for the introduction of the measure. They realize he is not a lawyer and that he is undoubtedly ignorant of the danger to miners that lurks within the provisions of his act.

Under the Smoot act, the present policy of the government toward the prospector and miner, dating from the inception of the present system of mining laws, inaugurated in 1866, will be reversed. By that system, mineral lands have been exempted from school and railroad land grants. This was done to facilitate the development of the mineral industry, which has been such a factor in the growth of the Pacific Coast.

Some of the best mineral lands in California have been found on school and railroad grants, and even in Senator Smoot's own state, some of the greatest mines at Park City, Tintic, Bingham and other places have been included in school grants. Under the existing law mineral lands are segregated when discovered, and the state is empowered to make lieu selections. There is no objection to this procedure because when the government assigned these lands to the different states it was not cognizant of their character. But the government has guaranteed protection to the prospector and miner to the extent that when land is discovered to be mineral it is withdrawn from land grants to states and railroads.

A close analysis of the Smoot bill shows a possibility that the law and method of procedure may be materially changed, and the change might be disastrous to the mining industry, and work a great injustice to the prospector and miner. He complies with the requirements of the federal laws and records his claim with the recorder of the county in which it is located, but there is no way by which his claim may be recorded in the United States district land office. The claim may be surveyed or unsurveyed lands for all he knows, it may be on a school selection or a railroad grant, but he is not cognizant of the fact until he makes application for patent, when serious complications are likely to arise. If the miner's claim is on a school grant, it may have been sold by the state to someone else without his knowledge because there is no record of his claim in the United States district land office to show that the land has been appropriated for mineral. If there is to be a change or revision in the mining laws it should be in favor of the prospector and miner. The state is well protected in its grants; the burden of proof is on the miner in all contests and hearings in the land courts, and there should be no further impositions forced upon him.

The Salt Lake Commercial Club has taken the matter up in earnest and has adopted strong resolutions opposing the Smoot bill and asking the Senator to withdraw it. Similar organizations throughout California should take a stand and the strongest influence and pressure should be brought to bear on Congress not to jeopardize the mining industry of the Pacific Coast by its passage.

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## Swedish Iron Trade, 1912

There were 6,700,556 metric tons of iron ore produced in Sweden in 1912. Of this, 5,945,394 were considered first class. No less than 4,521,460 tons carried 60 to 70% Fe; 1,247,626 tons carried 50 to 60% Fe. There were 4,863,666 tons carried 0.1007% or over of phosphorus, and 1,055,011 tons carried 0.030 to 0.050 of sulphur, 4,013,532 tons carried under 0.020 of sulphur, and 192,676 tons carried from 0.020 to 0.030 of sulphur.

The Swedish iron works consumed for the entire production of iron 43,219,576 hectoliters of wood charcoal; 359,584 tons of coal, 136,472 tons of coke, and for the production of ingots, 337,321 metric tons of pig iron and 212,143 metric tons of scrap iron.

The production was divided as follows, the items being arranged in descending order of value: Pig iron, 699,816 mtric tons; openhearth ingots, 404,118; steel and iron bars, 182,608; iron bars, 148,828; rods and hoops, 86,194; bessemer ingots, 107,254; castings for drawing weldless tubes from, 49,063; wire rods, 52,541; cast iron, 45,194; sheets, 25,560; crucible and electric-furnace steel, 3941; total, 1,805,117 metric tons. There were also 5906 metric tons of ferrosilicon and 997 metric tons of silicospiegel produced. The average Swedish blast furnace produces 20.07 metric tons of pig iron per day.

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## Goldfield Consolidated

Report of Goldfield Consolidated for July, 1913, shows a total production of 29,550 tons. From this amount $168,755 was realized, $48,725 through mining operations and $120,030 through milling.

Development cost $5.84 per ft., a total of 3430 feet having been performed. Combined operating costs are shown in the accompanying table.

| Mining. | Mining | Milling and Transportation | Total |
|---|---|---|---|
| Stoping | $2.86 | | $2.86 |
| Development | 0.68 | | 0.68 |
| Moving dumps | 0.06 | | 0.06 |
| Transportation | | 0.08 | 0.08 |
| Milling | | 1.91 | 1.91 |
| Marketing | | 0.05 | 0.05 |
| General expense | 0.39 | 0.06 | 0.45 |
| Bullion tax | 0.04 | | 0.04 |
| Construction | | 0.03 | 0.03 |
| Marketing ore shipped | 0.71 | | 0.71 |
| Total costs | $4.74 | $2.13 | $6.87 |
| Miscellaneous earnings | 0.04 | | 0.04 |
| Net costs | $4.70 | $2.13 | $6.83 |

# CORRESPONDENCE AND DISCUSSION

## Relation between the Composition and Physical Properties of Cast Iron

In an extremely interesting article by "Ironkem," on p. 1206, of the *Iron Age* for May 16, 1912, the following occurs:

"The analyses of two lots of No. 2 cast iron are given, together with their breaking strength as follows:

| | Close Grained No. 2 | Open Grained No. 2 |
|---|---|---|
| Silicon | 1.00 | 1.10 |
| Manganese | 0.38 | 0.53 |
| Phosphorus | 0.112 | 0.116 |
| Sulphur | 0.009 | 0.023 |
| Graphitic carbon | 2.72 | 3.16 |
| Combined carbon | 0.99 | 0.68 |
| Total carbon | 3.71 | 3.84 |
| Breaking strength of 1¼-in. round pins on 12-in. centers: | 4950 lb. | 2750 lb. |
| | 4500 lb. | 2700 lb. |
| | 4300 lb. | 2700 lb. |
| | | 2750 lb. |

The writer, who is evidently a master of his subject, produces this as evidence to show that "two irons of identical analyses made in the same furnace, from the same ore mixture, can have vastly different physical properties."

I call attention to the fact that there is no such closeness in these analyses as the writer evidently thinks. On the contrary, it appears to me that the difference in composition goes a great way toward explaining the difference in physical properties. In the first place, the weak iron has 0.44% more graphite than the strong, which in itself is an element of weakness; in the second place the weak iron has a combined-carbon content of 0.68 as against 0.99 for the strong iron. In other words the metallic matrix of the weak iron is that of rail steel, whereas the matrix of the stronger iron is equivalent to 1% carbon steel, which is, of course, much stronger than rail steel.

Adding to these differences the great difference in the structure, we need not wonder that one iron is so much stronger than the other, and that there is such a difference in the structure of the irons need surprise no one. A slight difference in temperature between the two irons as they run from the furnace might lead to such variations of structure, the hotter iron cooling more slowly than the other. We have by no means reached the end of knowledge in these matters, and we cannot as yet explain fully all the variations in properties. We cannot do this fully even in the simpler case of steel, but we can explain a large part of it.

HENRY M. HOWE.

Columbia University, Aug. 11, 1913.

## A Caution to Buyers of Steel

A coterie of European steel bunco men has been reported to be again active in this country. Anyone solicited for a trial order of a special-process, foreign-made, drill or tool steel, for which phenomenal claims are made and an extraordinary price is asked, would do well to exercise extreme caution against being swindled.

I will gladly inform anyone who has been so approached whether or not the steel company that has solicited an order is in any way affiliated with the particular group of individuals to which I refer.

C. CARLETON SEMPLE.

Stamford, Conn., Aug. 30, 1913.

## What the Union Has Done for Butte

In connection with the present Michigan strike, there have been numerous comparisons drawn between conditions in Butte and Michigan. Having read misleading statements about conditions in Butte and other Montana communities, I believe I should correct them and make a true statement of conditions, together with a brief résumé of the relations between the Western Federation of Miners and employers in Montana. The Butte miners' union was organized June 13, 1878. A minimum wage of $3.50 for all underground workers was established, men doing development on contract averaged from $5 to $7 per day, the minimum or union scale being guaranteed.

Thirteen years ago the Montana legislature enacted an 8-hr. day for all underground workers, mill and smelter men and reduction-works employees. John D. Ryan, president of the Amalgamated Copper Co., extended the 8-hr. day to all surface workers; even watchmen work 8 hr. only. An agreement was entered into between the local unions of the Western Federation of Miners in Butte, Anaconda and Great Falls and all the mining corporations of that district, June 1, 1912, wherein a minimum of $4 per day was established for all underground workers when the price for copper was 17c. or more; and $3.75 when exceeding 15c. but under 17c. per lb. The $4 wage was paid during nine months of the last year and $3.75 is the present minimum; $3.25 is the minimum for surface labor. Mechanics, machinists, carpenters, blacksmiths and boiler makers get $4.75 for eight hours. Men on first-motion hoists get $5, compressor men $4.50, and $4 for firemen.

The cost of living is being harped upon as being greater in Butte than Calumet. Single men in Butte pay $1 per day for board and room, and the accommodations include modern conveniences such as electric light, steam heat and baths; 80% of the married men own their own homes. Those who rent houses pay from $12 to $20 per month; the rent is estimated on the size and conveniences and includes water. There are no company houses. Men have an incentive to build homes and have a place to call their own and are not subject to eviction when they displease the boss. Meats and other necessities are cheaper in Butte than in the copper country of Michigan. Meals are cheaper in restaurants in Butte than in Calumet. A miner has more left of his daily wage after paying living expenses than the best-paid miner receives in the copper country for his entire daily wage. We have read that miners average from $3 to $[illegible] in this district. I have a number of monthly statements of miners working in different mines in Michigan and the highest does not exceed $65 and others range down to $29. How a man can support a family on such a wage is inconceivable. Compare this with a minimum of $112 paid to the men working in the Butte mines. If I were to use the same method of computation as the operators in Michigan I would put the wage of the Butte miner at $5 to $7, as that is earned by about 2000 of the underground workers of Butte.

During the 35 years that Butte miners have been organized, not one day's shutdown occurred due to any grievance with the employers. Can Michigan show such a record during the last 35 years of its unorganized state? Thousands of former residents of Michigan who were driven from that state by the intolerable conditions of employment are now residents of Butte, which is the best evidence of comparative conditions. The monthly dues are $1 and union miners are assessed whatever amount may be necessary whenever men are elsewhere fighting for better conditions. Out of the money so collected the union pays to its sick members $10 per week, and at death $90 for funeral expenses. In addition to this, special donations of $400 to $500 are paid to members who receive great bodily injury or long-continued sickness; $100,000 is paid yearly by the Butte miners' union alone for such purposes, and no member of that union filled a pauper's grave during the last 35 years.

The business men of Butte are the most prosperous in the country and the general *per capita* prosperity of Butte is the highest in the United States. I would suggest to the local business men who are so anxious to serve the corporations in Michigan to inquire of the Butte chamber of commerce as to the standing of the Western Federation of Miners in that district.

The local managers in Michigan say they will not deal with the Western Federation of Miners. Paine, Webber & Co. control the East Butte Mining Co. and are interested in the Butte & Superior Mining Co. Both of these companies have agreements with the Western Federation, as have all other companies in the district. Paine, Webber & Co. also control the Copper Range Consolidated and Manager Denton says he will not deal with the Federation. Why is it right in Butte and wrong in South Range. Denton, if transferred to Butte, would gladly do business with the Western Federation of Miners as others do. D. C. Jackling, of the Guggenheim interests, loudly proclaimed a year ago that he would not recognize organized labor; one week later as manager of Butte & Superior, he entered into an agreement with the Butte miners' union to pay $4 per day to his underground workers. It may be well for local managers to learn wisdom by the experience of others. I would also suggest to some of the clergymen of Michigan that they inquire of the clergymen of Butte, Anaconda or Great Falls, what is thought of the Western Federation of Miners in those places, before passing judgment on matters they are not acquainted with.

WILLIAM LAKELAND.

Secretary, Miners' Union, No. 22,
Western Federation of Miners.
Greenwood, B. C., Aug. 26, 1913.

# Discovery of the Maas Iron Mine

In P. B. McDonald's article, "Applied Geology, Michigan Iron Ranges," in the JOURNAL of Aug. 2, 1913, my discovery of the Maas mine is cited as an example of luck. I object to such a statement, because every drill hole that I put down was located after a diligent study of the geology of the district, supplemented with careful examinations of conditions in the adjoining Negaunee mine to the southeast, and the Hartford mine to the northwest. I also had data of explorations by diamond drilling conducted by the Lakeside Mining Co. close to the east shore of Teal Lake about the year 1889. About one year previous to this I had charge of diamond-drill work still farther east on the Muck farm, conducted by my father, the late J. B. Maas, after whom the Maas mine was named, by his friend, William G. Mather. It is true that I had a sketch by a German, but it was not marked "Here is a good place to look for iron ore." The sketch was made by me in following lectures of Dr. Wedinger, in the School of Mines, in Berlin, Germany, and indicated the probable line of contact between the Negaunee iron formation and the Siamo slates in the flat ground lying between the Negaunee mine and Teal Lake.

Working with this sketch as a basis, I started drill holes on the Muck farm in 1888, but discovered the contact much farther south than the professor had supposed. After sinking three drill holes, all in Siamo slates, working from the north, we cut the iron formation and some lean ore, but the price of ore at that time did not warrant further explorations through an immense body of quicksand. In 1898, when I started diamond drilling on what is now called the Maas mine, I not only had access to all known geological information, but had information of the lower levels of the Negaunee and Hartford mines, and the results of the Lakeside Mining Co.'s and my own previous drilling.

It is, then, not surprising that every one of my drill holes were started in the hanging and inclined toward the Siamo slates and Ajibik quartzite. However, it was only the third drill hole that cut ore, because the ore is capped sometimes to a great depth. In the explorations west of the American mine, every hole was started in the Goodrich quartzite and pointed at an angle to the north to cut the Siamo slates and Ajibik quartzite. These holes were located after a careful study of the geological conditions and as the overburden was like the case of the Maas mine, more than 200 ft., it must be conceded that there was more "applied geology" used in both these explorations than "luck."

GEORGE J. MAAS.

Negaunee, Mich., Aug. 28, 1913.

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# Power Required for Electric Smelting

An electric-smelting test on Copper Reef ores, recently made at Globe, for the Pittsburgh Electric Furnace Co., was noted in the "Mining News" pages of the JOURNAL of Aug. 30, wherein it was stated that about 3500 kw. was required per ton of charge. While the other statements made are correct, the power requirements actually amounted to 350 to 500 kw., depending upon the nature of the charge.

Pittsburgh, Sept. 3, 1913. R. S. WILE.

# EDITORIALS

## The Zinc Schedule

Several weeks ago we called attention to unfortunate phraseology of the zinc-ore schedule of the pending tariff bill, which would have resulted in importers of such ore paying a double duty. In order to correct this, Senator Thomas, on Sept. 2, introduced an amendment, adding the words "upon the zinc contained therein" after the words "ad valorem" in paragraph 164, line 14.

This is a simple and ingenious rectification which will probably straighten out the matter insofar as the zinc smelters are concerned, although the customs appraisers may have some difficulty in determining the value of the zinc in certain ores. Anyway, the importers are clearly relieved of paying duty on the silver, gold and copper contents of such ore, and of paying twice on lead contents.

After a brief discussion Senator Thomas' amendment was agreed to with the remark by Senator Thomas that "if anything needs rectification it can be easily returned to."

We think that some further rectification is necessary in order to insure justice to the lead and copper smelters. As appears from the discussion in the Senate on Sept. 2, it is the intention to assess a duty on lead ore under paragraph 154 and on zinc ore under paragraph 164. It is clearly the idea that lead ore and zinc ore are two different things.

However, paragraph 164 specifies not zinc ore, but zinc-bearing ore, and as amended provides for an ad-valorem duty upon the zinc content of such ore. Now, lead ores and copper ores are frequently zinc-bearing. Will the collectors of customs attempt to levy upon the zinc of such ore or will they be convinced that the zinc content in this case is of no value and consequently undutiable?

Section 164 as amended is a great improvement upon the original, but evidently there will have to be administrative rulings respecting it and probably cases will come up in litigation.

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## The Situation in Copper

We are at the present time witnessing a remarkable situation in copper, the world's stock having been reduced to the lowest figure on record since the American statistics have been reported, while the demand for consumption continues unabated. The statistical position was already strong before the Michigan strike occurred. The cessation of copper from that source was felt very quickly, inasmuch as that copper does not have to be refined electrolytically and goes directly from the smelteries near the mines to the consumers. Whereas in the case of electrolytic copper about three months from mine to consumer is a normal time, Lake copper is ordinarily less than a month in transit.

It appears now that the Michigan strike is going to be a long drawn-out affair. Even if it were settled tomorrow it would be many months before the former rate of production could be regained. Many of the mines are filling with water and the exodus of miners from the district will produce a shortage of labor that will check operations for a long time. Eventually the companies will probably have to offer higher wages in order to secure the men that they want. In the meanwhile the producers of electrolytic copper can offer only partial assistance inasmuch as the refineries of the country are already being operated at nearly their full capacity.

The copper market has consequently worked itself into a dangerous position and if consumers should become unduly excited they may develop highly uncomfortable conditions for themselves. The producers are sincerely, we believe, seeking to prevent that, realizing that in the end they always have to suffer from excesses. There will probably be a further advance in price, but it is hoped that there will be no runaway market. In view of the existing financial and industrial situation, which is not what it should be either in Europe or America, there will probably be no runaway market. The gradually increasing business recession in Germany will be a tempering influence, as will be also the absolute absence of any prospect of a boom in this country, where the partial failure of this year's harvest has checked all ideas of business expansion. However, there will, no doubt, be a very strong copper market for some months to come simply because of the restriction of production, the Michigan and Mexican troubles having come to a head just when stocks had already been reduced to a smaller quantity than it was thought a few years ago the requirements of commerce would permit.

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## The Situation in Spelter

Spelter has experienced a considerable rise since the beginning of summer and it is thought in the trade that the rise will go further. The improved situation results from the emerging of the galvanizers and brass-makers from their previously overbought condition, the maintenance of a large consumption and the reduced production on the part of the smelters. The smelters are now in no enviable position, owing to the contraction of margin between the value of spelter and the value of zinc in ore, which leaves them little or no profit. This results from the shortage of ore supply west of the Rocky Mountains, where Butte is the only district offering increased quantities. On the other hand, the Mexican supply is practically cut off. Outside of Butte no new supplies of ore of any great consequence are in sight. Therefore the miner is at present having things all his own way and is reaping all the benefit of the advance in spelter.

With the passage of the new tariff bill, now only a few months away, and the reduction of our bars against European spelter, a further advance in our market just now may appear unjustified. In indicating the European situation, the following from a recent number of the *Ironmonger* is interesting:

> It may be assumed that the Convention which regulates the [illegible], and to a large extent controls the prices, will be continued; although there is room for great difference of opinion as to the policy which it will eventually adopt in respect of selling prices and the manipulation of production on the Continent. Judging from external indications there has been no small amount of friction among the chief parties represented in the Convention, and the conditions of the market [illegible] of a very complex character. An eager demand has been attracted from numerous quarters lately owing to the abnormally low prices which have ruled, and under ordinary conditions this demand would probably have resulted in a very smart uplifting of prices. It is true that the price of spelter for forward delivery was at one time raised to a notable extent, but afterward there was a sharp setback. So long as the stocks on the Continent under the control of the Convention remain heavy and so long as the Convention is ready to meet the demand of the trade there is no reason for a runaway market, even if requirements of the trade should become exceptionally pressing. Consumption is proceeding on a much larger scale than during the earlier months of the year and if it continues at approximately its present rate the disappearance of the surplus stock may be only a matter of time, although only the Convention knows the extent of that stock.

A few months ago the unsold stock of the Convention was very large indeed, but during recent months it has been reduced materially, and probably is no longer a serious menace to the American market after the reduction of the tariff. Indeed the hopes of a further advance in our own market are based upon the expectation that the European price will rise to £23 or higher. However, while there is good ground for optimism as to spelter, the present is no time for the indulgence of extravagant hopes. We may see 6c. for spelter ere long, but probably it will be many a month before we may expect 7c. again if the precedents of the past are to hold good.

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## Scientific Management for Mines

The question of applying to mining the principles of scientific management is frequently raised. Their adoption is enthusiastically urged by well meaning amateurs and rejected quite as emphatically by stand-pat managers. It is a fact that of all main lines of human industry, that of mining seems least amenable to this new method of treatment. The great difficulty lies in the continually changing conditions which are inherent in the industry and unavoidable. The essence of scientific management is standardization, finding out how to do a thing most economically and then so doing it many thousand times until the cost of finding out has been paid for by the total saving. But rocks and orebodies unfortunately will not standardize and their refractoriness thus is transmitted down through the whole scale of mining operation. How to establish a standard rate of drilling, for instance, when the rock varies in hardness from inch to inch? How to prescribe the most efficient method for setting up a rock drill when the dip of the foot wall, the thickness of the vein, the reliability of the hanging may change over night? How, when outlining the time cycle for a shift's drilling, to allow for the time consumed in passing a troublesome slip?

To a less degree, other characteristics of mining oper[illegible] against the adoption of the methods of scientific management. Such are the feeble illumination, the scattered [illegible], making supervision difficult, and especially the temporary nature of all mining, which discourages initial expenditures. It is no wonder, then, that the mine manager has not rushed to welcome the efficiency expert. The limitations on his methods are too evident. It is however, foolish to reject a half loaf from failure to get the whole. There are many mining operations capable of standardization, where great economies could be effected by time study of the various units involved. One such in particular in hand tramming. It is an operation, unluckily, which no mine can quite eliminate, but which it often succeeds in thoroughly neglecting; yet it is the one important manual operation in mining in which reasonably uniform conditions are met. Spotting cars, loading, pushing, discharging, are all performed in about the same way day after day in all parts of the mine. An opportunity for analysis, time measurements and study exists here, and if work of this nature were done, we should know a great deal more about the elements that enter into hand-tramming costs, where at present we know little or nothing.

The size, weight and relative dimensions of an ore car are decided by guess. The type of bearing is chosen after asking the foreman. It is assumed that the proper track grade should result in about the same effort by the trammer, whether pushing the loaded car down grade, or the empty car up grade. This is about one-half of 1%. Left to themselves, the trammers would probably select a steeper grade, preferring to ride the loaded cars and work harder pushing back the empties. It may easily be that the trammers are right. Mr. Taylor found that in loading pig iron, periodic rests greatly increased the total which it was possible for one man to handle. One fact, which might be made more emphatically evident by the presentation of figures, is that the average mine track is sadly neglected. Too light rails are used, too little attention is paid to grade, and curves are often more nearly angles.

Switches in particular are often put in according to prejudice, and by promoting derailments and encouraging delays, reduce appreciably the efficiency of the trammer. The whole question of switches is more or less in the air. What is the choice between slick sheet, switch and turntable? If a switch be used, shall it be a double-point stub, a double-point split, a single-tongue, or shall it be fixed in position? If movable, shall it be thrown by hand, by foot, by lever, or shall it be automatic or semi-automatic? The choice of these various types is a matter of cost in the last analysis, the first cost balanced against the time cost of manipulation. But figures on manipulation costs can be had in these operations only by observations with a stop watch.

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## Respecting Ore Grinding

The fact that the Homestake mills in the Black Hills use stamps for crushing has long been a strong argument in their favor. Too little attention is given to circumstances which alter cases. That a large mill uses stamps is no reason why a smaller or larger one should do the same. That a crushing machine is best adapted for a particular service is no reason why the same machine should be best for performing a different function. It is interesting to note that the new Mogul mill, which is to be built in the Black Hills, will use the same crushing machines formerly installed in the old plant, chilean mills.

## BY THE WAY

The employees of the U. S. Steel Corporation, appreciating that wages have been steadily increased by the corporation, and being apprehensive of what might happen in the event of dissolution, are circulating a petition asking the government to drop its suit. It is said that more than 150,000 names have already been secured. This may furnish the government with the needed excuse to discontinue an action for which there never was any popular demand so far as we have been able to make out.

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The Department of Justice has agents in Colorado interviewing ore producers with respect to their treatment by the American Smelting & Refining Co. They have been informed by important producers that the smelting company is considered to have been fair in its operations, that a reasonable share of the benefits resulting from improvements in the art of smelting have been passed on to the ore producers, and that such complaint as exists comes from small producers who are often too ignorant to figure out an ore-settlement sheet. With respect to the erstwhile competing smelters at Golden, Florence and elsewhere, the Washington officials, previous to the advent in Colorado, appear to have received information that can only be characterized as weird.

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Respecting the recent very foolish war-scare, the *Evening Post* remarked that money, or the facilities for raising money, are in these days essential preliminaries to making war. Since Mexico could not therefore attack the United States, there could be no war unless the United States attacked Mexico—which we clearly had no intention of doing. This last way of judging probabilities was quite in Wall Street's line. Wall Street as a community is in touch, directly or indirectly, with the people who lend to governments like Mexico. It was therefore able to conclude that Huerta could do nothing whatever in the matter short of appearing before the Pujo Committee to complain of being forced out of business by the Money Trust, despite his moral right to have the money. And even the Pujo Committee was no longer in session.

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We do not understand why good raw material for stock-jobbing purposes is allowed to go to waste. We have had reports out on the giant kelp of the Pacific Coast as a source of potash for nearly two years; the technical magazines, the Sunday newspapers, and the Government bulletins have howled about the necessity of potash for the American farmer, and yet we have not yet received a single letter offering

5% first-mortgage sinking-fund gold bonds;
6% second-mortgage unsinkable silver bonds;
7% debenture copper-plated bonds;
8% participating preferred stock;
Unlimited common stock;

all in the United Kelp & Potash Co., chartered to acquire marine holdings, to plant, cultivate, harvest, and treat kelp, refine potash and iodine salts, radium compounds, and take in money. Certainly the promotors have gone to sleep at the typewriter.

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Tipping at the expense of the government is to cease, so far as the Post Office Department is concerned, with one exception. The individual who may be favored by department officials when traveling on government business is the train porter. Just why Postmaster-General Burleson exempted the porter is not made clear in orders issued today, limiting the expense accounts of post-office inspectors. The Postmaster-General disclosed definite ideas about what hotel waiters should receive. In his instructions is the item: "Tips for hotel waiter—Nothing." As to the piratical craft known as the taxicab, its use at government expense is taboo. Under regulations effective Oct. 1, board and room must not cost more than $5 a day; laundry may be charged at the rate of $1.25 a week, or 20c. per day; while the engaging of a stenographer or typist to aid in preparation of reports is forbidden.

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According to a dispatch to the New York *Sun,* the last shovelful of earth was dug from the Culebra cut at 3 p.m., Sept. 6. It was then expected that all the tracks and equipment would be removed by Sept. 9 and the flooding of the cut begun. It was originally intended that all steam-shovel operations on the Culebra cut proper should cease on Sept. 15 and that by Oct. 5 all the equipment, including 36 miles of track, must be out of the nine-mile channel between Gamboa dike and the Pedro Miguel locks. On Aug. 1 there remained to be removed 998,900 cu.yd. inside the theoretical canal prism, and it was estimated that two-thirds of this would be taken out by Sept. 15. The work on the canal is now progressing rapidly. On Aug. 31 the last barrier at the Pacific end of the canal was blown up by dynamite and that same day several dredges passed through the opening. Work was begun on the last barrier of the Atlantic channel two days later, and when this has been completed ships will be able to navigate to the locks at both ends.

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Out of the mouths of babes may we learn and even from the *Saturday Evening Post,* which tells us that the latest kink in gold-smelting is to cast the gold in conical shapes instead of bars and bricks, with the express purpose of making it difficult for a thief to walk away with a cone. The cones are molded to almost any size, one measuring 1 ft. or perhaps 1½ ft. in diameter on the base. Such a shape is extremely unwieldy. Slings and tongs have been designed to facilitate handling them in the smelting works because they are so clumsy. Our esteemed contemporary continues: "A thief provided with such a sling would have an embarrassing time getting away with a cone in contrast with the ease with which a bar or a brick may be covered up to give it an appearance that will not rouse suspicion. Some slight advantages in molding have also been obtained by using this shape in the Arizona smelting works where it has been adopted." We think that a cone of gold 1½ ft. in diameter might be unwieldy, if of any great thickness. Figure it out for yourself; the specific gravity of pure gold is about 19.3. Also, we are interested in noting that there are gold-smelting works in Arizona, but we wish we knew where they were. On sober second thought, we think we detect a resemblance in the above to one of our own items, p. 805, Apr. 19, 1913, and we do not believe that it was much improved by whomsoever lifted it, without credit.

## Gogo Juice and Gold

Gogo juice is obtained from the bark of a Philippine plant, whose botanical name is *Entada scandens* Bentham. According to F. T. Eddington, in the *Philippine Journal of Science*, April, 1913, it is customary for the gold washers in the Philippine placers, who are usually women, to squeeze gogo juice from time to time on the surface of the water in their *bateas*. The belief is that the fine gold is thus caused to settle instead of floating away. Gogo juice is neither acid nor alkaline and its chief constituent is saponin, a complex vegetable poison belonging to a group of glucosides, which are generally colloids. It has the property of holding fine particles in suspension in liquids, of "killing" mercury and of emulsifying oils.

Mr. Eddingfield conducted some experiments to determine the efficacy of the juice in gold washing. He obtained finely divided gold by precipitating it from gold-chloride solution with oxalic acid. Gogo juice added to this solution while the gold was still in suspension had no effect whatever in the rapidity or completeness of its precipitation. Further tests showed that the juice had no ability to increase the adhesion between gold and wood or between gold particles or to reduce the surface tension of water, or to clean the gold by cutting the oil which might be on it. The conclusion is reached that gogo juice has no qualities which make it beneficial in gold concentration, and since it has the ability to "kill" mercury, it is of a positive disadvantage where amalgamation is to be practiced.

A continuation of these experiments, however, showed that the gogo juice was a useful reagent in forming colloidal gold. Red, blue and purple solutions were obtained by the use of this material. This is interesting, in view of the belief formerly held that colloidal gold solutions could not be formed readily by means of a colloid or in the presence of an electrolyte. The juice, or at least the saponin, is a colloid and the colloidal gold was formed by means of oxalic acid, which is an electrolyte. It can be formed from gold-chloride solution by the use of fresh gogo juice and oxalic acid plus heat; or by the use of gogo juice plus heat after standing; or by the use of gogo juice, calcium carbonate and heat.

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## Smelting in Bond

WASHINGTON CORRESPONDENCE

Late on Saturday night, Sept. 6, the Senate, which then reported the tariff bill from committee of the whole to the Senate, sitting as a legislative body, adopted a new smelting-in-bond provision along lines already predicted in this correspondence. The amendment, which went through without debate, grew out of the dissatisfaction felt by smelting interests with the way in which the smelting industry was treated in the original draft of the tariff and reads as follows:

> That the works of manufacturers engaged in smelting or refining, or both, of ores and crude metals, may, upon the giving of satisfactory bonds, be designated as bonded smelting warehouses. Ores of crude metals may be removed from the vessel or other vehicle in which imported, or from a bonded warehouse, into a bonded smelting warehouse, without the payment of duties thereon and there smelted or refined, or both, together with other ores or crude metals of home or foreign production: Provided, That the bonds shall be charged with the amount of duties payable upon such ores and crude metals at the time of their importation, and the several charges against such bonds may be canceled upon the exportation or delivery to a bonded manufacturing warehouse established under paragraph M of this section of an amount of the same kind of metal equal to the actual amount of dutiable metal producible from the smelting or refining, or both, of such ores or crude metals, as determined from time to time by the Secretary of the Treasury: Provided further, That the said metals so producible, or any portion thereof, may be withdrawn for domestic consumption or transferred to a bonded customs warehouse and withdrawn therefrom and the several charges against the bonds canceled upon the payment of the duties chargeable against an equivalent amount of ores or crude metals from which said metal would be producible in their condition as imported: Provided further, That on the arrival of the ores and crude metals at such establishments they shall be sampled and assayed according to commercial methods, under the supervision of the Government officers to be appointed by the Secretary of the Treasury and at the expense of the manufacturer: Provided further, That antimonial lead produced in said establishments may be withdrawn for consumption upon the payment of the duties chargeable against it as type metal under existing law and the charges against the bonds canceled in a similar sum: Provided further, That all labor performed and services rendered pursuant to this section shall be under the supervision of an officer of the customs, to be appointed by the Secretary of the Treasury, and at the expense of the manufacturer: Provided further, That all regulations for the carrying out of this section shall be prescribed by the Secretary of the Treasury

The language stricken out is as follows:

> That the works of manufacturers engaged in smelting or refining, or both, of ores and crude metals, may upon the giving of satisfactory bonds be designated as bonded smelting warehouses. Ores or crude metals may be removed from the vessel or other vehicle in which imported, or from a bonded warehouse, into a bonded smelting warehouse without the payment of duties thereon and there smelted or refined, or both, together with other ores or crude metals of home or foreign production: Provided, That the several charges against such bonds may be canceled upon the exportation or delivery to a bonded manufacturing warehouse, established under section M of this section, of the actual amount of metal produced from the smelting or refining, or both, of such ores or crude metals: And provided further, That said metal may be withdrawn for domestic consumption or transferred to a bonded customs warehouse and withdrawn therefrom upon the payment of the duties chargeable against it in that condition: Provided further, That all labor performed and services rendered pursuant to this section shall be under the supervision of an officer of the customs, to be appointed by the Secretary of the Treasury, and at the expense of the manufacturer: Provided further, That all regulations for the carrying out of this section shall be prescribed by the Secretary of the Treasury.

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## Mineral Production of Great Britain in 1912

In our issue of May 17, 1913, the 1912 mineral production of Great Britain was reported as given in advance sheets, published by the British Home Office. The revised statistics have just been issued and are as follows, the figures including the production from mines under the Coal Mines Act and Metalliferous Mines Act, and also from quarries:

Arsenic, 2194 long tons; arsenical pyrites, 2450; barium compounds, 15,377; bauxite, 5790; chalk, 4,285,412; chert, flint, etc., 74,718; clays and shale, 12,808,950; coal, 260,416,338; copper ore and precipitate, 1933; diatomite, 62; fluorspar, 47,246; gold ore, 170; gravel and sand, 2,191,451; gypsum, 285,291; igneous rocks, 6,638,215; iron ore, 13,790,391; iron pyrites, 10,522; lead ore, 25,409; lignite, 62; limestone, 11,500,660; manganese ore, 4170; mica, 29,962; ochre, umber, etc., 13,947; oil shale, 3,184,826; rock salt, 218,055; salt from brine, 1,904,195; sandstone, 3,839,567; slate, 383,422; soapstone, 8; sulphate of strontia, 19,370; tin ore, dressed, 8166; uranium ore, 42; wolfram ore, 193; zinc ore, 17,704 tons.

## PERSONALS

J. Parke Channing returned from Arizona on Sept. 8.

Dr. L. D. Ricketts is expected in New York this month.

Dr. William B. Phillips, of Texas, is visiting in New York.

J. R. Finlay intends to leave for the West next week on professional business.

George E. Winkler is examining property in the Portland Canal district, British Columbia, for Victoria men.

C. H. Macnutt left London on Aug. 29, to take charge of the Burma Mines, Ltd., in the Northern Shan States of Burma.

Richard Trimble, of New York, treasurer of the Steel Corporation, was in Duluth this week. He was making a lake trip.

Robert E. Cranston has returned from Colombia and is now in San Francisco. He expects to go back to Colombia before long.

John Ross, a well known mining engineer of Sutter Creek, Calif., is at Galice, Ore., in Josephine County, making an examination of the Almeda property for parties who are financing the mine.

Robert Nye has resigned as superintendent of the Golden Gate mine, Grass Valley, and H. H. Estee has been appointed to the position. Mr. Nye will now devote his whole time to the superintendence of the Idaho Maryland.

Homer L. Carr, accompanied by R. C. Grant, sailed from New York on the SS. "Santa Marta," last week, for Colombia to drill the Mapuri tract of the Colombia Gold Mines Corporation on the Nechi River, a few miles below Zaragoza.

George A. Laird, who has lately been manager of the Candelaria Mining Co., in Chihuahua, has received the appointment of general superintendent of mines of the Great Cobar, Ltd., and leaves San Francisco for Australia, on Sept. 17.

Dr. R. Beck, rector of the Freiberg Bergakademie has been in America, attending the International Geological Congress. On Tuesday evening last, the Old Freibergers in America had a dinner party in his honor at the Engineers Club, New York. About 20 were present.,

Prof. H. M. Parks, director of the Oregon Bureau of Mines and Geology, accompanied by Prof. A. M. Swartley, a field worker in the Bureau, are in eastern Oregon, where they will identify and list the mineral resources of Baker, Grant and Wallowa counties for the Bureau.

A party of English capitalists, including Sir Augustus Fitzgeorge, a relative of King George V, and H. H. Van Custen, Richard Van Custen and Edward Van Custen, members of a syndicate which controls a group of Cobalt mines, have been making an investigation of the Cobalt camp.

Bancroft Gore has been appointed professor of metallurgy at the Montana State School of Mines, and will have charge of that department during the coming year. Mr. Gore was for many years a member of the engineering staff of the Washoe Reduction Works, and later was smeltery superintendent of the Gatico Copper Mining Co., in Chile, which position he held until his return to the United States last July.

## OBITUARY

Herman Hegeler, who was a member of the zinc smelting firm of Hegeler Bros., the other member being his brother Julius, died suddenly last week at Chicago, Ill., while on his way home from the Yellowstone Park. He was 41 years of age. He was born at Lasalle, Ill., the son of the late Edward C. Hegeler, famous as the father of the American zinc-smelting business in America, and together with his brother he was trained in the works of the Matthiessen & Hegeler Zinc Co. About six years ago the two brothers launched out for themselves and built a plant at Danville, Ill., which they have operated continuously ever since. Herman Hegeler was a man of sterling qualities and was a metallurgist of ability and achievement, but his absorption in his business prevented him from being the contributor to professional literature that he would have liked to be.

## SOCIETIES

**Second Coöperative Safety Congress**—The Second Coöperative Safety Congress, to be held under the auspices of the Association of Iron and Steel Electrical Engineers, will begin at the Hotel McAlpin, New York, on Sept. 22, and continue for three days thereafter.

**Mining and Metallurgical Society**—The New York Section will meet at the Chemists' Club, New York, on Tuesday, Sept. 16, at 8 p.m., the meeting being preceded by a dinner (informal) at 6.30 p.m. The meeting was first announced to be on Sept. 18, but the date has been changed.

**American Mine Safety Association**—The annual meeting of this association composed of leading coal and metal mine operators, mining engineers, mine-safety engineers, and mine surgeons will be held in Pittsburgh, Sept. 22-24. The association which held its first meeting a year ago has for its purpose a reduction of the number of accidents in the mines and quarries (3602 in the year 1911) and the alleviation of the more than 60,000 men who are injured each year. The program will include a mine-rescue and first-aid contest at Arsenal Park on Sept. 22; in the evening a reception to the members and motion-picture lecture on the mining industry. On the second day the opening session of the association will be held in the morning and a report of the executive committee will be made on the proposed constitution of the society. In the afternoon there will be an explosion in the experimental mine of the Bureau of Mines at Bruceton, Penn. On Sept. 24, the third day, there will be a business session at the hotel and an election of officers. In the afternoon members will visit the Experiment Station of the Bureau of Mines at Pittsburgh.

**Geological Convention, National Conservation Exposition**—A meeting of geologists, mining engineers and others interested in the development and conservation of the mineral resources of the country, will be held in Knoxville, Tenn., under the auspices of the National Conservation Exposition, Sept. 19, 1913. This meeting will occur in conjunction with the Miners' Field Day, which is to occur on Sept. 20. A partial list of the papers is: The State Geologist and Conservation, Dr. A. H. Purdue, State Geologist of Tennessee; Economic Non-Metallic Minerals of the Southern States, Dr. J. Hyde Pratt, State Geologist of North Carolina; Sane Development of the South's Mineral Resources, E. J. Watson, Commissioner of Agriculture, Commerce and Industries, South Carolina. On the day following (Sept. 20), will occur the Miners' Field Day. The exercises to be given on this occasion include demonstrations of explosions of coal dust and life-saving methods by the United State Bureau of Mines and contests between teams representing various coal mines in the Appalachian region, showing methods of life saving, etc. A large number of teams from all parts of the Appalachian field have entered for these contests for which valuable prizes have been contributed.

## NEW PATENTS

CONCENTRATOR. William P. Ogden, Denver, Colo. (U. S. No. 1,071,456; Aug. 26, 1913.)

DRILL—Hammer Drill. Andrew J. Carter, Victor, Colo (U. S. No. 1, 069,853; Aug. 12, 1913.)

SIZING—Hydraulic Sizing-screen. Frank E. Steffy, Great Falls, Mont. (U. S. No. 1,070,552; Aug. 19, 1913.)

HOISTING CABLE—Flat Hoisting Cable. Désiré Baudewyns, Montignies-sur-Sambre, Belgium. (U. S. No. 1,070,661; Aug. 19, 1913.)

CONCENTRATION—Method for Concentration of Ores. Orr Johnson Adams, Grand Junction, Colo. (U. S. No. 1,070,313; Aug. 12, 1913.)

TIN—Improved Cold Electrolytic Process for the Recovery of Tin from Waste Tinned Metal and Alloys. A. L. C. Nodon, Bordeaux, France. (Brit. No. 24,203 of 1912.)

DRILL CHUCK—Water-feed Drill Chuck. Russell S. Carter, Hewlett, N. Y., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,071,203, Aug. 26, 1913.)

ALLOY OF ALUMINUM, NICKEL AND MAGNESIUM. Arthur Lyell Brooke and Robert Dunbar Mackintosh, Mortlake, England. (U. S. No. 1,070,007; Aug. 12, 1913.)

BLAST FURNACES—Mechanical Feeding Apparatus for Shaft Blast Furnaces. Frederick Seaborne Sanderson, Melbourne, Victoria, Australia, assignor to The Mount Lyell Mining & Railway Co., Ltd., Melbourne, Australia. (U. S. No. 1,070,922; Aug. 19, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Sept. 4

**The California State Mining Bureau** fourteenth general report is in preparation. Five assistants are in the field gathering data. The general reports were discontinued with the issuance of the thirteenth in 1896. An effort was made to resume the publication in 1900; the data were obtained, but the report was not printed. These reports contain the names of all mines operating and idle, alphabetically arranged, in counties and a brief history or description of the life and operation of the property. Mr. Hamilton, state mineralogist, proposes an innovation. The result of the work of the field men will be issued in advance bulletins as each county is completed. These county bulletins will be of the same form as the general report; and when the work in all the counties is completed the several bulletins will be combined in the general report. While the large operating mines will not be ignored, the purpose of the report will be rather to assist prospective investors and prospectors than to exploit the accomplishments of the established mines. The field assistants are all men of technical education and training who have had experience in California fields. The chief purpose of the state mineralogist is at present to gather the data for the general report as expeditiously as possible. There are two other publications, however, to be issued as soon as the data can be prepared, that will not be controlled by or interfere with the field work. A compilation of the California mining laws is in preparation and will be issued as soon as completed. There has been a constant demand for such publication since the legislature adjourned. A number of new laws were enacted, some directly and other indirectly affecting the mining industry, and naturally the men interested in mining look to the State Mining Bureau for information respecting the laws governing or affecting the industry. There is also in preparation by the bureau a complete and comprehensive index to the determinations made by Edward B. Preston, the determinative chemist. There is an alphabetical index to these determinations, but it does not conform to the present-day practice of preserving records. The interior arrangement of the bureau has recently been improved. The library space has been enlarged. The offices of the state mineralogist, the secretary and the librarian have been enlarged and directly connected. The statistician and curator now have a combined office. The chemical laboratory has been rearranged and new equipment added. For the first time in several years the State Mining Bureau has an appropriation commensurate with its requirements.

### DENVER—Sept. 6

**Steps to Reopen Creede Mines** are being taken by united action of the several companies and it is not unlikely that the plan will be consummated.

**Pretty Good Business is Reported** by the Denver mining supply houses, but things are rather dull with most of the machinery manufacturers. The Denver Engineering Works Co. is doing some interesting things with the Richards jig. The new Plumb pneumatic jig is also attracting attention.

**Opinions Respecting Eagle and Platoro** are diverse. The geological conditions at Eagle do not appear to be favorable; yet the fact remains that considerable ore of high grade has already been shipped. The Mammoth mine, at Platoro, seems to have a fairly large tonnage of low-grade ore. Several hundred prospectors are at work in that district

**Leadville's Production** does not now include much of anything besides zinc ore. A large tonnage of that ore is, however, being shipped steadily, and producers are helped by the advance in the price for spelter. The zinc-ore miners are especially exercised by the new taxation requirements The value of the gross output when figured on spelter content at New York price and on ore prices are two very different things. There may be some litigation respecting the interpretation of the law in these cases.

**A Display of Gilpin County Ores** was made prior to the Knights Templar conclave, which brought, it is estimated, [illegible]0 visitors to Denver A fund was raised by Gilpin [illegible] Central City and Black Hawk, and a magnificent display of the gold-bearing ores was made in a building opposite the Brown Palace Hotel. What seemed to attract most attention however, was the display of the radium-bearing pitchblende from the German mine, and one or two other properties, near Leavenworth Gulch. This pitchblende is said to be the richest in radium. It is said that Eastern men have secured control of the pitchblende-producing mines in Gilpin County, the investment being made for the John Hopkins University, at Baltimore.

### BUTTE—Sept. 3

**The Butte, Wisdom & Pacific R.R.'s** chief engineer has a crew of 16 engineers in the field and has completed the preliminary survey of the line between Divide, the initial point, and Dewey's Flat, a distance of six miles. A maximum grade of 0.9% has been established. At the place where the road passes the Butte Power company's dam, about four miles above Divide, it will be necessary to cut three tunnels, but this will be the only work of the kind that will have to be done on the entire length of the line between Divide and Wisdom. The first construction will be from Divide to Elkhorn, a distance of 24 miles, and the management expects to begin grading operations this autumn.

**An Electric Railway Line** between Red Lodge and the Washoe and Bear Creek coal fields has been advocated by business men and property owners of Red Lodge for some time. A preliminary survey of the proposed route between Red Lodge and Washoe, a distance of 5½ miles, places the cost of grading, installation and equipment, at $50,000, and a mass meeting was held in Red Lodge, Aug. 26, during which local men subscribed $16,000 toward this amount. For the purpose of organizing a campaign to complete the stock subscription canvass, State Senator O'Shea, president of the Red Lodge Commercial Club, appointed a committee of five prominent business men. The object of the line will be to afford transportation facilities in order to open up rich agricultural land in the western half of Carbon County known as the Rosebud district, and with its completion the committee will turn its attention to the development of this land project, with the purpose of making Red Lodge the center of an interurban system.

### DULUTH—Sept. 6

**The Extension of the Cuyuna Deposits** is thought by some prominent Duluth mining men, among them members of the Locker-Donahue syndicate, which is prominent on the Cuyuna range, to exist in western St. Louis County, and they have tied up 4000 acres under options to purchase The land is in 50-19, 50-20 and 50-21, on the extreme western side of the county, and adjoining Aitkin County on the east. It is virgin territory, though some good ore has been located nine miles to the west, in Aitkin County. The new territory has the magnetic phenomena of the Cuyuna, and the general physical characteristics of the Mesabi range. Float ore of high grade is found in the glacial drift. Whether or not this is a new range, or an extension of the Cuyuna, is something that the Cuyuna-Extension Iron Co. will undertake to demonstrate One drill has been installed, at Prairie Lake, and other drills will be put in operation this month.

### CALUMET—Sept. 8

**President Moyer, of the Western Federation of Miners,** spent a few days, during the last week, in the strike zone. He visited Lansing with Clarence S. Darrow, formerly attorney for the Federation and had a conference with Governor Ferris in regard to settling the point at issue in the strike by arbitration, eliminating the question of recognition of the Western Federation of Miners. They called upon Mr. Ries, chief counsel for the Calumet & Hecla and subsidiary companies. Disturbances have been general throughout the district during the week. Several nonunion men were attacked by the union pickets, both men and women, and some of them were severely beaten. At the Kearsarge mine, a mob of strikers, numbering several hundred, attacked a party of deputies who were escorting some of the foremen to the property the morning of Aug. 30 A fight ensued in which several shots were fired and after the mêlée it was found that a 15-year-old Hungarian girl had been wounded, so that there was little hope of her recovery. At Centennial Heights, near the Calumet & Hecla property, the disturbances have been so frequent that troops are on duty constantly and the place is practically under martial law. Incidentally, this is the location from which the Federation secured several affidavits early in the strike, protesting that the troops were not necessary and that the community was peaceful. More men returned to work underground at the Calumet & Hecla and another shaft resumed operation during the week with a resulting increase in rock shipments to the mill. Nothing has been done toward attempting the opening of any of the mines north of Calumet. The Federation has given some of the members in destitute circumstances, orders for provisions, but no general distribution of strike benefits has been made.

A powerful searchlight has been erected on the Calumet & Hecla property to assist the guards in case any outbreaks are made in the night.

### JOPLIN—Sept. 6

**Suits Against J. M. Short** were filed last week in the circuit court for October trial. Short has developed a long list of profitable mining properties during the last three years. Edward Elliott sues him for $125,000, alleging that he had been a partner of Short and had assisted in prospecting the Sitting Bull lease. He demands a one-fourth interest. The other suit against Short and associates alleges that they failed to complete the organiztaion of the Black Hawk Mining Co. to take over a Thoms Station prospect according to a contract and damages to the extent of $30,000 are asked. Both suits will be tried in October.

**A Result of Better Ore Prices** is that the American Zinc, Lead & Smelting Co. has announced the starting up of two more of its Prosperity mills and the early erection of a plant in the north Webb City field. This new activity comes after a considerable period of idleness by some of this company's mills. The starting of these mines and mills places a large number of idle men at work again. Balancing these revivals of operations to a certain extent several of the district's large mills have been destroyed by fire during the last fortnight. The Athletic mill, one of the largest operating plants in the entire district, was burned to the ground while the Waneta, west of Joplin, was similarily destroyed. The recent dry weather is responsible for the facility with which fires may be started and the lack of fire protection makes destruction almost certain once a fire starts. There have been a large number of prairie fires in the last week, some of which narrowly missed setting fire to some plants northwest of Joplin. As no rain has fallen since May, all vegetation is dead and dry and passing trains set the grass and weeds afire almost daily.

### PLATTEVILLE, WIS.—Sept. 7

**Mining Is Progressing Steadily** with a fair production of zinc ore, and larger deposits are being shown up. Electrical power is rapidly taking the place of steam, and is supplied by two companies, the Interstate Light & Power, of Galena, Ill., and the Mineral Point Service Co., of Mineral Point, Wis.; three-phase current is commonly used. During the last season many new leases were acquired by the different mining companies of the district. Much drilling has been done in the last two years and in many cases with good results. As high as 216 churn-drill holes have been put down in one section. The Peaceful Valley Zinc Co. has two drills at work on the Peaceful Valley property near Elmo. Bock, Meyers & Brown Co., of Lancaster, are making arrangements for building a mill on their Bidick property near Livingston. Drifting from their recently sunk shaft shows a good grade of milling ore. This company will also start to unwater the Squirrel mine, near Mifflin as soon as repair work is completed on surface equipment. The Mineral Point Zinc Co., operating the large zinc smelting plant at Mineral Point, is operating two of the largest and oldest mines in the district, the Coker mine, near Livingston, and the Kennedy mine, near Hazel Green. The Coker mine has been operated almost continuously for 45 years and still looks as good as ever. This company owns the Sunrise lease adjoining the Coker mine. Here shaft sinking has been completed and the building of a 250-ton mill will be started soon. The company recently acquired the Black Jack mine, near Galena, Ill., where much water is being contended with and two 20-in. lift pumps, and two centrifugal pumps are being installed. Tailing is being milled at the Board of Trade mine, near Cuba City.

### WOODROW WILSON CREEK, ALASKA—Aug. 20

**The Placer Diggings** between Woodrow Wilson and Johnson Creeks tributary to the Shushanna River and known as Shushanna Camp, continue to promise to equal Dawson and Fairbanks. The gravel deposit is 15 miles long by seven wide, all workable ground and staked. Newcomers are staking the mountain top and the quicksand of the Shushanna river. Pay has been found in six creeks and colors have been found on the surface in benches. The shallow diggings are very rich. William E. James, the discoverer, has taken out $27,000 from his claim at the mouth of the Little Eldorado, but lack of water prevents regular work. The smallest cleanup on this claim with five men shoveling two days was $1450. The largest was $3100 in one and one-half days. Carl Whitham, is digging a channel for water alongside the pay streak on Claim Two, and is getting $50 per day from the gravel with one man shoveling. Five men shoveling on Andy Taylors fraction on Bonanza are taking out $100 per day per man; some of the nuggets are worth as much as $40. Sluicing of the surface gravel on the Big Eldorado is yielding pay. Work on the shallow claims is being held up owing to lack of lumber. Five hundred men are here with supplies to last until winter traffic opens. Over 2000 have been at the diggings and of these fully 1500 have been forced to leave owing to lack of food. The men who are here for the winter are building cabins in the timber on Woodrow Wilson Creek. Many have hurried their recording work on claims in order to get out before winter. Claims staked by men who could not stay to do the work lapse in 90 days. Late comers make lists of all claims and watch a chance to stake. Stampeders who came overland from Dawson and Fairbanks were 20 days on the trail. Many lost their packs in the rivers. It is rough from McCarthy over the Scolai Pass and the Russel glacier trail has proved much the best. This trail will soon be closed. A new trail is being surveyed from McCarthy up the Nazina River to the glacier and over the Shushanna glacier. This trail will be ready within two weeks. The new route is only eight miles long and will be used in winter. Wagons may be used to the foot of Nazina glacier and horses and sleds from there over the ice to within 15 miles of the camp. The government is being severely criticized for doing no work on the trails, and for negligence in not advising the many hundreds going to the diggings as to the best routes. No attempt has been made to police the region although many weeks have elapsed since the discovery and it is generally known that many "cheechacos" have gone in with insufficient supplies, and that the hardships that must surely follow will result in much suffering and probably in some loss of life. Commissioner H. E. Morgan of the White River district, is unable to handle the rush of recording work. Deputy Healy filled up the record book and then quit his job. Morgan is now keeping the records in bundles and has asked to be relieved. He wants to work his claim which from slight prospecting appears to be very rich. Mining operators with money to buy ground are arriving from all directions. Many choice claims have been secured by Fletcher Hamshaw, for eastern men. Hamshaw's outfit, with 14 men, was at the North Fork island on the White River, 28 miles away, when the strike was made. They were prospecting copper property. The party staked about 40 claims, all of which were recorded and later transferred to Hamshaw. The James claims, 15 in number, are owned in partnership by James and his wife and N. P. Nelson, who were with him when the discovery was made, and William E. Johnson, a Dawson man who grubstaked the outfit. Johnson has just arrived with a pack train of supplies. Owing to the scarcity of supplies little prospecting has been done far from the immediate place of the discovery. Many miners came in with just enough provisions to last them to the Shushanna, for a stay of a few days and for the return trip. Many of these have gone out for more supplies and when they return for the winter it is expected that the full area covered by the rich placer will be known. It is believed from hasty work that the area will extend into the Canadian territory.

### AGUJITA, COAHUILA—Aug. 25

**Destruction of the Lampacitos Coal Plant** of the Cia Carbonifera Agujita y Anexas, S. A., was effected Aug. 16, by the defeated Carranza forces in retreating northward from Hermanos, where they were badly defeated by the Federals. The destruction was premeditated, and as soon as word from Hermanos came that the fight there had been lost, the destruction commenced. The Carranza soldiers used dynamite and gasoline, and within two hours they had created a loss of fully $1,000,000. The washer was completely destroyed, as was the warehouse with $40,000 worth of supplies. In the power plant the 200-, 150-, 100- and 30-kw. generating units were first blown to pieces with dynamite, and then the building was burned. At the mines the tipples were burned, and the fans and fan houses, which were fireproof, were destroyed with dynamite, and the houses burned. A large number of employees' houses and miners' houses were also burned. The home of the manager was also destroyed with all conents. The mines are filled with water, which is also a great loss. The plant at Agujita has been threatened with similar disaster unless $50,000 is paid for "protection." This cannot be done. The rebels have already taken from there all supplies, furniture, etc., and it is feared that the property may be destroyed at any moment.

# THE MINING NEWS

## ALASKA

ALASKA UNITED (Douglas)—In the Ready Bullion mill 18,2[illegible] ore were crushed in July from which gold and co[illegible] worth $43,942 were recovered, or $2.41 per ton; $1[illegible] being estimated as net profit. In the 700 Ft. Claim [illegible] tons of ore yielded $2.60 per ton or a total of $[illegible] $19,271 being estimated as net profit.

## ARIZONA

### Gila County

OLD DOMINION (Globe)—Steel erection work on the new crusher plant, sampling mill and conveyors is rapidly nearing completion. Crushing machinery and transmission equipment is now being installed in the buildings. While the change from cage to skip hoisting is being made at the "A" shaft ore will be hoisted at the Kingdon shaft and sent around by rail to the old crushing plant. Additional custom ore-bins were built at the "A" shaft in August, almost trebling the capacity for custom ores. As soon as the steel workers have completed the crushing plant and sampling mill, erection work on the concentrator will be commenced. In August one of the three Chile mills and several tables and vanners were removed from the old concentrator to make room for new foundations. This has decreased the capacity of the old unit somewhat. The concrete work which remains to be done in connection with the new concentrator consists of completing the tailing and concentrate tunnels, the concentrate bins and slime tanks and part of the Hardinge mill foundations. A 100,000-cu.ft. fan has been installed at the "B" shaft for ventilating the west end of the mine, and the ventilation underground is already greatly improved. The sinking of the Grey shaft to the 1200 level of the Old Dominion continues to make good progress and should be completed early in October. Four furnaces are in operation at the smelting works

### Greenlee County

ARIZONA COPPER CO. (Clifton)—The new smelting works two miles south of Clifton was scheduled to be blown in Aug. 27. A notable feature of the new plant is the extensive application of electrically operated labor saving devices

### Maricopa County

VULTURE (Wickenburg)—Two motor trucks are hauling concentrates to Wickenburg. Several carloads of concentrates are shipped each month.

### Pima County

CALUMET & ARIZONA (Warren)—This company is reported to be making the final payments on the New Cornelia mine in the Ajo mountains. Four of the reverberatories at the new smelting works at Douglas were fired up Sept. 2. The starting of this plant will enable this and the Shattuck Arizona to increase production.

### Santa Cruz County

R. R. R. (Patagonia)—About 25 men are now being employed at this mine, not 8 men, as stated in these columns in the issue of Aug. 23. Within the last 18 months, as many as 150 men have been employed at one time and within that time more than $400,000 worth of high-grade copper ore has been mined and shipped. There are now in the mine more than 50,000 tons of low-grade ore that will assay between 3% and 4% copper. Nearly all the high-grade ore that was in sight has been mined, it extended from the 50- to the 400-ft. level. A payment is due Nov. 1. N. L. Amster is the buyer. The owners are R. R. Richardson, and A. E. Crepin, they have received more than $100,000 in royalties in payment so far.

### Yavapai County

UNITED VERDE (Jerome)—The new, steel, change house is nearly ready for use. The site is at the mouth of the 50-ft. adit which is soon to become the main entrance for all workmen.

BLUE RIDGE (Wickenburg)—The 40-ton concentrator and leaching plant on the Hassayampa River near Constellation has been put in commission. The company owns a process which is expected to treat the carbonate ores successfully.

ARKANSAS & ARIZONA (Jerome)—A new hoist is being installed at the main shaft. Drifting is in progress on the 1300- and 1400-ft. levels and a raise is being made from the 1400-ft. level to the shaft. When this is completed the shaft will be sunk to a depth of 1800 feet.

Y-P (Senator)—The first carload of ore was recently shipped to the El Paso smelters. The ore came from the 600-ft. level of the old Cash mine. This level is reached through a long drift from the Senator tunnel. The mill is running night and day treating the ores on the old dumps. The old workings have been unwatered to the 200-ft. level and as soon as the 300-ft. level is reached work will be resumed [illegible]

WAKOTA DEVELOPMENT CO. (Congress)—This company is a reorganization of the Coronado Gold Mining Co. A [illegible] mill is being built on the Grasshopper property [illegible] has in sight, according to statements of the manager, [illegible] worth of ore exposed by very little development. The ore assays $100 per ton and better. Work is also being continued on the old Coronado property. A diversion ditch from Sand Creek to the reservoir to supply the Grasshopper and Coronado properties and the company's ranch, has just been completed.

## CALIFORNIA

### Amador County

DEFENDER (Defender)—The mine is idle temporarily for lack of water for milling.

BUNKER HILL—(Amador City)—Dividend No. 86, of 2½c. per share, was declared Aug. 15. Cutting a station at the 2150-ft. level in the main shaft is in progress. Deepening the shaft to 2350 ft. will be resumed upon the return of the electric motor, which is being repaired.

KENNEDY EXTENSION GOLD MINING CO. (Jackson)—John A. Gibson, mine foreman, brought suit for $30,000 for personal injuries received Feb. 3, 1913, while riding a skip in the 1000-ft. shaft. The hoisting engine was suddenly started at high speed, the skip jumped the rails and Gibson jumped from the skip to avoid being crushed. He was caught between the skip and the timbers. His face was badly mutilated. The case is on trial.

### Calaveras County

CARPENTER (Mokelumne Hill)—The mill is completed, the electric hoist is installed and the pumping plant for furnishing water is ready for operation. The several drifts are reported to be in pay gravel.

INGOMAR (Campo Seco)—Development has been resumed, and it is reported that copper-bearing ore has been disclosed. The mine was opened as a gold mine, and should produce both gold and copper in commercial quantity. It is in the region of the Penn copper mine and in the same formation that is found in the West belt of the Mother Lode.

STANDARD AMALGAMATED EXPLORATION CO. (Esmeralda)—The wiring for the electric-light plant at the Economic mine is completed. This plant will furnish lights for the 20-stamp mill, the assay office and other buildings. The power line is nearing completion. It is reported that enough ore has been blocked out to supply the mill for more than one year.

CALAVERAS COPPER CO. (Copperopolis)—G. D. Fontana and Newton Rutherford, representing the company, have returned from Boston, where they went to confer with the Ames people, who control the title to the copper property, for the protection of California creditors. They report satisfactory results. Besides the claims of these creditors there was a sum due the miners, which has since been paid. The mine is shipping ore sufficient to pay current expenses, and the entire indebtedness of $30,000, it is now understood, will be settled without further disturbance of the operation of the property. Improvements and repairs to the smelting plant have been made within the last year, including a plant for desulphurizing the ore.

### Inyo County

IN THE PANAMINT DISTRICT options have been secured by San Diego men on some of the old mines. It is reported that development will be carried on through a new tunnel.

SKIDOO MINES CO. (Skidoo)—It was expected that the new 10-stamp mill which is to take the place of the 15-stamp mill destroyed some time ago by fire, would be completed and that the stamps would be dropping by Aug. 15, but delay in the delivery of material prevented. Much of the old material is being used, but a great deal of new material is necessary to improve the mill and make it modern.

SALINE VALLEY SALT CO. (Bishop)—Two carloads of salt were shipped from the plant at Swansea to Laws, July 27. Smaller lots have been shipped, but this was the first carload shipment. The tramway is reported as working satisfactorily. The full complement of buckets is in operation, but carrying only half loads. The two-story warehouse, 30x80 ft., at Swansea, has been finished. The grinding machinery with a daily capacity of 100 tons is on the ground and will be installed immediately.

### Nevada County

GOLDEN CENTER (Grass Valley)—The recent discovery of gold in an excavation begun under a garage for the setting of a gasoline tank has induced the owner of the garage to deepen the excavation and sink a shaft to a depth of 100 ft. The mineral rights below a depth of 100 ft. are owned by the Golden Center company, but A. B. Snyder, owner of the garage, believes he can profitably mine the first 100 ft. of depth.

### Placer County

WICKHAM (Rawhide)—Curtice Bros., of Stockton, will develop this mine with a small mill that is on the ground.

BELLEVUE-BULLION (Ophir)—A stamp mill will be built for crushing ores from this mine, and from the Grass Ravine group. The ore is now being treated at the Big Bonsar mill. The water in the shaft of the Grass Ravine is being pumped preparatory to retimbering and deepening the shaft.

### Shasta County

MIDAS (Harrison Gulch)—The 100-ton cyanide plant is being built. The equipment will include a tube mill and Merrill filter press.

NOBLE ELECTRIC STEEL CO. (Heroult)—The smelting plant was temporarily closed down in July while awaiting the shipment of electrodes from the East. Tests have been recently made to determine the economic value of coke as compared with charcoal.

## COLORADO

### Clear Creek County

LUCANIA—The properties on Fall River will be sold under foreclosure Sept. 16, 1913, to satisfy judgments amounting to $50,000.

SMUGGLER (Silver Plume)—This property, owned and operated by the Hollingsworth Mining Co., will be more thoroughly developed in depth. The company plans to sink the shaft an additional 200 ft. and drive east and west on the vein.

NORTH AMERICAN SMELTER & MINES CO. (Jefferson)—This company is to be reorganized. The property in Clear Creek and Gilpin Counties was recently bid in at sheriff's sale for $215,000, and includes the copper-smelting plant on Clear Creek below Golden. The new organization proposes the erection of a 300-ton concentration and cyanide mill, near Golden, designed to treat $4 ore. If the mines of the company and outside properties can assure an ore supply equivalent to 300 tons per day, the new organization is prepared to raise $500,000 for the construction of the proposed mill, the remodeling of the smelter and the purchase of custom ores.

HOOSAC TUNNEL & MINING CO. (Idaho Springs)—To satisfy a judgment obtained in the district court at Denver in favor of George E. Armstrong, trustee for the mortgagees and noteholders, in the sum of $78,810 all of the property of this company has been sold by Sheriff A. E. Straub for $40,000. The purchaser was Samuel T. Worley, representative of the trustee. The property is two miles above Idaho Springs, near the mouth of Fall River. The 100-ton mill, that was completed less than four months ago, will at once be put into commision. Development first will be centered on a 15-ft. vein intersected 2500 ft. from the portal of the crosscut tunnel.

### San Juan Region

GOLD HAS BEEN DISCOVERED IN LIME CREEK, recently, by a Mexican sheep herder, and his employer, A. M. Hubbard has brought in a sack of some of the richest ore seen in this region for many years. The strike was made 10 miles southwest of Silverton.

BUTTERFLY-TERRIBLE (Ames)—This property is being successfully developed and operated by lessees, who are employing a large force of men. The 30-stamp mill is in steady operation. An air-compressor plant has recently been purchased and is being installed.

LITCHFIELD—A small force of men is employed on development at this Mount Wilson property. The first-level drift has been advanced 140 ft., and the second level 275 ft. on the vein. The ore is reported to assay $35 per ton in gold, silver and lead. The mine is six miles from Snow Spur, the nearest shipping point on the Rio Grande Southern R.R. Excavations are being made at the mine for new buildings, which the management plans to erect this season.

JUNTA (Telluride)—About 45 men are employed in building the milling plant in Bear Creek Gulch, and the work is progressing rapidly. The erection of the mill building is under way and some of the machinery is being installed. The tank houses are completed. A small force of men is employed at the Jim Crow mine on Ballard Mountain, and the Wasatch mine in La Junta Basin, placing these properties in readiness for active operation by the time the mill is completed.

## IDAHO

### Cœur d'Alene District

GUELPH—Developments have exposed some good carbonate ore in a heretofore undeveloped vein.

EMPIRE (Mackay)—The crosscut from the face of the 1200-ft. tunnel at this property on Big Creek has encountered some good milling lead ore at a depth 1000 ft.

TERRIBLE EDITH (Murray)—The first shipment consisting of 100 tons of lead and 50 tons of zinc ore has just been made. It is thought that shipments can be made monthly in the future.

BRETT (Prichard)—A strike of rich copper ore was made recently at this property 20 miles from Prichard. The ore was encountered in the 100-ft. tunnel at a depth of 200 ft. Little development on the ore has been done but enough to insure a shipment of several carloads of ore. The ore is said to average about $145 per ton.

CEDAR CREEK (Murray)—The work preparatory to driving the new 4500-ft. tunnel from the creek level is nearing completion. The new compressor is being installed and the flume for water to supply power has been finished. New buildings have been built and the timber for the tunnel is on hand. The upper workings were destroyed by a snowslide last winter but the present location will prevent a repetition of such a disaster.

NATIONAL COPPER MINING CO. (Wallace)—The 500-ton mill now being built by contract by the General Engineering Co. of Salt Lake City, will be so constructed that it can readily be enlarged to a daily capacity of 1500 tons. The ore will be transported from mine to mill by an electric trolley, the distance being two miles on a 4% grade. Machine shop, compressor building, blacksmith shop, boarding and bunk houses and two water-driven electric plants are also being built. The treatment of the ore will consist of a combination of gravity and flotation systems.

MARSH MINING CO. (Burke)—This company has purchased control of the Poorman Extension Mining Co., one of the pioneer corporations of the Cœur d'Alenes, its charter having been issued in 1886. The holdings purchased consist of the Green Mountain, Fuller, Burke, Clark Fraction and Fir Fraction, all of which adjoin the original Marsh group on the north and the Poorman property on the east. The five claims include approximately 45 acres which, together with the Got-Em-Now claim, recently purchased from Patrick Clark of Spokane, gives the Marsh company control of 130 acres, patented, including a part of the town of Burke, lying on both sides of Cañon Creek. The portal of the Marsh main working tunnel is on the Green Mountain claim, an easement for the bore having been secured several years ago, and the purchase of the Poorman Extension ground gives the Marsh surface rights much needed in operation.

## MINNESOTA

### Cuyuna Range

DULUTH-BRAINERD MINING CO. (Iron Mountain)—The surface plant has been completed, and shaft sinking is progressing at a fair speed.

PENNINGTON MINING CO. (Crosby)—This operation, at present the only open pit on the Cuyuna, is averaging about 60 cars of ore per day. Only one shovel is now working in ore. Recently, in 10 hr., one shovel loaded 240 20-yd. dump cars, exceeding all previous records either on the Cuyuna or Mesabi ranges.

CUYUNA-DULUTH IRON CO. (Ironton)—At the recent annual stockholders' meeting at Duluth, a shaft was authorized for the Federal property adjoining the town of Cuyuna. Work will be started within 60 days. The Northern Pacific Ry. will secure the traffic. The company now has a shaft in the village of Ironton.

PITTSBURGH STEEL ORE CO. (Riverton)—The company is about to install one or more steam shovels at its open pit, to carry forward the stripping operations during the winter months, when the hydraulicking will be handicapped by low temperatures. The company has also purchased locomotives. No shipments will be made this season.

### Mesabi Range

NEW DANGER SIGNALS are to be adopted in the iron mines of Minnesota and Michigan. The district engineer for the Bureau of Mines, for the Lake Superior district, announces that the Government is about to adopt a new code of danger signals in which word signs are to be discarded because of illiteracy and different nationalities among the miners, heretofore necessitating printing the signs in several languages. Under the new system, green arrows will point to safety and black arrows will indicate danger. The background of the signs will be white, and the arrows will be painted over a red oval in the center.

GREAT NORTHERN RY. (Superior, Wis.)—It has been announced that the old ore dock No. 3 at Allouez Bay will be replaced next season with a modern steel structure. The present dock is of wooden construction. It is planned to have the new dock somewhat higher, to permit of greater drop into the vessel, thereby lessening the time required for loading.

## MISSOURI

### Joplin District

LACKAWANA (Galena, Kan.)—The concentrator is being repaired preparatory to handling a large quantity of ore. A large body of ore was encountered when blasting to remove a rock ledge that interfered with operations.

CHERRY TREE (Bellville)—This mine, worked several years ago but abandoned, has been cleaned out by a Joplin company. It is believed that the former operators failed to thoroughly develop an orebody which they worked. Some zinc ore has been taken out.

THANSKSGIVING (Duenweg)—This mine was closed down recently on account of difficulty in holding the water. Other properties in the vicinity having closed some time ago, the Thanksgiving faced trouble in keeping the mine drained and it was decided to cease operations until the others resume work. The Thanksgiving has been one of the big producers.

BANKERS LAND (Joplin)—A company, composed of Charles Wells, Franklin Smith and Charles Robinson, has made a rich strike with a drill, first discovering ore and continuing through mineral-bearing dirt to a depth of 102 ft. Other drill holes are to be put down. The lease, consisting of 28 acres, is a short distance from the Dexter mine, where a concentrator is being erected.

AMERICAN DAVEY (Carterville)—Mill No. 4 resumed operations recently after a long shut down, due to the decrease in zinc ore prices. The company will also start No. 2 mill. The mines are in the sheet-ground district, where low prices are more seriously felt than in any portion of the district. Three hundred men will be employed when the two mills have been placed in operation.

BIG IRISH (Thoms Station)—Frank Danglade and associates are operating this mine on a 20-acre lease of the Rusk land, having been successful in developing a zinc ore vein at the 140-ft. level. A 15-ft. face of ore is found there, while a 16-ft. face is said to have been found at a lower level. A new shaft has been sunk southeast of the mill shaft and ore from it will be conveyed to the mill by tramway, operations at the two shafts being expected to supply sufficient ore to keep the mill operating constantly.

### St. Francois County

DWIGHT A. JONES AND ROBERT HOLMES state that all controversies between Holmes and the administrations of the St. Joseph Lead Co., and the Doe Run Lead Co., have been pleasantly and satisfactorily settled and all suits brought by Holmes have been dismissed.

POTOSI MINES CO.—Some of the stockholders have asked for an investigation of the affairs of the company, alleging that the directors, at a meeting held July 2, 1912, voted to convey all of the property of the Potosi Mines Co. and the Potosi Lead, Baryta & Mercantile Co. to the St. Francois Lead Co. for $50,000 in cash and 17,500 shares of its capital stock. The property thus conveyed, the plaintiffs claim, had an actual value of $750,000, and as a result of a syndicate agreement the plaintiffs allege that the defendants made large secret profits. The plaintiffs ask that the conveyance be declared fraudulent and without adequate consideration; that the defendants be required to convey back all the property to the Potosi Mines Co., and to refund all profits and property obtained by them in consequence of the alleged conspiracy; that a receiver be appointed to take possession of 15,130 shares of the St. Francois Lead Co., now held in trust by Charles I. Norris, and Denman Blanchard; and that Norris and Blanchard be enjoined from disposing of, transferring or encumbering the stock. The plaintiffs say that the Potosi Lead, Baryta & Mercantile Co. developed zinc mines estimated to be worth between $2,000,000 and $3,000,000 and that the principal asset of the Potosi Mines Co. is stock in the Potosi Lead, Baryta & Mercantile Co.

## MONTANA

### Butte District

OPHIR (Butte)—A few months ago, the mine and mill were closed down because of lack of capital to continue operations. The men still remain unpaid. A number of these recently held a meeting with the purpose of formulating plans for protecting their interests, and securing the wages due them. It was decided before taking any definite steps to await news from the East regarding proceedings being brought to put the company into bankruptcy. The claimants have expressed a determination to employ an attorney to collect the amounts due.

EAST BUTTE (Butte)—The management has announced its intention of reopening No. 1 shaft, which was closed about six years ago prior to the acquisition by the company of the Pittsmont properties, one-half mile east. A new electric hoist will be installed. The company plans to have the improvements to the reduction plant completed by the end of the year. This work to consist of rebuilding the concentrator, and doubling the blast-furnace capacity, which will make possible the treatment of about 600 tons of ore daily in addition to the present amount. Trouble with the miner's union has been settled by the company agreeing to discharge non-union carpenters.

TUOLUMNE (Butte)—A statement of operations from Jan. 1 to July 31, 1913, has been issued, showing that operations have been conducted at a loss. A total of 22,395 tons of ore were mined and treated, yielding 1,310,569 lb. of copper, 46,857 oz. of silver, and 91 oz. of gold, with a total valuation of $133,819, after deducting freight and smelting charges. There was a balance carried over from Dec. 31, 1912, of $202,762, which, added to receipts from ore mined, interest on deposit, etc., totaled $338,498. The disbursements, including $160,000, the amount of dividends, Nos. 4 and 5, together with mining, development, and running expenses, amounted to $301,917. A balance of $36,581 is shown on the books, of which $34,509 is cash and $2072.40 accounts receivable. The company is at present shipping 100 tons of ore daily, and is just about paying expenses. Development work on the 1800-, 2000- and 2200-ft. level has shown up practically no ore of a shipping grade, and the company is planning to sink the shaft to greater depth, possibly to the 2800-ft. level.

### Lewis & Clark County

A STRIKE OF HIGH-GRADE GOLD AND SILVER ORE has been made in the Marysville district by a prospector named William Smigaj. The claim where the strike was made lies between the Gloster and Empire mines, and the vein is between 2 and 4 ft. wide.

### Silver Bow County

RELIANCE—A fine vein of lead, silver and copper ore has been opened at a depth of 95 ft. in a shaft being sunk on the vein in these claims in the Moose Creek district, 17 miles due south of Butte. The property is being operated by D. M. Adams, who located the claims several years ago.

## NEVADA

### Churchill County

NEVADA HILLS MINING CO. (Fairview)—The company has paid off all its indebtedness.

NEW YORK ORE MINING CO. (Wonder)—This company, which controls the Goldfield Oro Mining Co., recently purchased four properties in the Wonder district, the Vulture, Bald Eagle, Golconda and Dickey V.

### Clark County

YELLOW PINE MINING CO. (Goodsprings)—The company is now shipping daily 60 tons of zinc concentrate and 15 tons of lead concentrate, the mill having resumed operations after a shutdown of 90 days. Owing to the low price of spelter, no shipments were made during the summer, but a force of men was kept at work on development in the mine. The new oreshoot on the second level was followed to the third level, and a considerable tonnage blocked out. On the sixth level a large shoot of zinc-lead carbonates was recently encountered. The oreshoot is 40 ft. in width and bids fair to develop into the largest single shoot yet discovered in the mine. During the summer, the mill was thoroughly overhauled, and several changes were made with a view to increase capacity, the storage bin has been enlarged and new concentrating tables added. The company will also install a 100-hp. gas engine in the mill to replace the steam plant now in use, and is contemplating the installation of a filter plant to treat slime. The company has maintained its regular dividend of 2c. per share, paid monthly.

### Humboldt County

CODD LEASE (Rochester)—Regular shipments of 70 tons per day are being made.

### Lincoln County

CONSOLIDATED NEVADA-UTAH (Pioche)—The Pioche and other mining properties formerly owned by the old Nevada-Utah Mines & Smelter Corporation, have been reorganized. About 50% of the old company's shares, totaling 1,500,000, paid the 50c. assessment, thereby making available for carrying out reorganization approximately $350,000. The new management has pledged itself to carry forward an extensive program of development work and has retained as consulting engineer Allen H. Rogers, who some months ago, made an examination of the property. A period of fully eight months will elapse before the program mapped out for the development work will be completed.

### Lyon County

BURLINGTON-NEVADA (Mason Pass)—Shipments have been delayed recently on account of the destruction of the roads by heavy rains.

[illegible]EMAN PROPERTY (Mason Pass)—The 40-ft. shaft has [illegible] ore, and a tunnel, now 150 ft. in, is being driven to [illegible] oreshoot at depth.

[illegible]S GYPSUM MILL (Mound House)—This plant will [illegible] enlarged. The mill is running three shifts per day [illegible] capacity, and five cars of plaster, as well as considerable crude gypsum are being shipped daily.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Aug. 28, 1913, were as follows: From Mason Valley mine, 2012 tons; from Nevada-Douglas, 948 tons; from other mines, 1151 tons; total, 4111, or a daily average of 587 tons. During the same week five cars of matte were shipped. Power troubles Aug. 24 resulted in the first freeze-up in the history of the smelting plant.

NEVADA-DOUGLAS (Ludwig)—Development in the Copper Castings section is giving satisfactory results. On No. 1 level, several hundred feet of development has been done, and the oreshoot has been proved 30 ft. wide. On the 350-ft. level a crosscut has been driven from the shaft to the vein, and drifting on the vein is now in progress. On the eighth level, south of the main shaft, a shoot of chalcopyrite ore has been cut. From the main drift on this level a cross cut will be driven under the big oreshoot in the 703 stope above. On Douglas Hill the Pearse drift is now in a shattered country showing some copper, while on the 50-ft. level a crosscut to the north has cut 25 ft. of 8% copper ore. The new leaching plant will be erected near the town of Hudson, on the Copper Belt R.R. The mill site has been surveyed and plans for the building are being drawn. It is planned to build a plant of 500 tons capacity, and it is expected that all the units will be in operation early in 1914.

### Mineral County

AURORA CONSOLIDATED (Aurora)—Five auto trucks and 300 horses are hauling material from Hudson for the new mill, on which 100 men are working. Grading has been completed, but it will be a month before all the concrete foundations are finished. Some of the retaining walls are in and the concrete for the main ore-bins is now being poured. The machinery is now ready for shipment; some of it is already at the mill site, and all the lumber has arrived.

## NEW MEXICO

### Socorro County

MAUD (Mogollon)—The new shaft has reached a depth of a little over 500 ft. Good ore is being mined and sent to one of the custom mills.

OAKS (Mogollon)—Development work in East End tunnel group is producing some fine ore, which is being milled in one of the local plants. Another lease is about to be let.

ERNESTINE (Mogollon)—The main shaft has reached a depth of 150 ft. below the old workings. Levels are being opened at regular intervals to intersect the ore encountered in the upper zones.

## OREGON

### Josephine County

THREE LODES (Galice)—Arrangements have been made for clearing and grading ground for the installation of crushers and pulverizers, jig concentrators and other machinery.

### Baker County

DRILLING ON THE MILWAUKEE CLAIMS on Granite Creek is continued in an effort to determine their value as dredging ground.

JAMES B. SIPE MINING CO. (Sumpter)—A public sale of the holdings of this company was held Aug. 25, and the property was bid in by James B. Sipe, of Pittsburgh, Penn., who, with his associates, have spent over $100,000 in development work. The sale was made to obtain the balance of the unpaid purchase price due on claims held by the company, amounting approximately to $40,000, and also for the purpose of readjusting the affairs of the company and reorganizing in a way to carry on the development and operation of the property.

### Josephine County

GRANTS PASS & CRESCENT CITY R.R. is to be built by the Interstate Construction Co., contracts having been signed by the officials of this company and the city of Grants Pass. In view of the fact that the railroad will tap valuable mining ground as yet undeveloped a number of mining men are in the county looking over the situation.

ALMEDA CONSOLIDATED MINING CO. (Galice)—Judge Calkins, on application of the attorney-general, on action brought by Corporation Commissioner Watson, has appointed Thomas S. Burley, of Tacoma, Wash., receiver for this company. The receiver is a practical mining man. All claims will be met and the smelting plant will be put in running condition and matte will be shipped. Mr. Burley and associates will put up the necessary money to start smelting.

## SOUTH DAKOTA

### Lawrence County

TROJAN (Trojan)—A Lea recorder has been installed at this mill. Construction work on the additions to house tube mill, solution storage tanks, thickeners and agitators, is proceeding rapidly.

BISMARCK (Flatiron)—A Bury two-stage compressor, with air cylinders 14x7½x10 in., belt driven from a 50-hp. motor, has just been installed; additional drills will be used in the mine. The ore is broken in a big opencut, dropped through chutes and trammed to the mill. Some expensive stripping is necessary at present. The operations in July showed a good profit.

WASP NO. 2 (Lead)—A small steam engine has been put in operation to draw the cars of waste which are loaded by the steam shovel in the course of stripping. A system of belt conveyors has just been completed for removing the tailing from the leaching tanks to the dump. On account of scarcity of water and danger of polluting a stream, it is out of the question to sluice these tanks. Six conveyors, each 70 ft. in length, run under the discharge gates in the bottom of the tanks. These conveyors dump onto a belt 90 ft. long, running at right angles to those first mentioned, and this belt discharges on to a 150-ft. belt which delivers the tailing to the dump. Some difficulty has been experienced on account of moisture causing the tailing to stick to the belts, but it is hoped to overcome this by installing revolving brushes. With the belts the time of discharging a tank of 420 tons has been cut from 8 to 3½ hours.

### Pennington County

BLACK HILLS TUNGSTEN CO. (Hill City)—This company is employing a crew of men in both mining and mill construction work. The property is to be equipped with a small concentrating plant.

FIRST NATIONAL GOLD MINING COMPANY (Hill City)—This company has been organized by Detroit men to take over the Forest City property. The property consists of 20 acres, on which a shaft 110 ft. deep and lateral workings disclose a shoot of high-grade, free-milling ore. A contract has been let to sink the shaft an additional 200 ft., and work was to have been started the first week in September. A 10-stamp mill was erected last autumn, which is described as a nice plant of its kind. It is equipped with Pierce amalgamators and Wilfley tables. It is probable that a cyanide annex will be added.

## TENNESSEE

### Knox County

AMERICAN ZINC, LEAD & SMELTING CO. (Mascot)—The mine and mill are reported to be doing finely. A little high-grade spelter has been made from this ore at Hillsboro, Ill., but the output has not yet become regular.

## TEXAS

### Cass and Marion Counties

EAST TEXAS BROWN ORE DEVELOPMENT CO (Jefferson)—This company, operating iron-ore deposits in the extreme northeastern part of the state, and which recently shipped 3000 tons of ore from Port Bolivar to Philadelphia, has a contract to ship 150,000 tons to that city and an option to ship 500,000 tons if the ore already contracted for proves satisfctory. Shipping facilities limit production to 7000 tons per month. The methods of mining and handling the ore are said to be crude, compared to uptodate practices in the older iron fields.

## UTAH

### Summit County

MINES OPERATING CO. (Park City)—Complaints regarding chlorine fumes are being investigated, with a view to remedying conditions if this is necessary.

THOMPSON-QUINCY (Park City)—Assays running well in silver have been obtained from the east drift of the raise driven from the 900-ft. level of the Daly-West.

AMERICAN FLAG (Park City)—The vein between the 1000- and 900-ft. levels has opened to 3 ft. and 7 in. in places, and carries high-grade silver-lead ore with gold and some copper. Shipments for the week ended Aug. 9 amounted to 73 tons. The ore runs $60 and more per ton.

SILVER KING CONSOLIDATED (Park City)—The three-compartment shaft being sunk under contract by McIlwee & Co. was sunk 75 ft. in 18 days, ended Aug. 4. The best progress previous to this was 100 ft. in 31 days. When the 1700 level is reached sinking will be suspended, and a station cut. The shaft will be carried down another 100 ft. to the 1800-ft. level, which will complete the contract.

DALY-JUDGE (Park City)—Production for the first six months of 1913 amounted to 25,514 tons of concentrating ore, 2155 tons of shipping ore, or a total of 27,669 tons dry weight. Throughout the period 50 to 60 ft. of development was done daily at a monthly cost of about $16,280. This work was done from the 500 to the 2300-ft. levels, the greater part being toward the Bonanza Flat section, following the fissure systems, the faces of the various drifts being kept far ahead of the orebodies. The amount of development thus far for 1913 is almost equal to that for the whole of 1912. Average monthly earnings were $15,484, and the available balance July 1, 1913, was $527,385. Two dividends were paid during the period, amounting together to $90,000.

## WASHINGTON

### Lincoln County

REARDAN (Davenport)—A new pump has been installed at this gold mine and ore assaying as high as $17 per ton is being taken out.

### Okanogan County

CARL FREDERICK—Operations at this mine which has been idle for some little time have again been resumed by Chris Bernhart, owner.

LONE STAR (Conconully)—Preparations are being made for ore shipments. The mine is owned by the Syndicate Development Co., of Seattle.

## WISCONSIN

### Platteville District

ALDERSON—Charles Kistler is prospecting by drill on this eighty three miles southwest of Platteville.

DUGDALE—A Milwaukee company is prospecting for lead ore on this farm three miles northeast of Platteville.

KLAR PIQUETTE (Platteville)—A 20-ft. face of ore was penetrated in the new shaft on the west end of this lease; a Lawson loop aërial tram has been installed to connect with the mill.

MINERAL POINT ZINC CO. (Mineral Point)—This company has purchased the Baker farm near Whitson Junction comprising old mine workings that produced large quantities of drybone.

## CANADA

### British Columbia

BRITISH COLUMBIA GOLD PRODUCTION FOR 1912 totalled $5,322,000. Rossland produced one-half, or $2,730,000; the Boundary district is credited with $2,167,000 and the Nelson district with $361,000. The Nickel Plate mine at Hedley yielded $775,000 from free-milling ore. The total mineral production of the province was $32,440,000. The silver production was $1,810,000, of which the Slocan produced 61%, the Fort Steele district 12%, and the Lardeau and Nelson districts the rest. The total lead production was worth $1,806,000; copper, $8,405,000; zinc, $316,000; and coal, $9,200,000.

BLACK DIAMOND (Athalmer)—This group on Toby Creek has been bonded to Dr. H. Schurz, of San Francisco. It is a high-grade silver-lead property with considerable ore blocked out.

SILVER HOARD (Kaslo)—As a result of having found a larger and better oreshoot at the 100-ft. level than was found at the 50-ft. level, it has been decided to sink a two-compartment shaft to a depth of 500 ft. A compressor to be run by water from the north fork of Cedar Creek is to be installed to furnish power for drills and hoisting. This compressor will embody some new features and is the design of Prof. Francis A. Thompson, of the State College of Mines, Pullman, Wash.

CUMSHEWA (Moresby Island)—At this property a very rich strike has been made. Over $100,000 has been spent on this property by an English company. The vein is small on the surface, cutting slates of early Jurassic or late Triassic age, and occurs near a granite intrusion. The ore showed blende and small amounts of galena and gave assays in places of $150 and upward in gold, on the surface. An adit was driven along the vein. At a favorable spot in the tunnel a winze was started, and as a depth of 200 ft. was approached, some free gold was noticeable in the ore. At a depth of 226 ft. the winze was in 4½ ft. of ore assaying $320 per ton, 14 in. of which ran, $1100 per ton. The vein at this place was 6 ft. wide and showed every indication of persistency.

### Ontario

AT THE PEAT BOG AT ALFRED in the Ottawa district the experimental plant established by the Mines Branch of the Canadian government and afterward disposed of to private interests, has had a successful season. New improved machinery has been installed and about 2000 tons of peat fuel produced, which will shortly be placed on sale. About half of the output will find a market in Ottawa at about $5 per ton. There are at present only two commercial peat plants in operation in Canada, the other being at Farnham, Quebec.

O'BRIEN (Cobalt)—A large tube mill is now being installed, which with other changes is expected to increase the capacity of the plant from 100 to 150 tons.

HUDSON BAY (Kirkland Lake—The gang of men which has been doing surface trenching on the claims has been paid off and it is stated that the properties will be abandoned.

TOUGH-OAKES (Swastika)—Tests are now being made in the 5-stamp mill with a view of securing data for use in planning the scheme of treatment which will be used in the 150-ton mill which it is proposed to erect soon. In the meantime shipments of high-grade ore will be made to the smelters. All of this ore is being taken from development on the No. 2 vein.

DOME (South Porcupine)—Work has been started on the foundations for the addition to the 40-stamp mill. The addition will consist of 40 stamps, Dorr classifiers, 3 Dorr thickeners, 4 sets of Merrill classifiers, 4 sets of plates, 2 storage tanks, 3 pumps, 3 Merrill presses and 6, 40x10-ft. leaching tanks for the sands. Heretofore, the practice has been to slime and cyanide the total tonnage, but in the future the sand will be separated and cyanided in the leaching tanks provided in the new addition.

BUFFALO MINES CO. (Cobalt)—This company has been working a gang of about 20 men during the last two months on the Ribble claims in West Shining Tree. It is said they have opened up on the surface an oreshoot 200 ft. long and 20 ft. wide of $15 ore. This has caused some excitement and prospectors are going into the district which was originally staked in the summer of 1911. Rich gold samples were found, but the surface trenching and test pitting showed the veins to be too small and too narrow and the grades too low to warrant any extensive development.

## MEXICO

### Jalisco

SAN PEDRO ANALCO (San Pedro Analco)—These Hostotipaquillo district mines, owned by a Mexican company, have been taken over on a working contract by the San Rafael y Anexas company, one of the big operators of the Pachuca district of Hidalgo; it owns mines in the Parral district of Chihuahua as well. Negotiations for the purchase of the San Pedro Analco mines by the Real del Monte Co. (U. S. Smelting, Refining & Mining Co.) failed some time ago because of a disagreement over the price.

MAGISTRAL-AMECA (Ameca)—This American company, owning the Magistral copper mine in the Ameca district, is steadily shipping concentrates to the Aguascalientes smelters. The company is mining, on an average, 125 tons per 24 hr., and the monthly output of concentrates averages 500 tons. The mill has treated as high as 82 tons of ore in 12 hr., and it is expected soon to increase the daily average of ore milled. The concentrates have a value of from 80 to 85 pesos on board the cars at Ameca, the shipping point. The company's operating expenses are covered by returns from one-fourth of the present production.

### Puebla

TEZIUTLAN COPPER CO. (Aire Libre)—Smelting was discontinued Sept. 5, the fuel supply having been exhausted. No copper has been shipped since about the middle of August, owing to interruption of railway traffic by revolutionists.

## GERMANY

OIL HAS BEEN STRUCK AT HANOVER, according to a despatch to the "National Zeitung," at a depth of 1600 ft. by borers for potash, and 300 bbl. per day have been produced since Aug. 30, the oil being of good quality. The secret was kept by the finders for some days, but since it has become public, the surrounding land has been rapidly acquired by speculators. Oil has been produced near Hanover for many years, the wells there, together with those in Alsace, supplying about 1,000,000 bbl. annually. The above despatch, therefore, probably indicates merely that the field is more extensive than was supposed. Nevertheless, in view of Germany's efforts to establish her independence of the Standard Oil Co., the discovery is highly important.

# THE MARKET REPORT

## METAL MARKETS

### Copper, Tin, Lead and Zinc

**Copper**—From Sept. 3 to Sept. 8 there was almost a perpendicular rise in price under the influence of urgent demand which resulted in transactions amounting to many millions of pounds. The advance was so sharp that on most of the days there was a wide difference between the morning and afternoon prices. The openly quoted prices for electrolytic, including freight, and subject to discount, were as follows: (4th) 16⅛@16¼c.; (5th) 16¼@16½c.; (6th) 16⅜@16½c.; (8th) 16½@16¾c.; (9th) 16¾c.; (10th) 16⅝@16¾c.

By the end of Sept. 4 domestic consumers were actually paying 16¼c., delivered, equivalent to 16.10c., cash, New York. On Sept. 5 transactions varied a good deal, on business both for domestic and foreign shipment. Sales to domestic consumers were made on the 6th at 16⅜c., delivered, usual terms, while shipments to Europe were made at prices netting as high as 16.30c. On the morning of the 8th, the market opened firmly at 16½c., delivered, usual terms, and sales to Europe and to Connecticut, netting 16.30@16.35c. were made. Toward the end of the day some large sales were made at 16¾c., delivered, usual terms, equal to 16.60c., cash, New York, on the domestic business. The transactions of this day amounted to millions of pounds. On Sept. 9 the market was firmly established at 16.70@16.75c., delivered. Most of the agencies stood firmly at the higher figure, but certain houses offered concessions of a few points. Business became slack and toward the close of the day there were sales at 16.65c., delivered, usual terms. On Sept. 10, business continued slack and there were sellers at 16⅝c., delivered, although most of the agencies maintained their previous price of 16¾c., asked.

The business of the week was divided among domestic and foreign shipments. It would be difficult to estimate the division with any degree of precision. The statistics issued on Sept. 8 showed that the available supply of copper is very small indeed. The quantity of electrolytic copper in the hands of the refiners was but little over 20,000,000 lb., or less than the normal production of one week. The principal producers are well sold ahead and are meeting with difficulties in making their deliveries on time. Stocks of copper have dwindled to a dangerously low point, so much so that the least disturbance in the production at the present moment would create an actual shortage of copper. Under these conditions the market, of course, has been strong and advancing.

Business in Lake copper came to a standstill this week. Barring a few remnants of supply existing here and there, some carload lots, nobody now has any Lake copper except the Calumet & Hecla. That company is now understood to have withdrawn from the market. Its remaining supply will probably be reserved for its regular customers. In the absence of any business whereof we can learn, we are obliged to quote Lake copper in a purely nominal way, quoting it at ¼c. per lb. above the mean price for electrolytic.

At the close we quote electrolytic copper at 16.40@16.60c. and Lake at 16.75c. (nominal). We quote casting copper nominally at 16.15@16.20c. as an average for the week.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾c., carload lots at mill.

Exports of copper from New York for the week were 243 long tons. Our special correspondent gives the exports from Baltimore at 1597 tons for the week.

A reader of the "Journal" complained that he had tried to buy 200,000 lb. of electrolytic copper last week and could not get it within ⅛c. of our quotations. Upon inquiry we learned that he had been named a fancy price upon 50,000 lb. for a certain delivery, reason not asked nor stated. The average on the total business aggregating some millions of pounds during the week averaged within 0.02½c. of the average of our quotations. We do not quote the copper market on jobbing or retail business. The same remark applies to the criticisms of a journal that is interested in that character of market.

The London standard market, which on Sept. 4 was £73 for spot and £72½ for three months, advanced 15s. on the 5th. On the 8th spot was £74⅞ and three months £73¾. On the 9th the realization of speculative holdings set in. This was to be expected after the recent prolonged advance. In consequence, the market declined on the 9th to £73¾ for spot and three months. On the 10th spot closes at £73, with three months £72⅞.

**Tin**—The market in London eased off considerably during the week under review. Orders from this side were lacking and not much support was offered by the bull element. Consumers in this market were rather shy and sales by dealers were made under the cost of import. The market closes easy at £193¼ for spot and £192½ for three months, and about 42½c. for September tin here.

DAILY PRICES OF METALS

NEW YORK

| Sept. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb. | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 4.8570 | 59⅝ | 16¼<br>@16⅜ | 16.00<br>@16.10 | 43¾ | 4.75 | 4.65<br>@4.70 | 5.75<br>@5.85 | 5.60<br>@5.70 |
| 5 | 4.8545 | 59¾ | 16⅜<br>@16½ | 16.10<br>@16.30 | 43⅜ | 4.72½<br>@4.75 | 4.62½<br>@4.65 | 5.75<br>@5.85 | 5.60<br>@5.70 |
| 6 | 4.8560 | 59½ | 16½<br>@16⅝ | 16.20<br>@16.30 | 43⅛ | 4.70<br>@4.75 | 4.60<br>@4.65 | 5.75<br>@5.85 | 5.60<br>@5.70 |
| 8 | 4.8560 | 59⅝ | *16.60 | 16.30<br>@16.60 | 42¾ | 4.70<br>@4.75 | 4.60<br>@4.65 | 5.75<br>@5.85 | 5.60<br>@5.70 |
| 9 | 4.8560 | 59⅝ | *16.80 | 16.50<br>@16.60 | 42⅝ | 4.70<br>@4.75 | 4.60<br>@4.65 | 5.75<br>@5.85 | 5.60<br>@5.70 |
| 10 | 4.8570 | 59¾ | *16.75 | 16.40<br>@16.60 | 42½ | 4.70<br>@4.75 | 4.60<br>@4.65 | 5.75<br>@5.85 | 5.60<br>@5.70 |

*Nominal

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries, and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Sept | Silver | Copper: Spot | Copper: 3 Mos | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| 4 | 27 9/16 | 73 | 72½ | 77½ | 198½ | 197 | 21 | 21½ |
| 5 | 27 7/16 | 73¾ | 73 | 78½ | 195 | 194 | 20¾ | 21½ |
| 6 | 27½ | | | | | .... | | |
| 8 | 27 9/16 | 74⅞ | 73¾ | 80 | 195 | 194 | 20¾ | 21¼ |
| 9 | 27 9/16 | 73¾ | 73¾ | 79 | 194 | 192¾ | 20½ | 21¼ |
| 10 | 27⅝ | 73 | 72⅞ | 78½ | 193¼ | 192½ | 20⅝ | 21¼ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17¾c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

**Lead**—The market is dull and somewhat easier. Lead at St. Louis is quoted 4.60@4.65 c., and New York 4.70@4.75c.

The London market is quiet, with Spanish lead quoted at £20⅝ and English lead 15s. higher.

**Spelter**—The market is quiet and without special feature. St. Louis is quoted 5.60@5.70c.; New York, 5.75@5.85c. At 5.70c. St. Louis there are sellers over.

At London good ordinaries are quoted £21¼ and specials £21⅝.

Base price of zinc sheets stands unchanged at $8 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill. Extras and discounts unchanged.

**Brass Prices** are announced as follows to date from Sept. 8: Sheets, high brass, 17c. net per lb.; low brass, 18⅞c. Wire, high brass, 16¾c.; low brass, 18⅞c. Rods, high brass, 16¾c.; low brass, 19⅝c. Tubes, brazed, or open seam, 21½c. Angles and channels, 21½c. Scrap allowances are 11½c. net per lb. for high brass and 12⅞c. for low brass.

## Other Metals

**Aluminum**—The market is quiet, and still waiting on the tariff. Domestic No. 1 ingots are selling for 22@22¼c. per lb., and foreign, in bond, at 18 cents.

**Antimony**—The market is extremely dull. Consumers are living from hand to mouth in anticipation of an early change in the tariff. Prices are 8.30@8.50c. for Cookson's; 8@8.12½c. for Hallett's; and 7.25@7.50 for Chinese, Hungarian and outside brands.

**Quicksilver**—The market is fair and steady, with prices unchanged. New York quotations are $40 for both domestic and export. London is £7 5s. per bask, and £7 quoted from second hands.

## Gold, Silver and Platinum

**Gold** remains on the open market at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American gold. The receipts are chiefly from the Cape and South America, with engagements for Egypt.

Imports of gold at New York, week ended Sept. 6, were $851.652. exports, $25,000.

**Iridium**—The trade in this metal is dull, with $83@85 asked.

**Platinum**—The market has now become steady, and $43.50 @45 per oz. is being paid. For hard metal, $47.50@50 is being quoted.

**Silver**—The tendency of silver has been to slightly higher prices, and advices would indicate some farther improvement in the market this fall may be anticipated. It is thought the India government may make purchases on a moderate scale this year, especially if the later rains maintain the promise to the farming sections which has been created by the favorable season so far.

Imports of silver at New York, week ended Sept. 6, were $263,579. and exports were $1,041,054. Additional exports of $196,215 have been reported for the week ended Aug. 30, making the correct total $902,198.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Sept. 6

The base price paid this week for 60% zinc ore was $47 @48 per ton. The base price paid for 80% lead ore was $58@ 59 per ton.

SHIPMENTS WEEK ENDED SEPT. 6, 1913

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week ..................... | 2,923,380 | 169,600 | 966,920 |
| Year to date .............. | 102,133,810 | 4,757,590 | 41,399,870 |

Shipped during week to separating plants, 2,047,480 lb. zinc ore.

### JOPLIN, MO.—Sept. 6

The high price of blende is $52, the base per ton of 60% zinc ranging from $46@49 for choice grades and $45@47 base for blende carrying an excess of 8% iron. Calamine sold on a base of $21@24 per ton of 40% zinc. The average of all grades of zinc is $45.10 per ton. Lead was unchanged at $58 per ton of 80% metal content, and the average of all grades is $56.14 per ton.

SHIPMENTS WEEK ENDED SEPT. 6

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week.. | 12,228,860 | 1,751,810 | 1,877,530 | $369,155 |
| Totals 36 weeks.. | 388,812,700 | 29,110,180 | 63,529,520 | $10,782,014 |

Blende value, the week, $291,465; 36 weeks, $8,725,384.
Calamine value, the week, $23,770; 36 weeks, $373,171.
Lead value, the week, $53,920; 36 weeks, $1,683,459.

## IRON TRADE REVIEW

### NEW YORK—Sept. 10

Steel-market developments thus far in September have not proved reassuring. There is no increase in the volume of business booked, over the August average, and it is possible that on the whole there has been an actual diminution Such buying as occurs is practically confined to the filling of immediate requirements, and prices here and there have shown additional weakness in the past 10 days. The general list has not definitely receded, as the important products are still quotable, in the open market, at last week's range, but in spots there is more shading.

Some of the heavy steel orders have now been definitely placed. The Kresge store at Detroit, Mich., has placed a contract for 1700 tons of fabricated steel; the Maine Central has ordered 12 small bridge spans and one large, calling for 2400 tons, and the New York Central for 400 tons. Other large contracts are rumored, but it is said they will be held up until prices go down materially.

### PITTSBURGH—Sept. 9

Production of steel continues at maximum rate, and is possibly a trifle heavier than in July and August, as no productive units have been closed, and the mills naturally work better in present weather conditions than in July and August. It is insisted that jobbers and manufacturing consumers have been drawing from stocks, rather than adding to them, which would indicate that actual consumption has been at record rate, or very close to it, while the depleted condition of stocks—as claimed—would suggest that freer buying will soon become a necessity if consumption is to be maintained. There are no prospects of curtailment in consumption in the near future, except by the railroads, as their outside work is certain to decrease steadily in the next two or three months, with decreased shipments of rails and track material, while as to cars the orders on books of car builders will make them good consumers of steel until very nearly the close of the year.

**Pig Iron**—The September coke business seems all to have been placed, and at the full price of $2.50 unless for one or two sales of coke of second grade, but today it is reported that spot coke can be picked up at concessions of 25 to 30c., without there being any absorbing power in the market. The pig-iron situation is extremely quiet. There is little inquiry for any grade. In foundry iron so many purchases were made for third quarter only that further buying is expected in the next 30 days. There is no prospect of the Steel Corporation buying bessemer iron, as has frequently been rumored from the East. Bessemer has been somewhat scarce, but one of the Josephine stacks has lately been put on this grade, which may change the aspect. On the whole production seems to be well regulated to consumption, and furnaces are rigidly adhering to recently quoted prices, the market being quotable as follows: Bessemer, $15.75@16; basic, $14; malleable, $14.25; No. 2 foundry, $14; gray forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market continues quiet, the nominal price on prompt and contract being $56, Baltimore, with $2.16 freight to Pittsburgh, but dealers frequently shade this figure $1 per ton on prompt lots.

**Steel**—The market for billets and sheet bars is finding its level more slowly than expected, since the old basis was definitely departed from. Openhearth steel can be bought at $24 for billets and $25 for sheet bars, at maker's mill, Pittsburgh or Youngstown, but offerings at this level are limited. Hardly any mill quotes more than a dollar per ton higher, and there are rumors that still lower figures than here quoted have been named. As to bessemer steel there are no quotations as low as on openhearth, but the market has not been seriously tested since most buyers are holding off awaiting developments.

**Sheets**—Production has increased, over 90% of the independent mills being in operation, while the leading interest is running about 85% of its mills. Bookings are almost entirely for early shipment, and are hardly keeping pace with shipments. Additional cuts are rumored, in instances, from the general level, which remains quotable as follows: Blue-annealed, 10-gage, 1.65c.; black, 28-gage, 2.15c.; galvanized, 28-gage, 3.20c.; painted corrugated, 28-gage, 2.35c.; galvanized corrugated, 28-gage, 3.25c., per lb

## IRON ORE

Imports via the port of Baltimore during the week ended Sept. 8, included 13,960 tons of iron ore from Daiquiri and Felton, and 50 tons ferromanganese from Rotterdam.

## OTHER ORES

**Imports and Exports in Germany of Ores** other than those of iron and manganese, half-year ended June 30, metric tons:

| | Imports 1912 | Imports 1913 | Exports 1912 | Exports 1913 |
|---|---|---|---|---|
| [illegible] silver ores | 918 | 987 | 1 | 1 |
| [illegible] ore | 12,669 | 14,022 | 10,950 | 14,400 |
| [illegible] | 7,650 | 9,170 | | |
| [illegible] | 68,421 | 70,087 | 1,797 | 2,437 |
| [illegible] | 122,459 | 174,886 | 19,206 | 18,040 |
| [illegible] ore | 10,249 | 6,643 | | |
| Miscellaneous ores | 14,413 | 19,316 | 3,093 | 6,792 |
| Chrome ore | 10,838 | 7,731 | 284 | 328 |
| Pyrites | 465,694 | 508,957 | 13,504 | 16,966 |

Imports of slag and slag products for the half-year were 614,112 tons in 1912 and 655,245 in 1913; exports were 60,910 tons in 1912, and 86,395 tons this year.

## COKE

**Connellsville Coke**—Operators have had more trouble than for July and August in closing up for September such furnaces as were not covered for longer periods. There have been rumors that some coke went at concessions from the $2.50 price, but these cannot be confirmed as relating to first-grade coke. At any rate, the major portion of the tonnage required for September has been taken at the fall price, with two or three consumers not yet fully covered for the month. The New Jersey Zinc Co. is understood to have purchased 25,000 or 30,000 tons for delivery from September over the last four months of the year at $2.50, but guaranteed against decline. It is stated on the part of certain operators that they will further curtail production to meet the situation. We quote: Prompt furnace, $2.50; contract furnace, $2.50; prompt foundry, $3; contract foundry, $3 per ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Aug. 30 at 403,030 tons, an increase of 33,554 tons, and shipments at 405,115 tons, an increase of 35,792 tons. This makes the tonnages larger than the average for July and August, which was about 380,000 tons weekly, while the average in the first half of the year was 409,000 tons weekly. It is hard to understand how production and shipments could have been so large lately, considering the material decrease in pig-iron production, but as to shipments in the week ended Aug. 30, it is to be remembered the holiday at the beginning of the following week was doubtless being provided for.

**Foreign Coal Trade of Germany** six months ended June 30, metric tons:

| | Exports | Imports | | Excess |
|---|---|---|---|---|
| Coal | 16,368,690 | 5,028,462 | Exp. | 11,340,228 |
| Brown coal | 30,464 | 3,502,911 | Imp. | 3,472,447 |
| Coke | 3,405,212 | 253,542 | Exp | 3,151,670 |
| Briquettes | 1,637,500 | 71,229 | Exp. | 1,566,277 |
| Total | 21,441,866 | 8,856,144 | Exp. | 12,585,722 |

Of the briquettes exported 439,865 tons were made of brown coal or lignite.

**Coal Trade of Belgium** half-year ended June 30, metric tons:

| | Imports | Exports | | Excess |
|---|---|---|---|---|
| Coal | 4,482,500 | 2,400,800 | Imp. | 2,081,700 |
| Coke | 793,500 | 676,300 | Imp | 117,200 |
| Briquettes | 212,900 | 181,100 | Imp | 31,800 |
| Total | 5,488,900 | 3,258,200 | Imp | 2,230,700 |
| Total, 1912 | 4,636,900 | 3,359,100 | Imp | 1,277,800 |

Coal production reported for the half-year was 11,221,550 tons, an increase of 86,260 tons over last year

# CHEMICALS

### NEW YORK—Sept. 10

[illegible] business is dull This does not seem to be solely a matter of the tariff but of underlying small chemical consumption.

**Arsenic**—The market is dull, and what business is placed is at about $3 per cwt.

**Copper Sulphate**—The bluestone market has not yet reflected the spurt in copper prices, and prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—This is the dull season for nitrate, but under the influence of the nitrate convention the market stands firm at 2.40c. for all positions.

## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded

| | April | May | June | July | August |
|---|---|---|---|---|---|
| Alaska shipments | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 | . . . . |
| Anaconda | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 |
| Arizona, Ltd. | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 | 1,800,000 |
| Copper Queen | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 |
| Calumet & Ariz. | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 | . . |
| Chino | 3,925,409 | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 |
| Detroit | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 |
| East Butte | 1,400,000 | 1,268,595 | 1,055,646 | . . | . . . |
| Mammoth | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 610,000 | 610,000 | . . . . |
| Mason Valley | 1,264,304 | 1,186,560 | 1,097,014 | 908,892 | . . . . |
| Miami | . . . | 1,943,900 | 2,612,000 | . . . | . . . |
| Nevada Con. | 5,650,000 | 5,933,275 | 6,344,863 | 5,403,919 | . . |
| Ohio | 690,001 | 650,071 | 537,400 | 601,700 | . |
| Old Dominion | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 |
| Ray | 4,379,128 | 4,384,400 | 4,392,612 | 4,097,000 | . . . |
| Shannon | 1,238,000 | 1,080,000 | 924,000 | 880,000 | 1,248,000 |
| South Utah | 132,267 | 200,000 | 185,000 | 140,000 | . . . . . . |
| Tennessee | 1,718,188 | §1,037,115 | 1,379,220 | 1,247,804 | . . . . . |
| United Verde* | 3,000,000 | 3,000,000 | 2,900,000 | . . . . | . . |
| Utah Copper Co. | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 | |
| Lake Superior* | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 |
| Non-rep. mines* | 6,000,000 | 6,300,000 | 6,000,000 | 6,200,000 | . . . . |
| Total prod | 104,224,079 | 109,824,500 | 104,051,138 | . . . . . | . . . . . |
| Imports, bars, etc. | 25,578,297 | 22,205,942 | 18,255,267 | . . . . . . | . . . . . . |
| Total blister | 129,802,376 | 132,030,442 | 122,306,405 | . . . . . . . | . . . . . |
| Imp. ore & matte. | 7,177,363 | 10,528,562 | 7,497,002 | . . . . . . . . | . . . . . . . |
| Total Amer. | 136,979,739 | 142,559,004 | 129,803,407 | . . . | . |
| Miami† | 2,312,900 | | | 2,890,000 | 3,097,500 |
| Shattuck-Arizona | 1,158,326 | 1,026,170 | 1,059,625 | 1,019,388 | . . . . . |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 794,000 | . | . | . | . . |
| Granby | 1,857,452 | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,811,200 | 2,424,800 | 1,984,640 | 2,240,720 | |
| Cananea | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 |
| Moctezuma | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 |
| Cape Cop., S. Af. | 586,880 | 387,520 | 414,400 | . . . . . . . | . |
| Kyshtim, Russia. | 2,544,640 | 1,490,000 | . . | . . . . . . | . . |
| Spassky, Russia. | 974,400 | 721,280 | 835,520 | . . . . . . . | . . |
| Exports from | | | | | |
| Chile | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 | . |
| Australia | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 | . . |
| Arrivals–Europe† | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 | . . |

† Boleo copper does not come to American refiners Miami copper goes to Cananea for treatment, and reappears in imports of blister From May 1, Miami copper is refined in the U. S and appears under American mines. From July 1 Miami ore went back to Cananea

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May

## STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U. S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VIII'12 | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,105,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | . . . . |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,994,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,905 | 66,420,480 | 120,015,385 |
| IX | . | | | 38,314,037 | | . |

Note From Jan 1, 1913, visible supplies in Europe do not include copper afloat

## Mining Companies—United States

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt |
| Acacia, g | Colo | 1,438,989 | $ 1 | $ 129,618 | Jan. '11 | $0.01 |
| Adams, s.l.c | Colo | 80,000 | 10 | 778,000 | Dec. '09 | 0.04 |
| Ahmeek, c | Mich | 50,000 | 25 | 1,950,000 | July '13 | 5.00 |
| Alaska Mexican, g | Alas | 180,000 | 5 | 3,241,381 | Aug. '13 | 0.30 |
| Alaska Treadwell, g | Alas | 200,000 | 25 | 13,385,000 | Aug. '13 | 1.00 |
| Alaska United, g | Alas | 180,200 | 5 | 1,397,150 | Aug. '13 | 0.60 |
| Am. Zinc, Lead & Sm | U. S | 165,360 | 25 | 985,820 | Apr. '13 | 0.50 |
| Anaconda, c | Mont | 4,332,500 | 25 | 78,168,750 | July '13 | 0.75 |
| Argonaut, g | Cal | 200,000 | 5 | 1,200,000 | June '10 | 0.05 |
| Arizona Copper, pf | Ariz | 1,426,120 | 1.20 | 1,831,011 | May '13 | .... |
| Arizona Copper, com | Ariz | 1,519,896 | 1.20 | 15,983,475 | July '13 | 0.48 |
| Bagdad-Chase, g., pf | Cal | 84,819 | 5 | 202,394 | Jan. '09 | 0.10 |
| Baltic, c | Mich | 100,000 | 25 | 7,750,000 | Dec. '12 | 7.00 |
| Bingham N. H., c | Utah | 228,690 | 5 | 294,219 | July 12 | 0.10 |
| Bonanza Dev., g | Colo | 300,000 | 1 | 1,425,000 | Oct. '11 | 0.20 |
| Bunker Hill Con., g | Cal | 200,000 | 1 | 761,000 | Aug. '13 | 0.05 |
| Bunker Hill & Sul., l.s | Ida | 327,000 | 10 | 14,434,950 | Aug. '13 | 0.20 |
| Butte-Alex Scott, c | Mont | 74,000 | 10 | 111,000 | June '13 | 0.50 |
| Butte & Ballaklava, c | Mont | 250,000 | 10 | 125,000 | Aug. '10 | 0.50 |
| Caledonia, l.s.c | Ida | 1,300,000 | 1 | 52,000 | June '10 | 0.01 |
| Calumet & Arizona, c | Ariz | 596,353 | 10 | 17,714,441 | June '13 | 1.25 |
| Calumet & Hecla, c | Mich | 100,000 | 25 | 122,050,000 | June '13 | 10.00 |
| Camp Bird, g.s | Colo | 1,100,051 | 5 | 9,650,812 | Aug. '13 | 0.24 |
| Centen'l-Eur., l.s.g.c | Utah | 100,000 | 5 | 3,750,000 | Apr. '13 | 1.50 |
| Center Creek, l.z | Mo | 100,000 | 10 | 425,000 | July '13 | 0.05 |
| Champion, c | Mich | 100,000 | 25 | 8,000,000 | June '13 | 1.00 |
| Cliff, g | Utah | 300,000 | 1 | 120,000 | Jan. '13 | 0.10 |
| Cliff, g | Alas | 100,000 | 1 | 180,000 | Nov. '12 | 0.05 |
| Colo. Gold Dredging | Colo | 100,000 | 10 | 300,000 | Ang. '13 | 0.25 |
| Colorado, l.s.g | Utah | 1,000,000 | 0.20 | 2,570,000 | Dec. '12 | 0.03 |
| Columbus Con., g.s | Utah | 285,540 | 5 | 226,832 | Oct. '07 | 0.20 |
| Commercial Gold | Ore | 1,750,000 | 1 | 43,750 | Dec. '10 | 0.00½ |
| Con. Mercu., g | Utah | 1,000,000 | 1 | 3,415,313 | July '12 | 0.03 |
| Continental, z. l | Mo | '22,000 | 25 | 297,000 | July '13 | 0.50 |
| Copper Range Con., c | Mich | 393,445 | 100 | 13,788,175 | July '13 | 0.75 |
| Daly Judge, s.l | Utah | 300,000 | 1 | 585,000 | June '13 | 0.15 |
| Daly West, s.l | Utah | 180,000 | 20 | 6,606,000 | Jan. '13 | 0.15 |
| Doctor Jackpot, g | Colo | 3,000,000 | 0.10 | 45,000 | Mar. '11 | 0.00½ |
| Doe Run, l | Mo | 65,782 | 100 | 3,237,869 | Dec. '12 | 1.50 |
| Elkton Con., g | Colo | 2,500,000 | 1 | 3,079,460 | Aug. '13 | 0.02 |
| El Paso, g | Colo | 490,000 | 5 | 1,658,545 | Mar. '13 | 0.12½ |
| Ernestine, g. s | N.M | 300,000 | 5 | 400,000 | Dec. '12 | 0.00½ |
| Fed. M. & S., com | Idaho | 60,000 | 100 | 2,708,750 | Jan. '09 | 1.50 |
| Fed. M. & S., pf | Idaho | 120,000 | 100 | 9,028,060 | June '13 | 1.50 |
| Florence, g | Nev | 1,050,000 | 1 | 840,000 | Apr. '11 | 0.10 |
| Frances-Mohawk, g | Nev | 912,000 | 1 | 546,000 | Jan. '08 | 0.05 |
| Free Coinage, g | Colo | 10,000 | 100 | 180,000 | Dec. '09 | 1.00 |
| Fremont Con., g | Calif | 200,000 | 2.50 | 202,000 | Aug. '13 | 0.02 |
| Frontier, z | Wis | 1,250 | 100 | 171,272 | Aug. '13 | 2.00 |
| Gemini-Key'ne, l.g.s | Utah | 5,000 | 100 | 2,110,000 | May '13 | 10.00 |
| Gold Chain, g | Utah | 1,000,000 | 1 | 130,000 | May '13 | 0.03 |
| Gold Coin of Victor | Colo | 1,000,000 | 1 | 1,350,000 | Feb. '09 | 0.02 |
| Gold Dollar Con | Colo | 2,500,000 | 0.10 | 100,000 | Dec. '12 | 0.00½ |
| Gold King Con., g | Colo | 5,750,370 | 1 | 1,407,319 | Dec. '11 | 0.03 |
| Golden Cycle, g | Colo | 1,500,000 | 5 | 2,501,000 | Aug. '13 | 0.02 |
| Golden Star, g | Ariz | 400,000 | 5 | ,140,000 | Mar. '10 | 0.05 |
| Goldfield Con., g | Nev | 3,558,367 | 10 | 24,906,811 | Apr. '13 | 0.30 |
| Grand Central, g | Utah | 500,000 | 1 | 1,520,750 | Apr. '13 | 0.05 |
| Granite, g | Colo | 1,650,000 | 1 | 269,500 | Nov. '12 | 0.01 |
| Hazel, g | Cal | 900,000 | 1 | 873,000 | Nov. '12 | 0.01 |
| Hecla, l.s | Idaho | 1,000,000 | 0.25 | 2,870,000 | July '13 | 0.02 |
| Hercules, l.s | Idaho | 1,000,000 | 1 | 3,650,000 | July '11 | 0.06 |
| Homestake, g | S. D | 218,400 | 100 | 33,367,791 | Aug. '13 | 0.65 |
| Horn Silver, l.s.z | Utah | 400,000 | 25 | 5,662,000 | Sept. '07 | 0.05 |
| Iowa, g.s.l | Colo | 1,666,667 | 1 | 217,000 | July '13 | 0.00½ |
| Iowa-Tiger Leasing g.s | Colo | 12,655 | 1 | 13,921 | Jan. '12 | 0.10 |
| Iron Blossom, s.l.g | Utah | 1,000,000 | 0.10 | 1,670,000 | Jnly '13 | 0.10 |
| Iron Silver, s.l.g | Colo | 500,000 | 20 | 4,700,000 | Apr. '13 | 0.10 |
| Jamison, g | Cal | 390,000 | 10 | 378,300 | Jan. '11 | 0.02 |
| Jerry Johnson, g | Colo | 2,500,000 | 0.10 | 150,000 | Aug. '11 | 0.01 |
| Kendall, g | Mont | 500,000 | 5 | 1,475,000 | Nov. '12 | 0.02 |
| Kennedy, g | Cal | 100,000 | 100 | 1,831,001 | Apr. '10 | 0.03 |
| King of Arizona, g | Ariz | 200,000 | 1 | 396,000 | Aug. '09 | 0.12 |
| Klar Piquette, z.l | Wis | 20,000 | 1 | 162,500 | Dec. '12 | 0.50 |
| Knob Hill, g | Wash | 1,000,000 | 1 | 45,000 | May '12 | 0.00½ |
| Liberty Bell, g | Colo | 130,551 | 5 | 522,093 | Oct. '10 | 1.00 |
| Little Bell, l.s | Utah | 300,000 | 1 | 75,000 | Mar. '11 | 0.05 |
| Little Florence, g | Nev | 1,000,000 | 1 | 430,000 | Jan. '08 | 0.03 |
| Mammoth, g.s.c | Utah | 400,000 | 25 | 2,300,000 | July '13 | 0.05 |
| Mary McKinney, g | Colo | 1,309,252 | 1 | 1,051,373 | July '13 | 0.02 |
| May Day, g.s.l | Utah | 800,000 | 0.25 | 148,000 | Feb. '13 | 0.03 |
| Mexican, g.s | Nev | 201,600 | 2.50 | 20,160 | Aug. '11 | 0.10 |
| Miami, c | Ariz | 664,993 | 5 | 2,216,708 | Aug. '13 | 0.50 |
| Modoc, g.s | Colo | 500,000 | 1 | 275,000 | Dec. '11 | 0.01 |
| Mohawk M. Co | Mich | 100,000 | 25 | 3,175,000 | Aug. '13 | 2.00 |
| Monarch-Mad'a, g.s.l | Colo | 1,000,000 | 1 | 40,000 | May '11 | 0.01 |
| Montana-Tonop., s.g | Nev | 921,865 | 1 | 530,000 | Dec. '12 | 0.10 |
| Mountain, c | Cal | 250,000 | 25 | 4,216,250 | May '08 | 0.44 |
| National, g | Nev | 750,000 | 1 | 570,000 | May '11 | 0.10 |
| Nevada Con., c | Nev | 1,999,394 | 5 | 12,237,986 | June '13 | 0.37½ |
| New Century, z.l | Mo | 330,000 | 1 | 237,600 | Oct. '09 | 0.01 |
| New Idria, q | Cal | 100,000 | 5 | 1,710,000 | June '13 | 0.10 |
| North Butte, c | Mont | 410,000 | 15 | 11,070,000 | July '13 | 0.50 |
| North Star, g | Cal | 250,000 | 10 | 3,886,989 | June '13 | 0.20 |
| Old Domin'n, M. & Sm | Ariz | 162,000 | 25 | 3,158,500 | July '13 | 1.25 |
| Ophir, s. g | Nev | 201,600 | 3 | 2,068,360 | Jan. '12 | 0.10 |
| Opohongo, g.s.l | Utah | 898,978 | 0.25 | 80,907 | Jan. '13 | 0.02 |
| Oroville Dredging | Cal | 700,000 | 5 | 1,383,036 | Dec. '09 | 0.12½ |
| Osceola, c | Mich | 96,150 | 25 | 11,698,925 | July '13 | 3.00 |
| Parrot, c | Mont | 229,850 | 10 | 7,255,750 | May '13 | 0.15 |
| Pearl Con., g | Wash | 1,909,711 | 0.05 | 181,422 | Dec. '10 | 0.02 |
| Pharmacist, g | Colo | 1,500,000 | 1 | 87,500 | Feb. '10 | 0.00½ |
| Pioneer, g | Alas | 5,000,000 | 1 | 4,041,526 | Oct. '11 | 0.03 |
| Pittsburgh-Idaho, l | Ida | 803,000 | 1 | 216,810 | Oct. '12 | 0.04 |
| Pittsburgh Silver Peak, g | Nev | 2,790,000 | 1 | 613,800 | June '13 | 0.02 |
| Portland, g | Colo | 3,000,000 | 1 | 9,337,080 | Aug. '13 | 0.02 |
| Quilp | Wash | 1,500,000 | 1 | 67,500 | Feb. '13 | 0.01 |
| Quincy, c | Mich | 110,000 | 25 | 20,732,500 | June '13 | 1.25 |
| Republic, g | Wash | 1,000,000 | 1 | 85,000 | Dec. '10 | 0.01½ |
| Rochester, l.z | Mo | 4,900 | 100 | 188,396 | Dec. '10 | 0.50 |
| Round Mountain, g | Nev | 866,426 | 1 | 363,365 | Aug. '13 | 0.04 |
| Seven Troughs Coal., g | Nev | 1,500,000 | 1 | 37,500 | July '12 | 0.02½ |
| St. Joseph, l | Mo | 1,000,000 | $10 | $ 8,860,357 | June '13 | $0.15 |
| Shannon, c | Ariz | 300,000 | 10 | 750,000 | Jan. '13 | 0.50 |
| Shattuck-Arizona, c | Ariz | 350,000 | 10 | 1,400,000 | July '13 | 0.50 |
| Silver King Coal. l.s | Utah | 1,250,000 | 5 | 2,159,885 | Apr. '13 | 0.15 |
| Sioux Con., s.l.g | Utah | 745,389 | 1 | 872,097 | July '11 | 0.04 |
| Skidoo, g | Cal | 1,000,000 | 5 | 275,000 | May '12 | 0.02½ |
| Smuggler, l.s.z | Colo | 1,000,000 | 1 | 2,235,000 | Nov. '06 | 0.03 |
| Snowstorm, c.g | Ida | 1,500,000 | 1 | 1,169,610 | July '13 | 0.01½ |
| South Eureka, g | Calif | 299,981 | 1 | 366,881 | Apr. '12 | 0.07 |
| Standard Con., g.s | Cal | 178,394 | 10 | 5,229,809 | Jan. '12 | 0.10 |
| Stratton's Ind., g | Colo | 1,000,000 | 0.60 | 486,000 | May '13 | 0.06 |
| Success, z | Ida | 1,500,000 | 1 | 925,000 | May '13 | 0.02 |
| Superior & Pitts., c | Ariz | 1,499,793 | 10 | 4,799,340 | June '13 | 0.38 |
| Tamarack, c | Mich | 60,000 | 25 | 9,420,000 | July '07 | 4.00 |
| Tennessee, c | Tenn | 200,000 | 25 | 3,556,520 | June '13 | 0.75 |
| Tomboy, g. s | Colo | 300,000 | 4 85 | 3,069,090 | June '13 | 0.48 |
| Tom Reed, g | Ariz | 909,555 | 1 | 1,427,886 | Aug. '13 | 0.06 |
| Tonopah Belm't, s.g | Nev | 1,500,000 | 1 | 4,718,003 | July '13 | 0.25 |
| Tonopah Ext., g.s | Nev | 943,433 | 1 | 377,370 | July '13 | 0.02½ |
| Tonopah of Nev., s.g | Nev | 1,000,000 | 1 | 10,850,000 | July '13 | 0.40 |
| Tri-Mountain, c | Mich | 100,000 | 25 | 1,250,000 | Dec. '12 | 3.00 |
| Tuolumne, c | Mont | 800,000 | 1 | 520,000 | May '13 | 0.10 |
| Uncle Sam, g. s. l | Utah | 500,000 | 1 | 495,000 | Sept. '11 | 0.05 |
| United Cop. Min., c | Wash | 1,000,000 | 1 | 120,000 | July '13 | 0.01 |
| United (Crip. Ck.) g | Colo | 4,000,100 | 1 | 440,435 | Jan. '10 | 0.04 |
| United Globe, c | Ariz | 23,000 | 10 | 1,357,500 | July '13 | 7.50 |
| United Verde, c | Ariz | 300,000 | 10 | 32,572,000 | Aug. '13 | 0.75 |
| Utah, s.l | Utah | 100,000 | 10 | 325,000 | Dec. '10 | 0.02 |
| Utah, c | Utah | 1,562,599 | 10 | 18,616,484 | June '13 | 0.75 |
| Utah Con., c | Utah | 300,000 | 5 | 7,800,000 | July '13 | 0.50 |
| Valley View, g | Colo | 1,000,000 | 1 | 240,000 | Dec. '10 | 0.04 |
| Victoria, g.s.l | Utah | 250,000 | 1 | 207,500 | Mar. '10 | 0.04 |
| Vindicator Con., g | Colo | 1,500,000 | 1 | 2,722,000 | July '13 | 0.03 |
| Wasp No. 2, g | S. D | 500,000 | 1 | 421,965 | Aug. '13 | 0.01 |
| Wellington Mines, g | Colo | 10,000,000 | 1 | 260,000 | July '13 | 0.00½ |
| Wolverine, c | Mich | 60,000 | 25 | 7,940,000 | Apr. '13 | 5.00 |
| Work, g | Colo | 1,500,000 | 1 | 172,500 | July '08 | 0.00½ |
| Yak, s.l | Colo | 1,000,000 | 1 | 1,727,655 | July '13 | 0.02 |
| Yankee Con., g.s | Utah | 1,000,000 | 1 | 167,500 | Jan. '13 | 0.01 |
| Yellow Aster, g | Cal | 100,000 | 10 | 1,161,789 | Aug. '13 | 0.05 |
| Yellow Pine, l.z.s | Nev | 950,000 | 1 | 275,508 | Aug. '13 | 0.02 |
| Yukon Gold, g | Alas | 3,500,000 | 5 | 4,987,500 | June '13 | 0.07½ |

## Coal, Iron, Industrial and Holding Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Amalgamated, c | Mont | 1,538,879 | $100 | $78,968,110 | Aug. '13 | $1.50 |
| Am. Sm. & Ref., com | U. S | 500,000 | 100 | 24,333,333 | June '13 | 1.00 |
| Am. Sm. & Ref., pf | U. S | 500,000 | 100 | 44,606,333 | June '13 | 1.75 |
| Am. Smelters, pf. A | U. S | 170,000 | 100 | 7,875,000 | July '13 | 1.50 |
| Am. Smelters, pf. B | U. S | 300,000 | 100 | 11,982,000 | July '13 | 1.25 |
| Cambria Steel | Penn | 900,000 | 50 | 17,897,500 | Aug. '13 | 0.62½ |
| Greene Cananea | U. S | 2,471,314 | 25 | 2,426,877 | Mar. '13 | 0.25 |
| Guggenheim, Expl | U. S | 831,732 | 25 | 16,353,449 | July '13 | 0.62½ |
| Inter'l Nickel, com | U. S | 115,826 | 100 | 9,141,183 | June '13 | 3.00 |
| Inter'l Nickel, pfd | U. S | 89,126 | 100 | 4,140,503 | Aug. '13 | 1.50 |
| Inter'l Sm & Ref | U. S | 100,000 | 100 | 3,300,000 | Aug. '13 | 2.00 |
| Lehigh Coal & Nav | Penn | 482,956 | 50 | 22,535,092 | Nov. '12 | 1.00 |
| National Lead, com | N. Y | 206,554 | 100 | 7,385,393 | June '13 | 0.75 |
| National Lead, pf | N. Y | 243,676 | 100 | 26,708,074 | Apr. '13 | 1.75 |
| Old Dominion, c | Ariz | 293,245 | 25 | 4,313,579 | July '13 | 1.25 |
| Phelps, Dodge & Co | U. S | 450,000 | 100 | 26,084,304 | June '13 | 4.50 |
| U. S. Steel Corp., com | U. S | 5,083,025 | 100 | 188,050,070 | June '13 | 1.25 |
| U. S. Steel Corp., pf | U. S | 3,602,811 | 100 | 338,768,739 | Aug. '13 | 1.75 |
| U. S. S., R. & M., com | U.S.-Mex. | 486,320 | 50 | 5,308,854 | July '13 | 0.75 |
| U. S. Sm., R. & M., pf | U.S.-Mex. | 351,105 | 50 | 12,539,695 | July '13 | 0.87½ |

## Canadian, Mexican and Central American Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Ajuchitlan, g.s | Mex | 50,000 | $ 5 | $ 200,000 | Oct. '12 | $0.25 |
| Amparo, g.s | Mex | 2,000,000 | 1 | 1,166,884 | Aug. '13 | 0.04 |
| B. C. Copper | B. C | 591,709 | 5 | 615,398 | Jan. '13 | 0.15 |
| Beaver Con., s | Ont | 1,996,490 | 1 | 409,879 | Dec. '12 | 0.03 |
| Buffalo, s | Ont | 1,000,000 | 1 | 2,907,000 | Aug. '13 | 0.03 |
| Cobalt Townsite, s | Ont | 1,000,000 | 1 | 450,000 | Aug. '13 | 0.24 |
| Coniagas, s | Ont | 800,000 | 5 | 5,000,000 | Aug. '13 | 0.45 |
| Con. M. & S. Co. of Can. | B. C | 58,052 | 100 | 1,120,165 | July '13 | 2.00 |
| Crown Reserve, s | Ont | 1,768,814 | 1 | 5,306,444 | Aug. '13 | 0.05 |
| Crow's Nest Pass C. Co. | B. C | 248,506 | 25 | 2,182,864 | Mar. '11 | 0.25 |
| Dominion Coal, com | N. S | 150,000 | 100 | 5,550,000 | Jan. '13 | 1.00 |
| Dominion Coal, pf | N. S | 50,000 | 100 | 4,915,000 | Aug. '12 | 3.50 |
| Dos Estrellas, g.s | Mex | 300,000 | 0.50 | 14,130,000 | June '13 | 1.25 |
| El Oro, g.s | Mex | 1,147,500 | 4 85 | 8,947,261 | July '13 | 0.24 |
| Esperanza, s.g | Mex | 455,000 | 4.85 | 11,330,455 | July '13 | 0.36 |
| Granby, s.l.c | B. C | 148,496 | 100 | 4,642,573 | June '13 | 1.50 |
| Greene Con., c | Mex | 1,000,000 | 10 | 8,044,400 | Feb. '13 | 0.45 |
| Guanajuato D., pf., s | Mex | 10,000 | 1000 | 274,356 | Jan. '11 | 3.00 |
| Hedley Gold | B. C | 120,000 | 10 | 984,000 | June '13 | 0.50 |
| Hollinger, g | Ont | 600,000 | 5 | 990,000 | Aug. '13 | 0.15 |
| Kerr Lake s | Ont | 600,000 | 5 | 4,620,000 | June '13 | 0.25 |
| La Rose Con., s | Ont | 1,498,407 | 5 | 4,263,147 | July '13 | 0.25 |
| Le Roi No. 2, g | B. C | 120,000 | 24.30 | 1,471,580 | Jan. '13 | 0.36 |
| Lucky Tiger Com., g | Mex | 715,337 | 10 | 1,897,098 | Aug. '13 | 0.05 |
| McK.-Dar. Sav. s | Ont | 2,247,692 | 1 | 3,663,165 | July '13 | 0.10 |
| Mines Co. of Am. (new) | Mex | 1,700,000 | 10 | *1,215,000 | July '13 | 0.12½ |
| N. Y. & Hond. Ros | C. A | 150,000 | 10 | 3,152,500 | June '13 | 0.20 |
| Nipissing, s | Ont | 1,200,000 | 5 | 10,440,000 | July '13 | 0.37½ |
| Peñoles, s.l.g | Mex | 80,000 | 25 | 6,361,688 | June '13 | 1.25 |
| Peregrina M. & M., pf | Mex | 10,000 | 100 | 328,656 | Sept. '10 | 3.50 |
| Pinguico, pf., s | Mex | 20,000 | 100 | 600,000 | Oct. '11 | 3.00 |
| Right of Way Mns† | Ont | 1,685,500 | 1 | 202,260 | Dec. '11 | 0.02 |
| Rio Plata, s | Mex | 373,437 | 5 | 345,714 | Feb. '13 | 0.05 |
| San Rafael, g.s | Mex | 2,400 | 25 | 1,439,780 | Oct. '12 | 0.90 |
| San Toy, g.s | Mex | 6,000,000 | 1 | 540,000 | July '13 | 0.01 |
| Sopresa, g.s | Mex | 19,200 | 20 | 1,517,438 | Jan. '11 | 34.00 |
| Stand'd Silver-Lead | B. C | 2,000,000 | 1 | 825,000 | July '13 | 0.02½ |
| Timiskaming, s | Ont | 2,500,000 | 1 | 1,534,155 | Apr. '13 | 0.06 |
| Tem. & Hud. Bay, s | Ont | 7,761 | 1 | 1,823,835 | Aug. '13 | 3.00 |
| Trethewey, s | Ont | 1,000,000 | 1 | 961,998 | Jan. '13 | 0.10 |
| Wettlaufer-Lorrain, s | Ont | 1,416,590 | 1 | 566,636 | Jan. '13 | 0.05 |

*Previous to reorganization, $5,258,881.

†Previous to January, 1910, $324,644.

## Assessments

| Company | Delinq | Sale | Amt. |
|---|---|---|---|
| Central [illegible], Calif | Aug 14 | Sept. 14 | $0 025 |
| Con [illegible], Nev | Aug 28 | Sept. 19 | 0 01 |
| Copper [illegible], Ida | Sept 6 | Oct 4 | 0 002 |
| [illegible], Utah | Aug 30 | Sept 20 | 0 005 |
| [illegible], Nev | Aug 25 | Sept 22 | 0 003 |
| [illegible] (3d installment) | Sept 15 | Oct 11 | 0 005 |
| Exchequer, Nev | Aug 28 | Sept 17 | 0 02 |
| [illegible] | Aug 16 | Sept 16 | 0 001 |
| [illegible], Ida | Sept. 10 | Sept 30 | 0 0005 |
| [illegible] American, Ida | Sept 8 | Sept 29 | 0 000½ |
| [illegible], Nev. | Sept. 8 | Sept. 30 | 0 02 |
| [illegible] (postponed) | . | Sept 22 | 2 00 |
| [illegible] Gold, Ida | Sept. 8 | Oct. 8 | 0 0005 |
| [illegible] Metals (Boston) | . | Oct. 10 | 0 15 |
| [illegible] Argentine, Utah | Sept. 1 | Sept 16 | 0 005 |
| [illegible], Ida | Aug 25 | Sept 22 | 0 005 |
| [illegible] Hope, Ida | Aug 19 | Sept. 19 | 0 002 |
| [illegible]ano, Ida | Sept. 1 | Oct. 1 | 0 0015 |
| Phoenix Con., Mich. | . | Sept 20 | 1 00 |
| Potosi, Nev | Sept. 4 | Sept 26 | 0 02 |
| Slavonia, Ida. | Sept. 10 | Sept 30 | 0 002 |
| Sonora, Ida | Aug. 30 | Sept 16 | 0 002 |
| St Louis, Calif. | Sept. 22 | Oct. 4 | 0 01 |
| Sunshine, Ida.. | July 1 | Oct. 15 | 0 001 |
| Tuscumbia, Ida | Aug. 23 | Sept 23 | 0 003 |
| Winona, Mich | . | Sept 29 | 1 00 |
| Yellow Jacket, Nev. | Sept. 8 | Oct. 8 | 0 10 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53 795 | 56 260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February. | 52.222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March. | 52 745 | 58.375 | 57 870 | 24 324 | 26 875 | 26 669 |
| April | 53.325 | 59 207 | 59 490 | 24 595 | 27 284 | 27 416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24 486 | 28 215 | 27 199 |
| July | 52.630 | 60 654 | 58.721 | 24 286 | 27 919 | 27 074 |
| August | 52.171 | 61 606 | 59.293 | 24.082 | 28 375 | 27 335 |
| September | 52 440 | 63 078 | .. | 24 209 | 29 088 | |
| October. | 53 340 | 63 471 | .. .. | 24 594 | 29 299 | |
| November | 55 719 | 62 792 | . | 25 649 | 29.012 | .. |
| December | 54 905 | 63 365 | | 25 349 | 29 320 | . |
| Year | 53 304 | 60 835 | ..... | 24.592 | 28 042 | ..... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16 488 | 14 337 | 16.767 | 62.760 | 71.741 |
| February | 14 084 | 14 971 | 14 329 | 15 253 | 62 893 | 65 519 |
| March | 14 698 | 14 713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15 741 | 15.291 | 15 930 | 15 565 | 70 294 | 68 111 |
| May | 16 031 | 15.436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17.234 | 14.672 | 17.443 | 14 871 | 78 259 | 67 140 |
| July | 17.190 | 14 190 | 17 353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15.400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | ...... | 17 698 | | 78 762 | . |
| October | 17 314 | . . | 17 661 | | 76 389 | |
| November | 17 326 | . . | 17 617 | | 76 890 | |
| December | 17 376 | | 17 600 | | 75 516 | |
| Year | 16 341 | | 16 560 | | 72 942 | . |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 150 |
| March | 42 577 | 46 832 | 192 619 | 213 645 |
| April | 43 923 | 49 115 | 200 513 | 224 119 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | | 223 762 | |
| October | 50 077 | | 228 353 | |
| November | 49 891 | | 227 619 | |
| December | 49 815 | | 226 875 | |
| Year | 46 096 | | 209 322 | . |

New York in cents per pound London in pounds sterling per long ton.

### LEAD

| Month | New York | | St Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4 435 | 4 321 | 4 327 | 4 171 | 15 597 | 17.114 |
| February | 4 026 | 4 325 | 3 946 | 4 175 | 15.738 | 16.550 |
| March | 4 073 | 4 327 | 4 046 | 4 177 | 15 997 | 15 977 |
| April | 4 200 | 4 381 | 4 118 | 4 242 | 16.331 | 17.597 |
| May | 4 194 | 4 342 | 4 072 | 4 226 | 16 509 | 18 923 |
| June | 4 392 | 4 325 | 4 321 | 4 190 | 17.588 | 20 226 |
| July | 4 720 | 4 353 | 4 603 | 4 223 | 18 544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | | 4 924 | | 22.292 | . |
| October | 5 071 | | 4 894 | | 20 630 | . |
| November | 4 615 | | 4.463 | | 18 193 | ...... |
| December | 4 303 | | 4 152 | | 18 069 | . |
| Year | 4 471 | | 4.360 | | 17 929 | . |

New York and St Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January.. | 6 442 | 6 931 | 6 292 | 6 854 | 26 642 | 26.114 |
| February.. | 6 499 | 6 239 | 6 349 | 6 089 | 26 661 | 25 338 |
| March... | 6 626 | 6 078 | 6 476 | 5 926 | 26 048 | 24 605 |
| April | 6.633 | 5.641 | 6 483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5 406 | 6 529 | 5 256 | 25 790 | 24 583 |
| June | 6 877 | 5 124 | 6 727 | 4 974 | 25 763 | 22 143 |
| July .. | 7.116 | 5 278 | 6 966 | 5.128 | 26.174 | 20 592 |
| August. | 7 028 | 5 658 | 6 878 | 5.508 | 26 443 | 20 706 |
| September | 7 454 | . . | 7 313 | . | 27 048 | |
| October.... | 7 426 | . . | 7.276 | . | 27 543 | ... |
| November | 7.371 | .... | 7.221 | .. .. | 26 804 | .. |
| December.. | 7.162 | . | 7.081 | . | 26 494 | .. |
| Year | 6 943 | | 6.799 | . | 26 421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January... | $15 12 | $18.15 | $13.32 | $17 35 | $14 00 | $18 59 |
| February.. | 15 03 | 18.15 | 13 28 | 17 22 | 14 01 | 18 13 |
| March | 14 95 | 18 15 | 13 66 | 16 96 | 14 10 | 17 53 |
| April | 15 13 | 17 90 | 13.90 | 16.71 | 14 15 | 16 40 |
| May | 15 14 | 17 68 | 13.90 | 15.80 | 14.12 | 15 40 |
| June....... | 15 15 | 17 14 | 14.11 | 15 40 | 14 22 | 15 10 |
| July | 15 15 | 16 31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15 43 | 16 63 | 14.90 | 15 00 | 14 85 | 14 88 |
| September. | 16 86 | | 16.03 | . | 15 63 | |
| October | 17 90 | | 17.18 | ...... | 17.22 | |
| November.. | 18 07 | | 17.09 | ...... | 18.00 | ..... |
| December... | 18 15 | | 17.45 | .... | 18 73 | . |
| Year. | $16.01 | | $14.93 | .. .. | $15 28 | .... |

## STOCK QUOTATIONS

| COLO. SPRINGS Sept 8 | | SALT LAKE Sept 8 | |
|---|---|---|---|
| Name of Comp | Bid | Name of Comp. | Bid |
| Acacia | ‡ 02½ | Beck Tunnel | 05½ |
| Cripple Cr'k Con | ‡ 01½ | Black Jack | 07½ |
| C K & N | ‡ 10½ | Cedar Talisman | 01 |
| Doctor Jack Pot. | 05½ | Colorado Mining | 07½ |
| Elkton Con | 57½ | Columbus Con | 05 |
| El Paso | 3 15 | Crown Point | 01½ |
| Findlay | 02 | Daly-Judge | 6 20 |
| Gold Dollar | 06½ | Grand Central | 50 |
| Gold Sovereign | ‡ 02½ | Iron Blossom | 1 17 |
| Isabella | 10 | Little Bell | 10 |
| Jack Pot | 04½ | Lower Mammoth | 01 |
| Jennie Sample | ‡ 05½ | Mason Valley | 5 50 |
| Lexington | ‡ 005 | May Day | 06 |
| Moon Anchor.... | ‡ 009 | Nevada Hills | 80 |
| Old Gold | 20 | New York | 02½ |
| Mary McKinney | 57½ | Prince Con | 42 |
| Pharmacist | ‡ 01 | Silver King Coal'n | 3 25 |
| Portland | 97 | Sioux Con | 00½ |
| Vindicator | 87 | Uncle Sam | 03½ |
| Work | ‡ 005 | Yankee | ‡ 08 |

TORONTO Sept 9

| Name of Comp | Bid | Name of Comp | Bid |
|---|---|---|---|
| Bailey | 05½ | Foley O'Brien | 20 |
| Coniagas | 6 90 | Hollinger | 15 90 |
| T. & Hudson Bay | 70 00 | Imperial | ‡ 02 |
| Timiskaming | 24 | Jupiter | 17 |
| Wettlaufer-Lor | 15 | Pearl Lake | 33½ |
| Apex | 01 | Porcu. Gold | 09½ |
| Big Dome | 11 75 | Preston E. D. | 01 |
| Crown Chartered | ‡ 00½ | Rea | 15 |
| Doble | ‡ 10 | Swastika | 03½ |
| Dome Exten | 05 | West Dome | ‡ 10 |

SAN FRANCISCO Sept. 8

| Name of Comp | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | .06 | Belmont. | 7.12½ |
| Belcher | 31 | Jim Butler | 60 |
| Best & Belcher | 07 | MacNamara.. | .12 |
| Caledonia | 1 67½ | Midway | 45 |
| Challenge Con | 08 | Mont.-Tonopah. | 1 17½ |
| Chollar | 01 | North Star | 71 |
| Confidence | 28 | West End Con. | 1 47½ |
| Con Virginia | 09 | Atlanta.. | 14 |
| Crown Point | 31 | Booth .... | 02 |
| Gould & Curry | 03 | C.O.D. Con | 03 |
| Hale & Norcross. | .08 | Comb. Frac | 04 |
| Mexican | 1.20 | Jumbo Extension. | 12 |
| Occidental | 70 | Pitts.-Silver Peak... | ‡.45 |
| Ophir | .23 | Round Mountain. | 36 |
| Overman.. ... | 43 | Silver Pick. | .03 |
| Potosi | 03 | Tramp Con | ‡ 01 |
| Savage | 11 | Argonaut .. | 2 00 |
| Sierra Nevada. | .06 | Bunker Hill | ‡1.75 |
| Union Con | 12 | Central Eureka. | .17 |
| Yellow Jacket | 35 | So. Eureka | ‡2.50 |

N. Y. EXCH. Sept. 9

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 78½ |
| Am. Agri Chem | 42½ |
| Am.Sm.&Ref.,com | 68½ |
| Am. Sm. & Ref., pf | 101 |
| Am. Sm. Sec., pf. B | 82½ |
| Anaconda | 38½ |
| Batopilas Min | 1½ |
| Bethlehem Steel,pf | 72 |
| Chino | 43½ |
| Federal M. & S., pf. | 37 |
| Great Nor.,ore.,ctf | 34½ |
| Guggen. Exp. | 48 |
| Homestake. | 104 |
| Inspiration Con. | 15½ |
| Miami Copper | 24½ |
| Nat'l Lead, com | 46 |
| National Lead, pf | 105½ |
| Nev. Consol | 17½ |
| Phelps Dodge | 192 |
| Pittsburg Coal, pf | 84 |
| Quicksilver, pf. | 3½ |
| Ray Con | 20½ |
| Republic I&S,com | 23½ |
| Republic I&S, pf. | 87 |
| SlossSheff'd,com. | 29½ |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper. | 34½ |
| Utah Copper...... | 55½ |
| U. S. Steel, com | 63½ |
| U. S. Steel, pf | 108½ |
| Va Car.Chem.,pf. | 98 |

N. Y. CURB Sept 9

| Name of Comp | Clg |
|---|---|
| Ariz. Belmont | 20½ |
| Barnes King. | ‡1½ |
| Beaver Con | 28 |
| Big Four | 30 |
| Braden Copper | 7 |
| B. C. Copper | 2½ |
| Buffalo Mines | 2½ |
| Can. G. & S | 19 |
| Con. Ariz. Sm | ½ |
| Davis-Daly | 2 3/16 |
| Diam'field-Daisy | 02 |
| Ely Con. | 06 |
| Florence | 24 |
| Giroux | 1 5/16 |
| Gold Hill Con | ½ |
| Goldfield Con | 1½ |
| Greene Cananea | 34 |
| Greenwater | 04 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 3 7/16 |
| Keystone | ‡2 |
| La Rose | 2½ |
| McKinley-Dar-Sa | 1½ |
| Min. Co. of A. new | 2½ |
| Nipissing Mines | 9½ |
| Ohio Copper | 5/16 |
| Pacific Sm. & M. | 1/16 |
| Puebla S. & R. | 2 3/16 |
| South Live Oak | ‡2 |
| South Utah M&S | ½ |
| Stand'd Oil of N J | 369 |
| Stewart | 1½ |
| Tonopah | 6½ |
| Tonopah Ex | 1 13/16 |
| Tonopah Merger | 70 |
| Tri-Bullion | ½ |
| Tularosa | ½ |
| Union Mines | 07 |
| United Cop., pfd | 3 |
| Yukon Gold | 2½ |

LONDON Sept 3

| Name of Comp | Clg | | |
|---|---|---|---|
| Camp Bird | £0 | 17s | 6d |
| El Oro | 0 | 11 | 9 |
| Esperanza | 1 | 1 | 3 |
| Mexico Mines | 5 | 15 | 0 |
| Oroville | 0 | 6 | 9 |
| Santa Gert'dis | 1 | 0 | 0 |
| Stratton's. | 0 | 1 | 9 |
| Tomboy | 1 | 6 | 3 |

BOSTON EXCH Sept. 9

| Name of Comp. | Clg. |
|---|---|
| Adventure. ..... | 1½ |
| Ahmeek... .. . | 281 |
| Alaska Gold M... | 19½ |
| Algomah. . .. . | 1½ |
| Allouez.. . ... | 38 |
| Am. Zinc...... | 21½ |
| Ariz. Com., ctfs..... | 3½ |
| Bonanza.. . . | .32 |
| Boston & Corbin.... | .90 |
| Butte & Balak.... | 1½ |
| Calumet & Ariz.... | 67½ |
| Calumet & Hecla | 435 |
| Centennial. .. .. | 13½ |
| Cliff............ | 1 |
| Copper Range... | 40 |
| Daly West .... | 2 |
| East Butte. ... | 12½ |
| Franklin. ...... | 3½ |
| Granby. . . . . . | 75½ |
| Hancock.. .... . | 18 |
| Hedley Gold...... | 30 |
| Helvetia . ... | 40 |
| Indiana. .... | ‡5 |
| Island Cr'k, com. | 52½ |
| Island Cr'k, pfd. . | 84½ |
| Isle Royale.... ... | 20½ |
| Keweenaw..... .. | 1½ |
| Lake ....... | 6½ |
| La Salle ........ | 4 |
| Mass. .......... | 3½ |
| Michigan ....... | 1½ |
| Mohawk. .... | 43 |
| New Arcadian...... | 1½ |
| New Idria Quick.. | 3 |
| North Butte...... | 28½ |
| North Lake ..... | 1½ |
| Ojibway. . .... | 65 |
| Old Dominion..... | 52½ |
| Osceola ....... | 86 |
| Quincy. ....... | 62 |
| Shannon ....... | 6½ |
| Shattuck-Ariz.. .. | 26 |
| Superior ... | 27 |
| Superior & Bost... | 2½ |
| Tamarack .. . .. | 31 |
| Trinity . | 4½ |
| Tuolumne . . | 60 |
| U. S. Smelting. | 38 |
| U. S. Smelt'g, pf. | 47½ |
| Utah Apex .. | 1½ |
| Utah Con . | 9½ |
| Victoria .. . | 1 1/16 |
| Winona .. | 1 |
| Wolverine. .. | 46 |
| Wyandot | |

BOSTON CURB Sept 9

| Name of Comp | Bid |
|---|---|
| Bingham Mines | 4 |
| Boston Ely | 53 |
| Butte&Lon'nDev | 33 |
| Butte Central | 02 |
| Cactus | 02 |
| Calaveras | 2 |
| Chief Cons | 1 1/16 |
| Corbin | 1 3/16 |
| Cortez | .35 |
| Crown Reserve | 1 9/16 |
| Eagle & Blue Bell | 90 |
| First Nat. Cop | 3½ |
| Houghton Copper | 3½ |
| Majestic | 31 |
| Mexican Metals | ½ |
| Moneta Porc | ‡ 07 |
| Nevada-Douglas | 2½ |
| New Baltic | 60 |
| Oneco | .81 |
| Raven Copper | 14 |
| Rhode Island Coal | 01 |
| Smokey Dev | 1 |
| S. W. Miami | 2½ |
| South Lake | 4 |
| Trethewey | 28 |
| United Verde Ext | 58 |

‡Last Quotation.

The Engineering and Mining Journal

VOLUME 96 SEPTEMBER 20, 1913 NUMBER 12

# The Motherlode Mill, Salmo, B. C.

By C. Earl Rodgers*

*SYNOPSIS—Description of a modern amalgamation-cyanidation mill designed by Merrill, in the Sheep Creek district of British Columbia. The mill is run by water power, uses stamps and tube mills for ore reduction and treats a total-slime product. Continuous agitation in Pachuca tanks is followed by thickening in Dorr machines. Precipitation is by zinc dust.*

⁂

The mill of the Motherlode Sheep Creek Mining Co. is in the Sheep Creek district, 12 miles from Salmo, B. C., a point on the Great Northern Ry., 34 miles south of Nelson. The altitude at Salmo is about 2200 ft. and that at the mill about 3400 ft. Passengers and freight are hauled to the property over a good government road. The passenger rate is $2.50 and the freight charges average about $12 per ton, depending upon the class handled.

In July, 1911, work was started on the mill. William Watson was manager and Frank C. Languth, of the Merrill staff, was superintendent of construction, the latter later taking the position of mill superintendent. Both men remained about a year after crushing commenced, to perfect the process of treatment and put the property in good condition. Green lumber was used throughout, being cut from standing timber and sawed at the company's steam-driven mill. Approximately half a million feet were sawed; 324 thousand of this having been used in the mill.

The plant, designed by the Merrill Metallurgical Co., is built on six benches, has a vertical height of 129 ft. and occupies a horizontal space 87x187 ft. The roof covering is corrugated iron over 1-in. boards, and the sides are double-boarded with building paper between. The inside boards are set at 45° and those outside, vertical. No battens are used. Steam heat, furnished by a 40-hp. boiler situated in a building adjoining the mill, is used when needed. The fuel is wood. Approximately 5000 sq.ft. of radiating surface, made up of coils of 1½-in. pipe, cut and connected at the mill, was installed to heat the entire plant. Coils were placed in the gold-solution tanks for use as needed. Each tank coil contains 114 sq.ft. of surface, while the other coils vary from 54 to

The Motherlode Mill, near Salmo, B. C.

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*Mining engineer, South Porcupine, Ont.

114 sq.ft. The main supply pipe is 4 in. with a 2½-in. return. Only standard pipe fittings were used. The boiler now in use is too small, however, as some trouble was experienced in keeping the mill sufficiently heated last winter.

### Mill Operated by Water Power

The water supply for power comes from the north and south forks of Sheep Creek and is used in waterwheels furnished by the Pelton company. Wood-stave pipe of large diameter, laid at only a slight grade, conveys the water from two log dams to the main iron pipe. The two lengths of wood pipe are 2200 and 4400 ft. From the junction of these branches the line is laid in three sections of about equal length, made up respectively of 16-in. lead-flange pipe, 15-in. iron-flange pipe and 14-in. steel pipe. The approximate length to the head of the longest branch is 15,000 ft., with a total vertical head of 700 ft. The static gage pressure is 301 lb.; under normal load, 265 lb. per square inch.

The pipe line was installed by Anderson & Warden, of Vancouver, who give the following data when the line is discharging 700 cu.ft. per min.: Friction head, 231.9 ft.; effective head, 468 ft.; theoretical head, 618.3 ft. The system has been in operation over a year and no trouble has been experienced beyond a wide fluctuation of pressure shortly after the mill started. The trouble was traced to a defective valve.

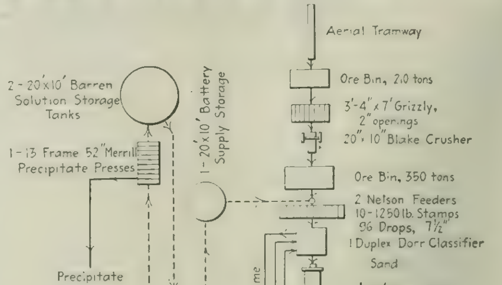
An automatic tram, furnished by the A. Leschen & Sons Rope Co., St. Louis, delivers the ore to a 210-ton, flat-bottom storage bin at the top of the mill. The vertical distance between the tram terminals is 1928 ft., horizontal distance, about 3700 ft. A 1.125-in. track rope is used with a ⅞-in. traction cable. The height of the towers varies from about 18 to 45 ft. and the longest span is 700 ft.

The system was originally equipped with 25 buckets, each of 6 cu.ft. capacity, but, as the load proved too great, the number was reduced to 20. Each bucket holds approximately 700 lb. of dry ore. When traveling at a speed of 300 ft. per min. (which can safely be maintained), the tram will deliver, if running continuously, about 130 tons in eight hours. All mine supplies are sent over this line, thus saving considerable time and expense, as there is no wagon road. The tram is operated only one shift. Because of this, in cold weather, trouble was experienced in removing and thawing the ore which froze in the loaded buckets on the line. The practice was to leave as few filled buckets as possible (5 or 6), remove the ore in one lump by striking the sides of the bucket, thaw partly with a wood fire and break to a suitable size for crushing.

### Stamps Used for Crushing

From the storage bin the ore is drawn through a rack-and-pinion gate, over a 3.3x7-ft. grizzly (2-in. openings) to a 20x10-in. Blake crusher. It is claimed this crusher requires 20 hp. to run when crushing 20 tons per hr. to pass a 1-in. ring. The crushed ore is delivered by gravity to a 350-ton, flat-bottom bin above the stamps, passing from here to two Nelson feeders. These feeders are operated by what is locally called the "monkey-wrench grip." The grip engages an auxiliary disk, beneath and protected by the usual disk, which forms the base of the feeder. Excessive wear is thus prevented.

Ten 1250-lb. Fraser & Chalmers stamps crush through 14-mesh (opening 0.046 in.) Tyler screens and have a rated capacity of 70 tons per day, though in a test run 102 tons were crushed in 24 hr. Water is supplied to each stamp at the back, through a pipe fitted with a valve to regulate the flow. Order of drop is 1-4-2-5-3; height of drop, 7½ in.; height of discharge, 4 in.; speed, 96 drops per min. Fraser & Chalmers forged shoes have an average life of 75 days, while Cammell-Laird dies run 81 days.


Aerial Tramway
Ore Bin, 210 tons
3'-4"x7' Grizzly, 2" openings
20"x10" Blake Crusher
Ore Bin, 350 tons
2 Nelson Feeders
10-1250 lb. Stamps
96 Drops, 7½"
1 Duplex Dorr Classifier
Sand
Slime
5'x20' Tube Mill
1-6'x17'
1-6'x12'
Amalgamating Plates
To Retorts
2-Frenier Pumps
1-30'x10' Dorr Thickener
2-5"x5" Aldrich Slime Pumps
1-8'x25' Pachuca Tanks Continous
1-25'x10' Dorr Thickener
1-25'x10' Mechanical Agitator Tank
2-3'x4', 35 Frame Merrill Slime Filter Presses
2-20'x10' Barren Solution Storage Tanks
1-13 Frame 52" Merrill Precipitate Presses
Precipitate Melted
1-20'x10' Battery Supply Storage
1-9'x13' Overflow Storage Tank
1-5'x7' Aldrich Pump
Zinc Feeder
1-9'x13' Overflow Storage Tank
12-3'x3' Frame Merrill Clarifying Filter Presses
2-20'x10' Pregnant Solution Tanks
Eng. & M. Journal

Flow Sheet of Motherlode Mill

An average screen analysis of the battery discharge is shown in Table 1.

TABLE 1 SCREEN ANALYSIS OF BATTERY DISCHARGE

|  | +40 | +60 | +80 | +100 | +150 | +200 | -200 |
|---|---|---|---|---|---|---|---|
| % | 18.5 | 12.2 | 9.0 | 4.7 | 15.0 | 19.2 | 21.4 |

From the stamps, the ore originally passed by gravity to one of the two Merrill cones of special design, tried first in Mexico, I believe. They were not hydraulic. Each had an intermittent discharge. A rod carrying a plug passed vertically through the cone, and the plug was kept in place by suitable counterweights, until moved by a power-driven wheel. The discharge was thus opened for a definite interval, depending upon the class of ore, and it was expected these cones would deliver a heavier and even better classified product than the usual type of Merrill hydraulic cone. They did not prove a success at this plant, owing to the heavy sulphide ore frequently milled, and were finally replaced by a Dorr duplex classifier. The overflow from the classifier goes directly to a 30x10-ft. Dorr thickener, the sand being delivered to the tube mill.

### TUBE MILL FOR REGRINDING

Sufficient dry lime is added at the stamps to bring the overflow of the first Dorr thickener up to about 0.2 lb. for settling. No lead salt is used regularly. The lime for the cyanide plant is weighed, slacked in one tank and discharged into a second tank fitted with a mechanical agitator. As usual, a residue is left in the process of slacking. This, amounting to approximately 10%, is fed to the tube mill as a further aid to settlement for dewatering.

As originally supplied, the tube mill (Fraser & Chalmers, 5x20 ft.) was gear-driven, but after breaking several pinions this drive was removed and belts, with the necessary pulleys, substituted. A speed of 30 r.p.m. was first tried, but this was later reduced to about 26, with satisfactory results. El Oro liners have been used, and the original set lasted eight months. There has been some talk of trying a liner closely resembling the Komata, though the El Oro liners are still in use and the consumption on the first set was 0.83 lb. per ton of ore milled.

Danish pebbles are used chiefly, although a few experiments were also made with Newfoundland pebbles and mine rock. Table 2 shows some of the data collected. All screen analyses given in this article were made dry.

Comparative samples of tube-mill discharge were taken, using the same mesh battery screen, as near as possible the same class of ore and running the mill the same speed and equal load in both tests.

TABLE II. COMPARATIVE WORK OF DIFFERENT PEBBLES

| Mesh Screen | Mine Rock | Newfoundland Pebbles |
|---|---|---|
| + 20 | 0.0 | 0.0 |
| + 40 | 1.3% | 0.2% |
| + 60 | 5.2 | 0.9 |
| + 80 | 18.7 | 5.6 |
| +100 | 19.3 | 3.5 |
| +150 | 23.3 | 22.3 |
| +200 | 13.5 | 34.4 |
| —200 | 18.7 | 33.1 |

| Mesh Screen | Newfoundland Pebbles | | Danish Pebbles | | Ratio of 7, of lump ore to 1 Danish Pebbles | |
|---|---|---|---|---|---|---|
| | Feed | Discharge | Feed | Discharge | Feed | Discharge |
| + 40 | 0.0 | 0.0 | 18.0 | .... | 16.2 | ...... |
| + 60 | 1.7 | 0.7 | 11.0 | 1.2 | 13.5 | ..... |
| + 80 | 5.0 | 2.5 | 12.3 | 1.7 | 10.5 | ...... |
| +100 | 4.0 | 1.5 | 7.0 | 2.5 | 3.0 | ...... |
| +150 | 20.0 | 12.0 | 15.7 | 20.7 | 10.5 | 20.5 |
| +200 | 22.0 | 14.5 | 17.5 | 39.0 | 12.5 | 43.0 |
| —200 | 47.3 | 68.8 | 18.5 | 34.9 | 33.8 | 36.5 |
| | (1) | | (2) | | (3) | |

No. 1 was made with 28-mesh (opening 0.0232 in.) screen on battery, while Nos. 2 and 3 were made with 14-mesh (opening 0.046-in.). Under normal conditions the moisture in the mill feed runs about 38 to 40 per cent.

### PLATE AMALGAMATION PRACTICED

Only the reground product goes over the plates. This flows by gravity. First, the plates were placed in two systems of four each, having drops of about ½ in. between each section, a grade of 1⅞ in. per foot, and a total area of 204 sq.ft. When milling ore carrying very little sulphide this grade was sufficient, but it was found necessary to have it increased to 2⅜ in. in order to handle the heavier material later encountered in the mine. One section of plate was removed from one of the systems, leaving 174 sq.ft. area. The drops were also reduced to the thickness of the copper plates, to prevent scouring.

From the plates, the pulp is elevated to the Dorr classifier by two 10x54-in. Frenier pumps (one old and one new type) where any oversize is returned to the tube mill.

The thickened pulp, gravity about 2, discharged from the first thickener already mentioned, is here automatically sampled, diluted with barren solution, milk of lime added to bring the strength up to about 2 lb. per ton and then lifted by two 5x5-in. Aldrich triplex slime pumps. The clear-water overflow from the thickener goes to a 9x13-ft. tank and is pumped by a 5x7-in. Aldrich triplex pump to a 10x20-ft. battery-water supply tank above the stamps.

The slime pumps discharge into the first of a series of four 8x25-ft. Pachuca tanks, connected in series. A gravity of about 1.3 is maintained; sufficient strong solution being added to bring the cyanide strength up to about 1.75 lb. per ton. As supplied, the tanks were connected by the "diagonal" system but, as it was difficult to keep the pipes open, straight connections were later made.

From the last Pachuca, the pulp is admitted through the usual slotted-sleeve arrangement, to the second Dorr thickener, 10x25 ft. The clear overflow goes to a 9x12-ft. supply tank, from which it passes to a 12-frame, 3x3-ft. Merrill clarifying press. The effluent from this press flows directly to the pregnant-solution sumps.

The pulp from the second Dorr thickener empties into a 10x20-ft. sludge tank. This is equipped with a mechanical agitator driven at 6½ r.p.m. The gravity here is 1.6 to 1.7.

Two, 3x4-ft., 35-frame, Merrill slime presses take this pulp under a pressure of about 27 lb. per sq.in. The time of operation, of course, varies considerably, but the following is about an average cycle:

| | |
|---|---|
| Filling at 27-lb. pressure.......... | 6 to 15 minutes |
| Washing, at 26-lb. pressure... | 15 to 30 minutes |
| Sluicing at 26-lb. pressure. | 25 minutes |

The screen analysis of the slime undergoing filtration is on 80-mesh, 1%; on 100, 1%; on 150, 8.5%; on 200, 23.5% and through 200-mesh, 66%. In this connection it may be said that the material treated by the presses is very granular. Even that which passes the 200-mesh screen shows the same granular form when examined under the microscope. The effluent solution from the presses goes to two 10x20-ft. gold sumps on the lower floor of the mill. Whenever necessary, the cloths from both the slime and clarifying presses are treated with commercial hydrochloric acid in the usual manner.

### ZINC-DUST PRECIPITATION

Zinc dust fed by a Merrill zinc-dust feeder of the later type is introduced to the suction of a 5x7-in. Aldrich triplex pump which lifts to the top floor of the mill to a 13-frame, 52-in. Merrill precipitation press, of the top-discharge type. The barren solution passes to two 10x20-ft. storage tanks just beneath the press.

The precipitate is acid treated, fluxed and melted, either in a coke- or a gasoline-fired furnace. A briquetting machine and an English cupeling furnace, wood-fired, form part of the refinery equipment, but have not been regularly used. By acid treating and melting, a bullion running over 820 fine can be obtained from an acid-treated product going about $27 per lb. As the amalgam bars run only about $2 per oz. higher than the cyanide bars, the results are quite satisfactory, considering the low cost of treatment and the small amount left in byproducts.

The method which gave these results was to obtain a matte while melting the precipitate. This matte was then re-treated and the bullion thus recovered added to the original, the entire metal being remelted and run into bars.

Two air compressors are used, both Sullivan machines. One is 10x12-in. class W. G., and the other 24x14½x18-in. class W. J. The first furnishes air for the mill; the second for the mine. A Canadian General Electric, 3-phase, 60-cycle, self-excited generator furnishes light for the mill, mine and adjacent buildings, and power for the assay office and refinery. It also supplies current for the hot plates in the assay office. The voltage to the mine is stepped up to 2200 for transmission. In all lighting the three wires are carried to the extreme end of each circuit to insure a perfect phase balance. Leads to the top of the mill are of No. 0 cable, B. & S. gage. From the mill to the transformers, No. 4 solid is used and No. 8 solid on the 2200 line. All are weatherproof. The wires are carried on wooden poles beside the tram.

The accompanying figures are averages, taken over a period of six months, of the amounts of materials used.

| | Lb., per ton ore treated |
|---|---|
| Pebbles | 7.78 |
| Cyanide | 2.26 |
| Lime | 3.60 |
| Zinc | 0.29 |

The total extraction based on assay of press charges is about 96 to 98%. Of this about 77% comes from amalgamation and about 88% from the cyanidation, a total of about 97% of the total ore content.

In closing, I wish to acknowledge my obligation to Frank C. Languth, of whom mention has already been made, for much information herein contained. Further, it may be well to state that the entire management of the Motherlode mill has recently been changed, and that, consequently, these notes may not conform strictly with present practice, but will be found correct for the period over which they were taken.

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## Production of Abrasive Materials

According to the U. S. Geological Survey, the production of natural abrasives includes millstones, grindstones and pulpstones, oilstones, corundum and emery, abrasive garnet, infusorial earth, tripoli and pumice. The difficulty of separating abrasive quartz and feldspar from the quartz and feldspar produced for other purposes has led to their omission from the chapter on abrasives.

The production of millstones, buhrstones, chasers and dragstones in the United States in 1912 was the largest in this country since 1888. For the last 25 years the returns to the Survey from this industry have shown great fluctuations, which have been difficult to account for satisfactorily. It is natural to suppose that a market for millstones, made as they are from quartz conglomerates, would have declined in recent years because of the introduction of other grinding machinery. The replacement of millstones, it is but natural to assume, would be gradual, and the value of millstones would therefore show a steady falling off. This, however, has not been the case. The production of abrasive garnet in 1912 amounted to 4182 short tons, produced in New York, New Hampshire and North Carolina. Production of pumice amounted to 27,146 short tons, an increase of 5457 tons over the 1911 production.

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## The Production of Fluorspar and Cryolite

The total quantity of domestic fluorspar reported to the U. S. Geological Survey, as marketed in 1912, was 116,545 short tons, as compared with 87,028 short tons marketed in 1911, an increase of 29,497 short tons. This increase represents nearly 34% of the quantity marketed in 1911. The production and sales of fluorspar in 1912 were by far the greatest ever recorded. The total quantity of domestic gravel spar marketed in 1912 was 99,285 short tons, as compared with 69,825 short tons in 1911, an increase in quantity of 29,450 tons.

Fluorspar was produced in 1912 in five states, Illinois, Kentucky, Colorado, New Hampshire and New Mexico, quantity of production being in the order named. Increases in sales were reported in Illinois and Colorado, and slight decreases in Kentucky, New Hampshire and New Mexico. Gravel spar was produced by all these states. Illinois and Kentucky reported sales of lump spar, and Illinois of ground spar. Fluorspar or fluorite, chemically calcium fluoride ($CaF_2$), consists of calcium and fluorine in a proportion of 51.1 to 48.9. The mineral is crystalline, only slightly harder than calcite. It crystallizes in the isometric system and is found commonly in cubical crystals.

In color it ranges according to purity from a clear slightly bluish or green glasslike substance through various other brilliant colors to dark purple, although much of it is white and opaque. No accurate estimate of the annual consumption of fluorspar in the United States can be made without a knowledge of the stocks maintained by the consumers. These stocks are probably variable, but as the value of fluorspar as a flux in openhearth steel making and in other metallurgical operations has become so generally appreciated, consumers are taking care to keep large stocks in reserve.

No cryolite is produced in the United States, the entire supply used in this country being imported from Ivigut, an Eskimo hamlet on the southern coast of Greenland. The quantity reported to have been imported for consumption in 1912 was 2126 long tons. Cryolite was imported free of duty in 1912.

⁂

**A Monster Blast in the Boundary District** of British Columbia broke down 200,000 tons of ore Sept. 1. The blast was made at the British Columbia Copper Co.'s Mother Lode mine, at Greenwood. For several months previous, in addition to the ordinary work at the mine, the task of drilling 4830 holes, averaging in depth between 14 and 15 ft., had been going on under the direction of the company's general superintendent, F. S. Norcross, Jr. This system of breaking ore was begun in 1911, but for dimensions this latest blast exceeded all others that have taken place in the history of the mine. The noise was not heard either at Phœnix or at Greenwood; at the latter town and at Midway, a slight tremor of the earth was the only intimation that the blast had taken place. Extreme precautions against accident were taken, and not only were the families of the mine employees ordered from the vicinity, but their household effects also went with them. Electricity was used to fire the charges, which were connected by 16 miles of wire, and consisted of 24½ tons of 40% dynamite.

# Factors Affecting Choice of Mining Method

By E. M. Weston*

*SYNOPSIS—Available methods of exploration and development. Choice of mining methods should consider protection of surface against caving, possible future mining of low-grade material, the assistance of gravity, the economical percentage of extraction, availability of labor and capital expenditure. A study of an ore deposit to be worked should include its probable persistence, effect of oxidation, dimensions, friability, lines of weakness, soundness of country rock, character of foot and hanging, overburden, the dip of the deposit as influencing the handling of material and spacing of levels, filling material available, etc. Timber substitutes, hand or machine drilling, safety and health of the workmen, are points requiring investigation.*

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An engineer charged with the necessity of developing and operating a mine, and turning to published accounts of mining methods for information, will find that, while a great number of methods are listed and described, there is relatively little information as to the particular fields for which each is suitable. A good method in one place will be worthless in another, and to make a choice for any one mine requires a detailed study of the local conditions, always bearing in mind that the object of mining is to obtain the greatest possible amount of the valuable constituents of the orebody at the minimum of expense in human life, time, capital outlay, labor, supplies and supervision.

### Methods of Exploration and Development

The first operation in connection with an orebody is exploration and development; the means available for this are drill holes, adits and shafts. An orebody lying at a flat angle, or a massive deposit, is susceptible to drilling. Such are the Main Reef series of the Witwatersrand, the disseminated copper ores of the southwestern United States, the iron deposits of the Mesabi range, and the lead and zinc of Missouri. Steeply dipping narrow deposits and deposits of an erratic nature will not repay exploration by boreholes, except in a supplementary capacity following partial development by full sized workings. Exploration through adits is to be recommended only after considerable work in the upper portions of the orebody has furnished information as to its size, dimensions and persistence. The man who starts an adit to intersect a lode in depth, instead of sinking on it, generally pays for his folly. Exploration through shafts and drifts is the most expensive and the most satisfactory; it should be so conducted as to give a maximum amount of information about the deposit and at the same time facilitate its final extraction.

Development work should be confined to the orebody, so far as possible; during preliminary exploration, openings in waste consume capital and do not even help to pay for themselves by furnishing filling, since this in early operations is not needed. It should be remembered also that development work, even when in the orebody, is more expensive than stoping per unit of volume or of weight, inasmuch as there is only one free face to break to. In some cases, where the orebody is large and stands well for some time, this fact leads to a combination of development and stoping operations, that is, development work is conducted on a large scale carrying a face 30 ft. or so in width in order that the easy breaking conditions obtained in a stope may be approximated.

### Protection of Surface and Future Operation Must Be Considered

An important point to consider in selecting a mining system, is the protection of the surface and of adjoining property. Damages due to caving may require the payment of penalties which will largely reduce the profit. It must also be borne in mind that what is waste today may be ore tomorrow, and the method of extraction must be devised with an eye to the possible future mining of bodies which are now unprofitable. Such a metamorphosis from waste to ore may be the result of improvement in treatment methods or of increases in metal prices. Cases are known where extensive drifting and timbering were necessary to reach low-grade deposits, the access to which was closed by collapsed workings, although with a slight expenditure this might have been prevented. Thus, in many cases, it may be advisable to abandon temporarily a certain amount of valuable ore, leaving it in the form of pillars to support the working places, or it may pay to go to some extra expense in the introduction of filling or timbering to keep the workings open on the chance that contiguous low-grade bodies may prove profitable in the future.

### Force of Gravity Should Be an Assistance

The assistance of the force of gravity in mining is one not to be neglected. In a country of rough topography, extraction through adits is possible, thus using the force of gravity to deliver the ore and water to the main haulage level without the necessity of hoisting. Similarly, gravity, acting through roof pressure, may be invoked to break down the ore, as in the caving method. It should be noted, however, when considering the possibility of caving, that heavy pyritic ores may be set on fire by the heat developed in the collapse.

### Economical Percentage of Recovery Varies

The percentage of ore which it will pay to recover depends on its value, on its mode of occurrence, and on the value of the overlying surface. To take extreme cases, in a narrow vein of extremely rich ore, it pays to remove every pound that can be economically broken and to keep the workings open with timber; while in mining large bodies of small unit value, such as gypsum, it is better to leave a large portion of the deposit in the form of pillars rather than to introduce more expensive forms of support.

### Considerations of Labor and of Capital Outlay

The human element must not be neglected when selecting a mining system. Apart from humanitarian considerations, dangerous methods, although apparently cheap, are likely to prove expensive in damages paid for employees killed and injured. Similarly, ventilation and dust laying must be provided for. On the Rand, the miners were allowed to kill themselves for years by inhaling dust and powder gas. As a consequence, the operators have lost millions of dollars by having to use inefficient labor. It is now realized that efficient work cannot be had while working conditions underground, or living conditions on the surface, are bad.

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*Union Club, Johannesburg, South Africa.

The ability of the available labor to carry out the method of mining selected is a matter of importance. A system which is dangerous or requires great skill must be rejected in favor of some simpler method where unskilled, ignorant labor is all that can be had. Turning to the Rand again, simple as the mining is and essentially safe, yet the natives contrive to kill or injure themselves in the most unexpected ways. In Australia and America, on the other hand, the accident rates, even in the heavily timbered mines, are relatively low, inasmuch as the miners are highly paid and intelligent. Some races have especial ability in certain lines. The Italians and Mexicans, for instance, can do wonderful work building dry rock walls underground. Where labor is cheap and plentiful, it pays to reduce the capital expenditure and stand a little more in wage cost, by adopting a system that uses hand work as against machine. In deciding the amount which it is wise to put into capital expenditure, the great point to be considered is the probable life of the mine. A heavy initial expenditure must be spread over a large number of tons to be justified.

### STUDY OF THE CHARACTER OF THE DEPOSIT

Before choosing his mining method, the engineer must ascertain all the facts possible in regard to the property in his charge. He must study the deposit, to ascertain, if possible, whether it is of a persistent and regular type, such as the Lake Superior copper beds, the massive sulphide bodies of Rio Tinto and Mount Lyell, the great lodes such as the Veta Madre, the Comstock and the California Mother Lode; or whether it is of an erratic type, requiring more preliminary and continued exploration and development. This will involve a study of the geology, mineralogy, topography, climate, etc., as influencing not only the character of the orebody, but subsequent operations as well. The character of the deposit itself must be examined, whether, if it be an oxidized outcrop which is sure to change to sulphide in depth, this change will influence mining and treatment methods. Thus if the gangue be hard and insoluble, the influence on mining methods of a change to sulphide might be small, while the influence on the method of treatment might be of the highest importance; if both gangue and ore are susceptible to alteration, both mining and treatment methods will have to be revised when unaltered horizons are entered in depth.

The dimensions of the deposit must be taken into consideration, its suitability to underground sorting for furnishing filling material, its friability, its stickiness or its lack of cohesion, and its liability to combustion by flame or friction. Hard vein material may contain its valuable constituents in a friable form and thus necessitate special care in breaking and handling, lest the rich fines be lost. There may be certain lines of weakness to which the ore will break, such as one of the walls; or in a soft vein it may be advisable to undercut along one side, so that the force of the blast will be at right angles to the direction of the workings, and thus allow timbering to be kept as close as necessary.

### INVESTIGATION OF COUNTRY ROCK, FOOT AND HANGING WALLS AND OVERBURDEN

The character of the country rock requires investigation; whether it be soft on the surface, changing to firm rock in depth, or whether alterations may be expected to continue well below the surface, thus necessitating protection against great pressures, or whether the rock be hard on the surface and in depth as well. The character of the hanging wall, whether it be regular and firm, thus reducing to a minimum the amount of necessary support, and the character of the footwall, whether it be hard and smooth, thus facilitating shoveling when the dip is flat, are points of great importance. The angle of dip is important in itself, and the possibility of its change in depth, such as often occurs in a bedded deposit, is even more important.

In a massive deposit the character of the overlying rock or soil is a factor to be reckoned with. When hard and solid, an immense orebody may be extracted below it without a support of any kind. When extremely soft, it may be splendidly adapted for caving or top-slicing methods of mining. When intermediate between these extremes, it may require the use of some filling system for its extraction.

### INFLUENCE OF FLAT DIPS

Flat dips, less than the angle of rest of broken material on the foot wall, add greatly to the expense of handling the broken ore. Depending on the dips will be the question of the proper spacing of the haulage levels. To determine this, the engineer must be familiar with the relative costs and advantages of the different systems of handling the material under these conditions, such as shoveling, self-acting inclines, shaking chutes, aërial trams, other mechanical conveyors, and water chutes. The points to be considered are the capital investment and working costs of the various systems, balanced against the capital investment and working costs of the haulage levels. The facility of distribution of timber, other supplies and filling, if secondary, is still an important point, as is that of ventilation. The economical spacing of the main levels is susceptible of calculation when sufficient information can be had.

### FILLING MATERIAL AVAILABLE

When filling is necessary, the sources of material open are sorted waste from mining, material from the surface, waste from special openings underground, and waste from development work. When sorted waste is to be used, the question of the loss of valuable ore during subsequent stoping must be considered. Sometimes this sorting may be done immediately without, however, putting the material into walls or filling until the face has advanced some distance, so that no fine stuff need be lost. This is the method adopted at the Nigel mine on the Rand, where the reef dips 15° and is so hard as to need to be broken with high-power explosives. When waste obtained from development work is used for filling, the method of transporting it to the stopes where needed requires to be worked out. Filling from the surface is becoming increasingly common. At Broken Hill, New

South Wales, the waste piles from the opencuts furnish a cheap filling; at St. John del Rey, the huge hill of red earth supplies an ideal material; at other properties special quarries on the surface are opened; residue from reduction operations, such as tailing from cyanide plants, is frequently available. The handling of this material and its transportation underground is becoming a study of increasing importance.

### Timbering, Machine Drilling, Safety and Health

When timbering is necessary, its reduction to a minimum is a subject requiring careful investigation, and the possible use of such substitute as steel, concrete, stone walls, whether dry or of masonry, etc., is claiming attention.

To determine the method of breaking the ore, the cost of power must be balanced against the cost of human labor. A large part of the cost of power is the fixed charge against the initial capital expenditure. When labor is cheap and efficient, the use of air compressors, rock drills, dynamos, etc., is often uneconomical; but where power is cheap and labor dear, the aid of machinery must be sought. Where machinery is to be installed, available sources of power must be investigated.

Perhaps the point of greatest importance is the matter of safety, and conservation of health. This covers such points as the prevention of accidents, including fires, the elimination of dust, the provision of an adequate supply of fresh air, and prevention of the spread of communicable diseases.

## Phosphate Rock Production

The marketed production of phosphate rock of the United States, in 1912, was 2,973,332 long tons, according to the U. S. Geological Survey. As compared with the marketed production of 1911, which amounted to 3,053,279 long tons, there was a decrease in quantity of 79,947 tons, or 2.6%. The quantity of hard rock marketed in Florida, in 1912, as compared with 1911, showed an increase, which was true also of its value and the price per ton which it brought, but the sales of both land pebble and river pebble in this state declined. There was also a decrease in the quantity of land rock sold in South Carolina. In Tennessee the sales of both brown and blue rock diminished. The sale of phosphate rock in the Western states, Idaho, Utah and Wyoming, increased slightly, but the production of these states is insignificant, amounting to less than 0.5% of the production of the country.

Prices generally averaged a little higher in 1912 than in 1911. The quantity mined showed gains in 1912 except in South Carolina; for example, 3% in Florida, approximately 12½% in Tennessee, and 10½% for the three Western states combined. The total quantity mined in 1912 was 3,190,587 long tons, as compared with 3,102,415 long tons mined in 1911. Stocks of rock on hand at the close of 1912 showed a gain of nearly 37% in the Florida field, and nearly 61% in the Tennessee field. In South Carolina, stocks diminished by about 27%. On the whole, activity in the main Southern phosphate field did not experience a setback. The relative production of the district is of interest from year to year, and during the year 1912 the proportions were very nearly the same as for 1911.

The imports of fertilizer material in the United States, in 1912, included a considerable diversity of substances, among which may be mentioned apatite, bone dust, calcium, cyanamid, guano, kainit, manuresalts, phosphates and basic slag, ground or unground. Reserves of phosphate rock are principally in Florida and in Idaho, Montana, Utah and Wyoming. The estimated quantity of high-grade rock containing 70% or more of tricalcium phosphate included in the area surveyed in detail to date is more than 3,000,000,000 long tons, yet it is possible that such an estimate may be excessive.

## Monkeying with the Buzzsaw

By Corliss Bulger

This has always been a most diverting pastime, appealing specially to the young and curious. We dearly love to find out the exact point where the actual edge is on the hazy outline of the whirring circular saw; it is great fun to see how near we can come to being run over by an automobile; it affords us reasonable entertainment to see how white a motorman gets when he just misses us; feeling moving machinery is fascinating; and there is no time when skating is more enjoyable than when the ice is not quite strong enough to support us.

And we never know just what will happen when we investigate a blasting cap. When we ask the results of hitting it with a hammer we are frowned upon, and there is no way of being enlightened on the subject so fruitful of immediate and convincing results as by trying it ourselves. When we ask "What is fulminate of mercury?" with which blasting caps are filled, even the learned are apt to hedge. If we inquire what could happen if we dropped a cap into the kitchen stove, our desire for learning is not appeased. We are told we had better not try it; so we have either to abandon our search for exact knowledge or try the experiment. It was reported lately that—

Willie found some dynamite,
Didn't understand it quite;
Curiosity never pays—
It rained Willie seven days.

The disintegration and distribution of this earnest investigator is much to be deprecated and lamented, of course, but Willie will probably be much better off as the result of his experiments with dynamite than he would have been going through life with one or two eyes and several fingers or a hand missing, which probably would have been the case if blasting caps had been the subject of his examination, instead of the beneficent and kindly dynamite.

Willie was undoubtedly an unusually resourceful child in making the dynamite go off at all. Modern powder makers are lying awake nights thinking up ways of making dynamite safer and more insensitive. That is all very well; but, unfortunately, larger and stronger blasting caps must be made to explode this dynamite, and more and more of them. Then some miner carries home a few caps in his overall pockets, his wife finds them when she goes through his pockets, and puts the caps on the kitchen shelf—and the first thing you know Willie or Heine or

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Dominick or little Angelo has one and is making off with it, and pretty soon there is trouble in that household.

There are lots of ways of getting crippled by exploding blasting caps besides hitting them with a hammer and putting them in the fire. Extracting the contents with a pin distributes untold fingers; holding a lighted match under them or thrusting the flaming end into the cap gets immediate action. In the mines and quarries, even, where the men who have to use blasting caps every day ought to know better, there are plenty of mangled hands and punctured hides as the result of crimping caps on fuse with a jack-knife, pointed nail, or any tool that's handy. Many a miner has blown a hole through his face in biting the cap on the fuse, and others have filled themselves with copper or have been killed outright by the sparks from their hat lamps or pipes dropping in an open box of caps. Lots of blasters continue to bite the caps on the fuse, and think that because they have never exploded them they never will; but some day they will bite the business end and lose something besides teeth. It is much easier, and lots safer, to use the crimper, a tool made for the purpose. Accidentally stepping on a cap will often spoil a perfectly good foot. Sparks, flame, heat, blows, friction—it's all the same to the cap.

Boys often play in and around quarries on Sundays, and sometimes pick up stray caps and start to investigate them. They perhaps know they are dangerous, and that a spark or a blow will explode them; but they do not realize how sensitive they are, how violent the explosion, or how the pieces of copper fly. Even the name is misleading in this respect. The word "caps" suggests the paper caps used with toy pistols, and because the blasting caps are called by this name it is natural to think that the two articles belong to the same family. They may; but they bear about the same resemblance to each other that a man-eating tiger does to the gentle pussycat.

Over 600 children have been hurt or perhaps crippled for life in the last five years from playing with blasting caps. If this had happened at one time, what a howl would have gone up all over the world! But because the accidents are spread all over the country and happen at the rate of only about ten a month, nothing is done by the authorities. Indeed, nothing can be done except to educate the whole population to realize how dangerous these exceedingly useful things are when they are out of their proper place, and what a dreadful thing it is going through life crippled or blinded for want of a little care and knowledge.

A blasting cap is a copper shell about 1/4 in. in diameter and an inch or two long, half full of fulminate of mercury. This fulminate is the most sensitive and about the most impulsive explosive in common use. Blasting caps contain anywhere from 15 to 20 grains of it; primers for firearms cartridges usually contain not more than 1 grain. The explosion of the fulminate is so exceedingly quick that the flying particles of copper will imbed themselves in iron a foot away. They will blow a hole through a steel plate 1/16 in. thick. A box of caps will blow a beautiful square hole right through a 2-in. oak plank. One cap will blow a child's hand off with the utmost certainty and dispatch. Lingg, one of the Chicago anarchists, committed suicide by biting a blasting cap between his teeth. [illegible] all the 600 or more accidents reported from playing with blasting caps, there are only two or three in which somebody was not hurt.

Electric blasting caps (fuses) are as strong as ordinary blasting caps; but as the capsule or shell is sealed up with a sulphur plug through which the wires are carried down to the fulminate, not so many accidents occur in playing with them. They are generally dipped in dark-colored wax, and are not such attractive playthings as the bright copper blasting caps; but "they get there just the same." Amateur electricians are earnestly advised to bury the electric cap a foot or two in the earth before trying to pass electric currents through the wires, and they had better not do it then. Don't open it up to see what's in it! Explosive manufacturers are not given to imparting trade secrets promiscuously; but they will gladly tell what's in the caps and how they are made rather than have you blow your hands off trying to find out for yourself.

Don't carry caps around in your pockets! Don't take them home with you! Don't leave them where children can get at them! *Don't monkey with them!*

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## Franklin Mining Co.

In 1912 the Franklin Mining Co., Hancock, Mich., completed 5134 ft. of development work and produced 1,710,651 lb. of refined copper. The company completed the year with a surplus of $41,839.27. All expenditures amounted to $412,933.41, of which $365,026.05 was reported as mine and mill expense. A summary of the statement of mine expense shows:

219 ft. of shaft sunk at $11.58 per ft.
351 ft. of raising at $9.302 per ft.
4,365 ft. of drifting at $5.792 per ft.
199 ft. of crosscutting at $5.57 per ft.
12,571 fathoms of stoping at $6.623 per fathom.

The following charges apparently are not included in the costs stated above: Compressor and drills, $25,171; labor and other expense, $42,777; hoisting expense, $17,181; rock-house expense, $5625; transportation, $18,432; surface and incidental expense, $29,358; stamp-mill expense, $56,640; construction at mine and mill, $43,209; exploring, $2980, and taxes, $11,122. It was planned to treat 1200 tons of ore per day, but owing to labor troubles and reorganization of the working force it was possible to treat only about two-thirds of this amount. An aërial tram 1100 ft. in length was constructed to carry coal from the new boiler house to the compressor plant. The company lost $81,394 through S. R. Dow's failure.

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## Shannon Copper Co.

Report of the Shannon Copper Co. for the second quarter of 1913 shows that 69,051 tons of ore from the Shannon group and 13,367 tons from the company's outside properties were mined and treated, producing 3,243,181 lb. copper, 21,925 oz. silver, and 123 oz. gold. Average cost of copper for the quarter was 14.434c. per lb., and 15.107c. per lb. was received for it. Net profit for the quarter was $28,721. High cost and low price of copper are responsible for the low profits.

Average extraction was 13.66 lb. of copper per ton from the Shannon ores and 13.57 lb. per ton from outside ores.

The company has acquired by purchase in the open market $42,000 par value of the Shannon-Arizona Ry. bonds, it being the policy of the company to buy each year a sufficient number of the bonds so that at their maturity in 1919 the copper company will be the sole holder.

# Extralateral Rights to Quartz Veins

*SYNOPSIS—A complete treatment of the law of extralateral rights, embracing all the conditions under which such rights may exist, as determined by the court decisions.*

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The term "extralateral rights," was coined by Dr. Rossiter W. Raymond, the eminent mining engineer and expert, soon after the passage of the Act of Congress of May 10, 1872, and was used by him to define the right given by the Act, to follow the vein on its departure from the perpendicular, on its descent into the earth, after it has passed through the vertical side lines of the claim.

### Text of the Extralateral Law

This right is given by Sec. 2322, U. S. Revised Statutes, which is as follows:

> **Sec. 2322. That the locators of all mining locations heretofore made, or which shall hereafter be made, on any mineral, vein, lode, or ledge, situated on the public domain, their heirs, and assigns, where no adverse claim exists at the passage of this act, so long as they comply with the laws of the United States and the state, territorial, and local regulations, not in conflict with said laws of the United States, governing their possessory title, shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations and of all veins, lodes, and ledges, throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of said surface locations; provided, that their right of possesion to such outside parts of said veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward as aforesaid, through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of said veins or ledges. And provided further, that nothing in this section shall authorize the locator or possessor of a vein or lode which extends, in its downward course, beyond the vertical lines of his claim, to enter upon the surface of a claim owned or possessed by another.**

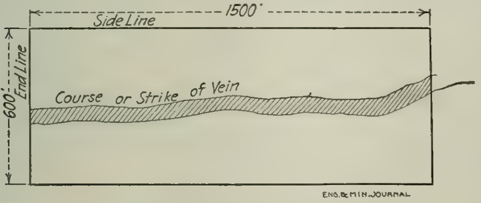

FIG. 1. IDEAL LOCATION

It is provided in Sec. 2320, U. S. Revised Statutes, "that the end lines of each claim shall be parallel to each other."

In order to obtain a full understanding of the provisions of this statute, a few definitions of the words and terms used therein seem necessary.

COURSE OR STRIKE—The course or strike of a vein is its length horizontally, within the boundaries of the claim. Some contend that the course of a vein applies particularly to the apex thereof, and the strike applies to the vein below the apex. The words, however, seem to be interchangeably used by the courts in their decisions.

DIP—The dip of a vein is its departure from the perpendicular, on its descent into the earth.

APEX—The apex of a vein is the entire top of a vein, on its course or strike through a mining claim. It is that part of the entire vein which comes nearest the surface of the earth; where the vein, to use the language of Judge Miller, "seems to have been broken off." It does not mean the highest point on the vein, as the ordinary meaning of the word would indicate, but the entire top of the vein within the boundaries of the claim.

SIDE LINES—The side lines of an ideal mining claim are those which mark the width of the claim on the surface, and run parallel with the vein on its course through the claim.

END LINES—The end lines of an ideal mining claim are those which mark the width of the claim on the surface and run at right angles to the vein on its course through the claim.

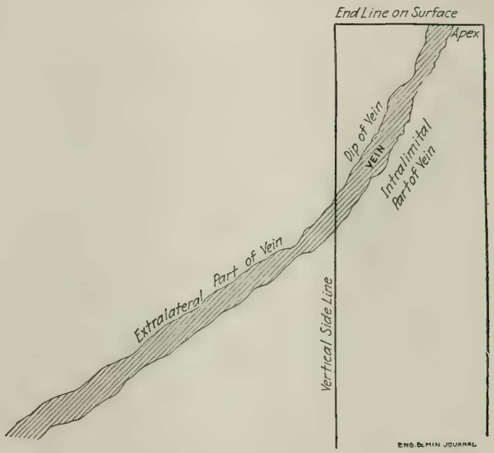

FIG. 2. CROSS-SECTION, IDEAL CLAIM, SHOWING DIP

### The Ideal Claim Defined

An ideal quartz-mining claim is a portion of mineral land, 1500 ft. or less in length, along the vein, and 600 ft. or less in width. Fig. 1 illustrates the surface of such claim, showing the apex and course of the vein, and the side and end lines of the claim. Fig. 2 illustrates a cross-section of such claim, showing the vertical side lines thereof, and the dip of the vein.

The statute, by its terms, seems only to refer to an ideal location, with the vein on its course or strike passing through its two parallel end lines. The planes of the end lines, dropped downward perpendicularly, and extended in their own direction until they intersect the exterior portions of the vein, bound the extralateral rights on such vein. In actual mining, however, an ideal location is the exception, rather than the rule. Such conditions result from the inability of a locator to determine the actual course or strike of the vein at the time of completing his location. As a matter of fact, the locator of a mining claim usually judges such course or strike from a small portion of the vein disclosed in his place of dis-

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Note—An article by John B. Clayberg, in the "California Law Review," May, 1913.

covery. It is almost impossible to determine correctly the true course or strike of a vein from such a small exposure. Veins are irregular in their course or strike, and may be found running through the earth in almost every conceivable direction.

The application of the law of extralateral rights, as provided for by the above Act, to the varied conditions which have presented themselves, depending on the course or strike of the vein within the surface boundaries of the location, and the form or shape of the location itself, has been the source of prolific litigation in the mining regions of the United States.

In applying this statute, certain well established principles must always be borne in mind, viz:

(1) That the basis of extralateral rights is the existence of the apex of the vein within the surface boundaries of the location, dropped downward perpendicularly, and therefore their extent along the vein should always be limited by the extent of the apex within the claim. This is recognized by the Supreme Court of the United States in Del Monte Mining Co. vs. Last Chance Mining Co.[1] in which the Court says:

> It must be borne in mind in considering the questions presented, that we are dealing simply with statutory rights. There is no showing of any local customs or rules affecting the rights defined in and prescribed by the statute, and beyond the terms of the statute, courts may not go. They have no power of legislation. They cannot assume the existence of any natural equity, and rule that by reason of such equity a party may follow a vein into the territory of his neighbor and appropriate it to his own use. If cases arise for which Congress has made no provision, the courts cannot supply the defect. Congress having prescribed the conditions upon which extralateral rights may be acquired, a party must bring himself within those conditions, or else be content with simply the mineral beneath the surface of his territory. It is undoubtedly true that the primary thought of the statute is the disposal of the mines and minerals, and in the interpretation of the statute this primary purpose must be recognized and given effect. Hence, whenever a party has acquired the title to the ground within whose surface area is the apex of a vein, with a few or many feet along its course or strike, a right to follow that vein on its dip for the same length ought to be awarded to him if it can be done, and only if it can be done, under any fair and natural construction of the language of the statute. If the surface of the ground was everywhere level, and veins constantly pursued a straight line, there would be little difficulty in legislation to provide for all contingencies; but mineral is apt to be found in mountainous regions where great irregularity of surface exists and the course or strike of the veins is as irregular as the surface, so that many cases may arise in which statutory provisions will fail to secure to a discoverer of a vein such an amount thereof as equitably it would seem he ought to receive.

(2) That in order that extralateral rights exist in any location its end lines must be parallel.[2] It is not held that the end lines of a mining location must be parallel in order that such location be valid, but only that they must be parallel in order to give extralateral rights to any vein, the apex of which may lie within the surface boundaries of such location. A prospector has the general right to make his location in such shape as he desires, and it will be held valid if he has otherwise complied with the law.

It has also been decided that the parallelism of the end lines need not be mathematically accurate; that a substantial parallelism is all that is necessary.

In the case of Iron Silver Mining Co. vs. Elgin Mining Co. (*supra*), the location involved was one of peculiar character (Fig. 3). The lines marked end lines on the location, and which were parallel, were not the lines of the location through which the vein passed on its course and therefore not end lines governing extralateral rights. The particular condition of the apex of the vein was probably occasioned by erosion. The vein lying very nearly horizontal, forces of nature had disintegrated certain portions thereof, by wearing out a gulch, which, of necessity, caused a portion of the apex of the vein to recede from the line which it had originally occupied.

The only method whereby the subject under consideration can be clearly discussed, is by considering the various conditions which may present themselves, and applying the law to each condition.

The statute is clear when applied to an ideal location, and this is the first condition which we shall consider.

(1) When the apex of a vein on its course passes through both end lines of a location which are parallel to each other, the extralateral rights to such vein are clearly defined by the statute, and are bounded by the vertical planes of the end lines of the claim, extended in their own direction until they intersect the exterior portions of the vein. This condition is sufficiently illustrated in Figs. 1 and 2, and needs no further comment.

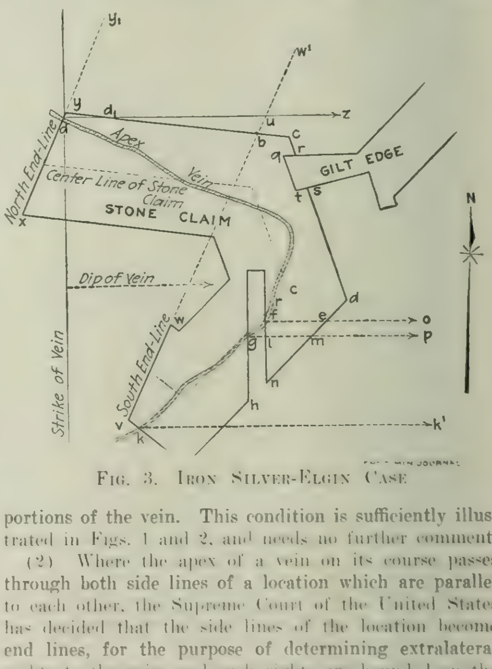

FIG. 3. IRON SILVER-ELGIN CASE

(2) Where the apex of a vein on its course passes through both side lines of a location which are parallel to each other, the Supreme Court of the United States has decided that the side lines of the location become end lines, for the purpose of determining extralateral rights to the vein, and such rights are bounded on the strike of the vein by vertical planes of such side-end lines extended in their own direction until they intersect the exterior parts of the vein.[3]

This condition is clearly disclosed in the diagram (Fig. 4) of the claims involved in the Amy Silversmith case (*supra*).

(3) Where the apex of a vein on its course crosses two boundaries of a location diverging from each other in the direction of the dip of the vein, in our opinion, no extralateral rights can exist under this condition, because the end lines are not parallel. We must remember

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[1] [illegible] U. S., 55.

[2] 2320 U. S. Revised Statutes; Iron Silver Mining Co. vs. Elgin Mining Co., 118 U. S., 196.

[3] Flagstaff Mining Co. vs. Tarbett, 98 U. S., 463; King vs. Amy Silversmith Co., 152 U. S., 222.

that the theory upon which extralateral rights are granted is, that one is entitled to so much of the vein on its dip, as he has apex therof within his surface boundaries. If the lines of the claim, through which the vein passes on its course, diverge in the direction of the dip, in each foot in depth, the vein would gain length between the planes, and thus include more of the vein extralaterally than there is apex within the location. If the apex of a vein within the boundaries of a location is a certain number of feet in length, equitably the owner of such location should be given the same number of feet on the strike of the vein extralaterally, at any depth, and no more, because he has only so much of the apex of the vein as lies within the boundaries of his claim. The Supreme Court of Montana, in the case of Hicky vs. The Anaconda Copper Mining Co.,[4] recognizes this to be the true doctrine. This condition is illustrated by Fig. 5.

(4) Where the apex of a vein crosses two boundaries of a location which converge toward each other in the direction of the dip of the vein, it has been held, in the case of Carson City Gold Mining Co. vs. North Star Mining Co.,[5] that the extralateral rights would exist under this condition, bounded by the vertical planes of the end lines, projected in their own direction, until they should intersect. Judge Lindley, in his valuable work on mines, announces the same conclusion.

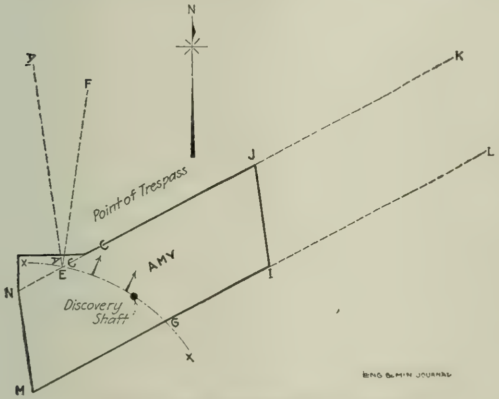

FIG. 4. AMY SILVERSMITH CLAIMS

While a strict construction of the statute, and a strict application of the doctrine of the Horse Shoe Case[6] would preclude extralateral rights under a condition of this character, we can see no reason why such rights should not attach. This condition is illustrated in Fig. 6.

(5) Where the apex of a vein on its course crosses one side line and one end line of a location, under the Act of Congress, the doctrine has been established by the Supreme Court of the United States, that the extralateral rights on a vein under this condition, would be bounded by a plane dropped downward perpendicularly through the end line of the claim, through which the vein passes on its course, and a plane parallel therewith, dropped downward perpendicularly through the point where the vein departs from the surface boundaries of the location through the side line. These planes extended in their own direction, would bound the extralateral rights on such vein under such condition.[7] This condition is shown by Fig. 7, illustrative of the case last above cited.

(6) Where the apex of a vein on its course enters and departs from the claim through the same boundary line, the Supreme Court of Colorado has held that under such condition, no extralateral rights exist.[8] The United States Court of Appeals for the Ninth Circuit, however, holds that extralateral rights to such veins do exist.[9]

The extent of the extralateral rights on a vein under the conditions presented to the Court of Appeals in this case, presented an interesting question. The vein in controversy was a wide one, and entered and departed from the St. Louis claim, at an angle, through the same side line thereof. To which location did the extralateral rights to the vein at the place of crossing this line belong? At the place of departure from the St. Louis claim, the apex of the vein was conceded to be 25 ft. in width, measured along the boundary line through which it departed. The St. Louis claim was conceded to be the prior location, and the owner thereof claimed that it was, therefore, entitled to all extralateral rights on the vein, so long as any portion of its apex remained within the boundaries of such claim. The owner of the 9-Hr. claim, into which it dipped, and into which the apex entered on its departure from the St. Louis claim, insisted that the St. Louis claim was only entitled to extralateral rights to the vein so long as its entire apex remained within the boundary of the St. Louis claim.

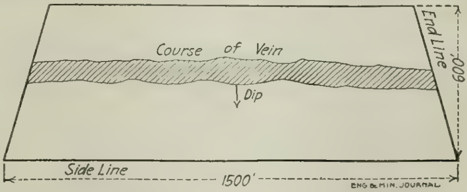

FIG. 5. BOUNDARIES DIVERGING DOWN THE DIP

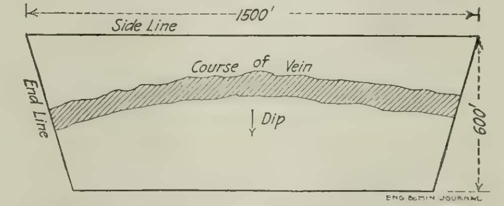

FIG. 6. BOUNDARIES CONVERGING DOWN THE DIP

The Court of Appeals, however, said:

> The only deduction which can be made from the foregoing rules is that, inasmuch as neither statute nor authority permits a division of the crossing portion of the vein, and the weight of authority favors the senior locator, the entire vein must be considered as apexing on the senior location until it has wholly passed beyond its side line.

This condition is illustrated by Fig. 8, which discloses the properties which were in conflict in the St. Louis case.

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[4] 33 Mont., 46.

[5] 86 Fed., 658.

[6] Iron Silver Mining Co. vs. Elgin Mining Co., 118 U. S., 196.

[7] Del Monte Mining Co. vs. Last Chance Mining Co., 171 U. S., 55; Clarke vs. Fitzgerald, 171 U. S. 92.

[8] Catron vs. Olds, 23 Colo., 433.

[9] St. Louis Mining Co. vs. Montana Mining Co., 104 Fed., 664.

While the Supreme Court of the United States has never directly passed upon this condition, it has frequently, since the decision of the Appellate Court (*supra*), cited the same on other points and, when we consider that the Supreme Court of the United States, on a writ of *certiorari*, reviewed a judgment which was obtained by the St. Louis Mining Co. on the theory established by the case above cited, and made no reference to the law as there established, we feel justified in the conclusion that the Supreme Court affirmed the same upon a later appeal of the same case. The Court of Appeals said:

> We are, therefore, of the opinion that the right of the St. Louis Mining Co. to extralateral rights in the Drumlummon to the extent that it apexes within the St. Louis Mining Co.'s claim, has been previously determined by this court, and that this determination has been affirmed by the Supreme Court of the United States (204 U. S., 204), and that such has become the law of the case.[10]

True, the vein in question in this case was an incidental or secondary vein, but in our judgment that makes no difference, because the statute provides that the owner of a location is entitled to all veins which apex within its surface boundaries, even though they depart from the claim on their descent into the earth. The doctrine announced by the above case gives to the locator precisely the amount of the vein extralaterally, to which he is entitled by reason of having the apex thereof within its surface boundaries.

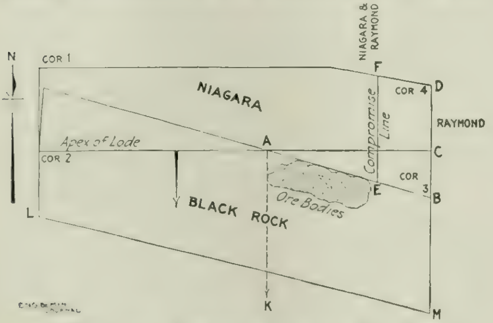

FIG. 7. APEX CROSSING SIDE AND END LINES

(7) Where the apex of a vein on its course is split by a boundary line of a location, or where the vein is wider than the location itself, the Supreme Court of the United States has decided that the prior location is entitled to the extralateral rights of the entire vein.[11]

This conclusion was reached by the Supreme Court, for the reason that the statute evidently did not intend that extralateral rights to any vein should be divided, and therefore gave the extralateral rights to the entire vein to the prior locator.

Diagram No. 9, used by Dr. Raymond, and copied from "Lindley on Mines," illustrates the condition discussed.

(8) Where the apex of an original vein on its course enters through one line of a location, and ceases before it reaches any other boundary; and

(9) Where the apex of an original vein on its course does not reach or pass through any surface boundary, the extralateral rights of the vein would be limited by planes dropped downward perpendicularly through the end lines of the claim.

It has been frequently stated that the boundary planes of the extralateral rights, under condition 8, would be the plane of the end line through which the vein passed, and another plane parallel thereto, drawn through the location at the point where the vein ceases on its course. If the vein, on its course, ceases at any point within the surface boundaries of the location, there is no occasion for bounding the extralateral rights by such plane, because such rights are limited by the end line planes of the location, and if there is no vein there are no extralateral rights.

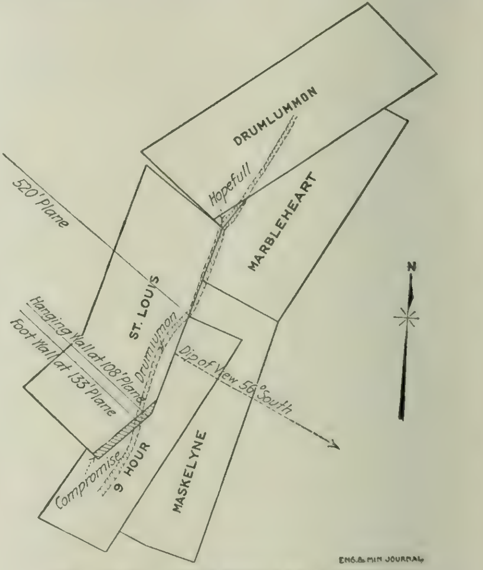

FIG. 8. ST. LOUIS-MONTANA LITIGATION

The same is true with condition 9, with the exception that in such instance it is claimed the extralateral rights would be bounded by the planes parallel to the end lines of the claim through which the vein would pass if projected in its own direction, dropped perpendicularly through the claim at the points where the vein ceases. There can be no occasion to bound such extralateral rights; they are limited by the planes of the end lines, either actual or constructive, as above stated.

We cannot conceive how any case should possibly arise, calling for the Court's construction of the Statutes, which would require or justify a holding that the extralateral rights would be bounded by planes dropped through the point of discontinuance of the vein.

(10) Where a vein passes through both end lines of a location but in its course departs from the claim through a side line, and reënters the claim through the same side line, as shown in Fig. 10, we find no reported case upon this condition, although Judge Ross in the case of Doe vs. Waterloo,[12] refers to one of the same character, and

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[10] [illegible] Fed., 61.

[11] [illegible]ntine Mining Co. vs. Terrible Mining Co., 122 U. S., [illegible] [illegible]son vs U. S. Mining Co., 207 U. S., 1, see also Empire State [illegible] vs. Bunker Hill Mining Co., 114 Fed., 417.

[12] 82 Fed., 45.

Judge Lindley in his valuable work on mines refers to a case of Sims vs. Garden M. & M. Co. as having been decided by Judge A. H. de France in one of the trial courts of Colorado, in which this exact condition presented itself.[13] By applying the principles hereinabove announced with reference to other conditions, no trouble will be encountered in determining the law upon this situation.

Extralateral rights as above stated are based upon the apex of a vein, being situated within the vertical boundaries of a claim. A claim is entitled to the same length along such vein, extralaterally, as it has length of apex within its vertical boundaries and no more; when a vein passes through an end line and departs from a side line of a claim the extralateral rights therein are bounded by the plane of this end line through which the vein passes, and a plane parallel thereto dropped through the claim at the point where it passes through the side line.

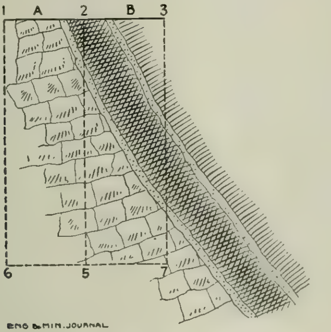

Fig. 9. Vein Split by Boundary Line

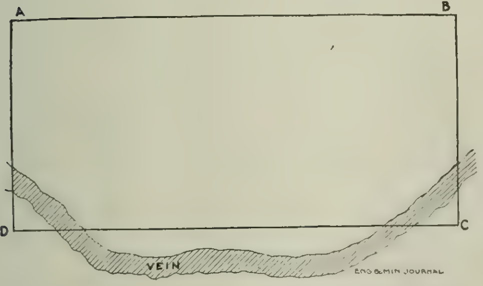

Fig. 10. Vein Leaving and Re-Entering Claim

## Extralateral Rights on Incidental or Secondary Veins

It must be remembered that the statute gives extralateral rights on all veins which have their apices or tops within the vertical boundaries of the location.

It frequently occurs that the apex of more than one vein exists within such vertical boundaries. The vein upon which the location is based, bears the designation of "original" or "discovery" vein; other veins are called "incidental" or "secondary" veins. This nomenclature is immaterial, inasmuch as the rights given by the statute apply to all veins apexing within the vertical boundaries of the location. Any designation is, therefore, only for the purpose of identification, and to distinguish the different veins from each other. Of course, the vein upon which the location is based, should be, and is the vein which determines the planes limiting the extralateral rights to all veins apexing within the location. In fact, the Supreme Court of the United States has said: "Appellant's right upon the contact (a secondary and incidental) vein is given by this statute (Sec. 2322, U. S. Revised Statutes). What limits the right extralaterally? The statute says vertical planes drawn downward through the end lines of the location. What end lines? Those of, and as determined by the original location and lode, the Circuit Court of Appeals decided. Those determined by the direction of the newly discovered lodes, regardless of whether they were originally intended as end lines or side lines, the appellant, as we have seen, contends. The Court of Appeals was right. Against the contention of appellant, the letter and spirit of the statutes oppose, and against it, the decisions of this court also oppose."[14]

Fig. 11 illustrates the controversy involved in this case. The effect of the opinion of the Appellate Court in this case,[15] and of the Supreme Court (*supra*), at first blush would seem to give a claim a greater length on the strike of a secondary or incidental vein, extralaterally, than it has length of the apex thereof, within its surface boundaries. If we apply the rule strictly as therein announced, i.e., that the end-line planes of a location, as fixed by the original vein, for determining extralateral rights thereon, bound the extralateral rights to all incidental or secondary veins, the absurd result would follow, that if the original vein on its course ran through two parallel end lines of an ideal location, such location would have extralateral rights on all secondary or incidental veins apexing therein, for the full length of the claim, while the length of the apex of such secondary vein, within the claim, might be only a few feet. We cannot impugn such an absurd conclusion to the greatest court in the world. It is very apparent from the opinion, that such conclusion never entered the minds of the judges of that court. The Del Monte case was decided on the same day, and in that case, the court announced the rule, that a greater length along the strike of a vein extralaterally, than the length of the apex within the location, should not be given. The court, in the Walrath case, cites and quotes from the Del Monte case, and relies upon it is as an authority.

The Supreme Court, however, was somewhat careless in the use of certain language of the opinion. Had it carefully confined itself to applying the principle announced in the language above quoted and held that the end-line planes would always "limit" the extralateral rights, much confusion might have been avoided.

Judge Lindley, the eminent author of "Mines and Mining" (one of the attorneys employed in the Walrath case), fully explains the conditions involved, and concludes that the court did not mean what has been attributed to it.

Much criticism in this case has been indulged in by mining lawyers, and we can but believe that if the opportunity is ever afforded, the Supreme Court will clear up the erroneous inferences which have been drawn from that opinion.

The Supreme Court of Colorado, in the case of Ajax

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[13] Lindley on Mines, 2d Ed., Sec. 591.

[14] Walrath vs. Champion Mining Co., 171 U. S., 293.

[15] 72 Fed., 978.

Mining Co. vs. Hilkey,[16] in our judgment, announces the true rule relative to extralateral rights on incidental or secondary veins, in patented quartz claims, although there may be some doubt as to whether the law announced by that court was correctly applied to the facts as they appeared in the litigation, under the decisions of King vs. Amy Silversmith Co.,[17] and Cosmopolitan Mining Co. vs. Foote.[18] Fig. 12 describes the veins and locations involved in the Colorado case.

The Court, in its opinion, did not rely upon any inference which might have been drawn from the Walrath case, but announced the rule that, when the original and incidental veins do not fully pass through the same segments of a location, such fact is no reason for denying the location extralateral rights on both such original and incidental veins, to the full extent each vein apexes within the location. The Court said:

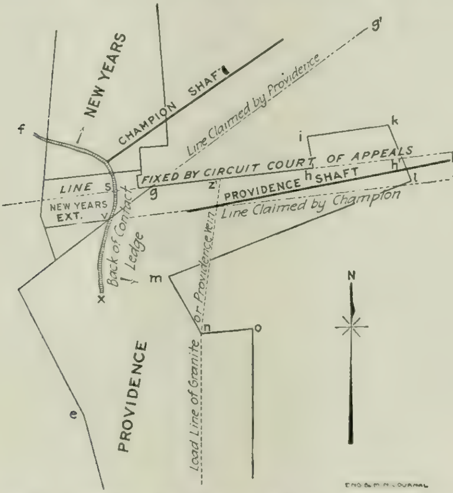

FIG. 11. EXTRALATERAL RIGHTS ON INCIDENTAL VEINS

> The end lines constitute a barrier, beyond which a locator cannot follow a vein on its strike, whether it be a discovery or secondary vein; and they also limit the bounding planes within which his extralateral rights are to be exercised in following such vein on its dip. In exercising such extralateral rights the locator cannot, in any case, pursue the vein on its dip beyond the bounding planes drawn through the end lines; but, as we have said, appellant is content to be restricted in the exercise of such rights in the secondary vein, to planes drawn parallel to the end lines, and passing, the one through the claim at the point where the vein enters, and the other where it departs from, the surface line of the location. The extent of the right depends upon the length of the apex, and the extralateral rights are measured not necessarily by the end lines and not only so when the vein passes across both end lines—but by bounding the planes drawn parallel to the end lines passing through the claim at the points where it enters into and departs from the same. It would seem, therefore, necessarily to follow that the extralateral right depends, inter alia, upon the extent of the apex within the surface lines, and while the end lines of the claim as fixed by the location are the end lines of all veins apexing within its exterior boundaries, the planes which bound such rights of different veins may be as different as the extent of their respective apices, though all such planes must be drawn vertically downward parallel with the end lines. It makes no difference in what portion of the patented claim the apex is. Its extralateral rights, under this rule, can easily be ascertained. The apex of a secondary vein need not be in the same portion of the claim as is the apex of the discovery vein. The statute does not say so.

In delivering its final conclusions upon the propositions involved, it further states:

> Our conclusion is that for all veins, both discovery and secondary, of a patented claim, the owner has extralateral rights, at least for so much thereof as apex within the surface lines; that such rights as to secondary veins are not confined to such veins as apex within the same segment of the claim in which the apex of the discovery vein exists; and while the end lines of the location, as fixed and described in the patent, are the end lines of all veins apexing within the surface boundaries, and may constitute the bounding planes for such extralateral rights, and in no case can the locator pursue the vein on its dip outside the surface lines beyond such planes continued in their own direction until they intersect such veins, yet these bounding planes, which in all cases must be drawn parallel to the end lines, need not be coincident.

There can be no doubt but that the end-line planes (as fixed by the position of the original vein), for the purpose of defining extralateral rights thereto, limit the extralateral rights to all veins apexing within the location, beyond which extralateral rights cannot exist. It is equally true that a locator can have but one set of end lines for all purposes. However, we cannot perceive how these principles are impinged upon by dropping an imaginary plane parallel to the end lines of the claim, through the point where an incidental or secondary vein enters or departs from the location, and extending it in its own direction for the purpose of bounding the extralateral rights upon such vein. The Supreme Court of the United States has found no difficulty in applying such planes to cases where the apex of the original vein enters the location through an end line, and departs therefrom through a side line.[19]

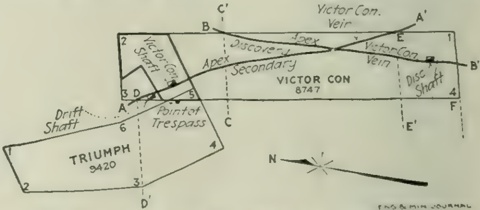

FIG. 12. EXTRALATERAL RIGHTS ON INCIDENTAL VEINS

It is clear, however, that when the secondary or incidental vein, on its course, crosses both side lines of a location, as fixed by the course of the original or discovery vein, no extralateral rights can attach to such secondary or incidental vein, if it is impossible to apply either of the limiting planes of the end lines in planes parallel thereto, as applicable to the original vein, to such secondary vein for the purpose of bounding the extent of such rights.[20]

Extralateral rights may be curtailed or interrupted by conflict on the dip of the vein with rights under a prior location. Thus when two or more locations, made on the same vein, are so situated with reference to each other as to cause a conflict on the dip of the vein. This is illustrated by the diagram, Fig. 13, of the conflict of rights in the famous "Stemwinder case" cited in the note.

In such instances the extralateral rights belonging to the prior valid location take that portion of the vein in conflict.[21] The extralateral rights of the junior location, however, again attach to the vein beyond the conflict.[22] One entitled to extralateral rights on a vein may convey a certain section of the vein on its dip, which will be carved out of his extralateral rights, leaving such rights beyond unimpaired.[23]

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[16] [illegible] lo., 131.

[17] [illegible] S., 222.

[18] 10[illegible] d., 518

[19] Del Monte vs. Last Chance Mining Co. (supra); Clark vs. Fitzgerald (supra).

[20] Cosmopolitan Mining Co. vs. Foote, 101 Fed., 518.

Whether the owner of a legally located quartz claim, having within its surface boundaries the apex of a vein, has the right to follow and mine such vein extralaterally after it enters the vertical boundaries of a tract of land which has been theretofore patented by the Government as agricultural land, is a question which has never been decided by the Supreme Court of the United States, to our knowledge.

Judge Sawyer, while sitting as Judge of the Circuit Court of the United States in the Ninth Circuit, however, decided that such vein could not be followed by the owner of such claim beyond the point where on its dip it enters the vertical boundaries of such prior agricultural grant.[24]

With this conclusion, Judge Lindley, the eminent author on mining law, does not agree, but is of the opinion that all of the acts of Congress relative to the disposal of the public domain should be construed as being *in pari materia,* and that when so construed all veins which, on their dip, enter the vertical boundaries of an agricultural grant, and reserved therefrom by operation of law, irrespective of whether such grant was prior or subsequent in time of right to quartz location.

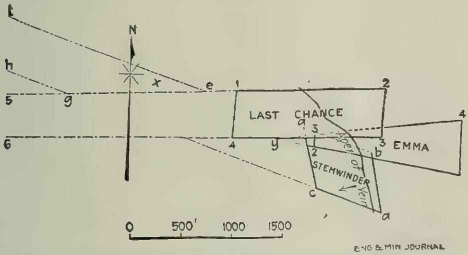

FIG. 13. EXTRALATERAL RIGHTS AND PRIOR LOCATIONS

When such eminent authorities hold diametrically opposing views upon any proposition of mining law, which has never been decided by the Supreme Court of the United States, one can only express an opinion as to which is correct. In our judgement the conclusions of Judge Lindley are correct and will be sustained if the question ever comes before the Supreme Court of the United States.

However, if the vein on its dip enters a prior patented mining claim it may be followed because it is always expressly reserved by the statute and by the patent itself.[25]

### UNAPPROPRIATED RIGHTS TO A VEIN ON THE DIP

Where the apex of a vein is entirely within located claims, which have end lines diverging in the direction of the dip, so that a portion of the vein on its dip is unoccupied and unappropriated, we find three lines of decisions: (1) That such portion of the vein may be divided between the adjoining locations which own the entire apex of the vein.[26] (2) That the owner of the surface under which the unappropriated part of the vein lies, owns it under his common-law rights,[27] and (3) that such unappropriated part of the vein may be located and acquired by any qualified locator, who makes a location, the surface boundaries of which include the apex of that part of the vein, even though such locations are made by placing the stakes and marking the boundaries thereof on other locations, provided such location is made for the purpose of covering such unappropriated extralateral rights.[28]

There can be no question but that the decision in 75 Cal., 78, *supra,* is without support, either on principle or authority. Such decision would give to each of the adjacent owners rights to a vein extralaterally, after it had passed out of the end-line planes of the location. This would be in direct violation of the Mining Act and the decisions of the Supreme Court of the United States.

As to the second class of cases[25] while the opinions of the Court are well reasoned, we cannot conceive how the conclusion of the Court arrived at can be sustained until the Supreme Court of the United States recedes from the doctrine foreshadowed by Judge Brewer in the Del Monte case, *supra.* The Supreme Court of the United States is the final arbiter upon all questions and rights growing out of the Mineral Acts of Congress.

### BOUNDARIES OF EXTRALATERAL RIGHTS BY AGREEMENT

The boundaries of extralateral rights on any vein may be fixed by agreement of the parties, either by conveyance or contract.[30]

It would seem that the law of extralateral rights under the Statute of 1872 is practically settled. It is fully settled when applicable to conditions which have presented themselves for adjudication, yet the forms of mining locations may be so variant, and the position of veins within the vertical boundaries thereof so strange and peculiar, that many complications, now unthought of, may present themselves for adjudication, but if the courts continue to bear in mind the purpose and intent of the Mineral Act, and the principles already settled, no serious difficulty will arise in determining the law applicable to any complications.

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**The Vertical Center Line for a Mining Transit,** says Herr Geheimrat K. Haussmann, discussing an article entitled "Some Considerations on the Specification of Theodolites for Mines," by L. H. Cooke ("Bull. No. 106," I. M. M.), should be double, but with not too great an interval between the two parts. The objection to this double wire, namely, that with short sights the image of the plumb line covers both of the wires so that sharp centering is impossible, can be avoided by not focusing sharply, whereby there results, not a black, but a gray image which can be weakened to any extent desired and can be centered on with accuracy since the black transit wires stand out prominently against it.

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[21] Tyler vs. Sweeney, 79 Fed., 227; Tyler vs. Last Chance Mining Co., 71 Fed., 848.

[22] Empire State, etc., Mining Co. vs. Bunker Hill, etc., Mining Co., 121 Fed., 937; see also: Empire State, etc., Mining Co. vs. Bunker Hill, etc., Mining Co., 114 Fed., 417; Bunker Hill Mining Co. vs. Empire State, etc., Mining Co., 109 Fed., 538; Bunker Hill, etc., Mining Co. vs. Empire State, etc., Mining Co., 134 Fed., 268; Davis vs. Shepherd, 31 Col., 141.

[23] Montana Mining Co., Ltd., vs. St. Louis Mining Co., 204 U. S., 204.

[24] Amador Mining Co. vs. S. S. H. Mining Co., 36 Fed., 668.

[25] Blake vs. Butte Silver Mining Co., 2 Utah, 54; Colorado, etc., Co. vs. Turck, 70 Fed., 294; Clark vs. Fitzgerald, 171 U. S., 92.

[26] Champion Mining Co. vs. Consolidated Wyoming Gold Mining Co., 75 Cal., 78.

[27] State vs. Second Judicial District Court, 25 Montana, 504; Parrott Silver, etc., Co. vs. Heinze, 25 Montana, 139; 87 Am. St. Rep., 386; 53 L. R. A., 491.

[28] Del Monte Mining, etc., Co. vs. Last Chance Mining Co., 171 U. S., 55; see also: Bunker Hill, etc., Mining Co. vs. Empire State-Idaho Mining, etc., Co., 134 Fed., 268; 109 Fed., 538.

[29] 25 Montana, 504; 25 Montana, 139, supra.

[30] Montana Ore Purchasing Co. vs. Boston, etc., Co., 27 Mont., 536; Butte, etc., Mining Co. vs. Montana Ore Purchasing Co., 27 Mont., 152; Kennedy Mining Co. vs. Argonaut Mining Co., 189 U. S., 1; Eureka Consolidated Mining Co. vs. Richmond Mining Co., Fed. Cases, No. 4548.

## Labor and the Lead District

In a letter to the St. Louis *Republic*, Aug. 27, 1913, H. J. [illegible] discusses the strike situation in the Missouri lead district from a theoretical as well as practical point of view. In part, he says that the Western Federation of Miners is not a body existing under the laws of the State of Missouri, or of the United States, and a contract with it cannot be enforced. A contract which cannot be enforced by law has none of the elements of a contract. No intelligent mine owner today denies the right of men to combine and bargain, collectively for their labor. Why, then, do the mine owners refuse to enter into a contract with the labor union? Simply because the mine owner has no means of compelling the performance of the contract by the labor union; because, when he refuses to accept the labor union's construction of the contract the labor union does not go into court for redress, but enforces its own idea of the contract, and its assumed right to vary and break the contract at will and enforce a new "contract" by violence.

The present strike in the Flat River district has gone beyond the question of wages. The Western Federation of Miners demands as a condition of arbitration that it be recognized. The method of recognition imperatively demanded was the agreement by the companies to deduct from each employee on the pay roll the union dues. In other words, the union seeks to compel the mine owners to furnish the "war chest" with which they may fight the mine owners, for the reason, presumably, that the union cannot rely upon the loyalty of its members to voluntarily make the contributions. The method of the enforcement of this demand was to call out all the members of the union in every department of the mines, including those engaged in the work of pumping mines, supplemented by the intimidation of all others except the office force, who might attempt to take their places in pumping. Not being permitted to pump the mines with other labor, the mine owner could do nothing but submit to the exactions of the union, or permit the mines to fill with water. As a result, millions of dollars' worth of property has been destroyed, and it will require at least $1,000,000 to unwater the mines, even though work should be attempted to be resumed tomorrow. In the meanwhile, from 2000 to 3000 men, at the least, will be out of employment for six months.

What should the mine owners have done? Should they have yielded to the demand under the threat of this destruction to their property? If so, what assurance had they that some other demand would not be made shortly, impossible to be performed, when a similar disaster would occur? What assurance have the mine owners that an organization which starts out by this destruction of property will have any regard for its contract, if it makes one? Is it not time that the state should step in and require all industrial organizations, including labor unions, to be incorporated under the law, to provide some fund to which resort may be made for violation of contracts and for torts committed by its members, and to submit, as all other organizations must, to the rule of the courts, or be suppressed as unlawful assemblages?

If the object can best be accomplished by labor unions regulating industry, then let them regulate it. If governmental powers are to be exercised or suspended by labor dictators and they can promote the well-being of mankind better than the present methods, let us recognize the fact and them, but let it be settled one way or the other, so that men may understand to what power they must submit and to which government they owe allegiance. It was said: "This nation cannot exist half slave and half free." Neither can it long exist half owing allegiance to labor unions as paramount to allegiance to the instituted government.

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## Proposed Explosives Monopoly

WASHINGTON CORRESPONDENCE

Representative Kent, of California, introduced on Sept. 4 in the House of Representatives, a joint resolution which was referred to the committee on military affairs and ordered to be printed, in which he proposes a government monopoly of the manufacture of explosives. The motives for introducing the resolution seem to be a mixture of peace sentiment, hostility to the so called "powder trust" and general disposition to manufacture political capital. There is no definite information thus far as to the attitude likely to be adopted by the military affairs committee, but it is understood the subject will be given consideration and that hearings relating to it will be held.

The text of the resolution is as follows:

### PROPOSING THE ESTABLISHMENT OF A MONOPOLY FOR THE MANUFACTURE OF EXPLOSIVES BY THE FEDERAL GOVERNMENT

Whereas there exists an international trust in the matter of manufacture of explosives; and whereas under the agreements of this trust foreign manufacturers have bound themselves to refrain from selling powder in the United States, even to the United States Government, that the interests of the American powder trust may be protected against foreign competition; and whereas the prices charged by the American trust against the Federal Government for explosives used by the army and navy are extortionate and unreasonable; and whereas the manufacture by the Government of explosives for the army and navy is rendered unduly expensive by the lack of continuity of manufacture; and whereas powder manufactured in large quantities and stored is subject to serious deterioration; and whereas economical and practical manufacture require the continuing operation of the mills and the continuing employment of a skilled force which in time of peace can only be accomplished by supplying explosives for other than military purposes; and whereas the inventions of American officers are not retained as secret processes for the benefit of the American Government, but have been freely given to the powder trust, which is at liberty to sell to foreign governments that may be at war with us, the work of our own inventors and army officers, and whereas it is practically impossible to restrain the international trade in munitions of war, even though our Government may attempt to do so in the interests of peace; and whereas all war is dependent upon the use of explosives and can largely be prevented by the control of those explosives:

Therefore be it Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the President appoint a commission, consisting of two members of the Senate of the United States and two members of the House of Representatives, two officers of the army, two officers of the navy, and a representative of the State Department, who shall be instructed to investigate and report a plan for creating a Government monopoly for the manufacture and control of explosives, and that suggestion be made to our representatives at The Hague that it would be well to consult with foreign nations as to suitable action to be taken by the nations of the world toward controlling the manufacture, distribution and use of explosives and other munitions of war.

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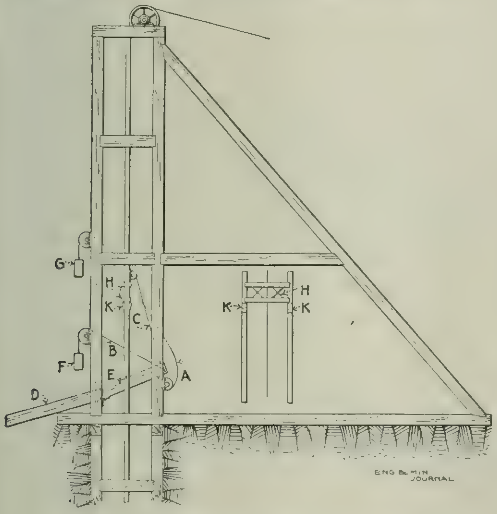
**Iron and Steel Material Underground Was Ruined by the Flooding** which was necessary to put out the disastrous fire occurring something less than a year ago in the North Mount Lyell mine. Among other things, all the rock drills had to be replaced. A large amount of cement copper was obtained when cleaning up the underground workings, the acid and copper laden water having reacted with the rails, pipes and tools, as in a copper-precipitating plant.

# DETAILS OF PRACTICAL MINING

## Automatic Water Bucket Dumper

By Algernon Del Mar*

When hoisting water from vertical shafts by means of a bucket, it is usual to have a man attend to the dumping at the collar of the shaft. The arrangement here shown, used at the shaft of the Bishop Creek Milling Co., dispenses with the extra man, so that the hoisting engineer attends to the whole operation, the device being automatic. The discharge trough $D$ is stationary with a hinged portion $E$. In the position illustrated, the bucket although not shown, is supposed to be resting on $E$, and is dumping the water through a bottom valve. The engineer hoists the empty bucket which strikes the crosshead $H$. The crosshead can not descend below the stops $K$. As the crosshead is raised, it pulls the rope $C$, which lifts $E$ to a vertical position, where it is held by the weight $F$. When the engineer hoists the full bucket, it strikes the crosshead and pulls on the rope $A$, which is connected to the crosshead and to $E$ over a pulley, again lowering the trough into the position shown; the weight $F$ is not heavy enough to raise the trough alone. The ropes $A$ and $B$ for convenience should be on the opposite side of the trough from $C$. The rope $A$ is long enough to allow $E$ to be vertical without pulling on the crosshead.



Self-Discharging Bailing Bucket

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**The Water Piston Drill Using Hollow Steel** is much easier on the steel itself, according to "Mine & Quarry," July-August, 1913. It is stated that during the use of Sullivan drills of this type in the Mount Royal tunnel there has been practically no breakage of steel, whereas with hollow steel subject to hammering action, breakage is always a large item.

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*Mining engineer, South Pasadena, Calif.

## Milling System of Mining Mesabi Iron

The milling system, as practiced on the Mesabi iron range, is a combination of the steam-shovel method with the underground. It is adapted for mining the ore from deposits favorable for stripping where size or location is such as to make it impracticable to mine with a steam shovel.

The relative depth of surface and ore, or rather the relative proportion of overburden to be removed to the amount of ore uncovered, the size and shape of the ore deposit, the space and facilities for trackage approaches, and relative outlay for equipment and development, are the determining factors for choosing between the milling and steam-shovel methods. Development is conducted with shafts, tramming levels, etc., much the same as in underground mining. The overburden is removed from the surface of the ore with steam shovels; this permits underhand stoping, the ore being worked into chutes and drawn out on the tramming levels to be handled in the same manner as in other underground mining systems.

In opening up a property for the milling system, the area to be stripped, the stripping approached, and the locations of shaft, shaft house, tracks and mine buildings are decided upon. The work of stripping or removing the overburden is usually the first work started, and while this is progressing, the working shaft is sunk, tramming levels opened up and raises driven to the top of the ore deposit. Raises are usually 4x5 ft., or 5 ft. square, are put up at intervals of from 30 ft. to 40 ft., and are equipped with chutes at the bottom. When ready to start mining, the milling or underhand stoping is begun by drilling holes around the tops of the raises and blasting them so that their burden will fall into the raises. After blasting, the loose dirt is usually picked down into the raise as long as it will run steadily and then blasting is again resorted to. It is customary to drill first what are usually called collar holes, and then to carry the stope up the bank by successively blasting and picking down the loose dirt, as long as it will run into the raises. The ores are of such a character as to break up fine and run readily at an angle of 45°, and in dry weather at even 38°. Better results are obtained after the mills or funnels have become enlarged; the larger the mill, the better.

When blasting large quantities, and particularly when starting mills, the ore often falls to the bottom of the raises with such force as to pack too hard to run out of the chutes; this is termed a "hang-up" and necessitates the use of chute bars to loosen the ore and start it running. The ore may hang up at a point higher than can be reached with bars, and other means of loosening must be employed. At the Monroe mine, where the raises were extremely high, a system of subdrifts was driven above the working level, connecting all the raises. This plan gave an opening from which to bar the ore through the raise lagging or cribbing. At the Albany mine the main-level drifts were made two sets high, opposite the raises or chutes. This permitted the use of longer bars and facilitated the process of barring. At the Iroquois mine they placed a chain or wire rope through the raise, and when a hang-up occurred, the rope or chain was pulled up by a small hoist and pulled down by a number of men standing on the level. At the Jordan mine, the trouble was solved to a large extent by working the first two mills [illegible] to the back of the tramming level, and after that holing the raises through into the sides of the slopes. The raises being from 30 to 40 ft. apart would hole through into the milling slopes when 30 to 40 ft. high. The first raises were 85 ft. high and caused a great deal of trouble. The subsequent raises, being shorter, were much freer from hang-ups. By starting milling on the lower sides of the raises where they holed through into the slopes, the distance from the collar of the raise to the chute was seldom over 30 ft., and a hang-up could be broken down by barring or drilling from the top, if the trammers failed to get it running by barring from below.

Another plan adopted to some extent was to make the raises larger at the bottom and tapering upward; the construction of the chutes, however, permits the ore to accumulate in the corners and the raise openings soon become smaller. While the hang-ups occur from the impact of the falling burden, blasted into the raises, the trouble from this source is increased by the raise opening becoming smaller and smaller as moist ore accumulates and cakes hard all around the raise. From time to time it is necessary to clean out the raise sides for some distance above the chutes.

Production by the milling method is usually irregular and varies from day to day, being influenced largely by weather conditions, as well as by the steadiness of the labor employed. During good weather and with a full crew, the daily production may be at a maximum, but a heavy rain drives home the men working in the mills and washes out the slopes, making holes and gullies and blocking the chutes with loose ore and water. If much water collects, any attempt to open and draw the chutes results in a rush of sloppy material which fills the level and necessitates cleaning up before tramming can be resumed. If the chutes are opened up more than a few inches, there is no closing them if the rush starts. In addition to the chute and level trouble, the slopes in the mills are so uneven and irregular that for several days much of the ore that is loosened by blasting or picking down, fills the holes and gullies instead of running into the chutes. Dry ores naturally run much better in the mills than wet ones, and some ores that would run readily on a 15° slope during dry weather, become soaked and will scarcely run on a 50° slope when wet.

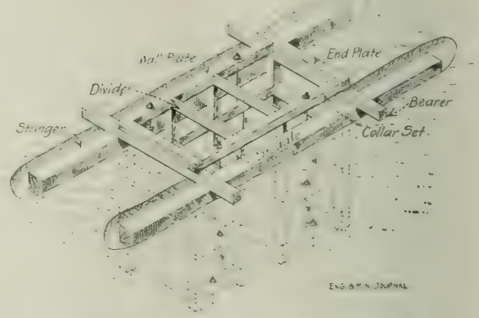
When the mills are worked down close to the back of the level, short raises are put up in the ridges and much of the remaining ore is milled through them. At some mines steam shovels have been used to dig the ore in the hog backs or ridges and drop it into the mills. This process was further developed, using the steam shovel to load the ore into cars which were either dumped direct into the skip pocket, or through a transfer chute and then trammed to the shaft.

The milling system is also used for the lower parts of [illegible] pits opened up for steam-shovel mining, when the [illegible] renders the use of locomotives impracticable. This [illegible] permits the recovery of all the ore, is more economical than underground mining and is, perhaps, a little safer. It is subject to the accidents incident to the limited underground work and to blasting in the open, but the greater danger is from men being carried into chutes by slides. This is guarded against to some extent by the use of ropes.

⁂

## Mesabi Shaft Collars

In beginning shaft-sinking operations on the Mesabi iron range, the sets are hung from the surface bearers put in as illustrated. The long stringers parallel to the wall plates are made of 24- to 36-in. timber, 40 to 50 ft. long. These are laid in trenches on 12- to 15-in. centers, according to Charles E. van Barneveld ("Iron Mining in Minnesota"), and carefully leveled. On these are supported cross bearers in the same vertical plane as the end plates. These are of 12x12-in. timber, 20 ft. long. A collar set is placed on these bearers and the first shaft set hung from the collar set. The collar structure is usually completed by building up one set high, carefully lagging the outside, bracing the set to the bearers, and banking around the set with the first dirt excavated, which is carefully tamped to keep out surface drainage.



METHOD OF HANGING SHAFT-COLLAR SET

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## Performance of the Jackhamer in Butte Shafts

The "jackhamer" drill is becoming increasingly popular for shaft sinking in Butte, where the rock is favorable (A. I. M. E. Bulletin, August, 1913). It is found that in either too soft or too hard ground, however, certain difficulties are encountered. In soft grounds the holes are likely to plug. Difficulty from this source is made less serious at the Pittsmont mine by placing a hole sidewise in the steel about 1 in. from the end of the bit, so that if the end hole becomes plugged the air, passing out through the side hole, keeps the drill-hole clean above the last inch of the drill. In soft rock the drill bits are enlarged so as to take 1¼-in. sticks of powder; but in hard rock if the bits are so enlarged, drilling is too slow, and when not enlarged the smaller powder will not break the bottom clean. It is suggested that a more powerful drill of the "jackhamer" type might prove satisfactory in hard rock.

# DETAILS OF METALLURGICAL PRACTICE

## Safety Rules—Boiler Repair and Operation*

(1) Two men should always work together when cleaning out boilers, it being the duty of one man to remain outside of the boiler all of the time in a position to see the man working in the boiler and give assistance in case it is needed.

(2) Never go into a boiler until you have locked the steam valve and closed all other valves.

(3) Before entering a boiler put a torch or candle inside to determine the presence of gas or bad air.

(4) In cutting a boiler in and out, use the nonreturn valves exclusively, in order to insure their proper working. Should the nonreturn valve fail to work in any instance, notify the foreman immediately.

(5) The automatic valves should be examined sufficiently often to insure their prompt action in emergencies, such as the bursting of tubes.

(6) When boilers are taken off for cleaning, the main stop valve in the steam connections should be shut off and dependence not put on the automatic quick-closing valves alone.

(7) A sign, "Danger, do not move," should be hung on the steam valve of any boiler when it is shut down.

(8) Never open a slide or valve when a danger sign is attached and until you have seen that no one is in the boiler.

(9) Safety valves should be tested every shift.

(10) When opening up any steam line take the following precautions: (a) Open all available drips; (b) warm the line by opening the bypass when possible, or by opening the stop valve sufficiently to warm it slowly; (c) never allow an inexperienced man to turn steam into a cold line, unless accompanied by the foreman; (d) never open the main valve until certain that the line is thoroughly heated.

(11) When starting up a boiler that has been dead, raise steam slowly, drop the pressure a few pounds on remaining boilers in the battery, and do not open the stop valve until the gage on the dead boiler shows the same pressure as the other boilers. Then open the stop valve slowly.

(12) All steam traps taking care of large lines shall be kept clean and in working order, as this is the only safe way to remove water from the line. Should a trap get out of order and it is impossible to repair it at once, the bypass should be opened sufficiently to eliminate all water that might collect. Blow off boilers every shift.

(13) Leaks in pipes, flanges and gaskets should be repaired at the earliest possible moment, as they may be caused by defective material.

(14) Keep the water glasses clean and the tops and bottoms open by frequent blowing out every shift.

(15) In carrying water, try cocks should be frequently used, and dependence not wholly placed on gage-glasses.

(16) Never tighten any bolts or nipples or do any caulking while steam pressure in on the boiler.

(17) Take great care in cooling and handling flue dust, as it is liable to fly, slide and explode, causing bad burns. Never step on it.

⁂

## Mauss Centrifugal-Filtering Machine

A number of efforts have been made to produce a continuous centrifugal-filtering machine, but up to the present time no great success has been achieved. Recently, however, Wilhelm Mauss, of Johannesburg, Transvaal, has devised and patented a machine (Brit. pat. No. 27113) which is expected successfully to solve the problem. It is of the type which has formerly been used for filtering beer wort and similar material, but in the present design it is so modified that it will handle pulverized material from metalliferous ores. The accompanying sketch shows a sectional view of the apparatus.

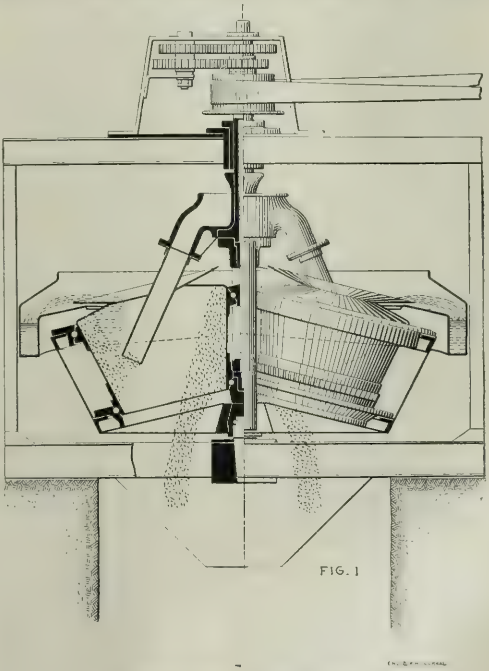

FIG. 1

Centrifugal Slime Filter

A main central shaft has rigidly attached to it a cradle which holds two drums. There may be more than two of these drums, so long as they are in even numbers, that is, two, four, six, etc., arranged symmetrically with the central axis. The drums are so attached to the cradle that they revolve bodily around the central shaft, and are also arranged so that each one revolves about its own axis, being moved by a smaller shaft passing through the center of the main shaft, operated by the gearing shown at the top of the machine. Each drum is served by a feed pipe extending from a common trough mounted upon and rotating with the main shaft. The drums are of such form that while providing at their parts remote from the main axis a chamber wherein the material is retained for separation by centrifugal force and also providing a lip over which the lighter material flows away, they also permit the whole of the contents to fall out by gravity in case of stoppage of the apparatus. The drums are made completely open at the bottom. The least inclination of the walls to the horizontal is greater than the angle of repose of the material upon them, and all upwardly directed angles are avoided. It is desirable that the portions of the walls nearest the central axis of the machine should be substantially vertical, in order that the separated material may fall freely from them.

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*From Inland Steel Co.'s book of rules.

In operation the device is first brought up to normal speed, the pulp introduced through the trough and pipe into the drum chambers. Here the centrifugal force causes the pulp to segregate from the liquid, and to settle on the wall of a drum, while the liquid flows off over the overflow lip into a receiver. The deposited pulp is carried around with the drum as the latter rotates on its own axis, thus causing the pulp to emerge from the liquid.

The effect of the centrifugal force in holding the material to the drum surface is thus gradually diminished until it disappears, when that surface is radial to the main axis of the machine, and afterward the effect is reversed, and the material, if it has not already fallen off by gravity, is projected from the surface by an increasingly effective force which reaches its maximum when the wall of the drum is directly vertical. Upon stoppage of the apparatus, the whole of the contents of the drum fall out, leaving the machine ready to start without having first to be cleared of settled pulp, as is frequently necessary in other centrifugal machines.

⁂

## A Tape-Repair Outfit for Field Use

It seems not generally known among engineers that a steel tape can be mended quickly in the field by soldering the two ends together, and this repair is more permanent than the usual method of riveting. A riveted joint always has a lap which has a tendency to catch on every little projection over which the tape passes, and is usually soon ripped off. A much better joint can be made by soldering, especially on the narrow 300- and 500-ft. tapes, which are especially difficult to rivet. Directions for making a soldered joint are here given:

First straighten out the rough ends of the break with a pair of pliers and clean the ends of any rust or mud. A little rubbing with a piece of paper or a small stone will suffice. Then cut a sleeve of soft tin plate, the kind used for the inner seal of some coffee cans is handiest to work with, as it can be easily cut with ordinary scissors and bent into shape with the fingers. The sleeve should be about an inch long and fitted to the tape, so that [illegible] folded down snugly the edges just come together. [illegible] folded around one end of the broken tape. The other end is then slipped into the sleeve just far enough to make the tape the proper length. This is determined with some other part of the same tape. The sleeve is then clamped down with the pliers to an almost snug fit, leaving just a very small crack still open. The joint is now ready to be soldered. First run in some soldering compound, holding the joint with the pliers. Now hold the joint in the flame of a candle and drop a little solder on the crack in the sleeve. It will run around in the sleeve covering all the joint. The sleeve is now squeezed down tight with the pliers and the job is done. The tape may break again but rarely at one of these repaired joints.

A repair outfit, consisting of a small piece of candle, a few inches of soft wire solder, which can be easily melted in the flame of the candle, an inch or so of stick soldering compound, such as electricians use, or a piece of resin, a piece of a tin can, a small pair of scissors and pliers to match, weighs less than a pound and can be carried in a 6-in. canvas sack, along with the regular field outfit. A broken tape can then be repaired in a few minutes right on the job.

The writer once lost two days' time going to town to get a jeweler to rivet a tape, because he didn't know this simple scheme. He had been told "solder wouldn't hold" and believed it.

⁂

## A New Gyratory Crusher

The gyratory crusher is a type of machine that has had a wide application in mining operations. As usually built, it has one objection and that is the amount of vertical height required for its installation, a matter which may be of extreme importance where headroom is scarce. With the idea of correcting this difficulty, B. W. Traylor, of New York, has designed a gyratory machine of small height, which he has patented under U. S. pat. No. 1,047,859. The additional advantages of the design are increased strength and durability, the short shaft used, together with the closeness of the lower bearing to the crushing point, removing the danger of springing the shaft when operating on hard rock or in case of foreign material getting into the machine. In the accompanying drawings, which amply illustrate the design, Fig. 1, is a vertical section showing the relation of the different parts, while Fig. 2 is a horizontal section on the line 2- -2. The reduced height is clearly shown and the substantial construction indicated.

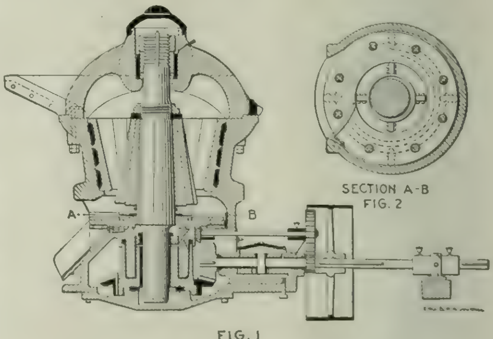

FIG. 1

Details of Gyratory Crusher

# THE COST OF DOING THINGS

## Shaft Sinking in the Transvaal

According to the annual report of the Modderfontein Deep Levels, operating in the Transvaal, it has sunk two shafts each about 3000 ft. for an average cost of $123 per ft. No. 1 shaft at the end of 1911 had attained a depth of 1949 ft. In August, 1912, it was completed to a depth of 3087 ft. from the surface, 1138 ft. having been sunk during the period. The Main Reef was encountered at a point 2990 ft. from the surface. The average rate of sinking during the year was 146.9 ft. per month, and for the whole period after the hoisting engine was erected, 137.1 ft. per month; the greatest footage obtained in this shaft for any one month was 212. The cost was as follows: Sinking, $56.24 per ft.; timbering, $32.80; pumping, $7.40; total, $96.44 per foot for a depth of 3087 ft. from surface.

No. 2 shaft was sunk 1504 ft. during the year, making its total depth 3126 ft. The foot wall of the Main Reef was encountered in this shaft at a depth of 3003 ft. The average rate of sinking for the year was 151.4 ft. per month, and for the whole period after the hoisting engine was erected, 130.1 ft. per month; the greatest footage for any one month was 234. The total cost of sinking this shaft was $109.24 per ft. for sinking, timbering and pumping. This cost was divided as follows: Sinking, $58.52 per ft.; timbering, $32.72; and pumping, $18 per ft. The water lifted from the shaft and mine amounted to 61,807,000 gal. for the year; 7.6% of this came from above the 700-ft. station, 74.3% above the 1400-ft., 7.4% from between the 1400-ft. and 1700-ft. levels, and 10.7% from the bottom of shaft and mine.

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## Round Mountain Mining Co.

The report of the Round Mountain Mining Co., Round Mountain, Nev., for the year ended Mar. 31, 1913, shows a net realization of $29,151 from 57,360 tons of ore treated. The gross value of the ore was $318,985, or $5.56 per ton. Tailings loss amounted to 64c. per ton, making a net yield of $4.92 per ton, or a total of $282,335. All costs amounted to $261,375, from which a credit of $8191 was deducted for miscellaneous earnings, leaving a net cost of $253,184. The quick assets of the company were: Accounts receivable, $4852; mine supplies, $10,910; mill supplies, $8277; unexpired insurance, $203 and cash, $146,148; total, $170,391. Surface plants, mill, buildings and movable equipment stand on the books at $104,089. The cost per ton for ore treated was as follows: Stoping, $2.26; development, 59c.; milling, 80c.; bullion tax, marketing, etc., 5c.; miscellaneous expense, 33c.; depreciation of mill equipment, 20c.; depreciation of mine equipment, 29c.; and litigation, 3c.; total, $4.55 per ton, with credits of 14c. per ton.

The ore reserves are estimated at 155,500 tons. The mill was in continuous operation with the exception of a 10-day shutdown on account of frozen pipes and occasional power troubles. Development work to the amount of 4716 ft. was performed during the year. A statement contained in the report covering period from May, 1907, to March, 1913, inclusive, shows that during the period 226,028 tons of ore have been milled. The gross value of this ore was $1,975,918, or about $8.75 per ton. From this ore, dividends aggregating $328,404 have been paid; these together with the balance of quick assets, $170,391, indicate a net profit of $498,795, or approximately $2.20 per ton to date. This, of course, is after providing for all equipment and construction.

⁂

## Cost of Equipping a Mesabi Underground Mine

According to Bulletin No. 1 of the Minnesota School of Mines, it costs from $58,000 to $90,000 to furnish a surface plant for a 10- to 20-yr. life underground mine on the Mesabi iron range, having a monthly output of 25,000 tons or more. The buildings and equipment would be as follows:

| | | |
|---|---|---|
| Steel headframe, stock-pile trestle and electric haulage | $10,000 to | $12,500 |
| Engine and boiler house equipment as follows: | | |
| 3—150-horsepower boilers | 20,000 to | 30,000 |
| 1—duplex 16x20 double-drum reversible hoist | | |
| 1—14x24 corliss engine | | |
| 1—100-kilowatt generator | | |
| 1—small compressor | | |
| 1—concrete smoke stack | | |
| Coal dock | 2,000 to | 3,500 |
| Water tower | 1,000 to | 1,500 |
| Miners' dry for 250 men | 7,500 to | 8,500 |
| Machine, blacksmith and carpenter shops and equipment | 10,000 to | 20,000 |
| Warehouse and sheds (carrying a $10,000 stock) | 2,500 to | 4,000 |
| Office and equipment | 5,000 to | 10,000 |
| Total cost of surface plant | $58,000 to | $90,000 |

This cost for surface plant is exclusive of location. A miners' boarding house may cost from $5000 upward. Cottages, four-room, six-room and eight-room, respectively, $750, $1000 and $1500. Superintendent's house, from $2500 to $4000. The cost of a 250-ft. shaft with stations and pockets complete under ordinary conditions will approximate $25,000. Cost of pump room and 1500-gal. pump, $15,000. Cost of underground electric haulage, including tracks and cars, $15,000. Total cost of shaft and underground equipment, $55,000. The total cost of surface plant and equipment and shaft and underground equipment will run from $125,000 to $150,000 when close enough to town to eliminate quarters for the men; a property remote from town will require an additional $30,000 to $50,000, and probably $75,000 for employees' living quarters.

For shaft sinking and surface construction it requires from 75 to 100 men, and from eight to 12 months' time according to working conditions. During development work the crew will run from 100 to 200 men, depending upon the desired speed. While development work is continuous until the decline of the mine it requires from 10,000 to 30,000 ft. before a mine is ready to commence stoping or slicing on any scale. During the height of its production a typical Mesabi mine will employ from 175 to 250 men, according to the tonnage mined. For an output of 20,000 and 30,000 tons per month a crew divided as follows would be required: Contract miners, stoping and development, 100 to 150; company account men underground, 30 to 50; surface crew, 40 to 50. The time required for development will vary from 15 to 18 months under ordinary conditions.

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## Cost of Small Frame Buildings

The bills of material and costs of three frame buildings erected for a construction camp are of interest to the mining industry, since the buildings are of the type and description frequently found installed in small camps and remote properties. The buildings are described by Clark A. Bryan (*Eng. & Cont.*, July 2, 1913).

One building was used as a store and dining-room combined. It was 36x16 ft. in plan, built with a gabled roof 7 ft. 3 in. from the top of the floor to the top of the plates, with a total height of 11 ft. 9 in. There were two rooms, 11 ft. 6 in. and 24 ft. 6 in., respectively, the former used as the store. The sills were made of 4x6-in. lumber, the four corner posts and the intermediate posts, of which there were two on each of the long sides, of 3x4-in. material. These upright posts were all mortised into the plate, which was of 4x4-in. material. As an additional brace a piece of 2x4-in. was run completely around the building between the uprights, 3 ft. above the floor. The building was braced in the direction of its short dimension by running a piece of 2x4-in. material from the top of one of the intermediate posts to the top of the opposite post, these braces set flush with the top of the plate. The 2x4-in. rafters were nailed to the plate. There were 19 rafters on each side, 10 ft. long, overhanging the sides by about 8 in. A piece of 1x5-in. material was nailed over their ends as a sort of trim.

The 1x3-in. purlins were laid at right angles to the rafters and nailed to them; they were spaced 1 ft. 6 in. on centers. Corrugated-iron roofing, weighing 115 lb. per square, was nailed directly to the purlins. This provided plenty of ventilation, inasmuch as at the sides the building was not tightly sheathed. The 2x8-in. joists were 16 ft. long, notched 3 in. on the sills; they were spaced 1 ft. 6 in. A 1-in. floor was laid. The sides were of 1-in. rabbeted barn boards, 10 in. wide. The partition was of this same material. There were five windows, each 2 ft. 6 in. x 2 ft., with six lights. There were three doors, each 2 ft. 9 in. x 7 ft. Table I gives the bill of materials and cost of construction.

The building used for a bunk house was 14x50 ft. in plan, built with a shed roof. It was 9 ft. 6 in. high on the high side and 6 ft. 6 in. on the low side, divided into five compartments, each of which was designed to accommodate eight men. The sills were of 4x6-in. material; the corner post and the eight intermediate posts on the long side, of 3x4-in. material. The [illegible]-in. plate was spiked to the top of the posts; the 3x4-in. by 16 ft. rafters were spaced 2 ft. and overhung the plate about [illegible], being spiked to the latter. The roofing and purlins were the same as in the other house. The bracing [illegible] similar to that of the first house. The partitions [illegible] of barn boards, 6 ft. high. Each room had [illegible] and two windows; against each side were two tiers of bunks 3 ft. wide and 7 ft. long, the lower being 1 ft. above the floor, and the upper resting on the 2x4-in. brace which extended around the building. The bunks were supported at the center by means of a trestle built of 2x4-in. material, braced on the sides. Table II shows the material consumed and the cost of the building. The cooking shed consisted of four upright posts about 7 ft. high, supporting a corrugated-iron roof 12 ft. square. In Table III are given the material and cost of the shed.

TABLE I. COST OF DINING ROOM AND STORE

| Items and Size | Rate | Cost |
|---|---|---|
| 114 lin.ft. sills, 4x6 in. | $0.05 | $5.70 |
| 100 lin.ft. posts, 3x4 in. | 0.0275 | 2.75 |
| 16 lin.ft. frames for doors, etc., 3x4 in. | 0.0275 | 0.56 |
| 104 lin.ft. plates, 4x4 in. | 0.03 | 3.12 |
| 104 lin.ft. braces, 2x4 in. | 0.015 | 1.56 |
| 32 lin.ft. braces at plate, 2x4 in. | 0.015 | 0.48 |
| 380 lin.ft. rafters, 2x4 in. | 0.015 | 5.70 |
| 432 lin.ft. purlins, 1x3 in. | 0.005 | 2.16 |
| 144 lin.ft. ridge, 1x3 in. | 0.005 | 0.72 |
| 36 lin.ft. ridge pole, 3x4 in. | 0.0275 | 1.00 |
| 416 lin.ft. joists (26 pieces 16-ft.) 2x8 in. | 0.028 | 11.70 |
| 576 sq.ft. flooring, 1-in. | 0.025 | 14.40 |
| 782 sq.ft. barn boards in sides, 1x10 in. | 0.025 | 19.55 |
| 72 sq.ft. barn boards in gables, 1x10 in. | 0.03 | 2.16 |
| 150 sq.ft. barn boards in partition, 1x10 in. | 0.025 | 3.75 |
| 40 lin.ft. tin ridge | 0.06 | 2.40 |
| 5 windows (six 8x10-in. lights), 2 ft. 6 in. by 2 ft. | 1.25 | 6.25 |
| 3 doors, 2 ft. 9 in. by 7 ft. | 0.90 | 2.70 |
| 2 mess tables, 16 ft. by 3 ft. | 2.50 | 5.00 |
| 4 benches, 18 ft. | 0.40 | 1.60 |
| 720 sq.ft. corrugated iron roof | 0.046 | 33.12 |
| 90 lb. wire nails | 0.035 | 3.15 |
| 7 lb. galvanized nails | 0.06 | 0.42 |
| 3 pairs hinges (10-in. strap) | 0.25 | 0.75 |
| 3 hooks and staples | 0.05 | 0.15 |
| 2 hasps and staples | 0.10 | 0.20 |
| 1 padlock | 0.28 | 0.28 |
| 112 lin.ft. trim, 1x5 in. | 0.035 | 3.92 |
| Total cost of materials | | $135.28 |
| Labor— | | |
| 14 hr. foreman carpenter | $0.275 | $3.85 |
| 66 hr. carpenter | 0.22 | 14.52 |
| 41.5 hr. carpenter's helper | 0.17 | 7.06 |
| Total cost of labor | | $25.45 |
| Total cost of building | | 160.73 |

TABLE II. COST OF BUNK HOUSE

| Items and Size | Rate | Cost |
|---|---|---|
| 128 lin.ft. sills, 4x6 in. | $0.05 | $6.40 |
| 93 lin.ft. posts, 3x4 in. | 0.0275 | 2.56 |
| 65 lin.ft. frames for doors, etc., 3x4 in. | 0.0275 | 1.78 |
| 132 lin.ft. plates, 2x4 in. | 0.015 | 1.98 |
| 128 lin.ft. braces, 2x4 in. | 0.015 | 1.92 |
| 224 lin.ft. braces at plate, 2x4 in. | 0.015 | 3.36 |
| 416 lin.ft. rafters, 3x4 in. | 0.0275 | 11.44 |
| 650 lin.ft. purlins, 1x3 in. | 0.005 | 3.25 |
| 405 lin.ft. joists (27 pieces 16-ft.), 2x8 in. | 0.028 | 11.34 |
| 75 lin.ft. braces foot of posts, 3x4 in. | 0.0275 | 2.07 |
| 800 sq.ft. flooring, 1-in. | 0.025 | 20.00 |
| 1000 sq.ft. barn boards in sides, 1x10 in. | 0.025 | 25.00 |
| 336 sq.ft. barn boards in partitions, 1x10 in. | 0.025 | 8.40 |
| 500 sq.ft. barn boards in bunks proper, 1x10 in. | 0.025 | 12.50 |
| 60 lin.ft. 2x4-in. supports for bunks | 0.015 | 0.90 |
| 50 lin.ft. braces, 2x4 in., for bunks | 0.015 | 0.75 |
| 132 lin.ft. trim, 1x5 in. | 0.035 | 4.62 |
| 10 windows (six 8x10-in. lights), 2 ft. 6 in. by 2 ft. | 1.25 | 12.50 |
| 5 doors (2 ft. 9 ins. by 6 ft.) | 0.54 | 2.70 |
| 800 sq.ft. corrugated iron roof | 0.046 | 36.80 |
| 128 lb. wire nails | 0.035 | 4.48 |
| 7 lb. galvanized nails | 0.06 | 0.42 |
| 6 pairs hinges (8-in. strap) | 0.18 | 1.08 |
| 6 pairs hooks and staples | 0.05 | 0.30 |
| 6 pairs hasps and staples | 0.10 | 0.60 |
| Total cost of materials | | $177.28 |
| Labor | | |
| 24 hours foreman carpenter | $0.275 | $6.60 |
| 95 hours carpenter | 0.22 | 20.90 |
| 34 hours carpenter helper | 0.17 | 5.95 |
| Total cost of labor | | $33.45 |
| Total cost of building | | $210.73 |

TABLE III. COST OF COOK SHED

| Items and Size | Rate | Cost |
|---|---|---|
| 40 lin.ft. corner posts, 4x6 in. | $0.05 | $2.00 |
| Other lumber | | 1.00 |
| 144 sq.ft. corrugated iron roofing | 0.046 | 6.63 |
| Total cost of materials | | $9.63 |
| Labor | | |
| 7 hr. carpenter | 0.22 | $1.54 |
| Total cost of shed | | $11.17 |

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**The Cost of Drawing No. 8 Copper Wire** is given by a government bulletin at about $20 per ton. If true, this is nearly twice the cost of the complicated electrolytic refining processes.

# American Electrochemical Society

*SYNOPSIS—An account of the Denver meeting of the Electrochemical Society, by our special correspondent.*

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The twenty-fourth general meeting of the American Electrochemical Society was held in Denver, Colo., Sept. 9, 10 and 11.

The members of the society reached Denver early Monday afternoon, Sept. 8, and the afternoon was spent in viewing the principal points of interest about the city, automobiles being provided by the local committee, members of the society, H. C. Parmalee being chairman. At 8:30 p.m., there was a meeting of the board of directors of the society at the Shirley Hotel.

At 10 a.m., Tuesday, a meeting was held at the Shirley Hotel for the reading of papers. The title of the papers read in outline and discussed informally were: "Some Aspects of Heat Flow," by E. F. Northrup; "The Shape Factor," by Irving Langmuir, E. G. Adams and G. S. Meikle; "The Heat Resistivity of Graphite and Carbon," by J. W. Richards, and the "Electrolysis of Cyanide Solutions," by E. F. Kern. Before the meeting began, Doctor Richards, secretary of the society, read a telegram of good wishes from the American Electroplaters Society, the latter being in joint session with the Electrochemical Society at the previous meeting, held at Atlantic City.

The first paper read discussed the theory of the flow of heat, showed the analogies between the flow of heat and electricity and pointed out the difficulties in obtaining measurements of the flow of heat due to radiation from the conductor, the slowness with which temperature equilibrium is restored after being disturbed, etc. The final part of the paper discusses modes of heat-flow, measurements by electrical and direct or thermometric modes. Certain analogies between heat and electricity are discussed in the form of a table and in the informal discussion which followed the outline reading of the paper, Doctor Richards remarked that there must be some error in comparison "14" of the table of analogies, viz., "No thermomotive force recognized which acts upon heat to move it," and the corresponding electrical analogy, "An electromotive force is recognized as that which moves electricity in its circuit," for the fall of temperature in parts of a conductor is precisely analogous to the difference in potential at two parts of an electrical circuit.

The second paper dealt with the flow of heat through furnace walls and methods for its measurements. The flow of heat from one parallel surface of a rectangular furnace to the other or outer surface and the effect of the corners is discussed with much ingenuity. Results of experiments with rectangular and other-shaped figures are given and formulas of comparatively high accuracy are furnished for the loss of heat from furnace walls.

The third paper presented was on the relative heat resistivity of carbon and graphite and represented the results of experiment in the metallurgical laboratory of Lehigh University. The ratio of resistivity of carbon to graphite was found to be 10:1. The ratio determined by other experimenters is summarized at the end of the paper. The temperature range in Doctor Richards' experiments was less than 1000° Centigrade.

The paper by Edward F. Kern, on the "Electrolysis of Cyanide Solutions," brought out considerable discussion. The first part of the paper deals with experiments on anodes of various kinds, the conclusion reached being that peroxidized lead and passive iron anodes are permanent in dilute cyanide electrolytes. Prof. G. Howell Clevenger, in discussing this portion of the paper, stated that his experience with peroxidized anodes was that their life was about a year. Part 2 of the paper deals with the electrolysis of cyanide solutions with insoluble electrodes in order, as the writer phrases it, to "determine whether strongly oxidizing or strongly reducing conditions during electrolysis increases the dissolving power of cyanide leach solutions," and he concludes from experiment that a greater loss of cyanide occurs by electrolysis at higher than at lower current densities. The effect of variations in the density of the current in the matter of increasing the gold extraction were negative with the particular ore submitted to test. The third part of the paper deals with experiments made to determine whether there is any regenerative effect to be obtained with cyanide solutions employing sulpho- and ferrocyanide, and the writer concludes they do not regenerate with electrolysis by direct current. In the discussion which followed the reading of the paper, Doctor Richards explained the arrangement of a regenerative cell which he had used in laboratory experiments, consisting of two compartments, divided by a baffle which dipped into mercury placed in the bottom. The left-hand compartment of the cell contained electrodes and a caustic-soda solution, which, on being electrolyzed, formed a soda amalgam with the mercury. The right-hand side contained an auro-cyanide solution, which yielded its gold to the amalgam, the sodium combining with the cyanide solution in the exchange and thus regenerating it.

On Wednesday, Sept. 10, the society held its proceedings at the University of Colorado, at Boulder. The president of the society, E. F. Roeber, presided as on the previous day. The first paper read was by Clevenger and Hall, on the "Electrolysis of Aqueous Solutions of the Simple Alkaline Cyanides." The writers conclude from experiment that the loss of cyanide from the current is less where there is no protective alkalinity than where there is and show the results obtained in the form of curves and tabulations. The paper discusses the modes of analyses employed for determining the compounds resulting from electrolysis, and the calculations employed are given with great fullness. The methods of research employed by present experimenters in the cyanide field were severely criticized by F. Austin Lidbury, the essence of his criticism being that there should be actual collection of the product arriving at the anode and determination of its character and amount and that given certain conditions it ought to be nearly possible to determine what would ensue on application of the current. This was the mode of procedure in other lines of electrolytic work, and the haphazard methods of cyanide investigators he did not understand.

The balance of the afternoon was given up to the reading and discussion of a paper by Dorsey A. Lyon and Robert M. Keeney, on the "Possible Applications of the Electric Furnace to Western Metallurgy," and published by permission of the Director of the U. S. Bureau of Mines. This paper is largely a summary of the recent literature on the electric furnace and deals with its application in smelting iron ores, concluding that charcoal is [illegible] feasible reducing agent and hence its application in most parts of the west where timber is scarce is impossible. The writers believe that it is feasible to use the electric furnace for copper ores and for complex lead-zinc ores where conditions are favorable. Its application to straight zinc ores they deem probable if the condensation problem can be solved and the mechanical problems of the electric furnace worked out. The latter part of the paper deals with minor uses of the electric furnace, such as the production of ferro alloys and the cost of power with various prime movers. In the discussion which followed the paper, some of the Eastern members spoke of the use of the electric furnace with favor for making small steel castings, for tempering, annealing, etc. The Western members thought it inapplicable to Western problems under present conditions of high power cost, high installation cost, imperfection of appliances and unsolved metallurgical difficulties.

On Thursday, preceding the meeting at the Colorado School of Mines, at Golden, visits were made to local metallurgical and chemical plants, the session being opened at two o'clock. A paper, by Woolsey McA. Johnson, was read on the "Art of Electric Zinc Smelting," and was a description of the Johnson furnace and the results obtained from it. This was followed by a paper by S. C. Lind, on the "Transformation of Radiant into Chemical Energy," a paper of real scientific merit, and one on the progress in electrostatic separation by Frank S. McGregor, describing late results obtained in practice with the Huff electrostatic separator. By the time these papers were finished, the hour was so late that all the remaining papers had to be read by title only.

Following the meeting the party ascended Lookout Mountain to obtain a night view of Denver from this [illegible] and returned to the city at a late hour.

The informal and last session of the society was held on Pikes Peak on Friday, Sept. 12. The party was hospitably entertained by local chemical and metallurgical enterprises, the local general committee and the faculties of the University of Colorado and the School of Mines. Elaborate luncheons were provided both at Boulder and Golden.

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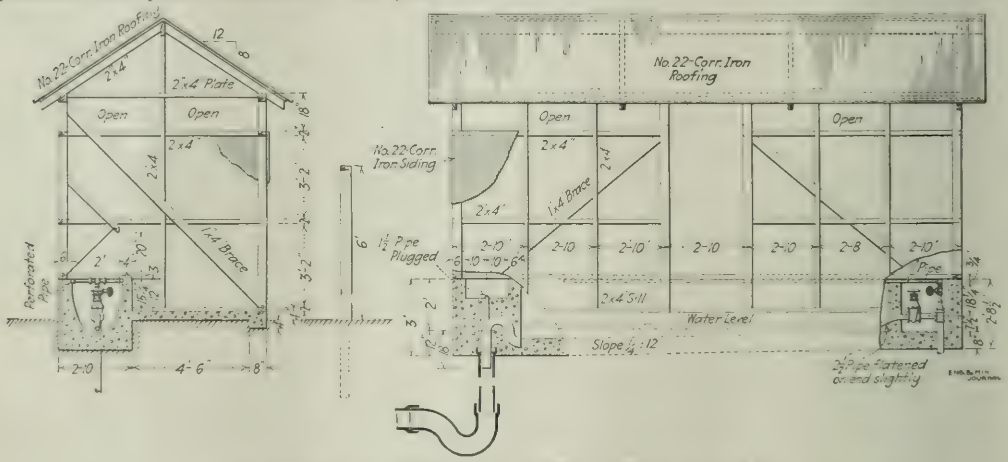
## Concrete Latrine at the New United Verde Smeltery

At Clarkdale, Ariz., a special effort is being made to maintain sanitary conditions both during the period of construction and later. At the new smeltery of the United Verde Copper Co. a concrete latrine will be provided, connecting with the general sewerage system which discharges into a septic tank. The building will be approximately 8x20 ft. and will be sheathed with No. 22 corrugated iron. The general arrangement is shown in the accompanying drawings by Repath & McGregor, who designed the new works. The bottom of the concrete trough will have a slope of one-quarter inch to the foot and the flow of water will be regulated by the valve at the head end, while at the outlet there will be a double trap consisting of a 4-in. lead pipe and an 8-in. tile trap. At the top of the trough on each side will be a 1-in. perforated pipe that will constantly spray the sides. The rail will be a polished and rounded 2x6-in. plank fastened to the concrete by ½-in. hook bolts. To insure cleanliness there will be a back rail placed 1 ft. 8 in. above the seat.



Concrete Latrine, United Verde Works, Clarkdale, Ariz.

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**Hydrometallurgy Is Active in Montana**, which is the scene of great activity in leaching processes for copper and zinc ores, says "Metallurgical and Chemical Engineering," August, 1913. At Butte the Butte & Duluth company is leaching copper ores with sulphuric acid and precipitating the solution electrically. An 80-ton experimental plant is being built in Anaconda at the Washoe smelter of the Anaconda Copper Mining Co., for treating tailing from concentration of second-class ores. A third process is under way at Helena, where the Northwestern Metals Co. is developing a process for treating zinc ores by dry chlorination. Experience with hydrometallurgy leads to the conclusion that it is applicable with success in certain cases, and that a process profitably applied at one place cannot be adopted without alteration in another locality. Each proposition must be considered individually. Natural conditions sometimes favor hydrometallurgy, presenting an ore free from deleterious elements that will foul solutions or offering special advantages in the way of cheap power or acid that can be made as a byproduct from other operations.

# First Pure Radium Salt Produced in America

It is of historical interest to note that the first pure radium salt prepared in the United States from Colorado carnotite ores, has been made by the Standard Chemical Co., in its research laboratory at Pittsburgh, according to the statement of C. H. Viol, in the September number of *Radium*. Recently this company delivered to a well known Baltimore surgeon, 133 mg. of anhydrous radium chloride, sealed in two glass tubes, each 15 mm. long and 2.4 mm. in diameter. The radium content of this material was determined by a comparison with radium standards by the gamma-ray method.

Colorado carnotite does not contain thorium in quantities that can be detected by ordinary analytical methods. If thorium is present in a radium ore, the mesothorium, a decay product of thorium chemically analogous to radium, is separated along with the radium. Thus far it has not been possible to separate radium and mesothorium by any ordinary chemical or physical methods.

The half decay period of mesothorium is 5.5 years, and that of radium is 2000 years. Since mesothorium gives rise to penetrating rays, it is not possible, by a simple gamma-ray measurement to distinguish between radium and mesothorium. Practically all minerals contain traces of uranium and thorium and consequently radium and mesothorium are also present. Meyer and Hess have estimated that about 0.001% of the gamma-ray effect of radium extracted from Austrian pitchblende is due to mesothorium. Preliminary work using radium from Colorado carnotite ores, shows that the quantity of mesothorium present, as determined by actually separating the radiothorium which the mesothorium produced in six months, is very small, being estimated at less than 1.01% of the total gamma-ray effect. Since the gamma-ray method of comparing quantities of radium is only accurate to about 0.3%, it is evident that 0.01% due to mesothorium in a radium preparation could have no effect even if the preparation were being used as a "radium standard," and for all ordinary uses this small quantity of mesothorium need never be taken into consideration.

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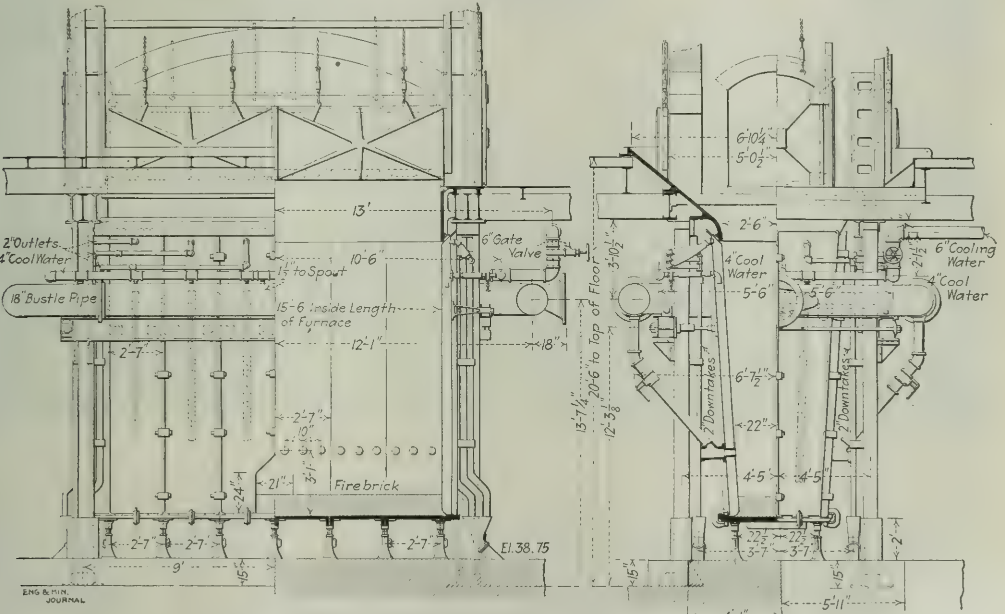
# Blast Furnaces at Chrome, N. J.

The accompanying illustrations show the blast furnaces at the plant of the United States Metals Refining Co., Chrome, N. J., the plant itself being described in the JOURNAL of May 24, 1913. There are two of them, 44x186-in., each with 16 single-tier jackets, six to a side, and two at each end. The tuyeres are 4-in. extra-heavy pipe, welded to the jackets with the oxyacetylene flame. The breast jackets are cast from refined copper, cast around a 1¼-in. extra-heavy pipe for water circulation, and the blast is trapped 8½ inches.



BLAST FURNACE, U. S. METALS REFINING CO., CHROME, N. J.

The furnace bottom consists of 12-in. chrome or magnesite brick, and the space at the back of the furnace is bricked up, so that it can be drilled through in case of emergency, to tap out the furnace. Sheet-steel charging doors have been abandoned and heavy cast-iron doors substituted, as they do not warp, and hence reduce the admission of extraneous air. There are no particular novelties, but we believe illustrations of standard practice may be more acceptable than doubtful innovations.

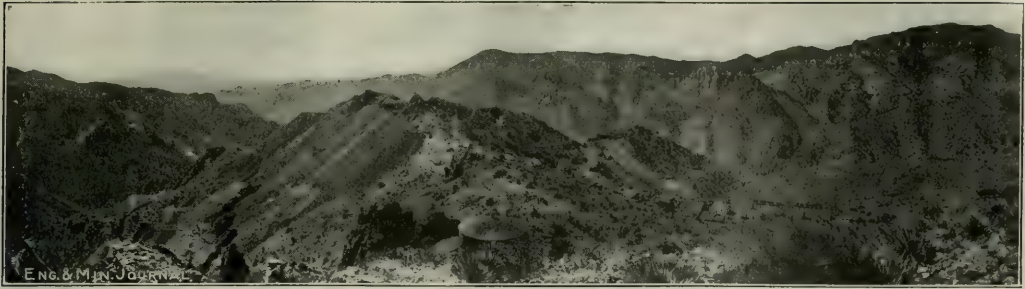
# PHOTOGRAPHS FROM THE FIELD

Constitutionalists or Rebels in Coahuila

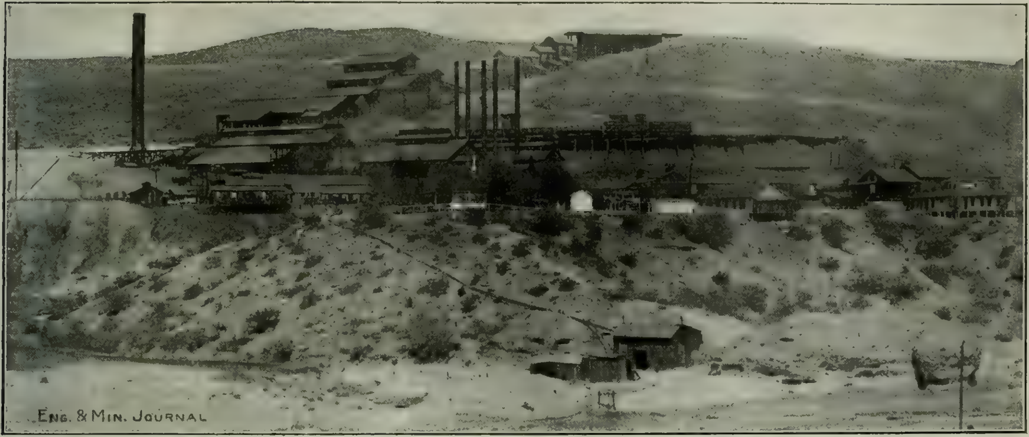
Some of Carranza's Men, Who Were Defeated at Hermanos

Manager's Residence Destroyed by Carranza's Men

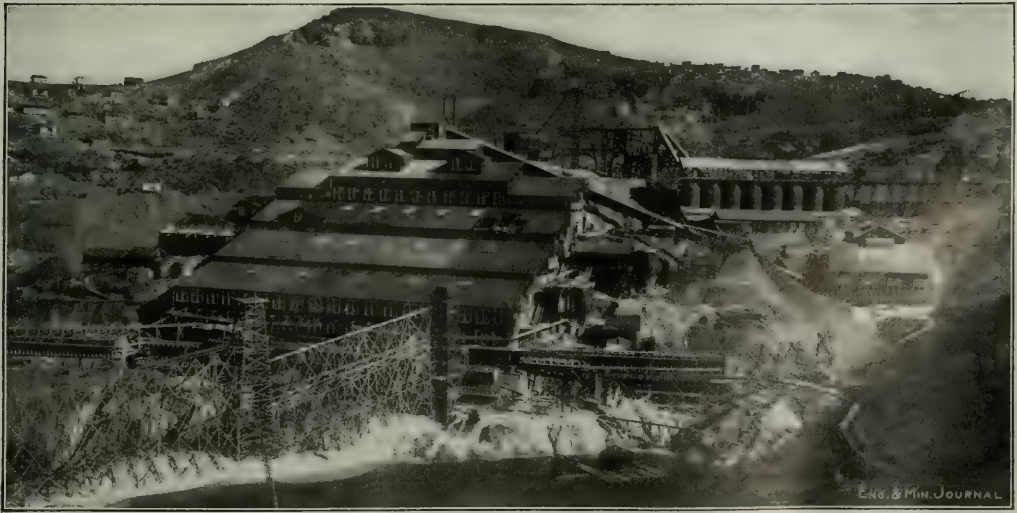
The [illegible] was the residence of the manager of the Cia Carbonifera Agujita y Anexas. The $1,000,000 plant of the company at Lampacitos was dynamited and burned.



Shannon Copper Mine at Metcalf, Ariz.



Shannon Copper Co. Concentrator and Smelter, Clifton, Ariz.



Concentrator of Detroit Copper Co., at Morenci, Ariz.

# NEW PUBLICATIONS

THE [illegible] OF SULPHIDE ORES. By William Har- [illegible] Pp. 252. Bull. 529, U. S. Geological Sur- [illegible]ington, D. C.

[illegible] FORMATION IN OHIO. By D. Dale Condit. [illegible] pp. 363, illus. Fourth Series, Bull. 17, Geological [illegible] of Ohio, Columbus.

GEOLOGY AND ORE DEPOSITS OF LEMHI COUNTY, IDAHO. By Joseph B. Umpleby. Pp. 182, illus. Bull. 528, U. S. Geological Survey, Washington, D. C.

PRINCIPLES OF IRRIGATION ENGINEERING. By Frederick Haynes Newell and Daniel William Murphy. 6¼x9½, pp. 293, illus., $3. McGraw-Hill Book Co., New York.

GEOLOGY OF THE NOME AND GRAND CENTRAL QUADRANGLES, ALASKA. By Fred H. Moffit. Pp. 140, illus. Bull. 533, U. S. Geological Survey, Washington, D. C.

GEOLOGY AND ORE DEPOSITS OF THE MONARCH AND TOMICHI DISTRICTS, COLORADO. By R. D. Crawford. Pp. 317, illus. Bull. 4, Colorado Geological Survey, Boulder.

GEOLOGY OF THE GOLD BELT IN THE JAMES RIVER BASIN, VIRGINIA. By Stephen Taber. Pp. 271, illus. Bull. VII, Virginia Geological Survey, Charlottesville, Va.

AMERICAN MINING CONGRESS, REPORT OF PROCEEDINGS. Fifteenth Annual Session, Nov. 25-29, 1912. Pp. 251. Published at the office of the Secretary, Denver, Colo.

REPORT ON MINING OPERATIONS IN THE PROVINCE OF QUEBEC DURING THE YEAR 1912. Pp. 236, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec.

THE COALFIELDS OF INDIA. By V. Ball. Revised and rewritten by R. R. Simpson. 7x10½, pp. 191, illus., paper; 6s. 8d. Vol. XLI, Memoirs, Geological Survey of India, Calcutta.

REPORT OF THE COMMITTEE OF THE COLORADO SCIENTIFIC SOCIETY ON UNIFORM MINE ACCIDENT LAWS 6¼x9½, pp. 135. Published by the Society, Denver, Colo., July 1, 1913.

ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA DURING THE CALENDAR YEAR 1911. By John McLeish. Pp. 316. Canada Department of Mines, Mines Branch, Ottawa.

THE NICKEL INDUSTRY: WITH SPECIAL REFERENCE TO THE SUDBURY REGION, ONTARIO. By A. P. Coleman. Pp. 206, illus. Canada Department of Mines, Mines Branch, Ottawa.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE. VOL. LXXXVII. NO. I, 1913. Edited by George C. Lloyd, Secretary. 5½x8½, pp. 774, illus. Published at the offices of the Institute, London.

GEOLOGY AND ORE DEPOSITS OF THE SAN FRANCISCO AND ADJACENT DISTRICTS, UTAH. By B. S. Butler. Pp. 212, illus. Professional Paper 80, U. S. Geological Survey, Washington, D. C.

GEOLOGY AND ORE DEPOSITS OF THE ALMA DISTRICT, PARK COUNTY, CLORADO. By Horace B. Patton, Arthur J. Hoskin and G. Montague Butler. Pp. 284, illus. Bull. 3, Colorado State Geological Survey, Boulder.

FIRST SERIES OF COAL-DUST EXPLOSION TESTS IN THE EXPERIMENTAL MINE. By George S. Rice, L. M. Jones, J. K. Clement and W. L. Egy. Pp. 115, illus. Bull. 56, U. S. Bureau of Mines, Washington, D. C.

THE COBALT-NICKEL ARSENIDES AND SILVER DEPOSITS OF TIMISKAMING (COBALT AND ADJACENT AREAS). Fourth Edition. By Willet G. Miller. Pp. 179, illus. Vol. XIX, Part 2, Report of Ontario Bureau of Mines, Toronto, Canada.

REPORT ON THE COBAR COPPER AND GOLD FIELD. Part I (1911). By E. C. Andrews. 6x9¾, pp. 207, illus., board covers; maps in separate portfolio, 7s. 6d. Mineral Resources No. 17, New South Wales Department of Mines, Geological Survey, Sydney.

A GEOLOGIC RECONNOISSANCE OF THE FAIRBANKS QUADRANGLE, ALASKA. By L. M. Prindle. With a detailed description of the Fairbanks district, by L. M. Prindle and F. J. Katz, and an account of lode mining near Fairbanks, by Philip S. Smith. Pp. 220, illus. Bull. 525, U. S. Geological Survey, Washington.

EXCAVATING MACHINERY. By Allen Boyer McDaniel. 6½x9½, pp. 340, illus.; $3. net. McGraw-Hill Book Co., New York.

Contents: Drag and wheel scrapers, road or scraping graders, elevating graders, capstan plow, steam shovels, dry land excavators, floating excavators, trench excavators, levee builders; the comparative use of excavating machinery, appendixes.

DIAMANTBOHRUNGEN FUER SCHUERF- UND AUFSCHLUSSARBEITEN UEBER UND UNTER TAGE. By Georg Glockemeier. 5¾x8½, pp. 58, illus. 1.60 marks. Julius Springer, Berlin, Germany.

This little pamphlet covers, in a brief way the art of [illegible] boring with the diamond drill. Sections 1 and 2 describe [illegible] rotating and feeding mechanism; section 3 describes [illegible] process of setting the stone in the bit, mentioning one [illegible] not employed in America, for which several ad- [illegible] are claimed. The next sections, on driving mechan- [illegible] mountings are very incomplete, but that on the appli[illegible]s of the drill to mine prospecting is better. The book adds nothing to the knowledge already possessed by most drill runners, and is not sufficiently exhaustive nor discriminatingly representative to be of great value to students.

METALLIC ALLOYS: THEIR STRUCTURE AND CONSTITUTION. Second edition, revised. 5½x7¾, pp. 409, illus.; $3.25. Charles Griffin & Co., Ltd., London; J. B. Lippincott Co., Philadelphia.

This book represents the attempt to present the theory of alloys on a systematic basis, and not to write a practical book for the mixer and founder. The chapter headings are: Methods of investigation; the physico-chemical equilibrium of mixed substances; binary alloys in which no definite chemical compounds are formed; binary alloys which show evidences of the formation of definite chemical compounds; transformations which take place in completely solid metals and alloys; equilibrium conditions in metallic mixtures; the structure of metals and alloys; the bronzes, the brasses, and other alloys of copper; steel, and other alloys of iron; alloys of more than two metals; the microscope in engineering practice.

POOR'S MANUAL OF INDUSTRIALS. Fourth Annual Number, 1913. Manufacturing, Mining and Miscellaneous Companies. 6x9, pp. 2268; $7.50. Poor's Railroad Manual Co., New York.

As is well known to the users, "Poor's Manual" has grown to such a size as to require publication in three sections, railways, public utilities and industrials, the last being the one of most interest to the miner and metallurgist. In the mining field proper there are 237 pages of mining companies, on which the information given, so far as we can see, is reliable. The metallurgical companies are scattered through the miscellaneous section, and it is consequently impossible to tell just their bulk in the publication. There is no question of the necessity of this book to the investor, or to the manager of any company having wide financial dealings or extended interests, and we feel that the Poor's Railroad Manual Co. is much to be congratulated on this book.

LA INDUSTRIA MINERA DE MEXICO, Tomo I. Compiled and edited by A. Grothe and L. Salazar, S. 8x11½, pp. 304, illus.; paper. $3.

This volume contains information pertaining to the mining industry in the states of Hidalgo and Mexico. Although sanctioned by the secretary of Fomento, whose department has rendered much assistance to the compilers, the publication is not an official document. It is the first of a proposed series of volumes in which the mining industry in each of the Mexican states is to be described, giving as much information of a general nature as can be gathered by a large corps of mining engineers, who have promised their assistance. To the first volume, Edmundo Girault, C. W. Van Law and Cesareo Puente have contributed extensively. The text, which is to be commended to those seeking proficiency in technical Spanish, is profusely illustrated by halftones, maps, diagrams and sectional drawings of the ore deposits and working of Pachuca, Real del Monte and El Oro as well as of other mines in the states of Hidalgo and Mexico.

THE MANUFACTURE OF SULPHURIC ACID AND ALKALI, WITH THE COLLATERAL BRANCHES. VOL. I, Parts 1, 2 and 3. Fourth edition, revised, in three volumes. By George Lunge. 6x9, pp. 1658, illus.; $18 net. D. Van Nostrand Co., New York.

Lunge's "Sulphuric Acid and Alkali" is one of those books of which it would almost suffice to say as do the magazine makers of their pets, "Bigger and better than ever." The last previous edition was that of 1903, and since then the acid industry has made some great strides in burners, in greater efficiency of chamber space, such as the Falding chambers, and especially in the working of the contact process. All of this has Doctor Lunge described in his painstaking and illuminating manner, using 1657 pages to tell only of sulphuric acid and its making. There are a few points at which the captious may cavil, the only mention we see of the Tennessee Copper Co.'s great plant is an inconsequential note from a Geological Survey publication, but when one begins to find fault here he is hunting for trouble with a microscope. The book remains the authority for the worker in sulphuric acid and the model for the technical author and the student.

The introduction and historical notes occupy 11 pages of the present work, the raw materials of sulphuric-acid manufacture, including nitric acid, 25 pages; properties and analysis of the technically employed oxides and acids of sulphur, 128; the production of sulphur dioxide, 192; construction of lead chambers, 198; recovery of nitrogen compounds, 123; the chamber process, 136; the purification of sulphuric acid, 40; its concentration, 146; arrangement of a sulphuric-acid works on the chamber-process, yields and costs, 29; manufacture of fuming acid, and sulphuric anhydride, 183; byproducts of the manufacture, 84; uses and statistics, 13; addenda and index, 113 pages.

# CORRESPONDENCE AND DISCUSSION

## Peruvian Copper Production

In the JOURNAL of June 28, 1913, I read with much interest the statement of the copper production for 1912. The production for Peru shows a considerable decline, compared with 1911, so that the following tabulation might be of interest:

| In Metric Tons | 1910 | 1911 | 1912 |
|---|---|---|---|
| Eng. and Min. Journ.......... | 27,375 | 28.500 | 27,600 |
| Henry H. Merton & Co......... | 18,600 | 25.900 | 27,600 |
| Aron Hirsch & Sohn........... | 26,000 | 26,000 | 27.400 |
| Official Peruvian reported..... | 27,375 | 27.734 | 27,500 |

Since 1903 the Peruvian output has increased three fold, according to the Estadistica Minera del Peru.

LESTER W. STRAUSS.

Lima, Peru, Aug. 11, 1913.

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## Promoting and Engineering Ethics

The communication from William B. McKinlay, appearing in the JOURNAL of Aug. 30, 1913, I find most welcome as breaking an almost complete silence following the publication of my opinion regarding consulting engineers. I am particularly pleased with this letter, because I find after reading it through that Mr. McKinlay and I are in complete accord. The purpose of my original communication was to set forth the merits of the engineer in charge of operations as against those of the consulting engineer, so called. Mr. McKinlay likewise calls attention to the fact that the ability and the labor of the engineer on the job are not sufficiently appreciated and we are therefore of one mind. The object of my letter was, more or less, to start something; this it failed to do at first, as it drew forth only one letter and that was of similar purport to my own. Apparently my statements were either unanswerable or beneath contempt. Mr. McKinlay's letter proves that neither was the case.

It is a little hard to see what connection there may be between what I wrote and the machinations of the much abused mining promoter, at whom Mr. McKinlay takes a crack. However, there may be some connection not evident to the eye and brain of the nonconsulting engineer. One can but envy Mr. McKinlay his wealth of figurative language drawn from sources mechanical, agricultural, medical and sepultural. The mixed metaphor, however, would seem to be not the perquisite of enthusiastically oratorical congressman only. Mr. McKinlay says, "When the corpse is in a condition fit for the undertaker . . . . . the practical mining man . . . . . beseeches the consulting engineer to bring the pallid child back to life." The transformation of a "corpse fit for the undertaker" into a child, even a "pallid child," comes pretty near to being resurrection. Mr. McKinlay notes that this job of curing the "pallid child" or resurrecting the "corpse" or trying to do one or both, distasteful as it must be, is one which the honorable consulting engineer never can refuse. Can it be that a reward for the disagreeable task influences his willingness in any way? And did anybody ever see a consulting engineer fail to get a big, fat fee for what he did or failed to do in such a case?

Mr. McKinlay suggests "sour grapes." Well, to be frank, possibly something of this feeling has beset me at times. I have no envy for the consulting engineer in his entirety, since, as I outline, anybody who so chooses can be a consulting engineer. But it does pass the endurance of the average human to see a faker getting away with it and not to envy him his spoil.

CARL E. MORRIS.

New York, Sept. 12, 1913.

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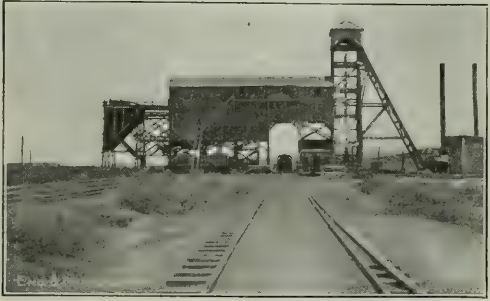
## Destruction of Coal-Mining Plant at Lampacitos

The entire plant of the Agujita Coal Co., at Lampacitos, Coah., Mexico, was destroyed on Aug. 16, 1913, by the Constitutional forces by use of fire and dynamite. The rebels had lost a small battle at Hermanos, 10 miles south of Lampacitos and in retreating through the latter place they committed the destruction. It is claimed that it was done to prevent the Federals from using the coal. The destruction of the property was plainly premeditated and prearranged. The day before the fight at Hermanos, soldiers had been placed at the mines with orders to destroy everything should the rebels loose the fight. As soon as the retreat northward commenced, the destruction began and within two hours fully one million dollars had been sacrificed.



AGUJITA TIPPLE THREATENED WITH DESTRUCTION

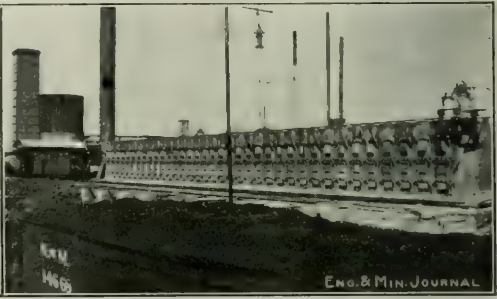
The large coal-washing plant was completely consumed by the fire as was the large warehouse, supply house and lumber yard. The power plant contained one 200-kw. direct-connected generator, one 150-kw. direct-connected generator, one 100-kw. belted set and one 30-kw. belted set. All of these machines were destroyed with dynamite and then the building burned over them. The large machine shop, electric shop and carpenter shop were also destroyed.

At mines Nos. 2 and 3 the fans, which were "Sirrocco" driven by electric motors, with reserve steam engines, all in stone and concrete houses, were destroyed by gasoline and dynamite. The two large direct-hoisting engines, 22x42 in., were also destroyed in the same manner and their houses [illegible]. Two 25-hp., two 50-hp. and one 130-hp. [illegible], which were used on the property, were [illegible] destroyed.

At mine No. 2, a large tipple, equipped with a four-[illegible] [illegible]mp., was destroyed by fire. A number of dwelling houses of office employees and a great number of miners' houses were also burned. The large residence of [illegible], an American, was first looted by the soldiers and then burned with its entire contents. All of the office records, books, maps and notes were lost. The plant was equipped with a complete water system, which was also dynamited.

Of the 2000 people who lived in Lampacitos and depended on the mines, every one was compelled to leave. The greater part left on refugee trains, leaving all their belongings behind. Many also fled on foot, wagon and mule-back. It has been impossible to get to Lampacitos to estimate the exact loss, as the Federals have not advanced north of Hermanos and the Carranzistas are to the north of Lampacitos; that is, Lampacitos lies in the dangerous zone between the two lines. The consequence of this is that the mines are fast filling with water, and it is impossible to get in there to install machinery for putting the electric pumps in operation.

LAMPACITOS COAL WASHERY, DESTROYED



KOPPERS COKE OVENS AT LAMPACITOS

Lampacitos is on the Mexican National Lines, 120 miles south of Eagle Pass, Texas. The property was opened about 6 years ago and in normal times a good producer, having a capacity of 1000 tons per day. There is also installed a plant of 36 Koppers waste-heat retort ovens, these were not damaged so far as is known.

The Constitutional officers, in answering a protest made by the American Consul at Piedras Negras, claimed that they destroyed Lampacitos as a military necessity and further denied that they had destroyed any property of foreigners. As a matter of fact, the Agujita company is controlled by French capital and there are a number of American stockholders. Also the furniture and personal effects of the manager, an American, were stolen or burned. The houses of the superintendent and master mechanic, both Americans, were looted but not burned. None of the few Americans there at the time of the trouble were molested in any way.

The Agujita company has a larger plant located at [illegible]ita, five miles northwest of Sabinas. On Aug. 17 [illegible] officers of the company were notified by the Carranza [illegible] that the Agujita property would be destroyed [illegible] same manner as Lampacitos, if the company did not [illegible] deposit in the bank, for their account, the sum of $50,000, gold. It has not been possible to do this nor has it seemed advisable and consequently the Agujita plant has been taken in charge by petty officers under direction of General Pablo Gonzales. On Aug. 23 and 24, a force of fifty soldiers went to Agujita and took from the warehouses all material and supplies of value, amounting to probably $20,000. They also took from the office all furniture and equipment of value. The Agujita plant has three large mines, 400 beehive coke ovens and a large coal-washing plant of 2000 tons daily capacity.

Even though there has been no sale for coal since Feb. 22, 1913, when this latter revolution began, and there has not been an outlet for a single car of coal or coke, the Agujita company has gone ahead with its work in order to give a living to its men and their families. A total population of fully 7000 persons depended on it for support. It can, therefore, be seen that such wanton destruction of property as occurred at Lampacitos will soon impoverish the country and demonstrate the real meaning of the present revolution.

If the Agujita property is destroyed, as is now threatened, it will be an irreparable loss to the coal industry of Mexico and will clearly show to what straights the rebel forces have been driven to raise money. As stated before, this company is controlled by French capital and it is greatly to the interest of the United States to look to both sides of the case before extending recognition of belligerency to a faction which can permit such acts as those being perpetrated upon the property of the Agujita company.

M. A. A.

El Paso, Texas, Aug. 25, 1913.

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## Questions and Answers

### A SMALL MINE-LIBRARY

We want to begin a small library for our underground foremen and shift bosses. What books would the JOURNAL recommend?

R. E. T.

We think that the best books for a small library for mine foremen and shift bosses would be the following:

"Principles of Mining," Hoover.
"Rock Drills," E. M. Weston.
"Timbering and Mining," W. H. Storms.
"Mine Timbering," W. E. Saunders.
"Geology Applied to Mining," J. E. Spurr.
"Handbook of Mining Details," "Engineering and Mining Journal."
"Mining without Timber," R. B. Brinsmade.
"Practical Shaft Sinking," Francis Donaldson.

# EDITORIALS

## Pestiferous Patents

The files of the patent office teem with combination patents, which often are so obvious in their composition, so utterly devoid of meritorious invention, that there is wonder that they are allowed. A patent ranges in character from the great generic patent down to the more or less trivial combination patent. If, in the days when there was no conception of telephony, an Edison discovers the art of talking between distant places by means of an electrified wire, he may obtain a generic patent upon that discovery and the World is in his debt. Nowadays, however, generic patents are rare, but the combination patent is commoner than ever. Anybody, who makes a new combination of the figures of a kaleidoscope may patent it if he chooses, and his patent may turn up some day to plague people who might previously have described the same thing if it had been thought worth while. An example of this appears to exist in the recent case in which Joseph H. Vincent, successor to Alden H. Brown, secured a decision against the Tonopah Mining Co., and the Desert Power & Mill Co., of Nevada, for alleged infringement of patent rights.

On Feb. 7, 1905, Brown was granted a patent on "a process for treatment of ore, consisting in first pulverizing the ore in the presence of cyanide solution; second, subjecting the ore to hydraulic classification by the introduction of cyanide solution at the bottom of an overflow tank to produce an ascending current; third, leaching the ore by the use of cyanide solution whereby the finer values are dissolved; fourth, removing the dissolved metallic values from the ore in any suitable manner; and finally, the subjection of residue of ore to concentration."

Obviously this patent was intended to cover a process of treatment in cyanide solution terminating with mechanical concentration of the tailings, but unless the steps were carried out identically as specified, there was nothing new in it. Crushing in solution was practiced much earlier, as was concentration of cyanide tailings. Brown added nothing to metallurgical knowledge and his system has not been widely, if at all, adopted.

Concentration has been largely considered necessary in the treatment of silver ores in order to remove cyanide-consuming material. The system of crushing, concentrating and performing all succeeding process in cyanide solution instead of water, is not essentially different from the procedure followed at the Maitland mill in 1903. Cyanidation still follows concentration. The idea of concentrating after cyanide lixiviation was early advanced and was early tried in practice. Indeed, there is no step in the claims of the Brown patent which is not of old usage. We suppose the precise combination had not previously been made, else the Patent Office would not have allowed the patent, or the court upheld it. Yet, it is a combination that would occur to any experienced millman if he had the need to operate in just that way and probably did occur independently to those who ran against the Brown patent. We shall not criticize the decision of the Court in this case, not knowing sufficient of the evidence, but we feel like expressing the indignation of the industry at some of these pestiferous patents.

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## Clipping and Filing

The field of the technical weekly is an extensive one; it must perform partly the function of a newspaper and partly that of a textbook, and cover most of the ground between these extremes. It is the aim of the JOURNAL to fulfill these requirements and as a result our many pages contain matter varying widely in the nature of its appeal, part of it being news of temporary interest only and part of it being material of permanent value.

Probably for general purposes of reference, nothing can surpass a complete series of bound volumes, since this is sure to contain everything that will ever be wanted. In many cases, however, clippings, filed in groups, are much superior. They offer the advantage always of forcing at least a superficial reading of the article to be filed. It is remarkable that many of the numerous readers of the JOURNAL fail to read it with any care and consequently fail to get the full worth of their money. One correspondent recently complained that he had subscribed for the purpose of reading Mr. Megraw's series of articles on cyaniding practice and wanted to know why they did not begin—after some ten or twelve of the articles had appeared. On the other hand, many subscribers embrace the opportunity offered to obtain classified technical data by clipping. A Mexican mine manager tells us, for instance, that at his property all articles that may possibly prove of use, especially those published as Details of Practical Mining and of Metallurgical Practice, are clipped and classified for the use of his staff.

Many advantages accrue to this system. It is extremely convenient to lift out of the files in a single handful all the information on any subject it is desired to investigate. Suppose an engineer to have taken charge of a property which must be whipped into shape. He finds a rudimentary and slow chute-gate in use underground and decides to adopt a more efficient type. By going to his files he obtains a mass of detailed information covering chutes and chute-gate design and by spreading this before him he can eliminate and compare and select the gate best adapted to his conditions. With every other detail about the mine the same method can be followed. Or suppose an engineer called suddenly to make an examination in a new district. Without adding appreciably to the bulk or weight of his baggage, he can carry with him all the published material on the district in question, pulled from his files in a minute or two, and can study it at his leisure on the train. This would be obviously impossible if bound volumes only were to be had. This saving is equally important for an engineer who might need to carry his files with him into a remote district for a stay of a year or several years.

Many engineers clip and file conscientiously, but many do not and we believe they lose thereby. Particularly for the young engineer is the system to be recommended. It keeps him in touch with developments in the industry: it furnishes him criteria on which to base his observations; it makes him read more carefully; and it accumulates for him a compact encyclopedia which will be of great future value.

## Extralateral Rights

While it is our belief that extralateral rights are an invention of the evil one—or of the lawyers—and should not be tolerated by any civilized community, their existence is a condition and a theory, and we must, while it lasts, make the best of it. As being a complete treatise on this subject, both as taking up all the theoretical possibilities, and also as embodying all the court decisions rendered, in this issue we reprint John B. Clayburg's article on "Extralateral Rights," which appeared in the California Law Review.

This should have a particular current interest for our California readers, as the Kennedy Extension vs. Argonaut case was set for Sept. 15; another of the ever-present reminders of the evils of a law which seems now merely intended to stir up litigation. It is, we may note in passing, one of the peculiar defects of our legislative personnel, that the class most interested in having a maximum of litigation, e.g., the lawyers, should be the majority of the law makers. It is for that reason that public opinion must be the more clamorously expressed to gain the suppression of a litigation-making law. After studying the complexities of the extralateral-right situation, we hope the JOURNAL readers will all join the active workers against this pernicious legislation.

## Heberlein on American Metallurgy

Dr. Ferdinand Heberlein, the distinguished German metallurgist, who visited America last year, reported some of the results of his observations in a paper, read recently before a German metallurgical society. Doctor Heberlein is unusually competent to characterize his American observations. He is not only a metallurgist of a high order of achievement, being one of the inventors of the Huntington-Heberlein process, but also he is associated with the Metallgesellschaft of Frankfurt-am Main, which is interested in many important metallurgical enterprises in America, wherefore Doctor Heberlein, in his capacity of consulting engineer, has access to all the data, which is something that does not fall to the lot of the ordinary visitor.

Doctor Heberlein confined his remarks to the status of our lead-, zinc- and copper-smelting industries. Apparently he did not visit our iron and steel works. Consequently he was especially impressed by the absence of coke ovens at our smelteries and the fact that at such works where they existed they were of a backward type, especially in the matter of byproduct recovery. This is, of course, a perfectly valid criticism. Our steel makers are farther advanced, but even they fall very far short of the European practice.

Doctor Heberlein especially admired our labor-saving [illegible] both of the nature of machinery and of the nature of installation, such as our works' tramway systems. His praise of our works' laboratories is rather surprising to us, that being a matter in which we imagined the Germans probably excelled. However, Dr. Heberlein also surprises us in the opposite way by expressing the opinion that notwithstanding the higher wages paid for labor in the United States, the results are not superior to what are realized in Germany; in other words, our much vaunted efficiency of labor does not exist in his estimation. Finally, he stated his belief that the Americans are ahead of the Germans only in the metallurgy of copper and in the treatment of low-grade lead ores; in other words, in silver-lead smelting. In the treatment of high-grade galena and in zinc smelting we are inferior. In the main, this summary is probably correct. However, the reflection that copper smelting and silver-lead smelting are our main branches of nonferrous metallurgy is some consolation to us.

## New York's Mining Law

New York possesses a rather important mining industry, indeed one that is a good deal more important than is commonly supposed. New York and New Jersey combined make annually an output of mineral products which exceeds that of California, both in tonnage and in value. New York also has what California has not, viz., a general law governing mining operations. It is not a very good law, but it has been a long time on the statute books. It is commendable that it has been recognized that this law is imperfect, but the manner in which a new one is to be sprung upon us is too hasty.

At the last session of the legislature, a law was enacted providing for an industrial board, with the commissioner of labor as chairman. This board is authorized to frame rules and regulations for the safety of employees in mines and quarries. The board comprises, besides its chairman, Messrs. John R. Shillady, R. J. Cullen, Charles C. Flaesch, and Maurice Wertheim, and Miss Pauline Goldmark. No one of the board is known ever to have been in a mine.

New York has a State Mine Inspector in the person of W. W. Jones, who is an earnest, efficient and conscientious official. Mr. Jones has been for many months preparing a new set of rules to submit to the board. Under date of Sept. 8, we received from the acting commissioner of labor a copy of a "preliminary draft of proposed rules and regulations" and the notification that a public hearing respecting them would be held at Albany on Sept. 17. Whether this draft is the preparation of Mr. Jones, or not, we do not know.

Our points in commenting upon the matter are especially that it is improper to present such a matter for discussion with such short notice, and secondly that it is unfortunate that any state take measures to adopt a new mining law just now, when a report by a committee of the U. S. Bureau of Mines is so soon forthcoming.

The proposed New York code, so far as we can determine from the hasty examination that we have been able to give it, is pretty good as such codes go. It is nowhere near so good as the code that is being drafted by the committee of the U. S. Bureau of Mines. Without directing criticisms to details, the New York code is too unspecific in too many particulars. There is too much of "if possible," "if practicable," "in the discretion of the commissioner of labor," etc.

## BY THE WAY

A speaker before the Society for the Promotion of Engineering Education urges the discouragement of the units "slugg," the "geepound," and the "wogg." We shouldn't think anything with names like that would need any external discouragement.

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The announcement that the U. S. Department of Agriculture is going to start a monthly magazine, the *Agricultural Outlook,* marks another step of the paternal participation in the publishing business by Uncle Sam and the satisfying of bureaucratic ambitions.

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Standard Oil capital has entered the automobile field by organization of the Rockefeller Motor Co., which will take over rights and property of Goby Engine Co., with headquarters in Cleveland, say the daily papers. The company plans to make an engine that will deliver an average of 50 miles per gallon of either gasoline or kerosene. This is indeed important, if true.

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Thomas A. Edison never is to have another vacation, if his physician has his way about it, report the newspapers. A vacation of two weeks from which he returned recently to his home in West Orange, N. J., fagged him out completely, and he is unable to continue his experiments upon inventions. He is more tired out than he ever was from working 20 and 22 hours per day, declared his physician.

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Gertrude Atherton has been studying mining conditions in Montana, and is writing a novel dealing with them. O, joy! G. A. recently visited the Chicago stockyards in a white gown and picture hat to make an intimate examination of their workings. If she visited the mines in as suitable equipment, and if any publisher will send us a novel by a Montana miner dealing with G. A., we will sit up until morning to read it.

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The Senate passed the tariff bill on Sept. 11, and there was general relief that enactment of the new measure thus came so nearly in sight. This led the *Evening Post* to remark: "It was with feverish anxiety that we scanned the financial news and comment yesterday. Although most people seem to have completely forgotten it, we have never for a moment lost sight of the fact that the great financial panic of the spring of 1893 was caused by the tariff act passed in the summer of 1894. Today we breath free at last. Perhaps, after all, it was *not* the tariff of 1894 that caused the panic of 1893."

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The latest mining excitement is reported in Indiana, where press dispatches say that the Adams township residents of Carroll County, are agog over the discovery on the Marian Briney farm of what seems to be gold. Dozens of farmers in that vicinity have abandoned their regular work and are digging test holes in the knolls on their farms where there are indications of gravel ledges. When hauling gravel, Richard Leslie and Frank Edgerly found a white stone which was noticeable for its softness. It crumbled up readily in their hands and among the soft particles were yellow grains that look like gold. Gravel ledges are new to us. We opine that the Adams farmers will learn that all is not gold that glitters. Often it is only pyrites.

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John D. Ryan attended a banquet given in his honor by Helena business men on Sept. 12, and made the following remarks: "Talk of monopoly," he said, "of the the water power in Montana is driveling idiocy. There are more powers than markets. Montana owes a very large part of its prosperity to mining operations, and mining distributes more than $40,000,000 a year in the state, the expenditures of the Anaconda company being approximately that sum. While it has been popular for politicians to attack Anaconda, the time is coming when men will demand fair treatment for such enterprises." The Amalgamated has, he said, for 10 years controlled the largest copper mines in the state and has paid out in dividends in that time not more than 10% of the amount that it has paid for labor, supplies, transportation and other necessary expenses within the state.

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Discussing the retained expert, W. M. Grosvenor, in the *Journal of Industrial and Engineering Chemistry,* cites an amusing definition of the title: "In the early days of telegraphy, an application was filed for a new kind of relay that, to make it very sensitive, possessed a long arm pivoted near one end between strong electromagnets and making relay contacts at the other. The examiner found nothing to anticipate it, but wrote the applicant to know, before allowing the application, why it was entitled "Expert Relay." The applicant answered that he called it a relay because it was for repeating forward telegraphic impulses and an expert because it possessed a tongue suspended in the middle and adapted to lie with equal facility in either direction, according to the nature of the influence brought to bear." This reminds us of the college professor who made his daughter name her doll "President," because it would lie in whatever position it was placed.

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The U. S. Bureau of Mines has issued a bulletin devoted exclusively to a review and abstracts of decisions based on the laws governing the rights and duties of mine owners, operators, miners, and persons trafficking in all kinds of mining properties. It includes abstracts of current decisions of all the Federal and State courts of last resort on questions relating to the mining industries. The bureau proposes to issue similar bulletins with sufficient frequency to keep the reports of the courts mentioned reasonably current. There is no present medium known to the bureau by which this information is conveyed immediately to miners, mine owners or other persons interested in mining and mining industries. The interest manifested in this bulletin by the persons for whom it is intended will be taken as a basis for determining whether the subsequent publication of similar bulletins is warranted. The issuance of such bulletins will accordingly depend on the number of individual requests received for this one and on the opinion as to its value expressed by those who receive it.

## Appropriation for Geological Survey Fire Damage

WASHINGTON CORRESPONDENCE

The House of Representatives has passed the general deficiency bill; among the items likely to be retained in the Senate is the following:

> For the purchase of instruments, equipment, apparatus, supplies, file cases and other furniture, and lumber, and the reprinting of maps and folios, to replace certain ones destroyed by the fire of May 18, 1913, in the building occupied by the U. S. Geological Survey, including the repairs to instruments and equipment made necessary by said fire, these emergency purchases to be made under such rules as the Secretary of the Interior shall prescribe, to continue available during the fiscal year 1914, $50,000. For reimbursement of carpenters and other laborers for the loss of personal property, tools and work clothes, $80.16.

In this connection the situation with reference to the housing of the Bureau of Mines and of the Geological Survey has been rather carefully investigated by the House Committee on Appropriations which has obtained information with reference to the cost of going upon the present basis as compared with the cost of providing new quarters for both these branches of the government.

## Mining and Metallurgical Society

The New York Section of the Mining and Metallurgical Society of America held its first meeting of the year 1913-14 at the Chemists' Club, New York, on Tuesday, Sept. 16. The following officers were elected for the ensuing year: E. G. Spilsbury, chairman; H. S. Munroe, vice-chairman, and L. D. Huntoon, secretary.

It was reported from the council of the Society that the subject of the award of the annual medal in 1914 would be for distinguished contributions to the literature of mining.

The subject of discussion of the evening was the report of the committee on mining law, of which H. V. Winchell is chairman. This committee has made the following recommendations:

> (1) The mining law should be revised, not piecemeal, but thoroughly, so as to coördinate and harmonize its various provisions.
>
> (2) Mining claims should be locatable regardless of a "discovery" and held only so long as the specified development work is performed.
>
> (3) Placer locations should be limited to deposits of loose material above solid bedrock. The locator should have a preference right to locate also any lodes developed on his placer ground.
>
> (4) A statute of limitations should establish a reasonable term of years beyond which placer patents shall be immune from attack on the ground of fraud.
>
> (5) Provision should be made for the location and working of petroleum, phosphates, rare earths, haloids and other mineral substances not specifically mentioned in the present law.
>
> (6) Full privilege of appeal to some competent court of law should be provided for in all cases of contests between rival claimants, or between a locator and the government.
>
> (7) Notices of mining locations should be so recorded as to give the fullest possible notice to the world and to all concerned.
>
> (8) The apex law should be abolished.
>
> (9) Existing titles should be reaffirmed and fully recognized and no effort should be made to create retroactive legislation.
>
> (10) For the purpose of giving the fullest consideration to the needs of every branch of the mining industry and [illegible] section of the country, it is desirable that a Government commission be created by act of Congress, whose [illegible] shall be to investigate by every proper means the [illegible] and interests here referred to, and to make recommendations as a basis for the proposed mining-law revision.

The above recommendations were taken up item by item, and there was active discussion respecting most of the points. The proposals that mining claims should be locatable regardless of a "discovery," and that the apex law should be abolished were unanimously approved, but in general the opinion of the members present at the meeting was that a new mining law should not undertake to distinguish among lode mines, placer mines, phosphate mines, etc. It should provide simply for the location of a rectangular area of ground and the securing of definite title to everything existing within its side lines.

## Metal Schedules in House and Senate

WASHINGTON CORRESPONDENCE

Enough has been done by the conference committee on the tariff to indicate that most of the Senate amendments to the House bill are likely to prevail in the metal schedule. The subject has already been thoroughly canvassed, but the most sharply contested items have been passed over or left with only a partial settlement. Some of them will not be accepted by the House, but the Senate will be called upon to yield at certain points. Thus far the contest within the committee has related to pig iron, ferro-manganese, lead, aluminum, antimony, and a few other items. The House has contended that the items yielding the most revenue, such as pig iron, should be retained on the dutiable list instead of being made free, for the reason that the income from them is needed from a revenue standpoint. It is also urged that the Senate has gone too far in taking the protection off from iron and steel by free-listing so many of the heavy products of the furnace, and that it would be only right to restore at least some portion of the products thus free-listed to a dutiable basis, even if the rates were very low. The conference committee has been endeavoring to work in comparative secrecy and no official data concerning its operations has been made public. Changes may, therefore, occur at any time up to the final moment when its labors are completed.

## Hydro-Electric Shovels for Menominee Range

The Penn Iron Mining Co., a subsidiary of the Cambria Steel Co., operating properties in the Norway and Vulcan district of the Menominee Range, is preparing to experiment with a hydro-electric shovel, designed to replace steam shovels in the openpits and in loading ore from stockpiles. The company has a power plant on the Sturgeon River and electricity has supplanted steam at most of its mines. William Kelley, general manager, believes it is possible to design an electric shovel that will be more economical than one operated by steam. Some time ago he had the company's master mechanic, Frank Armstrong, draw plans for a shovel of the proposed design; patents have been applied for. The material that will be used in the construction of the shovel has arrived at Vulcan and the work of assembling the machine is in progress. The motor will be of 250 horsepower.

# PERSONALS

Herman A. Keller is in Germany.

Pope Yeatman started from New York last week on his way to Chile.

Edwin J. Collins has completed some examination work in northern Colorado and has returned to Duluth.

S. H. Brockunier has just completed an examination of tungsten and vanadium properties in Arizona.

Will Halloran and J. M. Harlan have opened an office in Albuquerque, New Mexico, as consulting engineers.

L. A. Test has resigned his position as assistant professor of chemistry, in the Missouri State School of Mines, at Rolla.

Dr. David T. Day, of the U. S. Geological Survey, is visiting California and has included the principal gold-dredging fields in his itinerary.

Frank Burr Mosher, a well known mining man, president of the Gifford and Gifford Extension, of Cobalt, has gone to England on financial business.

G. W. Crane, formerly with the Missouri Geological Survey, is now making special geological investigations for the Chief Consolidated Mining Co., at Eureka, Utah.

C. W. Wright, manager of the mining interests of Lord Brassey, in Italy, who has been spending the summer in the United States, sails on Sept. 20 for Europe.

Capt. C. Henry Thompson, of Los Angeles, Calif., with his consulting engineer is making an examination of mining properties in Josephine County, Oregon.

Arthur W. Burgren, engineer of the Matehuala Unit of the American Smelting & Refining Co., at Matehuala, San Luis Potosi, Mexico, is now in Oakland, California.

R. B. Brinsmade has been studying the economic geology of Las Minas district, state of Vera Cruz, Mexico, with the view of reopening some of the "antiguas" there.

Messrs. James E. Hyslop and H. M. Beckman, mining engineers, who are interested in the Republic of Mexico, are in southern Oregon, looking over mining conditions.

R. L. Lee will sail for Chile in October, having accepted a position as assistant superintendent at the smelting works of the Central Chile Copper Co., at Panulcillo, Coquimbo, Chile.

A. L. Davis, general manager of the Skidoo Mines Co., has returned to the mine in Inyo County, Calif., after three months' visit at his new home at Monrovia, a suburb of Los Angeles.

Howland Bancroft, of Denver, has been requested to give the lectures on Economic Geology at the University of Colorado at Boulder, during the absence of Prof. R. D. George. He will probably be engaged on this work, at Boulder, for the next five weeks.

Frederick G. Clapp of the Associated Geological Engineers has returned from the gas fields of Hungary, and has gone to New Brunswick in company with Myron L. Fuller and Lloyd B. Smith of the same firm.

George E. Farish, after a short trip to Chicago, has returned to British Columbia and is now engaged in making an examination of the properties of the Queen Mines, Inc., at Sheep Creek, West Kootenay.

F. C. Sutherland, of Toronto, and a party of British capitalists, including the Earl of Denbigh, Sir James Sievewright, and Major Frank Johnson, have gone to Vancouver Island to inspect a copper-mining property in which they are heavily interested.

Carl O. Y. Montelius, assistant chief engineer, and Hugo M. Rahmber, electrical engineer of the Swedish State Railway, are traveling in Canada, inspecting power transmission plants in connection with the proposed electrification of portions of the railway system of Sweden.

Sidney J. Jennings, vice-president of the United States Smelting, Refining & Mining Co., has been in California visiting the properties of the company. Mr. Jennings began his practical experience in mining at the New Almaden quicksilver mine, in Santa Clara County, California.

Austin Young, general manager of the Skidoo Trading Co., is visiting in northern California and will return to the Skidoo mines by way of Los Angeles. This is the first time Mr. Young has left Skidoo since his arrival there in 1906. He has been on the desert for 18 years, starting in at Randsburg in 1895.

George H. Garrey, who has just completed a detailed geological examination of the Trinidad, San Salvador, Fronteriza, Oriental, Italia, Volcan y Dolores, Jesus Maria, and San Jose mines, in the State of Coahuila, Mexico, for the American Smelting & Refining Co., has returned to the States and is now in Chicago.

W. C. Ralston, president of the California Miners' Association and ex-assistant treasurer of the United States, at San Francisco, has removed his offices to 315 Bush St., San Francisco. In addition to the mine-brokerage business, he is now dealing in mining properties, giving especial attention to reopenng old mines and new developments.

W. H. Storms, former state mineralogist, has recently made an examination of the Longfellow mine, at Big Oak Flat, Tuolumne County, Calif., and other mining properties in the Mother Lode region. Mr. Storms is well known as an authority on this region, because of his practical experience as an engineer in development and operation of some of the important mines.

E. H. Davidson, mining engineer in charge of the North American Dredging Co., operating at Tobasco on the Usumasinta River, Mexico, returned to San Francisco on the liner "Colusa," Sept. 4. Miss Alexandria Elliott, of Alameda, Calif., was a passenger on the vessel, returning from a mining camp in Oaxaca, where her brother is engaged at mining. They were not refugees, but were glad to get away as the conditions are not improving.

Dr. A. P. Low, Deputy Minister of Mines of Canada, is to retire. The candidates for the place are R. W. Brock, at present director of the Geological Survey, Dr. A. E. Barlow and W. R. Askwith. Mr. Askwith is a well known mining engineer and represents the hopes of those who think that the mines department ought to be under a mining engineer. Messrs. Brock and Barlow are distinguished geologists and represent the geological branch. The appointment probably will be made in October.

Fohs & Gardner, consulting geologists, whose eastern office is at Lexington, Ky., have opened a Mid-Continental office at 212-213 Clinton Bldg., Tulsa, Okla. Mr. Fohs has just returned from a series of investigations in the oil fields of Indiana and Illinois and will have charge of the Tulsa office, while Mr. Gardner, who has just returned from coal investigations in New Mexico will have charge of the Lexington office. He is now conducting investigations in the oil fields of Kentucky and Indiana.

W. J. McGee has been appointed by the President, assistant treasurer of the United States, at San Francisco. He succeeds W. C. Ralston, who has held the office through changes in national administration until the Democratic party came into power. Mr. McGee is a resident of Sutter Creek, Amador County, Calif., and is an attorney of large practice and engaged in mining enterprises. It was through his promotion that the Keystone was reopened. Mr. McGee also reopened the Lincoln and organized the Lincoln Consolidated Mining Co., and included the Wildman-Mahoney mine.

# OBITUARY

Ambrose Spencer Hurlbutt died at Westport, Conn., Sept. 4, aged 88 years. He went to California in 1849 and lived in that state some 25 years. After his return to Connecticut he was a large investor in coal-mining compantes.

Frank Merkel, a native of Germany, aged 76 years, died at Ione, Calif., Aug. 22. He went to California in a sailing ship around the Horn. He landed in San Francisco in 1856, and with his brother, Ernest Merkel, began mining at Michigan Bar.

Merritt E. Tabor died in Chicago, Aug. 30, aged 55 years He was born at Homer, Mich. He was one of the first Americans to go to Alaska upon the discovery of gold there. He had been a resident of Chicago for twenty-three years, and was the author of several textbooks on mining and mineralogy.

William S. Smith died at Sutter Creek, Amador County, Calif., Aug. 30, aged 85 years. Mr. Smith crossed the plains to California in the early fifties. He engaged in mining and was one of the early settlers of Sutter Creek. Mr. Smith never married. During the latter part of his life he practically lost the use of his eyes.

Jennings S. Cox, Jr. died at his residence in New York, Aug. 31. [illegible] He was born and brought up in New York. [illegible] the School of Mines of Columbia University. [illegible] with the Carnegie Steel Co. for a few years [illegible] to the State of Washington to take charge [illegible] Cristo mine. Later he became connected [illegible] Pennsylvania Steel Co. and since 1895 he [illegible] charge of that company's iron-ore interests [illegible] engineer and then general manager of the Span[illegible]ican Iron Co., with his headquarters at Santiago [illegible]. He was a member of the American Institute of [illegible] Engineers.

[illegible] Eugene A. Byrnes, of Washington, D. C., a well known [illegible] attorney, died on Aug. 1, at Haven, Me., while on a vacation, the cause of his death being acute peritonitis, following an attack of appendicitis. Dr. Byrnes was born in New York State in 1862, and was graduated from the University of Michigan, later becoming a member of the examining corps of the U. S. Patent Office, and rising to the position of principal examiner of Division 8, "Metallurgy, Etc.," in April, 1891. He was admitted to the bar after graduating from the law school of Columbian, now George Washington University, and also took a post-graduate course leading to the degree of Ph.D. in electrochemistry and physics. In 1901 he resigned his official position and began the active practice of his profession, and was a member of the firm of Byrnes, Townsend & Brickenstein, of Washington, D. C.

## SOCIETIES

**American Iron & Steel Institute**—The fall general meeting will be held in Chicago, Oct. 24 and 25 next.

**American Petroleum Association**—The organization of this society, which has been under discussion for some time, was completed at a meeting held in Pittsburgh, Sept. 10. The following officers were elected: President, C. D. Chamberlain, of the National Petroleum Association, Cleveland, Ohio; vice-president, R. Galbreath, of the Independent Oil & Gas Producers' Association, of Oklahoma, Tulsa, Okla.; secretary, Dr. Irving C. Allen, United States Bureau of Mines, Pittsburgh; treasurer, Warren C. Platt, of the Independent Petroleum Marketers' Association, Cleveland. Executive Committee: Ralph Arnold, Los Angeles, Calif.; C. F. Clarkson, New Ycrk; G. M. Swindell, Los Angeles; Edmund O'Neill, University of California, Berkeley, Calif.; E. B. Rich, Gasoline Producers' Association, Parkersburg, W. Va.; George H. Taber, Gulf Refining Co., Pittsburgh.

**Old Freibergers in America**—The dinner in honor of Oberbergrat Dr. Richard Beck, Rektor of the Freiberg Bergakademie, Freiberg, Saxony, was held on Tuesday, Sept. 9, 1913, at the Engineers' Club, New York. A fine dinner was served and many reminiscences told of former Freiberg days. During the evening several toasts were given. Franklin B. Guiterman, of the American Smelting & Refining Co., acted as toastmaster. Dr. R. W. Raymond, secretary emeritus of the American Institute of Mining Engineers, responded to the toast "Reminiscences," Charles L. Bryden, head of the School of Metal Mining & Metallurgy, Scranton, Penn., responded to the toast "Old Freibergers in America," and Dr. Beck responded to "Alma Mater." Doctor Beck, who has been visiting this country, attended the International Geological Congress in Canada. While there he was honored by the degree of LL.D. from the University of Toronto. Doctor Beck sailed on Sept. 12 for Europe.

## INDUSTRIAL NEWS

The H. W. Johns-Manville Co., of New York, has opened a new office and warehouse at Galveston, Texas. The H. W. Johns-Manville Co. now boasts three offices in the Lone Star State, at Houston, Dallas and Galveston. At the last named place, in a modern brick warehouse of large proportions, will [illegible] consolidated the stock for distribution to the different [illegible] and throughout the firm's Texas territory. Galveston, [illegible] of its location and shipping facilities, makes an ideal [illegible]ation center. The company plans to receive direct [illegible]int, heavy shipments by coastwise lines from New Y[illegible] steadily increasing trade with Central and South Amer[illegible] makes Galveston a convenient point of distribution.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ORE-TREATING PROCESS. Thomas J. Lovett, Chicago, Ill., assignor to Copper Process Co., Chicago, Ill. (U. S. No. 1,071,763; Sept. 1, 1913.)

CYANIDING—Apparatus for Treating Ore Pulps, Slimes, and the Like. Bernard MacDonald, Guanajuato, Mexico. (U. S. No. 1,071,447, Aug. 26, 1913.)

GOLD-SAVING MACHINE. Loyd C. Dibert, San Francisco, Calif. (U. S. No. 1,071,891; Sept. 2, 1913.)

ORE TREATMENT—Process of Treating Ores by Chlorination. Frank W. Pugsley, Pittsford, N. Y. (U. S. No. 1,071,791; Sept. 2, 1913.)

HOT-BLAST FURNACES—Valve for Hot-Blast Furnaces. Paul L. Keiser, Pottstown, Penn. (U. S. No. 1,070,693; Aug. 19, 1913.)

NICKEL—Improvements Relating to the Extraction of Nickel from Mixtures of Nickel and Other Metals. H. E. Fierz, Basle, Germany, and E. Cahen, London, Eng. (Brit. No. 4249 of 1913.)

ZINC—Process of Extracting Zinc from Residues Containing Zinc, Especially Slags, in Reverberatory Furnaces. Adolphe Henri Desgraz, Hanover, Germany. (U. S. No. 1,072,209; Sept. 2, 1913.)

ZINC—Treatment of Metal-Bearing Solutions. Edgar Arthur Ashcroft, Balestrand, Norway. (U. S. No. 1,071,856; Sept. 2, 1913.)

HOISTING—Safety-Clutch for Mine Cages. Brereton Burgess Roberts, Cimla, Neath, Wales. (U. S. No. 1,072,362; Sept. 2, 1913.)

PROSPECTING—Mineral-Prospecting Apparatus for Drilling and Obtaining Samples of Minerals. Benjamin Andrews, Houston, Tex. (U. S. No. 1,071,199, Aug. 26, 1913.)

CENTRIFUGAL CONCENTRATOR. Martin Prior Boss, San Francisco, Calif. (U. S. No. 1,071,870; Sept. 2, 1913.)

CLASSIFICATION—Process and Apparatus for Classifying Crushed Ores. William F. Deister, Fort Wayne, Ind. (U. S. No. 1,071,715; Sept. 2, 1913.)

CRUSHING MACHINE. Edgar B. Symons, Milwaukee, Wis. (U. S. No. 1,072,193; Sept. 2, 1913.)

CRUSHING MILL. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. Nos. 1,072,058 and 1,072,059; Sept. 2, 1913.)

MAGNETIC SEPARATION—Apparatus for the Magnetic Separation of Ores and Other Material. Georg Ullrich, Magdeburg, Germany. (U. S. No. 1,072,277; Sept. 2, 1913.)

MAGNETIC SEPARATOR. Joseph Weatherby, New Cumberland, Penn., assignor, by mesne assignments, to Electric Ore Separator Co., New Cumberland, Penn. (U. S. No. 1,071,838; Sept. 2, 1913.)

ORE CONCENTRATOR (Magnetic). Joseph Weatherby, New Cumberland, Penn., assignor to the Electric Ore Separator Co., New Cumberland, Penn. (U. S. Nos. 1,071,839 and 1,071,975; Sept. 2, 1913.)

SLIME CONCENTRATOR. William F. Deister, Fort Wayne, Ind. (U. S. No. 1,071,714; Sept. 2, 1913.)

ROASTING—Muffled Roasting Furnace. Harry Mackenzie Ridge, London, England. (U. S. No. 1,070,534; Aug. 19, 1913.)

SCOOP CAR for Lifting and Transporting Ash or Other Materials. Francis P. Sinn, Palmerton, Penn., and Frederic E. Pierce, Newark, N. J., assignors to The New Jersey Zinc Co., New York, N. Y. (U. S. No. 1,071,104; Aug. 26, 1913.)

ELECTRIC FURNACE. Albert Edwards Greene, Chicago, Ill., assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. (U. S. No. 1,070,337; Aug. 12, 1913.)

ELECTRIC FURNACE. Walter N. Crafts, Oberlin, Ohio. (U. S. Nos. 1,069,923, 1,069,924 and 1,070,017; Aug. 12, 1913.)

ORE TREATMENT—Process of Extracting Metals from Minerals, Rocks and Other Materials. Kristian Birkeland, Christiania, Norway, assignor to Norsk-Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. (U. S. No. 1,071,290; Aug. 26, 1913.)

ROASTING—Feeding Device for Roasting Furnaces. Harry H. Stout, Berkeley, Calif., assignor to General Chemical Co., New York, N. Y. (U. S. No. 1,069,738; Aug. 12, 1913.)

ROASTING FURNACE. Frederick Laist, Anaconda, Mont. (U. S. No. 1,070,490; Aug. 19, 1913.)

CORROSION—Process for Protecting Iron Surfaces from Corrosion. Sherard Osborn Cowper-Coles, Westminster, London, England. (U. S. No. 1,072,091, Sept. 2, 1913.)

FERROCHROMIUM—Refining Process for Iron and Steel by Means of Ferrochromium Alloy. Josef Buchel, Wengern-Ruhr, Germany. (U. S. No. 1,071,873; Sept. 2, 1913.)

ALUMINUM ALLOY. William A. McAdams, Bay Shore, N. Y. (U. S. No. 1,072,017; Sept. 2, 1913.)

FELDSPAR—Process of Obtaining Potash Salts from Feldspar. Harry P. Bassett, Baltimore, Md., assignor to the Spar Chemical Co., Baltimore, Md. (U. S. No. 1,072,686; Sept. 9, 1913.)

DRILL—Fluid-Pressure-Driven Tool. Alexander Palmros, Syracuse, N. Y., assignor to the Pneumelectric Machine Co., Syracuse, N. Y. (U. S. No. 1,072,358, Sept. 2, 1913.)

DRILL—Rock Drill with Water Feed. Alexander Palmros, Syracuse, N. Y., assignor to the Pneumelectric Machine Co., Syracuse, N. Y. (U. S. No. 1,072,359, Sept. 2, 1913.)

DRILLING MACHINE. Gini Piccone and Samuel Lippis, Chandler, Colo. (U. S. No. 1,072,256, Sept. 2, 1913.)

# EDITORIAL CORRESPONDENCE

## SAN FRANCISCO—Sept. 10

**The Afterthought Bond Issue** for $800,000 has recently been about half subscribed. The company owns the Afterthought copper and zinc mines in Shasta County. The bonds have been offered to the stockholders, in order to raise sufficient money to pay off the indebtedness on the property and install a 50-ton treatment plant, for the recovery of zinc, copper, silver and gold. At present only five men are employed at the mine, but that is a sufficient number to keep everything in repair and do such underground development as is at present necessary. The company has been carrying on a series of experiments for the recovery of zinc in addition to other metals during the last year, and considers it unnecessary to continue these experiments until it is possible to build a commercial unit of at least 50 tons daily capacity. The company acquired the Anderson & Bella Vista R.R. which has been taken over by a company formed for the purpose of operating it for the benefit of the mines. It is the purpose to extend this railroad to the Afterthought mines; and when that is done it is expected to increase the treatment plant to 2000 tons capacity. S. E. Bretherton, of San Francisco, is general manager for the company and Frank Wilson is in charge of experimental work at the mines.

**The Schedule of Pipe-Line Rates** filed by the Standard Oil Co. with the California State Board of Railroad Commissioners will be contested by oil men who were the proponents of the bill which was enacted into a common-carrier law by the last session of the legislature. Immediately upon being notified by the commission to file its rates, the Standard signified its intention to comply to the requirements of the law and within due season filed its schedule of rates. The Associated Oil Co. also signified its willingness to comply, but the Associated Pipe Line Co. and the K. T. & O. Co. have declined through a suit in the U. S. court to submit to the requirements of the new law. The contestants against the Standard rates and regulations have formed the Oil Producers' and Consumers' League. It is claimed by the contestants that the fixing of the minimum quantity of oil to be transported by a producer at 100,000 bbl. is an attempt to prohibit absolutely the use of pipe lines as common carriers. The league contends that the minimum should be 500 or not more than 1000 bbl. The Standard regulation filed with the commission declines to transport oil under 15 gravity. It is claimed that this regulation would bar the Kern River field and a large part of Midway and Maricopa fields from transporting their oil through common-carrier pipe lines. It is claimed by the league that oil as low as 12 gravity has been transported by the Standard, which has been possible by heating the oil before turning it into the pipe line. The league contends that the common-carrier pipe lines should be compelled to carry low-gravity oil and to prepare it for transportation by the usual method of heating and that the heating should be done by the pipe-line companies and the expense charged to the consignor of the oil.

## BUTTE—Sept. 10

**More Adequate Transportation** facilities for the mining properties being developed near the foot of the continental divide on the eastern boundary of the Butte district, are to be established within a few months. The new line, in the form of a spur from the Northern Pacific R.R., the preliminary surveys of which have already been made, will run northwest from a point on the main line some distance east of Butte, crossing the Butte & Duluth property, the Bullwhacker, Butte, Main Range, Tropic mine of the Anaconda company, Butte & London, and thence on to a point near the Butte & Bacorn property, where a curve will be made and the road continued in a southerly direction to connect with the main line south of Meaderville. The rapid development of this new field has made necessary the construction of a railroad, as all of these properties are compelled at present to do their shipping by wagons.

**Boring for Gas** in the vicinity of Havre was considered at a meeting of business men, in the city council chambers, with representatives of the firm of Stoner, Lockwood & Wheeler, owners of the townsite and gas franchise, at Red Cliff, Alberta, where gas has been found in large quantities. It has for a long time been thought that Havre is situated in a gas belt which is believed to extend north and south from Billings, to Northern Alberta, and B. J. Bott, representing the Canadian firm, after a convincing discourse upon his belief in the truth of this theory, proposed on behalf of his company that a company be formed to explore this field by drilling. Mr. Bott suggested that the company have an authorized capital of $50,000 of which the citizens should subscribe $15,000 one-half to be paid at once, and the remainder after gas in commercial quantities should be found; the company to pay for drilling and casing to a depth of at least 2000 feet.

## DENVER—Sept. 13

**A Strike of Coal Miners in Colorado,** New Mexico, and Utah has been called for Sept. 22.

**Deep Shafts in Cripple Creek** extend to an average depth of 1240 ft. In the early days of the district, it was said that the ore would not persist to much depth, that it was the wrong formation, etc. In this connection it is interesting to know that there are in the district, 38 shafts of an aggregate depth of 47,174 ft., nearly all of which are producing ore of commercial grade. These are distributed as follows: Battle Mountain and Bull Hills, 22 shafts averaging 1358 ft.; Globe and Beacon Hills, 6 shafts averaging 929 ft.; Gold Hill, 3 shafts averaging 1270 ft.; Guyot Hill, 2 shafts averaging 1130 ft.; Poverty Gulch, 3 shafts averaging 1044 ft., and Raven Hill, 2 shafts averaging 1225. Outside of these there are the Jerry Johnson on Ironclad Hill, 975 ft., and many others of minor depth. Probably the richest ore at the greatest depth has been mined by the Portland on Battle Mountain, the Vindicator and Golden Cycle on Bull Hill, the Mary McKinney laterals under Gold Hill, and the El Paso at the deep-drainage-tunnel levels at an approximate depth below the summit of Beacon Hill of 1500 ft., the tunnel portal being at 8033-ft. elevation.

## SALT LAKE CITY—Sept. 11

**The International Smelting & Refining Co.** has completed its fifth lead furnace at Tooele, and it is now ready for operation. Improvements are being made at the Garfield copper plant of the American Smelting & Refining Co. Foundations have been laid for a new stack, to be 350 ft. high or about 25 ft. higher than the present stack. This will have an inside diameter of 22 ft. at the top. Work on this stack is in progress.

**The Salt Lake & Alta R.R.** is building a standard gage road between Midvale and Wasatch in Little Cottonwood cañon. The immediate purpose of the road is to open the granite quarries which are to supply rock for the new state capital. The road will be 11 miles long. Practically all of the grading has been done, and about four miles have already been built. Track is being laid over the remaining seven miles. Beside furnishing transportation for the granite, the road will afford an outlet for ores from Alta, as it will shorten the present wagon haul.

**The July Production of the Utah Copper Co.** amounted to 9,849,043 lb. Operating conditions at the mine and mills are good, and it is expected that the output for August will show a marked increase. On Sept. 1 in 24 hr., there were mined and shipped to the concentrators at Garfield 29,000 tons of ore. At 50 tons per car this would mean that 580 cars were loaded and hauled, though all this tonnage was not milled. This is the record output for the company, being about 5000 tons greater than any previous day's shipments. The average daily tonnage has been 20,000 to 22,000 tons. The production for the second quarter of the year was 31,785,448 lb. of copper, from 1,910,933 tons of ore, carrying 1.2807% copper. The cost of production was 8.933c. per lb. The net profit for the quarter was $2,218,753, from which a dividend was paid and $1,032,125 added to the surplus.

## HOUGHTON—Sept. 12

**The Strike** is wearing itself down. As has been predicted it will never be called off, but gradually the miners keep on returning to work and the strikers are moving away, so that the Federation's foothold is becoming less and less important. The Calumet & Hecla daily rock shipments ran over 3500 tons daily this week and the Copper Range mines now are running at 1000 tons daily output. There has been no notable increase at the Quincy, Superior or Isle Royale mines as yet and at none of the other mines has any work been attempted. The strike at the present time and particularly with reference to the Calumet & Hecla is a trammer's strike. The majority of the miners are at work and they are doing their own tramming to a large extent, working an extra man with each drilling party. Early in the strike women were brought into action. They had peculiar methods of showing their [illegible] for the men who went to work, a description of [illegible] would be barred from the mails. The woman's pickets, armed with brooms, operated for several mornings and succeeded in keeping some of the men from work. Then the wives of the workers got into action and the next morning they accompanied their men to the shafts. The pitched battle that resulted between the two parties of women was worth going a long way to see. The wives of the workers took the brooms away from the others and smeared them with their own dirt and then went after the strikers. One of the leaders of the women applied to the sheriff for a deputy's star. Since then there has been little attempt on the part of the strikers to use their women for picket duty.

### EVELETH—Sept. 14

**Opening of More State Land** has been started by the Arthur Iron Mining Co., the mining subsidiary of the Great Northern ore interests. The tract being opened is in Section 16, 56-23, on the Mesabi range and will be one of the largest iron producers in the world. The sinking of the initial shaft has been started. It is expected the mine will ship next year. From the properties owned by the State of Minnesota and leased to operating concerns and explorers it is figured that the commonwealth this year will derive an income of $900,000. The shipments of ore will approximate 3,000,000 tons, on which a royalty of 25c. per ton will be paid to the state, and in addition $100,000 will be received in annual payments from properties of the non-producing class. All of this money goes into the permanent school fund which has now reached a total of $32,000,000. When in 1880 iron ore was first discovered in the northern part of the state the mineral was held of little value. Not until 1888 did the real worth of the deposits begin to be realized. Much of the land had been cleared of its pine timber and at the time was not considered desirable for agricultural purposes, because of the stumps and the character of the soil, although now many fine farms have been developed in the region. The state owned an extensive acreage in the mineral belt and when the discovery of merchantable ore was made it found itself the possessor of a rich heritage. Fifty-year leases of lands at a royalty of 25c. were authorized by the legislature in 1889, since which time 9,000,000 tons of ore have been shipped under these contracts. Just how much revenue will be derived in the future cannot be approximated. The state lands have been explored in part only. There are 150,000,000 tons of ore in that part which has been proved, at least that amount is on the tax rolls. It is estimated that the land covered by mineral contracts now in force on the Mesabi range alone will yield 600,000,000 tons. There is thus in sight a revenue of $150,000,000 and there remains the possibility of still further important discoveries. Section 16, 56-23, the development of which has now been started by the Hill interests, has been only partly explored. While now taxed on a basis of 30,000,000 tons the tract is believed to contain at least 100,000,000 tons. The half-section comprising the Leonidas mine is thought to contain 75,000,000 tons, although to date only part of this has been proved. Three 40-acre tracts of swamp land, the Scranton mine, assessed at 20,000,000 tons, probably will yield more than double that tonnage. The leasing law of 1889 was repealed in 1907 and in due time will be replaced by a law more advantageous to the state. The royalty of 25c. was the standard price in the early days. Ore now is more valuable and those procuring new contracts will be called upon to pay a materially higher figure.

### JOPLIN—Sept. 12

**Coöperation of the State Geological Survey** with prospecting operations in the Joplin district having requested State Geologist H. A. Buehler is inaugurating a new line of work which will entail the employment of a man in the Joplin field who will give his entire time to the work of assisting prospectors in developing ore by applying the salient features of the local geological conditions intelligently in the work. Hitherto prospecting has been done almost entirely in a haphazard way by the churn drill. The cuttings were given no consideration unless they carried ore. What consideration was given them was entirely general in character. The significance from a geological standpoint was never considered. [illegible] sees in the thousands of drill holes put down, [illegible] the possibilities of better development but a means [illegible] acquainting the prospector, miner and mine operator with the [illegible] of geology when applied to mining and therefore after a closer association between the Bureau of Geology, the mines and the men engaged in the industry. With the entrance of the geologist in the field of prospecting it is hoped that a standard will be set for keeping records of all the holes drilled during the year. At present there is no certain standard, each driller having his own system. What may be "shines" to one driller may be "fair jack" to another. What may be "boulder ground" to one driller may be called "lime boulders" by one and "open ground" by another. The various types of cherts, shales and limestones have no standard descriptions so that a set of drill holes on one tract drilled by one man might be correlated with another set drilled by another man on an adjoining tract. These variations in system alone destroy any lasting value from the drilling that has been done in the past. If the coöperation of the geologist with the drill men accomplishes the setting of a standard method of keeping records for the district it will have accomplished a result of incalcuable value to the industry even if nothing else be done. Mr. Buehler is studying conditions in anticipation of starting the work and the announcement of his purpose has met with the hearty endorsement of many of the most progressive mine operators and the entire engineering profession. The mining engineer who has been called upon to make a report upon a property in the Joplin district has been faced with such a system of prospecting records as to discourage certainty of judgment and opinions have been given with considerable reservation by reputable men on that account. As the number of large properties is limited and it is only those properties that have kept accurate and intelligible records the general conditions have been discouraging to the engineer and the investor has many times taken properties wholly upon guess-work. That the new work undertaken by the state geologist is a large one admits of no doubt and most of the operators while applauding the work have considered the task of such magnitude as to be beyond all hope of accomplishment.

### MIAMI, OKLA.—Sept. 12

**The Grade of Concentrates Has Improved,** and Miami which formerly produced low-grade zinc concentrates now ships material that approaches the average of the entire Joplin fields. When the camp was first opened its concentrates scarcely averaged more than 40% zinc with only an occasional carload reaching 57%. Now most of the mines are producing concentrate containing 55% zinc or better and some lots carry more than 60% zinc. The transformation from a low-grade camp to a high-grade camp has come with the deeper mining operations. When first discovered the orebodies of the Miami field were found at slight depths, averaging from 60 to 100 ft. from the surface. As the shallower levels were worked out deeper drilling operations developed the fact that there were ores at a still deeper level and when the ground was tested out it was found that the ores from 160 to 300 ft. were devoid of much of the iron sulphides which in the upper deposits so contaminated the concentrates as to cause heavy penalties on selling to the smelters. This discovery has proved to be of importance to the Miami operators and the results will be manifested in the higher valuation of the year's product. Ore concentrates have been known to sell as low as $4 per ton in that camp due entirely to the heavy iron penalties and low-grade concentrates made in the earlier history of the camp. Today there is little ore that is being found of this character as the bulk of the output is coming from the deeper deposits. After another year's development the average grade of the concentrates will probably be equal to the average of the entire district.

### TORONTO—Sept. 13

**The Report of the Ontario Chief Mine Inspector** for the second quarter of 1913, shows a considerable increase over the corresponding period of last year. In the mines proper, there were seven fatalities, as compared with six, but in the metallurgical works, there were five as compared with two in the previous year and four fatalities in the quarries against none for the corresponding period of 1912. The total number of men injured during the quarter, in addition to the fatalities, was 164 made up as follows: At the mines, below ground, 85; at the mines, above ground, 16; metallurgical works, 60 and quarries, 3. For the first six months of 1913, the total number of fatalities was 46 as compared with 46 in the previous year, and they are classified as follows: Fatalities due to danger inherent to the work itself, 15 or 32.6%; arising out of defects in the workings, 12 or 26.1%; due to fault of fellow workmen, 3 or 6.6%; and due to fault of the injured person, 16 or 34.7%. The employees' lack in keeping the mines and works properly safe-guarded was responsible for 12 of the accidents, while for 19 the workmen's carelessness was responsible.

# THE MINING NEWS

## ALASKA

THE DROUGHT AT NOME HAS BEEN BROKEN by a two days' rain. All available men are being employed to take advantage of the last days of the fast closing season.

THE FIRST CARGO OF NATIVE TIMBER EVER EXPORTED from Alaska cleared from Hadley, Sept. 3, aboard the SS. "Melville Dollar" which carried about 1,500,000 ft. The cargo is made up mostly of spruce, which is of good grade in this part of the country. It is understood that the cargo just taken out is but one of several that will follow, as it is reported that arrangements have been made to handle all the Southeastern Alaska output for the next year.

THERE WILL BE NO WINTER MINING AT SHUSHANNA in the opinion of Dr. Cairnes, of the Canadian Geological Survey, chiefly owing to the facts that the diggings are several miles above timberline and the ground is too shallow to render drift mining advisable. A town has been started at Donjek Landing, at the head of navigation on the White River, from which place supplies will be freighted in. On the American side, it is planned to start a town at the head of navigation on the Tanana, which is at the place where the Nabesna and the Shushanna or Chisana form the Tanana. From Fairbanks a large number of stampeders have gone on the various river steamers that have been placed on the run to the mouth of the Nabesna. It is rumored that the White Pass company has a squad of surveyors in the field to determine the feasibility of extending the White Pass Ry. to the Shushanna country should developments justify such a course. The proposed extension would be about 250 miles long.

NO. 17 GOLDSTREAM (Fairbanks)—One man was killed and one was seriously injured by a cave-in, Aug. 13. The timbers were crushed suddenly under the thawed ground overhead. Most of the gold-bearing gravel in the Fairbanks district is tightly frozen, but there are occasional thawed spots, and these make mining very dangerous. Close timbering with heavy timbers is essential and even then the sets are likely to give way under the sudden shifting of the gravel. The present lessees state that, by the time they have their block of ground worked out, they will have spent $30,000 for timbers alone.

## ARKANSAS

### Independence County

TWO MEN WERE KILLED by a premature explosion, Sept. 11, in a manganese mine near Batesville. Several other miners were injured, but none seriously.

## ARIZONA

### Gila County

LONDON ARIZONA CONSOLIDATED COPPER CO. (Winkelman)—This company organized under the laws of Maine, with a capitalization of 2,400,000 shares, par $5 each, or a total of $12,000,000, has taken over the properties of the London Arizona Copper Co., London Range Copper Co., London Shamrock Copper Co. and Ball Copper Co. The consolidated property comprises 2367 acres, five miles north of Winkelman. Frank M. Murphy, president of the Santa Fé, Prescott & Phoenix Ry., is a director.

SUPERIOR & BOSTON (Globe)—The crosscut from the 800 level has been completed and the vertical raise that will tap the intermediate workings between the 600 and 800 levels and serve as an ore chute has been started. Two raises have been started from the 600 level to explore and develop the ore zone above. The mine is now shipping the limit allowed by its contract, but Superintendent Tinker visited El Paso a few days ago and made arrangements with the smelters by which he will ship a greater amount during the next few months if the progress of the present plan of exploration and development necessitates hoisting considerably more ore than at present.

MIAMI (Miami)—The Captain orebody is being prepared for development as rapidly as consistent with careful mining. Not until the tramming level has been completed will any work be done on the drawing-off level above, and the latter will be completed before the actual development of the orebody above is begun. The retimbering of the Red Springs, No. 3, shaft has been completed and the Captain, No. 1, is rapidly nearing completion. At the mill the new Deister sand and slime concentrators are making concentrate, in an experimental way, which assays high. These new tables concentrate four times the quantity of ore treated by the old type of tables and occupy little more than half as much space.

MIAMI AND INSPIRATION (Miami)—There has been a local impression that there was a feud between the Miami and Inspiration companies, but there is no foundation for such belief. On the contrary the Miami company still continues ready to help Inspiration in any manner possible, as formerly. In support of this attention has been called to the fact that the Miami company is furnishing Inspiration with power and is considering the problem presented by Inspiration's request for enough water to operate its test mill. Concerning the litigation that has resulted from Inspiration's attempt to drive an adit through New Keystone ground, J. Parke Channing recently said that the action taken by the Keystone officials was done wholly from the viewpoint of what was considered the best interests of the stockholders of that company. That the Miami and New Keystone companies have some of the same officials in the personnel of their management, he said, should in no sense be considered as a reason for antagonism between the Miami and Inspiration.

## CALIFORNIA

### Amador County

THE FOREST FIRE ON ASHLAND CREEK, Aug. 23, burned through an area of 1000 acres. The South Eureka Mining Co. lost 300 logs and a number of farm buildings were also destroyed. There were no rangers in the vicinity. The fire, which lasted for a week, was extinguished by residents and men from Jackson.

HARDENBERG (Jackson)—The drifts are in swelling ground and are said to be giving some trouble, and may necessitate the exploration of new ground.

JOHN A. GIBSON VS. KENNEDY EXTENSION (Jackson)—The jury returned a verdict allowing the plaintiff $20,000 for injuries resulting from an accident in the shaft.

ETTA STAFFORD VS. ALPINE GOLD MINING CO. (Plymouth)—Notice of attachment has been filed against the directors in a suit for the collection of $25,000 on promissory notes. The company was incorporated Dec. 2, 1908. The mine was idle for some time, and was reopened last year.

SOUTH EUREKA (Sutter Creek)—The second dividend in 1913, of 3c. per share was paid in August. It is reported that the surplus for the month over operating expenses was $14,000, out of which the dividend was paid. The full 80 stamps are dropping on good ore. At the Oneida, the adjoining mine owned and operated by the same company, 20 stamps are dropping on good ore and the drift to connect the two mines is being steadily advanced.

### Butte County

ORO ELECTRIC CORPORATION (Oroville)—Line connection has been made with the Northern California Power Co. at Biggs for the delivery of 2000 hp. for distribution in the Oroville, Biggs and Gridley divisions. This corporation is also extending its power service in other mining counties.

### Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—J. H. Trerise, manager, is reported to have filed notice of attachment on account of $18,000 unpaid salary. It is feared by other creditors that this will cause the appointment of a receiver, and thus delay the payment of their claims. Recently engineers were sent out from Boston to examine the property for the owners.

### Eldorado County

YUKON GOLD CO. (Georgetown)—Articles of incorporation have been filed for record at Placerville. The company has recently taken over stream dredging lands on Middle American River, lying in both Placer and Eldorado Counties. A 7-cu.ft. bucket-elevator dredge is under construction. The company is a Guggenheim organization, incorporated at Augusta, Maine, capitalized for $25,000,000.

### Fresno County

ASSOCIATED (Coalinga)—A 55,000-bbl. oil tank was fired by lightning Aug. 30. The blazing oil was thrown several hundred feet and destroyed two derricks. Other tanks caught fire, but were saved from total destruction by turning steam into the top of one of the tanks and using earth and fire extinguishers at the others. Some of the oil from the bottom of the first tank was pumped into the Monterey pipe line and several thousand barrels of oil were saved.

### Kern County

YELLOW ASTER (Randsburg)—Electric power will displace steam. A long-term contract has been made with the Southern Sierras Power Co., which includes the construction of power transmission lines from the Randsburg substation to Goler wells and Old wells. The surveys have been completed and the material for the pole line is ordered. The total power required will be 1200 hp. Two 300-hp motors will be installed in the 100-stamp mill and 100 hp. will be required for the 30-stamp mill. The motors for the two wells and the repumping station will aggregate 500 hp. The oil-burning locomotives will be retained on the ore tramway. Exploration of new territory in the mine is contemplated. The company has disbursed a total of $40,000 in dividends in the first eight months of 1913.

### Nevada County

PENNSYLVANIA (Grass Valley)—It is reported that the recent strike in the 1700-ft. level is of greater value than the owners will admit, and that it is the most important and significant strike of high-grade ore that has been made in the district within a year. Stoping from the 1700-ft. level on the new ore shoot is in progress.

OUSTOMAH (Nevada City)—Underground telephones are being installed in compliance with the state law passed at the last session of the legislature. The 1000-ft. inclined shaft is to be deepened to 1500 ft. The 10-stamp mill is running full time on the best ore that the present operators of the mine have encountered. This ore comes from the stopes above the 300-ft. level.

### Placer County

ZEIBRIGHT (Towle)—A new drift is being driven 350 ft. above the tunnel level. New mortars and a new cam shaft will be installed in the mill.

### San Benito County

PACIFIC—A second boiler and a cement water tank, conduit and stoppers are being installed at this quicksilver mine in the Little Panoche district.

## COLORADO

### Chaffee County

ALLIE BELL GROUP (Saint Elmo)—In this property on Chalk Creek, [illegible] Felton, of Pueblo, the owner, has opened [illegible] of lead and zinc ore carrying gold and silver [illegible] ft. below the surface. The ore is similar [illegible] the Mary Murphy vein, of which the Allie Bell [illegible] to be the extension.

### Clear Creek County

[illegible] MEDAL (Idaho Springs)—A bond and lease has been [illegible] on this property in Gilson Gulch, and the [illegible] will develop the mine through the shaft.

STANLEY (Idaho Springs)—During August 129 ft. of development work was done in the fifth level, 100 ft. of the [illegible] is in pay ore. The vein is from 2 to 3 ft. wide. Raise [illegible] West has been extended 10 ft. in pay ore. This raise will be continued to the third level.

CAPITAL (Georgetown)—The west drift on the Aetna vein has developed a 5-ft. vein of $9 ore. A streak of smelting ore is hand sorted, resulting in a product worth $40 per ton. The Capital tunnel is being enlarged for a distance of 6000 ft. and new 40-lb. rails will be laid. A storage battery locomotive has been ordered, which will be used in the transportation of ore from the Capital and Onondago workings.

HOOSAC (Idaho Springs)—The property of this company, on Clear Creek, near Fall River station, was recently sold at sheriff's sale for $40,000. Total judgments against the property amounted to about twice this sum. The purchasers are planning extensive development and contemplate early resumption of mining and milling operations. During the last year the property was equipped with a 40-ton amalgamating and concentrating mill, and it is reported that considerable low-grade milling ore is available in the mine.

### Lake County

ANOTHER RICH STRIKE is reported from the new gold district between Leadville and Twin Lakes. J. D. McAlpine, one of the owners of the Lackawanna Belle, opened a vein in Half Moon Gulch across the valley from the Mount Champion mine. Samuel Smith also reports the opening of a large vein of $50 ore in the Fidelity company's property, half way between the Lackawanna mine and Twin Lakes.

### San Juan Region

BROWN MOUNTAIN SMELTING CO. (Ouray)—The company has closed a contract with the Wanakah Mining Co. for 25 tons of ore per day and also with the Rico-Wellington and Rico Consolidated for about the same tonnage. This Rico ore contains about 4% copper. The smelters are in the market for 50 tons per day, and Manager Kremer said he would be ready to blow in Sept. 15. The matte will be shipped to the Garfield plant in Utah.

### Teller County

HIAWATHA (Cripple Creek)—Work has been resumed on this mine on Beacon Hill under lease to Greenfield & Co., and at 120 ft. depth a new sheet of milling-grade ore has been opened and the first shipment sent out. The grade is improving as the drift is extended.

PORTLAND VS. STRATTON'S INDEPENDENCE (Victor)—The long pending suit to recover $300,000 damages for ore alleged to have been wrongfully mined by the defendant company, a British corporation, from the territory of the Portland company, on Battle Mountain, has been dismissed and settled by stipulation.

## IDAHO

### Bannock County

MOONLIGHT (Pocatello)—The vein has been cut by the long lower tunnel, but no ore was encountered. The vein, however, contained 18 in. of quartz and talc, which is nearly always present with ore in the mines of the district. The vein will be developed by drifting east and west of the crosscut.

### Cœur d'Alene District

MINERS' ACCOMMODATIONS IN MULLAN have been hard to find since the discovery of ore in the National mine a few months ago. Every hotel, boarding house and rooming house is filled to capacity. Men are forced to go two miles to the Snowstorm boarding house. The Morning, Hunter and Snowstorm mines are working more men than ever before. The National mine now employs over 100 men, where previously only about 10 men were employed. It is now planned to develop the Missoula Copper and the Independent mines. It is believed that by following the same ideas entertained previous to the discovery of the National orebody, the orebodies in these two properties will be encountered. As soon as the mill is built and in operation at the National a much larger crew will be put on and the tonnage then shipped from Mullan will be the greatest of any town in the Cœur d'Alenes.

IDAHO-KNICKERBOCKER (Osburn)—This property on Moon Creek is again shipping concentrates, which are being hauled to Osburn. Development work is progressing rapidly and the results are satisfactory.

HERCULES (Burke)—The big cave-in which recently occurred at this property has not curtailed the output. August was the best month in the mine's history. The long lower tunnel is now in 6000 ft., and there is still 2000 ft. more to drive. This will take one year. When the tunnel is completed the ore will be delivered through the tunnel to the railroad in the town of Burke and will eliminate the operation of the aerial tramway.

MONITOR (Mullan)—A long lower tunnel will be driven [illegible] the vein at a depth of 2000 ft. The portal of the [illegible] will be on a level with the railroad tracks. The sub-[illegible] the power lines have been completed and sufficient [illegible] will be developed to operate the mine and surface [illegible]. A great deal of ore has been shipped from this mine [illegible]. All the surface works were destroyed during the [illegible] of 1910. Since then the property has remained idle.

## MICHIGAN

### Copper

A REPRESENTATIVE OF THE DEPARTMENT OF COMMERCE AND LABOR, John A. Moffitt, was ordered to Calumet, Mich., by Secretary Wilson to offer his good offices to bring about an amicable settlement of the strike.

### Iron

JUDSON MINING CO. (Crystal Falls)—The five-compartment shaft has reached a depth of about 75 ft., and will be sunk to nearly 400 ft. before crosscuts are extended to the ore. The shaft is 11x21 ft., and will be one of the largest on the Menominee range.

STEPHENSON (Gwinn)—This property has been shut down by the Cleveland-Cliffs Iron Co. because there is considerable ore in stock, and it was deemed advisable not to hoist any more until it can be sold. Most of the men employed were transferred to the company's other mines in the Gwinn district.

LAKE ERIE ORE CO. (Crystal Falls)—It is reported on good authority that this company is negotiating for the Hilltop, Victoria and Crystal Falls mines, all in the Crystal Falls district. The Victoria and Hilltop have been idle for some time, while the Crystal Falls ceased operations last spring when M. A. Hanna & Co. surrendered the lease.

GARDNER (Gwinn)—Preparations are being made by the Cleveland-Cliffs Iron Co. for starting work at this property, as well as the Mackinaw, a short distance away. Concrete shafts were sunk to ore at these properties a few years ago, but the shafts will have to be sunk deeper and crosscuts be driven before ore can be taken out. Several mine buildings were erected this summer and it will not take long to get the work going. The company will have about eight mines in the district when all of the properties are opened.

## MINNESOTA

### Cuyuna Range

BARROWS (Brainerd)—Hoisting of ore has been commenced, but shipments will not be started for some time; in fact, it is unlikely that any ore will be sent out this season. The property belongs to the Virginia Ore Mining Co. and will be a large shipper in the years to come.

PITTSBURG STEEL ORE CO. (Riverton)—This company, which is stripping its mine by hydraulicking, is building four barges upon which will be placed the pumps and motors. Four steam shovels have been ordered and will assist in the stripping work. The property should be in shape to ship by next spring, and the stripping work will be continued all winter if conditions permit. As announced a few weeks ago, a concentrator will have to be built in order to bring the ore up to good grade.

### Mesabi Range

THE TOTAL AUGUST TONNAGE of iron ore shipped via Great Lakes was 7,677,601 tons, and the total for the season to Sept. 1, 1913, was 32,007,072. Up to Sept. 1, 1912, the total movement was 29,051,152. Thus, so far, this season's shipments exceed 1912 by 2,955,920 tons.

INTERSTATE MINING CO. (Coleraine)—Work has finally been commenced at the Buckeye property, which was to have been opened several years ago. The actual work of shaft sinking started about three weeks ago and a considerable force is now employed. The mine is between Coleraine and Prairie River and the deposit there has been known to exist for several years, having been thoroughly drilled. Every summer announcements were made that the property would be opened up but something came up to hinder the work.

## MISSOURI

### Joplin District

GREAT WESTERN (Thoms Station)—Work is to be resumed after a year's shut down.

TEXAS BULL (Thoms Station)—A concentrator has been removed from Smelter Hill and will be erected on this lease.

FALLS CITY (Joplin)—The lease has been transferred to the Underwriters Land Co., which plans much improvement to the plant to increase capacity.

SOUTHSIDE (Galena, Kan.)—An old shaft is being opened up by W. A. Walker. It has reached a depth of 85 ft. and a 25-ft. face of zinc ore has been encountered.

DOUGLAS MINE (Joplin)—A new shaft has been sunk, which entered mineralized ground at a depth of 65 ft. The main shaft is to be sunk deeper to develop ore at the 68-ft. level.

BOSTON-AURORA (Aurora)—C. C. McCormick has purchased this 80-acre tract, which has long been prospected. Several shafts have been sunk and many drill holes have been put down.

WALKER LAND (Duenweg)—R. L. McGee is operating a lead mine that has taken a position as one of the best of the smaller properties in the district. With but one hand jig, 60,000 lb. of ore were produced in a recent week.

WENTWORTH MINING & LAND CO. (Joplin)—A lease on the Martha Ball in the West Joplin district, has been obtained. A new shaft will be sunk near the mill, to provide sufficient ore to nearly double the plant's output.

HARMON (Galena, Kan.)—A pressure water system has been installed by the Galena Zinc Mining Co., along with other improvements to the mill. The improvements having been completed, the company expects to operate the property regularly now.

MEXICO-JOPLIN (Thoms Station)—The Boston-Aurora Co. has been granted an option on a 10-acre lease and a development campaign is to be conducted. Numerous drill holes were sunk on the lease and ore is said to have been discovered.

CHAPMAN-LONGACRE CO. (Miami, Okla.)—Rich strikes on a 40-acre lease have been made by drilling. Five holes were put down in the center of the tract, each entering mineralized ground. The ore is found at 92 ft., continuing to 125 ft., and the operators believe an even deeper orebody exists.

## MONTANA

### Butte District

A SUIT AGAINST THE ANACONDA company has been started by Elmer Frederickson, who claims $25,000 damages for injuries sustained in the accident last spring at the Leonard mine, when two cages dropped in the shaft, wrecking the hoist.

ANACONDA (Butte)—The installation of the new Nordberg hoisting engine at the Badger State mine was recently completed, and ore is now being hoisted by skips instead of in mine cars as formerly was the practice. Round cables, 1¼-in. diameter, are being used, which necessitated the installation of new sheave wheels, those used before being adapted only to the use of flat cables. Ore is automatically dumped from the skips into a pocket above the collar of the shaft, from which it flows through a chute mouth controlled by an air gate into 20-ton conveyor cars electrically operated, and in which it is transported to the ore bins about 100 ft. distant. The main shaft has been sunk to the 2000-ft. level, where a station has been cut on the east side, and crosscutting has been started both north and south. Recently while hoisting a skipload of ore the sheave wheel over the north compartment went to pieces, allowing the cable to drop to the axle of the wheel, and causing a cessation of hoisting operations for about 24 hr. until a new wheel could be put in place.

### Lincoln County

THE MONTANA POWER CO. has spent a large sum at Thompson Falls this summer in the erection of comfortable buildings for the accommodation of 600 men to be employed in the construction of the dam on Clarksfork River, where a large power plant is to be erected.

KALISPELL-LINCOLN GOLD MINING CO. (Libby)—This company has closed down its mill on West Fisher Creek on account of a shortage in the water supply. The mill will be started after the fall rains come, and in the meantime development work will be carried on.

ADOLPH LACHARITY has taken a force of men to his copper prospects on Parmenter Creek, six miles from Libby, and will begin doing development work. These properties were discovered about two years ago, but so far only a small amount of work has been done, although the owner states that the showing made is good.

### Madison County

A QUARTZ MILL ON WISCONSIN CREEK will be built to treat the ore being mined on the Sheridan and other lodes in the district, which have been discovered and developed within the last few years. Messrs. Hamilton and McCranor, of Virginia City are at the head of the project, and they now have a surveying crew in the field surveying a location for the mill and a line for a tramway from the mines. It is understood that the machinery has been ordered and will be installed as soon as received. The properties to be served by this plant have been developed sufficiently to show up some excellent ore.

MOUNTAIN MEADOW (Pony)—The shaft at this property in the Mineral Hill district has been sunk on the vein to a depth of 200 ft. Ore is being mined from the 70-ft. level and shipped to the East Helena smelters. The bulk of the ore is of a milling grade, running between $8 and $10 per ton, but a portion of it is much richer, the ore being shipped running about $65 in gold and 10 oz. of silver per ton.

## NEVADA

### Clark County

MONTE CHRISTO (Goodsprings)—This property, under lease to Duncan & Frederickson, has resumed shipments of zinc-carbonate ore. During the summer, considerable ore was blocked out in the mine, and shipments are now being made at the rate of three cars per week.

ANCHOR (Goodsprings)—During the summer, a new hoisting plant was installed, and recent development has shown the presence of large quantities of lead-zinc carbonates. Owing to the inaccessibility of the property, no shipments have been made, but it is stated that in the near future the company will install an aërial tramway to handle the ore.

### Humboldt County

CHARLESTON NATIONAL MINING CO. (National)—The hoist has been installed. It is reported that a working shaft will be sunk in the foot wall of the vein.

ROCHESTER MINES CO. (Rochester)—An injunction has been granted, restraining Joseph Nenzel, president, from disposing of 420,000 shares of the treasury stock at a price which other stockholders claim would cause a loss to the company.

CROWN POINT (Rochester)—In lease No. 4 on this property a drift from the bottom of the old shaft has struck a shoot of high-grade silver ore. A new working shaft will be sunk and crosscuts driven to cut the vein at a greater depth.

SILVER BELT R.R. (Rochester)—A steam locomotive has been added to the equipment of this road. The gasoline locomotive is still in use, but is not of sufficient power to handle the traffic. Over 100 tons of ore daily are now being shipped from the Rochester district.

### Lyon County

YERINGTON MOUNTAIN (Yerington)—The roads have been repaired and shipments have been resumed.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Sept. 4, 1913, were as follows: From Mason Valley mine, 1978 tons; from Nevada-Douglas, 780 tons; from other mines, 1430 tons; total, 4188, or a daily average of 598 tons. During the same week four cars of matte were shipped.

### Mineral County

A POTASH DISCOVERY is said to have been made at Bovard by F. C. Shrader, of the U. S. Geological Survey. A deposit of alunite at this place assays as high as 10 to 11% potash.

WILSON MINE (Pine Grove)—It is reported that this mine, which has produced $5,000,000 in the past, has been thoroughly examined by the present owners, and will be reopened.

### White Pine County

AMALGAMATED NEVADA CO (Blackhorse)—The stamp mill was burned to the ground, Aug. 3. The mine had been worked in a desulatory manner the last year, and it is not likely that the mill will be rebult.

LEAD KING MINING & MILLING CO.—This company's property, situated in the Duck Creek district, has been leased to Cergneux and associates, and is now being worked by them. Several cars of high-grade lead ore have been shipped from this mine in the last two years.

CONSOLIDATED COPPERMINES (Ely)—Three steam shovels and some dinky engines for use in development have been ordered. The Ora claim is practically surrounded by Nevada Consolidated territory. It is not quite a full claim and was never believed to have any particular value as mineral territory until a Nevada Consolidated steam shovel digging a cut for a new railway grade out of the Liberty yards ran into sulphide ore only about 6 ft. from the surface. The strike has delayed the laying out of the new railway yards planned by the Nevada Consolidated management for trackage for ore trains from the Liberty pit as a portion of the new yard was on the Ora claim to which the Nevada Consolidated had surface rights under an agreement with the Giroux company. It is locally reported that a reduction plant is to be built, probably at Warm Springs, near Ely.

## NEW MEXICO

### Grant County

EMMA (Fierro)—It is reported in Silver City that recently while driving a drift a great mass of thin mud was encountered which flowed through the drift and rose over 100 ft. in the shaft. It was too thick to pump and had to be bailed out. Some time ago a vast quantity of water was struck on the 400-ft. level and large pumps had to be ordered to empty the mine.

### Socorro County

A SAW MILL WILL BE BUILT by a Canadian company which recently purchased several million feet of timber from the U. S. Government, on Mineral Creek, a few miles above Mogollon. The lumber will be flumed to a place about one mile above Mogollon for delivery to consumers, chief of which is the mining industry of the camp.

MAUD (Mogollon)—Sinking of the new shaft has been temporarily stopped and drifts are being extended from the 500-ft. level. Ore mined is sent to a custom mill for treatment.

OAKS (Mogollon)—Some high-grade milling ore is being shipped to custom works from developments in the East End tunnel group. Part of this work is done under the contract-lease system. Another block of ground will be let under similar conditions.

## NORTH CAROLINA

### Montgomery County

CANDOR MINES CO. (Candor)—In addition to ore from the mine it has for some time been the practice to treat tailings from a dump accumulated 8 or 10 years ago under the Jones regime, when the rich surface ores were treated in a stamp mill by amalgamation only. An incline 400 ft. long runs from the mill to the pit and the tailing is fed to the tube mill.

### Rowan County

COGGINS (Salisbury)—Forty men are at work. A mill of ten 1000-lb. stamps and three Wilfley tables is being erected, to replace the Lane mill plant, which was burned last summer. A new headframe and orebin have been built. Sinking with air drills below the 200 level is in progress and a depth of 250 ft. has been reached. This is a large deposit of low-grade ore and is one of the rejuvenated mines that were actively worked in this, the Uwharrie district, years ago. There seems to be an abundance of ore.

### Stanly County

SOUTHERN ALUMINUM CO.—At the narrows of the Yadkin River below Whitney, 1300 men are at work on grading and construction operations connected with the building of the power dam and reduction plant. Twin tunnels, 35x40 ft. in section, 1200 ft. long and 30 ft. apart are being driven to divert the Yadkin River during the actual construction of the dam. A 2000-cu.yd. (per 10 hr.) crushing and concrete mixing plant is being built. This consists of one No. 21 gyratory crusher; six No. 6 gyratories; four 54x24-in. sand rolls, and four 2½-cu.yd. concrete mixers. Eleven American Hoist & Derrick Co. derricks are used in the river gorge near the dam site. A switchback railroad connects the works with the main line on the level land above the river. Compressed air used for hoisting and drilling, is furnished by two plants, one steam driven, the other electrically driven by power from the Southern Power Co. plant. The dam is to be 200 ft. high and willdevelop more than 100,000 hp. Water will be backed over the dam built by the Whitney company six miles upstream.

## OREGON

### Baker County

UNION-COMPANION (Cornucopia)—These mines are being operated by the Cornucopia company. The quartz vein follows a basalt dike, which traverses the Granite Mountains, and ranges from 3 to 14 ft. in width, and the ore assays from $10 to $100 per ton. The mine is developed by several tunnels at various levels, and by a shaft sunk 550 ft. below the lower tunnel about 1200 ft. back from the tunnel entrance. The underground workings total nearly four miles and have developed enough ore to keep the mills in operation for several years. The quartz carries gold and silver with the iron sulphides and contains little free gold.

### Coos County

GOLD IN THE PAVING STONES of the streets of Coquille has been discovered to be present to the extent of $6.40 per ton. The paving rock was taken from the quarry just outside the town. In the early days of '49 a great deal of placer mining was done in this section, but there has been no activity for many years.

### Josephine County

ALMEDA CONSOLIDATED MINING CO. (Galice)—Under the management of Thomas S. Burley, receiver for the properties of this company, much work is being done. John Ross, of [illegible], Calif., has been appointed superintendent of the property, and is now in active charge of affairs [illegible]. Before Burley accepted the receivership of the property, Ross spent two weeks in making a complete investigation of the ore and its value, and it was upon that report that Burley decided to make the extensive development [illegible] now planned. Mr. Chambers, of Portland, has [illegible] the smelting plants. Sixty men are at work in the [illegible] will be employed as needed. Mr. Burley states [illegible] ample funds at his command to carry out the [illegible] development. White auto trucks will be used to haul [illegible] matte to the railroad at a cost estimated at $2 [illegible], against a former cost of $7 per ton by teams. The [illegible] has turned the books of the company over to the state corporation commission for a thorough investigation. The report when received will show up the past history of the management and supposed mismanagement. Burley says that there are 4,000,000 tons of ore blocked out. The great body of ore assays better than $6 per ton at the surface. Stockholders will be kept informed about the operations and business management, and all inquiries will be cheerfully answered. The offices of the company have been moved from Portland to Grants Pass.

## SOUTH DAKOTA

### Lawrence County

HOMESTAKE (Lead)—In making adjustments of valuation for purposes of taxation, the recently created state tax commission has raised the company's assessment from $8,000,000, as returned by the county commisioners of Lawrence County, to $16,000,000. Many regard this as an unjust valuation, and it is believed that an effort will be made through the courts, to have it reduced.

## UTAH

### Beaver County

MOSCOW (Moscow)—The orebody faulted on the 600 has been encountered on the 700. Work on the new shaft is progressing, and it is planned later to connect it with the winze started at the 500, and being sunk below the 700. The 700-ft. level of the shaft will about equal the 1000 in the old workings, and it is here that connections will probably be made.

### Juab County

AUGUST SHIPMENTS FROM TINTIC amount to 765 cars of ore.

EAGLE & BLUE BELL (Eureka)—During August ore was for the first time taken from a winze 150 ft. below the 1350, the lowest level in the mine.

CHIEF CONSOLIDATED (Eureka)—The management has been introducing a new system of mining by which the stopes are filled as they are mined out. Under this system the ground surrounding the stopes is more thoroughly prospected before being abandoned, and timbering is unnecessary. The new work has held down the output, but it is expected that production will be normal within a short time.

### Summit County

PARK CITY SHIPMENTS for August amount to 7499 tons.

DALY-JUDGE (Park City)—The dividend for the third quarter of the year has been declared, payable Oct. 1.

SILVER KING CONSOLIDATED (Park City)—A dividend of 25c. per share was paid Sept. 16, leaving $500,000 in the treasury.

DALY (Park City)—At special stockholders' meetings to be held Oct. 1 two amendments to the articles of incorporation will be voted on. The question of increasing the capitalization from 150,000 shares, par value $20, to 200,000 shares of the same par value will be considered. The object of the second amendment is to authorize supplying light, power and heat to other mining corporations, etc. The company has interests in the Ontario and other sources of water at or near Park City, and in coal deposits at Coalville, Utah.

### Utah County

UNION CHIEF—The indebtedness of this company has been cleared off, and with some money in the treasury, development, suspended for a short time, has been resumed.

## WASHINGTON

### Baker County

MOUNTAIN TOP (Bellingham)—A new mill in the Slate Creek district is being planned.

### Ferry County

INTERNATIONAL (Orient)—Some extensive development work is being planned for this property.

### Snohomish County

BURNEY—Fire recently destroyed the compressor plant at this mine, in the Monte Cristo district; it will be rebuilt.

### Stevens County

ORIOLE (Metaline)—A new mill is to be built.

## WYOMING

### Park County

NORTHWEST SULPHUR CO. (Cody)—It was recently decided at a special meeting to double the output of the plant. A [illegible] machine will be installed and powdered sulphur [illegible] in the plant's output. A large new deposit of sulphur has recently been opened up. The capital stock has been increased to $200,000 from $100,000 and a [illegible] dividend declared. The enlarged plant will have a capacity of 30 tons per day.

## CANADA

### Alberta

EDMONTON-PORTLAND CEMENT CO. (Marlboro)—The 1500-bbl. plant built at a cost of $750,000, is now in operation and turning out 1000 bbl. per day. Orders have already been placed for 60,000 bbl., and the company can obtain contracts for as much more as soon as the first consignment is delivered.

### Nova Scotia

A GOLD PROPERTY IS BEING OPENED BY H. M. Rogers and J. H. Brown, near Ingonish, Cape Breton Island. Concrete mine buildings have been erected. The vein has been opencut at a number of places and sinking and drifting are now under way with a force of about 12 men.

### Ontario

HUDSON BAY (Cobalt)—The option on the Kirkland Lake property has been dropped.

RIGHT-OF-WAY (Cobalt)—The option on the Flynn claims, south of the Burnsides, has been dropped.

HUNTON (Swastika)—The option on this property, held by Penman and Cartwright, has been dropped.

SWASTIKA (Swastika)—This property has been closed owing to lack of both money and ore.

TOUGH-OAKES (.Swastika)—The public offering of the stock of this company, formerly known as the Foster, has been a failure.

O'BRIEN (Cobalt)—The management will install the necessary machinery to increase the capacity of the mill from 100 to 150 tons per day.

CASEY-COBALT (Cobalt)—It is expected that this company will commence in November, the payment of dividends at the rate of 10% per annum.

ARCTIC GOLD EXPLORATION SYNDICATE, LTD. (Toronto)—This company has been incorporated with $100,000 capital to explore and prospect the territories of Labrador, Ungava, Keewatin, Hudson Bay, Baffin's Land and other Arctic regions, for gold, coal and other minerals, and trade in furs, fish, etc.

WETTLAUFER (Cobalt)—At a special meeting the shareholders authorized a by-law, permitting the directors to pay dividends out of the funds of the company notwithstanding that the value of the net assets may be reduced to less than the par value of its issued capital stock. The adoption of this by-law was to enable the company to conform with the Canadian laws. The company has approximately $200,000 cash, which has been held for exploration and development purposes, but so far, the distribution of this amount has not received serious consideration.

DOME LAKE (South Porcupine)—The shareholders at a special meeting, held in Toronto, on Sept. 8, received a financial statement, showing that the company was in debt to the amount of $61,000. Of this $41,000 was owed to General Assets, Ltd., which offered to take 45,000 shares of stock at par in settlement. To meet other liabilities and provide funds for continuing development, the directors proposed to issue 100,000 shares at 35c. each, the stock being offered to present shareholders first. The bylaws authorizing this course were duly ratified.

## MEXICO

### Jalisco

CINCO MINAS (Hostotipaquillo)—Good progress is being made in mill construction, and much of the machinery has arrived. Shipments now are being brought in through the Pacific port of Manzanillo. It is expected to have the 250-plant in operation by the end of the year.

MOLOLOA (Hostotipaquillo)—A new shoot of high-grade ore has been opened. The bulk of the ore taken out so far assays 57 kilos silver per ton, and the gold averages 2½ grams per kilo of silver. The rich ore was opened by a drift on the sixth level of the Soledad claim, and is between the Soledad and the famous old Mololoa mine.

CASADOS (Hostotipaquillo)—Sastisfactory results are being obtained in the treatment of ores in the small experimental plant. Work is going forward on the 100-ton plant, and it is hoped to have it completed by the end of the year. High-grade ore from Casados, formerly shipped to the Torreon smelters, now is being sent to San Luis Potosi.

EL FAVOR (Etzatlan)—Fifteen stamps, 2-tube mills, concentrators and cyaniding equipment to correspond have been added to the mill. The new equipment will be used exclusively in milling Mololoa ores, and the original 20-stamp mill of El Favor will run on El Favor ore. For some time much of the ore treated at El Favor has been from Mololoa. The milling ore now blocked out in the El Favor mine amounts to 150,000 tons, enough to keep the present mill operating for several years. Laboratory tests in connection with a new process for the treatment of the manganese ores of El Favor have shown high extraction, and it is hoped soon to put this process into practice. Heavy shipments of high-grade ore from El Favor to Aguascalientes continue, and the monthly profits are large. A fourth dividend of 1c. gold, per share will be paid Oct. 30.

### Tepic

TROUBLE FROM REVOLUTIONISTS is being experienced by Americans who, upon arrival at San Francisco after leaving the country, reported that Morris P. Rood, superintendent of the El Tigre mine, was killed, and that Max Lambert, another American, had a narrow escape.

## NORWAY

THE ORE CONCENTRATION COMPANY (1905) LTD.—During July the Elmore vacuum plant at the Sulitelma mines, produced 850 tons of copper concentrates.

## SOUTH AFRICA

### Transvaal

ANOTHER STRIKE ON THE RAND is impending according to a cable dispatch. The trouble is over Hindu racial restrictions of the immigration laws.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Sept. 17

The metal markets have been a little more steady, but remain strong and the upward tendency is still apparent.

MONTHLY INDEX NUMBERS

| Month | 1912 | 1913 | Month | 1912 | 1913 | Month | 1912 | 1913 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 111 | 126 | May | 118 | 126 | Sept | 127 | . |
| Feb. | 109 | 125 | June | 117 | 117 | Oct. | 133 | . |
| March | 111 | 125 | July | 114 | 110 | Nov. | 129 | . |
| April | 115 | 124 | Aug. | 120 | 116 | Dec. | 129 | ... |

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115 Numbers for each month and year calculated on approximate sales of pig ron, copper, tin, lead, zinc and aluminum.

## Copper, Tin, Lead and Zinc

**Copper**—The recession which was indicated at the close of last week continued into the early part of this week and was due wholly to the decline in the London market. The continued rise of copper had brought with it the accumulation of a considerable bull account in London standard copper, and most of the bulls endeavored to realize their profits at the same time. In consequence the London market declined sharply. This led consumers, both in Europe and this country, to hold off. The principal producers being well sold ahead, and recognizing that consumers had not yet covered their entire wants for the next 60 days, were not at all affected, maintaining their asking price of 16¾c., delivered, but refined copper in second hands, also by certain first hands, was offered for sale at concessions. A considerable tonnage was sold at 16½c., delivered, usual terms.

With the recovery in London, things turned strong again here and by the end of Sept. 16 all the copper offered at concessions had been absorbed. The leading producers raised their nominal price to 16⅞c. and on Sept. 17 considerable business was done at that price and a few points lower. One lot of 1,000,000 lb. was sold at 16.67½c., cash, New York. There was a good deal of talk about 17c. copper and one of the agencies raised its price to that figure, but no such price has yet been realized. Up to the close of business on Sept. 17, all of the other agencies were still offering at 16⅞c., delivered, usual terms.

The situation in the Lake market continued about the same as we reported last week. The Calumet & Hecla is the only company that now has copper to sell. It appears to be reserved in its offerings but is understood to be supplying its regular customers at 17c.

The total volume of business done during the week of Sept. 11-17 was decidedly less than during the previous week, and on the whole the market was rather quiet, despite its interesting features.

At the close we quote electrolytic copper in cakes, ingots and wirebars at 16.65@16.75c., and Lake copper at 17c. Casting copper is quoted nominally at 16.25@16.30c. as an average for the week.

On Thursday, Sept. 11, the London market declined to £72 10s. for spot and £72 5s. for three months under heavy realizations of speculative purchases. On Friday it advanced 10s. By Monday, the pressure to sell having ceased, the market rebounded and closed that day at £74 15s. for spot and £74 7s. 6d. for three months, advancing on Tuesday to £75 2s. 6d. for spot and £74 13s. 9d. for three months, but closes today at £74 12s. 6d. for spot and £74 7s. 6d. for three months.

It is reported that the Trade Committee of the New York Metal Exchange has turned down the proposal to substitute a call on electrolytic copper in place of a call on Standard copper for the reason that the producers of electrolytic copper would not agree to trade on the Exchange. The market for electrolytic copper is in the offices of the agencies in New York. In the main they deal directly with the consumers and there is no good reason why they should do otherwise.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾@18c., carload lots at mill.

Exports of copper from New York for the week were 6768 long tons. Our special correspondent gives the exports from Baltimore at 3690 tons for the week.

**Visible Stocks in Europe** on Sept. 15, as reported by cable: Great Britain, 16,090; France 3270; Rotterdam, 2100; Hamburg, 1380; Bremen, 1450; other Continental ports, 900; total, 25,190 long tons or 56,425,600 lb., a decrease of 3250 tons from the Aug. 31 report. The decrease was chiefly in the stocks in Holland and Germany. In addition to the stocks above 2350 tons were reported afloat from Chile and 4300 from Australia, making a total of 31,840 tons.

**Tin**—The latter part of last week, the market both here and in London ruled extremely dull. Efforts were made by dealers to stimulate business by underquoting London prices to the extent of £1 per ton without avail. When London at the beginning of this week came higher and very strong, the situation here changed completely and business became active, even at an advance over import prices. The close is easier

DAILY PRICES OF METALS

NEW YORK

| Sept. | Sterling Exchange | Silver | Copper |  | Tin | Lead |  | Zinc |  |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 11 | 4.8565 | 60⅛ | 17.00 | 16.30<br>@16.40 | 42⅜ | 4.70<br>@4.75 | 4.60<br>@4.62½ | 5.75<br>@5.80 | 5.60<br>@5.65 |
| 12 | 4.8570 | 60⅛ | 17.00 | 16.30<br>@16.40 | 42⅜ | 4.70<br>@4.75 | 4.60<br>@4.62½ | 5.70<br>@5.80 | 5.55<br>@5.65 |
| 13 | 4.8560 | 60⅛ | 17.00 | 16.30<br>@16.40 | 42⅝ | 4.70<br>@4.75 | 4.60<br>@4.62½ | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 15 | 4.8555 | 60⅛ | 17.00 | 16.35<br>@16.45 | 42⅞ | 4.70<br>@4.75 | 4.60<br>@4.62½ | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 16 | 4.8540 | 60¼ | 17.00 | 16.45<br>@16.60 | 42⅞ | 4.70<br>@4.75 | 4.60<br>@4.62½ | 5.70<br>@5.75 | 5.55<br>@5.60 |
| 17 | 4.8530 | 60½ | 17.00 | 16.65<br>@16.75 | 42⅝ | 4.70<br>@4.75 | 4.60<br>@4.62½ | 5.70<br>@5.75 | 5.55<br>@5.60 |

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium The quotations on spelter are for ordinary Western brands; special brands command a premium Silver quotations are in cents per troy ounce of fine silver

LONDON

| Sept. | Silver | Copper |  |  | Tin |  | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
|  |  | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos |  |  |
| 11 | 27¾ | 72½ | 72¼ | 78 | 192¾ | 192½ | 20½ | 21¼ |
| 12 | 27¼ | 73 | 72¼ | 78¼ | 192¾ | 192 | 20 | 21¼ |
| 13 | 27¼ |  |  |  |  |  |  |  |
| 15 | 27¼ | 74¼ | 74⅜ | 79½ | 194¼ | 194 | 19⅞ | 21¼ |
| 16 | 27$\frac{11}{16}$ | 75¼ | 74$\frac{11}{16}$ | 80 | 194½ | 194 | 20½ | 21¼ |
| 17 | 27$\frac{15}{16}$ | 74⅝ | 74⅜ | 80 | 193¼ | 192¼ | 20⅝ | 21¼ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

at £193 [illegible] and £192 15s. for three months, and 42⅝c. for September [illegible].

**Lead**—The market is quiet and a little softer, at 4.70@4.75c., New York, and 4.60@4.62½c., St. Louis.

The [illegible] market is firm, Spanish lead being quoted £20 [illegible] and English lead £1 higher.

**Spelter**—This market is quiet and lower. St. Louis is [illegible] 5.60c., and New York 5.70@5.75 cents.

The London market is unchanged at £21 5s. for good ordinaries and £21 12s. 6d. for specials.

The base price of zinc sheets stands unchanged at $8 per 100 lb., less 8% discount, f.o.b. cars, Peru, Ill. Extras and discounts unchanged.

## Other Metals

**Aluminum**—The market is quiet and only necessary business will be done until the tariff is settled. No. 1 ingots, domestic, are quoted at 22@22½c. per lb., while foreign ingots sell at 18@18½c. per lb. in bond.

**Antimony**—Spot business is small, and futures are largely dependant on the tariff. On the small business doing quotations are 8.25@8.50c. per lb. for Cookson's; 7.75@8c. for Hallett's; 7.15@7.50c. for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business is quiet, and prices a little easier. New York quotation is $39 per flask of 75 lb. San Francisco, $39 for domestic orders and $36.50 for export. London price is unchanged at £7 5s. per flask, with £7 quoted from second hands.

**Exports and Imports in Germany** of metals other than iron and steel half year ended June 30, metric tons:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Copper | 118,116 | 127,700 | 45,088 | 53,200 |
| Tin | 8,169 | 7,084 | 4,721 | 5,255 |
| Lead | 40,136 | 41,573 | 24,606 | 32,954 |
| Zinc | 24,261 | 28,213 | 57,472 | 61,798 |
| Nickel | 911 | 1,189 | 1,328 | 1,018 |
| Aluminum | 7,503 | 6,584 | 2,431 | 4,520 |
| Minor metals | 827 | 958 | 8,399 | 10,557 |

The figures include alloys and manufactures of the different metals named.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London is unchanged at 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. London is still receiving some gold from Brazil and Argentina.

Imports of gold at New York for the week were $621,716, chiefly from Mexico and South America. There were no exports.

Gold in the United States on Sept. 2 is estimated by the Treasury Department as follows: In Treasury current balance, $174,031,112; in banks and circulation, $605,566,895; held in Treasury against gold certificates outstanding, $1,101,842,169, total, $1,881,440,176, an increase of $8,446,718 during August.

Imports of gold into France, half-year ended June 30, were 293,046,000 fr.; exports, 33,332,000 fr.; excess of imports, 259,714,000 fr., an increase of 155,323,000 fr. over last year.

**Iridium**—A little business is doing in this metal, at $83@85 per oz., New York.

**Platinum**—The market is still weak and unsettled, both here and abroad. Dealers here have tried to maintain the price of $45, but sales have been made as low as $43 per oz., and more can be had at that price. Hard metal continues to bring $47@50 per oz., according to the proportion of iridium.

**Silver**—The market this week has been firm, with an upward tendency. This is occasioned in part by a broader demand from China and India, while the supplies from this side have not been up to normal, owing to Mexican troubles.

Shipments of silver from London to the East, Jan. 1 to Sept. 4, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £6,418,700 | £5,108,500 | D. £1,310,200 |
| China | 933,500 | 572,000 | D. 361,500 |
| Total | £7,352,200 | £5,680,500 | D. £1,671,700 |

Imports of silver at New York for the week were $246,-[illegible]. Exports were $1,139,871, chiefly to London and Paris. [illegible] silver in the United States on Sept. 2 is estimated by the Treasury Department as follows: Standard dollars, [illegible]; subsidiary coins, $175,645,870; total $741,294,890. [illegible] dollars, $487,[illegible] are held in the Treasury against [illegible] silver certificates.

Imports of silver into France, half-year ended June 30, were valued at 174,619,000 fr.; exports, 187,459,000 fr.; excess of exports, 12,840,000 fr., which compares with an excess of imports of 18,560,000 fr. last year.

## Zinc and Lead Ore Markets

### JOPLIN, MO., Sept. 13

The high price of zinc blende is $51, the base per ton of 60% zinc ranging from $45 to $48 for choice grades; a $48.50 base was paid for one lot with 5% iron, and blende carrying an excess of 8% sold up to a base of $52. Calamine sold on a base of $21@24 per ton of 40% zinc. Lead is unchanged at $58 per ton of 80% metal contents. Average all grades zinc, $45.30; lead $57.78 per ton.

SHIPMENTS WEEK ENDED SEPT. 13

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 9,414,650 | 631,970 | 2,069,580 | $287,320 |
| 37 weeks | 398,227,350 | 29,742,150 | 65,599,100 | $11,069,334 |

Blende value, the week, $217,680; 37 weeks, $8,943,064.
Calamine value, the week, $9940; 37 weeks, $383,111.
Lead value, the week, $59,700; 37 weeks, $1,743,159.

### PLATTEVILLE, WIS.—Sept. 13

The base price paid this week for 60% zinc ore was the same as last week, $47@48 per ton. The base price paid for 80% lead ore was $58@59 per ton.

SHIPMENTS WEEK ENDED SEPT. 13, 1913

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,558,670 | 185,700 | 289,430 |
| Year to date | 105,692,480 | 4,943,290 | 41,689,300 |

Shipped during week to separating plants, 1,937,650 lb. zinc ore.

## IRON TRADE REVIEW

### NEW YORK—Sept. 17

The iron trade generally continues a little quiet, though new business has been much better than had been expected. Structural business is improving. Consumers' stocks are low for the most part, and improvement is looked for in orders before the end of the month.

On the whole, the finished-steel market shows an improved outlook this week, though conditions are mixed and the apparent improvement is based upon theory rather than upon an increased volume of purchases. There is, however, distinct improvement in inquiry for some products, notably structural material and sheets, there being more structural business in the market, chiefly in small orders, than for several months. In sheets, buyers are showing more disposition to contract ahead, while the mills are naming higher prices for extended delivery than for prompt shipment, even of relatively small lots.

Throughout the finished-steel industry current bookings are less than current shipments, but shipments are up to practically the capacity of the mills, and tonnage outputs are running somewhat heavier than in July and August, due to better weather conditions. Buyers are as urgent for delivery of material actually ordered as they have been.

The Steel Corporation report of unfilled tonnage at the close of August furnished a surprise to the trade, as the August loss was only 176,000 tons, against 250,000 to 275,000 tons generally expected. Shipments appear to have averaged about 40,000 tons a day, and bookings about 33,300 tons. Last May the bookings were less than half the shipments.

A good deal of business has been done in pig iron, rather quietly for the most part and it is believed that many large consumers are now fairly well covered for fourth quarter. Prices have been pretty well maintained.

**The Steel Corporation** reports unfilled orders on its books on Aug. 31 at 5,023,508 tons, a decrease of 175,848 tons from July 30. This is a better showing than was generally expected.

**Pig-Iron Production**—The statements of the blast furnaces, as collected and published by the "Iron Age," show that on Sept. 1, there were 260 coke and anthracite furnaces in blast with a total daily capacity of 82,400 tons, an increase of 700 tons over Aug. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in August was 2,595,600 tons; for the eight months ended Aug. 31, it was 21,679,700 tons. Of this total 15,141,900 tons, or 70%, were made by the steel works furnaces.

### PITTSBURGH—Sept. 17

Finished-steel prices have undergone no material change. While the trend of the market has been toward lower prices, little ground, if any, has been lost in the past week. There being a wide open market on practically all steel products, comparisons can be made only by averages. The openly quoted prices are usually cut in the case of especially attractive orders, such orders being attractive from their involving early delivery. There is more question regarding wire prices than there was, it being evident that much business, involving the largest buyers, has gone at concessions from 1.45c. for plain wire and $1.65 for nails, though these are still the openly quoted market.

**Pig Iron**—The local pig-iron market continues quiet, with a decided undertone of strength. The question is not whether previously quoted prices could be shaded, but whether furnaces can secure advances over them. Current buying runs chiefly to small lots of foundry iron and purchases of this grade are practically certain to increase, as many consumers who covered for third quarter have not yet taken hold for fourth quarter. We continue to quote: Bessemer, $15.75@16; basic, $14; No. 2 foundry, $14; forge, $13.50; malleable, $14.25, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is weak and previous concessions of $1 a ton from the nominal price appear to be yielding to larger concessions, with little business done. We quote the nominal market for prompt or forward at $56, Baltimore, with $2.16 freight to Pittsburgh.

**Steel**—The mills are not reducing quotations materially. The Youngstown mills assert that they will not do below $25 for billets and $26 for sheet bars at mill, when for early consumption, but in competition for business in the immediate Pittsburgh district they would probably absorb some of their freight disadvantage. We quote billets at $24 and sheet bars at $25, f.o.b. maker's mill, Pittsburgh district.

**Foreign Trade of Germany,** half-year ended June 30, metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel | 3,269,230 | 315,323 | Exp. 2,953,907 |
| Machinery | 277,354 | 49,871 | Exp. 227,483 |
| Total | 3,546,584 | 365,194 | Exp. 3,181,390 |
| Total, 1912 | 3,175,268 | 370,780 | Exp. 2,804,488 |

Increase in exports, 371,316 tons; decrease in imports this year, 5586 tons.

### IRON ORE

Ore movement on the Lakes has been rather slow and September had a poor beginning. There was some congestion of boats at the Lake Erie docks. The business is improving, however.

Shipments from the Lake Superior district from the opening of the season to Sept. 1 were, in long tons:

| Port | 1912 | 1913 | Changes |
|---|---|---|---|
| Escanaba | 3,240,011 | 3,623,632 | I. 383,621 |
| Marquette | 2,001,400 | 2,155,363 | I. 153,963 |
| Ashland | 2,865,397 | 3,073,628 | I. 208,231 |
| Superior | 9,066,190 | 8,585,838 | D. 480,352 |
| Duluth | 6,076,452 | 7,891,903 | I. 1,815,451 |
| Two Harbors | 5,801,702 | 6,676,708 | I. 875,006 |
| Totals | 29,051,152 | 32,007,072 | I. 2,955,920 |

The decrease at Superior was due to the strike at the Allouez docks. The total shipments in August were 7,677,601 tons, of which 6,075,726 tons went to Lake Erie docks.

The market in the East is quiet, with few transactions reported. The first cargo of 3000 tons of Texas ore consigned to the Alan Wood, Iron & Steel Co., finally reached Philadelphia last week.

### COKE

There are some signs of a break in the firm position of the producers. Contracts for furnace coke for Cleveland delivery have been taken at $2.25 at oven, a break of 25c. per ton. It is said that others will be placed at the lower rate.

## CHEMICALS

### NEW YORK—Sept. 17

The general market is still quiet and consumption appears to be restricted to some extent.

**Arsenic**—The market is dull, and what business is going is placed at about $3 per 100 lb. Supplies are good.

**Copper Sulphate**—The market has not yet reflected the advance in copper, and prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—This is the dull season for nitrate, but under the influence of the nitrate convention the market stands firm at 2.40c. for all positions. Business has been slow.

### OTHER ORES

**Manganese Ores** in Great Britain are quoted as follows: Indian or Brazilian, 50%, 22c. per unit; 48% manganese, 21c. Caucassian, 50%, 20@21c.; 48%, 19¾@20¾c. per unit.

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### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded

| | April | May | June | July | August |
|---|---|---|---|---|---|
| Alaska shipments | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 |
| Anaconda | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 |
| Arizona, Ltd. | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 | 1,800,000 |
| Copper Queen | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 |
| Calumet & Ariz. | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 |
| Chino | 3,925,409 | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 |
| Detroit | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 |
| East Butte | 1,400,000 | 1,268,595 | 1,055,646 | 1,060,257 | .......... |
| Mammoth | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 610,000 | 610,000 | .......... |
| Mason Valley | 1,264,304 | 1,186,560 | 1,097,014 | 908,892 | .......... |
| Miami | .......... | 1,943,900 | 2,612,000 | .......... | .......... |
| Nevada Con. | 5,650,000 | 5,933,275 | 6,344,863 | 5,403,919 | .......... |
| Ohio | 690,001 | 650,071 | 537,400 | 601,700 | .......... |
| Old Dominion | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 |
| Ray | 4,379,128 | 4,384,400 | 4,392,612 | 4,097,000 | .......... |
| Shannon | 1,238,000 | 1,080,000 | 924,000 | 880,000 | 1,248,000 |
| South Utah | 132,267 | 200,000 | 185,000 | 140,000 | 223,498 |
| Tennessee | 1,718,188 | §1,037,115 | 1,379,220 | 1,247,804 | .......... |
| United Verde* | 3,000,000 | 3,000,000 | 2,900,000 | .......... | .......... |
| Utah Copper Co. | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 | .......... |
| Lake Superior* | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 |
| Non-rep. mines* | 6,000,000 | 6,300,000 | 6,000,000 | 6,200,000 | .......... |
| Total prod. | 104,224,079 | 109,824,500 | 104,051,138 | .......... | .......... |
| Imports, bars, etc. | 25,578,297 | 22,205,942 | 18,255,267 | .......... | .......... |
| Total blister | 129,802,376 | 132,030,442 | 122,306,405 | .......... | .......... |
| Imp. ore & matte. | 7,177,363 | 10,528,562 | 7,497,002 | .......... | .......... |
| Total Amer. | 136,979,739 | 142,559,004 | 129,803,407 | .......... | .......... |
| Miami† | 2,312,900 | .......... | .......... | 2,890,000 | 3,097,500 |
| Shattuck-Arizona | 1,158,326 | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 794,000 | 618,076 | 634,238 | 618,379 | .......... |
| Granby | 1,857,452 | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,811,200 | 2,424,800 | 1,984,640 | 2,240,720 | .......... |
| Cananea | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 |
| Moctezuma | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 |
| Cape Cop., S. Af. | 586,880 | 387,520 | 414,400 | | .......... |
| Kyshtim, Russia | 2,544,640 | 1,490,000 | 1,000,000 | 2,500,000 | .......... |
| Spassky, Russia | 974,400 | 721,280 | 835,520 | 660,800 | .......... |
| Exports from | | | | | |
| Chile | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 |
| Australia | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 | 6,720,000 |
| Arrivals-Europe† | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

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### STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VIII'12 | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | 113,299,200 | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ...... | . | ...... |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,591,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | ............ | ............ | ...... | 38,314,037 | 63,716,800 | 102,030,837 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Alpha Con., Nev | Sept. 22 | Oct. 15 | 0.02 |
| American, Utah | Sept. 18 | Oct. 18 | 1.00 |
| Confidence, Nev | Sept. 23 | Oct. 14 | 0.10 |
| Copper King, Ida | Sept. 14 | Oct. 14 | 0.01 |
| Copper Mountain, Ida | Sept. 6 | Oct. 4 | 0.002 |
| [illegible]-Hailstone, Nev | Aug. 25 | Sept. 22 | 0.003 |
| [illegible], Utah (3d install) | Sept. 15 | Oct. 11 | 0.005 |
| [illegible], Utah | Sept. 19 | Oct. 18 | 0.005 |
| Gold Hill, Ida | Sept. 10 | Sept. 30 | 0.0005 |
| Hamburg-American, Ida | Sept. 8 | Sept. 29 | 0.000½ |
| Justice, Nev | Sept. 8 | Sept. 30 | 0.02 |
| Lake, Mich (postponed) | ... | Sept. 22 | 2.00 |
| [illegible] Swede, Ida | Sept. 20 | Oct. 16 | 0.003 |
| McKinley Gold, Ida | Sept. 8 | Oct. 8 | 0.0005 |
| Mexican Metals (Boston) | .. | Oct. 10 | 0.15 |
| Nabob, Ida | Aug. 25 | Sept. 22 | 0.005 |
| Oreano, Ida | Sept. 1 | Oct. 1 | 0.0015 |
| Potosi, Nev | Sept. 4 | Sept. 26 | 0.02 |
| Sierra Nevada, Nev | Sept. 25 | Oct. 25 | 0.10 |
| Silica Mountain, Ida | Sept. 15 | Oct. 15 | 0.002 |
| Slavonia, Ida | Sept. 10 | Sept. 30 | 0.002 |
| St. Louis, Calif | Sept. 22 | Oct. 4 | 0.01 |
| Sunset, Nev | Sept. 2 | Oct. 13 | 0.01 |
| Sunshine, Ida | July 1 | Oct. 15 | 0.001 |
| Teddy, Ida | Sept. 15 | Oct. 15 | 0.001 |
| Tuscumbia, Ida | Aug. 23 | Sept. 23 | 0.003 |
| Yellow Jacket, Nev | Sept. 8 | Oct. 8 | 0.10 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | ... | 24.209 | 29.088 | .... |
| October | 53.340 | 63.471 | ... | 24.594 | 29.299 | ..... |
| November | 55.719 | 62.792 | | 25.649 | 29.012 | .... |
| December | 54.905 | 63.365 | | 25.349 | 29.320 | . |
| Year | 53.304 | 60.835 | .. | 24.592 | 28.042 | . |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York Electrolytic 1912 | New York Electrolytic 1913 | New York Lake 1912 | New York Lake 1913 | London Standard 1912 | London Standard 1913 |
|---|---|---|---|---|---|---|
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | | 17.698 | | 78.762 | |
| October | 17.314 | | 17.661 | | 76.389 | |
| November | 17.326 | | 17.617 | | 76.890 | |
| December | 17.376 | | 17.600 | | 75.516 | |
| Year | 16.341 | | 16.560 | | 72.942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.150 |
| March | 42.577 | 46.832 | 192.619 | 213.645 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | | 223.762 | |
| October | 50.077 | . | 228.353 | |
| November | 49.891 | . | 227.619 | |
| December | 49.815 | | 226.875 | |
| Year | 46.096 | | 209.322 | |

New York in cents per pound London in pounds sterling per long ton

### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | | 4.924 | | 22.292 | |
| October | 5.071 | | 4.894 | | 20.630 | |
| November | 4.615 | | 4.463 | | 18.193 | |
| December | 4.303 | | 4.152 | | 18.069 | |
| Year | 4.471 | | 4.360 | | 17.929 | |

New York and St. Louis cents per pound. London, pounds sterling per long ton

### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | | 7.313 | | 27.048 | ... |
| October | 7.426 | | 7.276 | . | 27.543 | |
| November | 7.371 | | 7.221 | . | 26.804 | |
| December | 7.162 | | 7.081 | | 26.494 | |
| Year | 6.943 | | 6.799 | . | 26.421 | .. |

New York and St. Louis, cents per pound. London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.86 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | . | 16.03 | ... | 15.63 | |
| October | 17.90 | . | 17.18 | ... | 17.22 | |
| November | 18.07 | | 17.09 | ... | 18.00 | |
| December | 18.15 | | 17.45 | ... | 18.73 | ... |
| Year | $16.01 | | $14.93 | | $15.28 | .. |

## STOCK QUOTATIONS

COLO SPRINGS Sept. 16

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02 |
| Cripple Cr'k Con | .01 |
| C K & N | .08 |
| Doctor Jack Pot. | .05½ |
| Elkton Con | .56½ |
| El Paso | 3.65 |
| Findlay | .02 |
| Gold Dollar | .10½ |
| Gold Sovereign | .02½ |
| Isabella | .10½ |
| Jack Pot | .04½ |
| Jennie Sample | .05½ |
| Lexington | ‡.005 |
| Moon Anchor | .006 |
| Old Gold | .01½ |
| Mary McKinney | .57 |
| Pharmacist | .01½ |
| Portland | .98 |
| Vindicator | .88 |
| Work | ‡.005 |

SALT LAKE Sept. 16

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .04 |
| Black Jack | .08½ |
| Cedar Talisman | .01½ |
| Colorado Mining | .12 |
| Columbus Con | ‡.05 |
| Crown Point | .01½ |
| Daly-Judge | 6.25 |
| Grand Central | .51 |
| Iron Blossom | 1.22½ |
| Little Bell | ‡.10 |
| Lower Mammoth | .00½ |
| Mason Valley | 6.12½ |
| May Day | .06 |
| Nevada Hills | .90 |
| New York | .03 |
| Prince Con | .36 |
| Silver King Coal'n | 3.30 |
| Sioux Con | .01 |
| Uncle Sam | .04½ |
| Yankee | ‡.08 |

TORONTO Sept. 15

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .05 | Foley O'Brien | .20 |
| Coniagas | 7.00 | Hollinger | ‡16.00 |
| T. & Hudson Bay | ‡70.00 | Imperial | ‡.02 |
| Timiskaming | .24 | Jupiter | .17 |
| Wettlaufer-Lor. | .14 | Pearl Lake | .30 |
| Apex | ‡.01 | Porcu. Gold | .09 |
| Big Dome | 12.50 | Preston E. D. | ‡.01 |
| Crown Chartered | ‡.00½ | Rea | .15 |
| Doble | .10 | Swastika | .03 |
| Dome Exten | .04 | West Dome | .10 |

SAN FRANCISCO Sept. 16

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | .05 | Belmont | 7.37½ |
| Belcher | .25 | Jim Butler | .66 |
| Best & Belcher | .06 | MacNamara | .12 |
| Caledonia | 1.70 | Midway | .46 |
| Challenge Con. | .07 | Mont.-Tonopah | 1.20 |
| Chollar | .03 | North Star | .70 |
| Confidence | .10 | West End Con. | 1.60 |
| Con. Virginia | .09 | Atlanta | .14 |
| Crown Point | .24 | Booth | .02 |
| Gould & Curry | .03 | C. O. D. Con. | .03 |
| Hale & Norcross | .07 | Comb. Frac | .04 |
| Mexican | 1.12½ | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | .44 |
| Ophir | .23 | Round Mountain | .37 |
| Overman | .41 | Silver Pick | .03 |
| Potosi | .04 | Tramp Con | ‡.01 |
| Savage | .13 | Argonaut | 2.50 |
| Sierra Nevada | .05 | Bunker Hill | 1.75 |
| Union Con | .11 | Central Eureka | .16 |
| Yellow Jacket | .26 | So. Eureka | 2.50 |

N. Y. EXCH. Sept. 16

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 79¾ |
| Am. Agri. Chem | 48 |
| Am. Sm. & Ref., com | 69¾ |
| Am. Sm. & Ref., pf | 101 |
| Am. Sm. Sec., pf. B | 84 |
| Anaconda | 39¼ |
| Batopilas Min | 1½ |
| Bethlehem Steel, pf | 73¼ |
| Chino | 44 |
| Federal M. & S., pf | 38½ |
| Great Nor., ore, ctf. | 37¼ |
| Guggen. Exp. | 47½ |
| Homestake | 107 |
| Inspiration Con. | 16¼ |
| Miami Copper | 24 |
| Nat'l Lead, com | 48¼ |
| National Lead, pf. | 105 |
| Nev. Consol | 17¼ |
| Phelps Dodge | 192½ |
| Pittsburg Coal, pf. | 88 |
| Quicksilver, pf | 3½ |
| Ray Con. | 20½ |
| Republic I&S, com | 24¾ |
| Republic I&S, pf. | 89 |
| Sloss Sheff'd, com | 36¼ |
| Sloss Sheffield, pf | 90 |
| Tennessee Copper | 33¾ |
| Utah Copper | 56¾ |
| U. S. Steel, com | 65¼ |
| U. S. Steel, pf | 109¾ |
| Va Car Chem., pf | 102 |

N. Y. CURB Sept. 16

| Name of Comp. | Clg. |
|---|---|
| Ariz. Belmont | ¼ |
| Barnes King | 1¼ |
| Beaver Con | .34 |
| Big Four | .29 |
| Braden Copper | 8¼ |
| B. C. Copper | 2¼ |
| Buffalo Mines | 2 7/16 |
| Can. G. & S. | .19 |
| Con. Ariz. Sm | 3/16 |
| Davis-Daly | 2¼ |
| Diam'field-Daisy | .02½ |
| Ely Con | .06½ |
| Florence | ¼ |
| Giroux | 1¼ |
| Gold Hill Con | 3/16 |
| Goldfield Con | 2 |
| Greene Cananea | 35 |
| Greenwater | .04 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 3½ |
| Keystone | 1¼ |
| La Rose | 2 3/16 |
| McKinley-Dar-Sa | 1½ |
| Min. Co. of A. new | 2¼ |
| Nipissing Mines | 9 |
| Ohio Copper | ½ |
| Pacific Sm. & M. | 1/16 |
| Puebla S. & R. | 2 1/16 |
| South Utah M&S | ½ |
| Stand'd Oil of N. J. | 370 |
| Stewart | 1½ |
| Tonopah | 4¼ |
| Tonopah Ex | 2½ |
| Tonopah Merger | .69 |
| Tri-Bullion | ¼ |
| Tularosa | ¼ |
| Union Mines | .06 |
| United Cop., pfd | 3 |
| West End Ex | .08 |
| Yukon Gold | 2 1/16 |

LONDON Sept. 6

| Name of Comp. | Clg. |
|---|---|
| Camp Bird | £0 17s 3d |
| El Oro | 0 14 6 |
| Esperanza | 1 1 3 |
| Mexico Mines | 5 15 0 |
| Oroville | 0 7 0 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 9 |
| Tomboy | 1 6 3 |

BOSTON EXCH. Sept. 16

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1½ |
| Ahmeek | 280 |
| Alaska Gold M. | 19¾ |
| Algomah | ½ |
| Allouez | 38 |
| Am. Zinc | 21½ |
| Ariz. Com., ctfs. | 5 1/16 |
| Bonanza | 30 |
| Boston & Corbin | ¾ |
| Butte & Balak | 2 |
| Calumet & Ariz | 69½ |
| Calumet & Hecla | 445 |
| Centennial | 14½ |
| Cliff | 2 |
| Copper Range | 40¼ |
| Daly West | 2 |
| East Butte | 12¼ |
| Franklin | 4 |
| Granby | 77½ |
| Hancock | 19 |
| Hedley Gold | 30 |
| Helvetia | ½ |
| Indiana | 4¼ |
| Island Cr'k, com | 54 |
| Island Cr'k, pfd | 85½ |
| Isle Royale | 21½ |
| Keweenaw | 1¼ |
| Lake | 7 |
| La Salle | 4 |
| Mass | 3 |
| Michigan | 1¼ |
| Mohawk | 43 |
| New Arcadian | 2½ |
| New Idria Quick. | ‡3 |
| North Butte | 28½ |
| North Lake | 1½ |
| Ojibway | ‡.65 |
| Old Dominion | 54¼ |
| Osceola | 88 |
| Quincy | 63 |
| Shannon | 7 |
| Shattuck-Ariz. | 27¼ |
| Superior | 29 |
| Superior & Bost. | 3½ |
| Tamarack | 34½ |
| Trinity | 5¼ |
| Tuolumne | .58 |
| U. S. Smelting | 41¼ |
| U. S. Smelt'g, pf. | 48¼ |
| Utah Apex | 2½ |
| Utah Con. | 9¼ |
| Victoria | 1 3/16 |
| Winona | .95 |
| Wolverine | 45¼ |
| Wyandot | |

BOSTON CURB Sept. 16

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 4¼ |
| Boston Ely | 67 |
| Butte&Lon'nDev | 34 |
| Butte Central | .02 |
| Cactus | .02 |
| Calaveras | 1 11/16 |
| Chief Cons | 1 1/16 |
| Corbin | .95 |
| Cortez | .30 |
| Crown Reserve | 1¼ |
| Eagle & Blue Bell | 1 |
| First Nat. Cop | 3 11/16 |
| Houghton Copper | 3¼ |
| Majestic | .37 |
| Mexican Metals | [illegible] |
| Moneta Porc | ‡.07 |
| Nevada-Douglas | 2¼ |
| New Baltic | .80 |
| Oneco | .80 |
| Raven Copper | .14 |
| Rhode Island Coal | .01 |
| Smokey Dev | 1 |
| S. W. Miami | ‡[illegible] |
| South Lake | 3¼ |
| Trethewey | .28 |
| United Verde Ext | .56 |

‡Last Quotation

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# The Platoro District, Colorado

By Carl A. Allen*

*SYNOPSIS—This district was discovered 40 years ago, when the oxidized ore was treated, but low-grade sulphides could not be profitably milled, so mining soon fell off until a year ago, when rich ore was again discovered, leading to renewal of activity. Gold and silver are found with copper in quartz veins in diorite and rhyolite; the district will become a producer of milling rather than of smelting ore. The several camps in the region are briefly described.*

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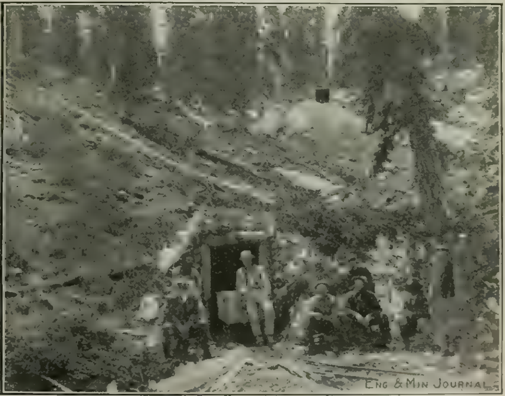
The discovery that led to the present excitement over the Platoro district was made by George Gilmore, in the autumn of 1912. He found some rich quartz on some old claims several miles west of Platoro, on the drainage of the Alamosa River. There were some patented claims near this place, and some old workings, but they were not extensive. The region is one of severe winters and excessive snowfall, so little prospecting could immediately be done. Long before all the snow was off in the spring, however, many people entered the region and, by July 1, the country had been prospected and many claims staked. This, in brief, is the history of the present excitement, but it is not the history of the district for that dates back many years ago.

The Miser Mine at Jasper



Lower and Upper Workings, Gilmore Mine

The district is in the south-central part of the state, about 30 miles from the New Mexico line. The principal towns are Summitville, Jasper, Stunner, Gilmore and Platoro. All of these, except Gilmore, are old towns or camps which have been revived by the interest caused by the late discovery and can properly be included in the Platoro-Gilmore district.

### Placer Mining Begun in 1870

At Summitville, which is about 25 miles southwest of Del Norte, on the Denver & Rio Grande R.R., and reached by wagon road from that place, placering began in 1870, and Theodore Goupil is credited with having made about $20 per day for each man he employed in sluicing the gravels along the creek, now called Wightman's Fork. In 1871 or 1872, he located the first lode claim, now known as the Aztec. The Little Annie and other claims were the next locations, made by Peterson and Brandt, and the discovery of rich ore on the Annie claim brought a rush to the district when nearly all the present claims were located. The first mill was of five stamps, brought in in 1874 by Doc. Adams, who had purchased the Aztec claim. By 1882 four more mills had been built which, with the completion of the Iowa mill of 40 stamps that year, made a total of 105 stamps, all of which, however, were not working at the same time. Amalgamation with some concentration was the milling practice. The Little Annie 60-stamp mill was added in 1884 and, up to 1886, when the rich oxidized ores were worked out, the district was a heavy gold producer. The total production has been reported as high as $11,000,000. In 1882, Summitville had a population of 3000, 22 licensed saloons and three newspapers.

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*Mining engineer, Ideal Building, Denver, Colo.

After the exhaustion of the free-milling gold ore, the mills could not successfully treat the low-grade sulphides and work was carried on only in a desultory manner. From 1897 to 1904, a deep crosscut tunnel, called the Golconda, was driven by A. E. Reynolds, of Denver, and his associates which, including the drifting along the vein, is 8000 ft. long. This tunnel, however, did not penetrate rich ore and, although many attempts have been made to treat the low-grade ore, the mine has either laid idle or been operated in a small way by lessees ever since.

### Veins Not Well Defined

The ore occurs in a series of parallel veins in rhyolite. The veins are not well defined, but resemble shear or fault zones along which the solutions circulated and impregnated the rhyolite. In places the large phenocrysts of feldspar have been dissolved from the rhyolite and the mass of the rock has been silicified and mineralized, giving the appearance of honey-combed sugar quartz. Much of the rich free-gold ore was mined in opencuts on the surface, the veins in places being 30 to 40 ft. wide. Down a few hundred feet bornite, enargite, tetrahedrite and pyrite are found, sometimes filling the voids left by the dissolving out of the feldspar.

In 1900, Messrs. Ewing and Smith (Thesis No. 29, State School of Mines) made over 135 assays of ore from the Little Annie mine which, in gold, silver and copper ran from a few dollars to $160, few, however, being over $20. An average of 26 of their samples gave $8.88, of which over $4.50 was in copper, figuring copper at 16c. With this combination, it can readily be seen why the problem of treatment was not solved 15 years ago; with freight to Del Norte costing $8 to $12 and from Del Norte about $20 per ton; the transportation problem is a difficult one also. At present, Mr. Reynolds controls most of the claims and lessees are working about half a dozen men, searching mostly for rich, oxidized ore near the surface.

All the workings of the mines at Summitville are in the rhyolite. On the north and east this rhyolite is bounded by a fine-grained andesite. To the south runs a high ridge, which is composed of many varieties of rhyolite. The top of the ridge is capped by hard rhyolite sheets and underneath this capping is soft iron-stained rhyolite, which has eroded rapidly, leaving the high ridge with peaks of the harder capping, reaching to 12,500 ft. elevation. The south end is called Lookout, or Table Mountain, and, standing on it, one obtains a magnificent view of the continental divide to the west and down 2000 ft. into the valley of the Alamosa River, which flows south and east of the mountain. At the southern base of Lookout Mountain is the Pass-me-by mine, at which a small force of men is working, cleaning out a [illegible] adit previously driven and preparing to develop. Passing eastward, down into the main gorge of the Alamosa River, the rhyolite disappears and all the rock is diorite, which extends over another ridge to the valley of the Conejos River and on past Platoro. This diorite is cut here and there by strong andesite dikes and south of Gilmore large bodies of andesite again appear.

The Gilmore mine is on the mountain above the new town of Gilmore, on the banks of the Alamosa. The workings are in quartz veins in the diorite. I also found patches of andesite near, which apparently were portions of a flow of andesite which has overlain the diorite before erosion took place. The quartz in the vein has been formed by the silicification of the diorite and the gradual change from unaltered diorite to pure quartz can be noted. The veins range up to several feet in width and disseminated through the quartz is fine pyrite, some gold telluride and free gold. On sinking on the vein the quartz flattened and pinched out. A crosscut tunnel, driven to intersect the vein at a lower level passed through a slide of large, loose boulders and then entered soft, decomposed diorite, which gave considerable water. No appreciable amount of quartz was found and Mr. Gilmore will do further development to ascertain whether the ore does not go down, or whether the vein has been broken by landslides. The boulders intersected in the lower tunnel and the topography of the hillside clearly indicate more than one slide or fault displacement. Near the Gilmore mine the "1876" claims, owned by A. C. Cole and associates, are being developed and other properties will be worked, if the results on these properties are satisfactory. Only a few men are at work on the hill at present.

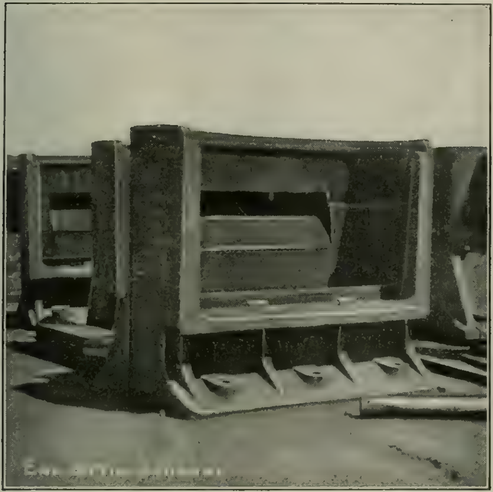
In the bed of the Alamosa River, 1½ miles south of the town of Gilmore, what is known as the Lewis and Zangmeister claim is being developed. The vein is largely altered andesite along a contact between the andesite and rhyolite. A thin sheet of obsidian or volcanic glass also lies on the contact. An average sample of the ore gave $7 in gold and silver.

About two miles below the town of Gilmore is the Stunner camp and eight miles farther down the river is the camp of Jasper, at the north base of Cornwall Mountain. These camps were discovered in the rush to Summitville and Platoro, at which time the country was searched by prospectors as it has been searched again this last year. At Stunner several veins have been exploited, principal of which are the Eurydice and No. 10. The latter, from what indications are visible, is a quartz vein in the diorite, similar to the veins in the vicinity of Gilmore's mine.

### Platoro the Center of the District

At Jasper, the Miser and Guadalupe are the principal mines. The former has been the scene of a rich ore strike within the last few months. High-grade ore is now being shipped to the smelters at Pueblo. Last, but by no means the least of the camps in the district, is Platoro, situated on the Conejos River, where its valley is about one mile wide, with the mountains rising on either side. It is reached by good roads from Monte Vista or Alamosa, Antonito or La Jara. Due to its lower elevation and more propitious site and ease of access, it has become a center for the rest of the district, except Summitville, and now has a population of several hundred people. The Valley Queen, Parole and Mammoth mines are southwest of town and all are on the same vein. The Forest King mine is on a parallel vein farther southwest, on the mountain. The mines were located in the early '80s, report by Alden C. Massey and Charles F. Fish, and were worked more or less continuously for years, producing upward of $100,000 in high-grade ore, but since 1893 little work has been done. The veins are of quartz and in the principal mineral is pyrite finely disseminated through the quartz. The strike is northwest and, in places, the veins attain a width of 30 ft. The presence of casts of feldspar and hornblende lead me to infer that the veins are along the line of rhyolite dikes. The line of the dike was a plane for the circulation of the ascending solutions which silicified and mineralized the dikes and to some extent the walls. The Mammoth vein, at Platoro, according to the old books of the company, report cited, was shipping ore in 1890 in 10-ton lots, that assayed 250 to 400 oz. silver and 10 to 30 oz. gold. A large amount of development work was done, which opened up large tonnages of $7 to $10 ore, which have not yet been profitably treated.

In conclusion it might be said that when George Gilmore found the high-grade quartz, he caused the attention of mining men to be turned toward a district which has possibilities for new mines and has old camps with considerable tonnages of low-grade ore which could not be treated a few years ago, but in the light of present-day metallurgical developments, may be made to pay. The new strikes, while not warranting undue excitement, are worthy of development to determine their value and extent. The country is far from the railroad, rugged and the winters are severe, with heavy snowfall. The streams furnish abundant water for milling and, undoubtedly, if the district makes any production in the future, it will be more from milling than from smelting ores. Prof. H. B. Patton, with a party of seniors from the State School of Mines, has spent the summer studying the district for the state geological survey and a complete map and detailed geological report will be issued.



Open-Front Mortars at Van Ryn Deep Mill

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# North Carolina Mine Trespass Law

A new law enacted in North Carolina in March, 1913, provides for surveys of mines, and actions in cases of trespass. Section 1 provides that anyone whose mining property is being damaged can bring action to prevent the damage; when ore has been illegally extracted, double the gross value of the material as it lies in the ground is recoverable, together with awards for other damage; punitive damages are further allowed if the trespass is willful. Section 2 provides that anybody suspecting a trespass can obtain an order for survey from a competent court, provision being made for the entrance and protection of the surveyors appointed by the court in question. The costs for such an order and survey are to be borne by the person making the application, unless a case is made out against the other party and damages recovered, in which case the defendant will pay the cost of the survey.

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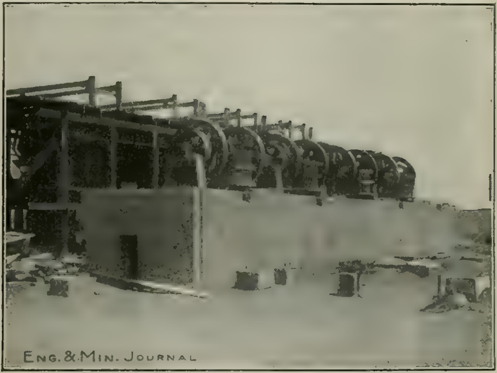
# Johannesburg Notes

Special Correspondence

The Van Ryn deep mine, which lies on the dip of the New Kleinfontein mine, has started crushing with its 80-head mill. This mine affords an example of the fact that mining, even on the Rand, may have surprises. When first opened, developments showed poor ore and much broken ground and the company had to be reconstructed. Recently rich ground was met with. In the last three months, 180,000 tons, valued at 11.3 dwt. over 48 in. were added to the reserve, which now amounts to 1,450,000 mill tons, valued at 9.4 dwt. It is estimated that about ten million payable tons will be contained in the mine.



Rock Breakers at Van Ryn Deep Mill

The Springs Mines continue to show good results from development just started; 450 ft. sampled showed 10 dwt. over 36 inches. The position of the mines today is, generally speaking, good as regards development. The Cinderella Consolidated, which recently suspended milling to push developments, is driving east at the 4100-ft. level; at this depth 1875 ft. sampled show 8.7 dwt. over 54 in., the last 100 ft. of which show 15 dwt. over 23 in. This deep mine has produced about £1,200,000 worth of gold, but owing to the mistake of attempting to mill with only one 5-compartment shaft, costs were excessive, the managers were compelled to pick the eyes out of the mine, and little profit was made, though the mine was worked to a standstill. Ventilation and roof problems and the transport of the working force made it impossible to mine at such a depth with safety or profit.

# Outline of Mesabi Topslicing Method

*SYNOPSIS—Topslicing or caving is the one prevailing method of underground mining on the Mesabi at present. Shafts and main drifts placed where they best serve the [illegible] as outlined by drilling. Sublevels are developed from raises and caved in successive rooms from the boundary back. Drift-set, square-set and prop methods are in use under different conditions.*

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There is one prevailing method of underground mining in use on the Mesabi range at the present time, the topslicing or caving method. A top slice over the whole area of the orebody is removed, using timber to the full height of the ore. As fast as the various rooms of this top slice are worked out, the bottoms are covered with boards, and the timber is blasted down, allowing the overburden to cave and fill up solidly the space formerly occupied by the ore. When the top slice is out, another slice over the whole area is taken out just below it, also using timber the full height of the slice, up to the boards of the slice above. Rooms are blasted in as fast as they are mined out and the cave follows. Successive slices are taken in like manner to the bottom of the orebody. The use of timber to the full height of the ore in each slice, thus insuring a high percentage of extraction, is the most important feature of this method. The crosscuts to the various rooms are always in solid ground, providing a safe retreat for the miners. The general practice in opening up and mining an orebody to be worked on the system may now be briefly considered.

### LOCATION AND DIMENSIONS OF SHAFTS AND MAIN DRIFTS

For an orebody of considerable size, a shaft 8x20 ft. outside is generally used. There are two skip compartments, 5x6 ft., and one ladder-and-pipe compartment, 6x7 ft., with 6-in. dividers. The sets are of 12x12-in. timber. This shaft is located near the deepest part of the orebody, either in the ore itself or in the adjacent rock, so that the drainage of all the ore to be mined through the shaft may be taken care of.

Usually the sinking of a timber shaft, somewhere near the main shaft, is begun at the same time. From one to three additional shafts, depending on the size of the mine, are sunk at advantageous points. These may be 6 ft. square, or 6x9 feet.

A close study of the bottom contour map, as plotted from drilling records, is necessary to decide the location of the main drifts. Where the drilling has been sufficient, one or more troughs of deep ore will be found running through the orebody, generally from northwest to southeast, or from west to east, with the deepest part of the trough at the easterly end. It is in these troughs that the main drifts are located. The chief considerations are to have them near the bottom rock and still have them extend as near to the limits of the orebody as possible. The idea is to make the motor tramming long and the hand tramming short. When an orebody is 50 ft. or more, it is good practice to locate the main level high enough up in the orebody so that it will extend a considerable distance from the shaft, another main level being opened up nearer the bottom later. If the ore trough is wide enough, two parallel drifts, from 60 to 100 ft. apart, are driven, connected by a loop near the shaft. The advantage of two drifts lies in opening up the ground quicker for drainage; small connecting crossdrifts improve the ventilation; if one of the main drifts strikes rock unexpectedly, it can be discontinued temporarily, while the other continues, the rock encountered being explored therefrom. The main drifts are timbered with sets 5 ft. apart, using 8- or 9-ft. posts and 10- or 12-ft. caps, with lagging over the back. Vertical raises, 4 ft. square and without cribbing, are put up every 50 ft. along the main drifts and carried to the top of the ore.

### SUBLEVELS AND DRIFT-SET SLICING

A top sublevel is located at such an elevation that the average height of the ore to be removed will be from 12 to 14 ft. capable of being taken out with drift-sets. The sublevel is outlined with 5x6-ft. untimbered drifts run from each raise, parallel with each other and at right angles to the main drifts, until they reach the limit of the orebody or the boundary line of the property. At these outside limits the stoping or slicing of the ore begins. The general plan of development is exhibited in Fig. 1, an underground plan.

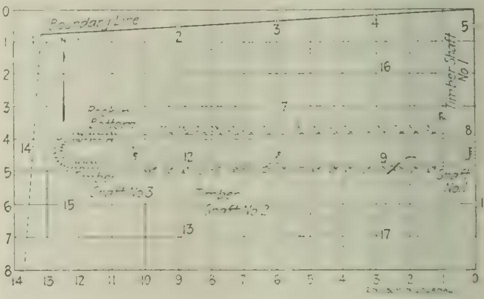

FIG. 1. PLAN OF GENERAL UNDERGROUND DEVELOPMENT

Fig. 2 shows a plan of two adjoining rooms, each 50 ft. long and 15 ft. wide, opened up at the boundary line and assumed to be against caved ground, together with a cross-section through one of them. When the boundary line was reached by crosscut No. 1, the first drift slice was started by blasting out all the ore at the set marked No. 1, and sets of timber with 12-ft. posts and 7-ft. caps, the caps being parallel with the crosscut, were put in place, using 6-ft. lagging overhead. Set No. 2, also in the crosscut, is the next to be taken and securely timbered and spragged, thus making the entrance secure. The four sets of timber at the entrance of the two slices of a room or stope are usually referred to as the "open sets." The first slice on the long side of the 50-ft. room is now completed by taking out sets 3 to 9. The track is continued from the crosscut into this slice as it advances. The next sets to be taken out depend upon whether the timber is taking much weight or not. If it is not, sets 10 to 16 are consecutively mined out, completing the long side of the room. The short side of the room is now taken out in the order indicated: 17, 18, 19, 20. On the other hand, if the room is heavy and the timbers are taking considerable weight, the order of removing the sets must be changed. A safe exit for the miners has to be maintained and it would be inadvisable to weaken the entrance to the room by taking out set 10 at this time. The slice would be worked out from the far corner retreating toward the crosscut. Instead of taking set 16 first, however, the miners make their attack on set 15, because it would blast out a little easier and there would be more room for them to shovel into the tram car standing on the track in set 7 or 8. Therefore the sequence of sets taken out would be 15, 16, 14, 13, 12, 11. Set 10 is left standing to protect the entrance while the short side of the room is next mined out, and it is the last set to be taken. This order of working out a room is not invariable, many changes being made depending on conditions. Under a strong back, or with solid ore on both sides of a room, the ore would be taken out two sets wide from the crosscut back to the far end. Again, when the preceding room has not filled up solid with the cave, sets 10 to 16 would be taken first, leaving one set of solid ground against the unfilled cave, after which sets 9 back to 3 would be taken.

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*Excerpts from a paper entitled, "Mining Methods on the Mesabi Iron Range," prepared by a committee consisting of W[illegible]lles, E. D. [illegible]Neill and J. S. Lutes, for the Minnesota meeting of the Lake Superior Mining Institute.

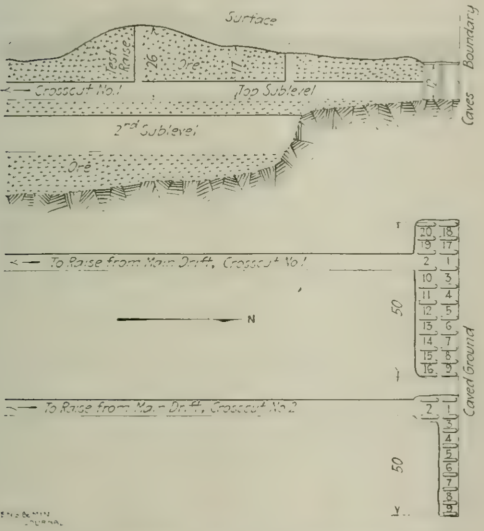

Fig. 2. Section and Plan of Crosscuts and Rooms

The reason for having a long side and a short side to a room is that thus only one set of curved rails need be laid to get the cars to convenient shoveling distance for all the sets. The track is laid in only one of the slices. The ore from the short side is shoveled into a car standing in the crosscut.

When a room is worked out, the side and ends next to the solid ore are boarded up with cull boards to prevent the sand coming in with the cave from mixing with the ore of the next room when it is mined. The bottom is also covered with boards if there is a slice to be taken out underneath. The double row of posts in the center, and those along the cave side, throughout the length of the room, are blasted out and the caved ground follows and fills the room. There is usually no difficulty in this operation; the room soon fills up solid against the boards so that another slice may be started alongside after a few hours.

The height of the ore on this top sublevel varies considerably on account of the rolling contact with the overburden. The length of posts used in the successive slices must be changed accordingly. The limit to successful slicing with drift-sets is reached when posts 16 ft. long are necessary. Rather than use such long posts to any considerable extent recourse is usually had to the square-set system, two sets high, which would take out the same height of ore.

### Slicing with Square Sets

In the cross-section, Fig. 2, a test raise is indicated which shows a roll in the back, making a maximum height of ore of 26 ft. above the top sublevel. Rather than open up a sublevel of limited area in the upper half of this roll, for the purpose of removing the ore with drift timber, it is the usual practice to mine it all out on square sets. The change from drift slicing to square-set slicing would begin where the height of ore shows 17 ft. The first square-set slice would be taken in the solid, that is, leaving one set of ore standing between it and the last drift slice. This is to insure getting the line on the square sets straight and at right angles to the crosscut. The two sets in height of this slice are both mined out and timbered as the slice advances. The pillar left standing next to the drift slice is then mined out and timbered, the order of removal of the sets depending on whether the ground is heavy or not. The long side and the short side of the room being mined out, the side and ends next to ore are boarded up in the same manner as a drift slice, except that lagging instead of boards is used on the bottom set. The lagging is stronger than boards and there is more pressure from the cave on account of the room being higher. The span between sets is also greater. The rooms are blasted in as soon as the timbers show that much weight is on them, which usually occurs when they are two sets wide. The blasting is done in such a manner as to leave undisturbed the timber which stands against the solid ore.

In the succeeding square-set rooms, the first slice is taken out along the cave, the caps connecting with the timber of the previous room. There are usually five sets on one side of the crosscut, and one set on the other, which, with the set occupying the crosscut itself, makes the total length of the seven-set room 51 ft. 8 in. A girt of odd length is used in connecting the timbering of end-joining rooms.

Bottom posts are 8 ft. over all, with a 4-in. tenon. Regular top posts are 8 ft., with two 4-in. tenons. Top posts of lengths varying from 4 to 12 ft. are used on the top set where the back is irregular. The regular cap is 8 ft. long.

There is very little square-set slicing exceeding four sets in height on the Mesabi range at the present time. With a greater height than this much trouble is experienced in keeping the rooms in shape, on account of the pressure of the caved ground. Where the ore on the top sublevel is found to exceed the height of four sets, it is divided by opening up another small sublevel and is mined out with drift timber.

There are extensive stretches of ground in many of the mines where the ore is overlaid by firm taconite or slate. In such cases the top slice can be taken out with the use of props, spaced irregularly as required. The maximum height of the props used is 20 ft. Often the ore does not exceed this height and, consequently, can all be mined out in one slice. Where such conditions occur the cost of mining is considerably decreased.

### LOWER SUBLEVELS

When the ore in any part of the top sublevel has been mined out back to a point 20 ft. from the raise from the main-level drift, a second sublevel is opened up by starting another crosscut from the raise, directly under the one above, and, of the same dimensions, 5 by 6 ft. Parallel crosscuts on the same level are driven from each raise as other places above are finished. The distance below the bottom of the top sublevel at which these crosscuts are started depends on the total thickness of the ore down to the main level, measured from bottom to bottom. This total height is divided so that the sublevels will be from 11 to 15 ft. high. Where as little as 11 ft. is selected, there remains 5 ft. of solid ground over the back of the second sublevel crosscut up to the boards of the top slice above. The ground is usually firm enough so that these crosscuts will stand without being timbered. They are driven to the boundary line or until they strike the bottom rock, when slicing begins and is carried on in the same manner as on the top slice. The rooms are timbered right up to the bottom boards of the slice above.

The topslicing method can be adapted to all conditions met with in underground mining on the Mesabi. It is favored alike by fee-owner and operator, for in these days of rapidly diminishing ore reserves, wasteful methods of mining are no longer tolerated. In any method of mining, the safety of the miner should be the first consideration; the conservation of the ore, the second. This system has both features to recommend it.

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## Borax Production in the United States in 1912

In 1912 the production of borate ores in the United States was 42,315 short tons, as compared with 53,330 tons in 1911. The quantity stated is the crude ore, as mined for delivery at the mills or for shipment.

All of the borax in this country is now produced from ores derived from California; in fact, virtually the entire product is derived from four mines, one in Inyo County, one in Los Angeles and two in Ventura Counties. The property in Ventura County resumed production to a small extent in 1912, after having been closed since 1907, according to the U. S. Geological Survey. There are a large number of other large deposits of colemanite ore, similar to that now being mined; all of these, so far as now known, being situated in the State of California. Formerly borax was obtained from the so called marsh deposits, which were worked in Nevada, California and Oregon.

## Finished Steel in Canada

The figures collected by the Statistical Bureau of the American Iron & Steel Association show that the total production of steel in Canada in 1912 was 853,031 long tons; 207,569 tons being bessemer, 645,062 openhearth and 400 tons special steel. The openhearth steel was all basic. The production included 4238 tons of direct castings from bessemer steel and 28,001 tons from openhearth steel. By provinces, Nova Scotia produced 416,313 tons and Ontario 417,634 tons, the remaining 19,084 tons being made in Quebec and British Columbia.

The production of steel ingots—including direct castings—in Canada has been as follows for nine years in long tons:

| | Bessemer | | Openhearth | | Total |
|---|---|---|---|---|---|
| | Tons | Per Cent. | Tons | Per Cent. | Tons |
| 1904 | 42,738 | 28.7 | 106,046 | 71.3 | 148,784 |
| 1905 | 164,488 | 40.8 | 238,681 | 59 2 | 403,449 |
| 1906 | 219,791 | 38.5 | 347,778 | 60 1 | 570,889 |
| 1907 | 202,268 | 31 3 | 440,936 | 68 2 | 646,754 |
| 1908 | 108,433 | 21 3 | 401,119 | 78 7 | 509,957 |
| 1909 | 182,304 | 27.0 | 496,142 | 73.0 | 678,751 |
| 1910 | 199,570 | 27 0 | 542,354 | 73.0 | 741,924 |
| 1911 | 189,797 | 24.0 | 601,074 | 76.0 | 790,871 |
| 1912 | 207,569 | 24 4 | 645,062 | 75 6 | 853,031 |

The small production of special steels is included in the totals. In most of the years given it was only a few hundred tons, except that in 1906 and 1907 it reached 3320 and 3550 tons, owing to the inclusion of some experimental work.

### FINISHED IRON AND STEEL

The production of all kinds of finished rolled material in Canada in 1912 was 861,224 tons, 109,012 tons being iron and 752,212 tons steel. The total was greater than that for 1911 by 79,300 tons, or 10.1%. Of the total, rails were 423,885 tons; structural steel and wire rods, 64,082; plates, sheets, bars and other forms, 373,357 tons. Ontario produced 418,346 tons, Nova Scotia, 337,466; Quebec, 88,172, the remaining 17,240 tons being from New Brunswick, Alberta and Manitoba.

The production of rails and the total make of all kinds of finished iron and steel in Canada for 10 years has been:

| | Rails | Total | | Rails | Total |
|---|---|---|---|---|---|
| 1903 | 1,243 | 129,516 | 1908 | 268,692 | 496,517 |
| 1904 | 36,246 | 180,038 | 1909 | 344,830 | 662,741 |
| 1905 | 178,885 | 385,826 | 1910 | 366,465 | 739,811 |
| 1906 | 312,887 | 571,742 | 1911 | 360,547 | 781,924 |
| 1907 | 311,461 | 600,179 | 1912 | 423,885 | 861,224 |

In 1912 there were 31 plants which made steel ingots or castings or rolled iron and steel into finished forms. Six of these were in Nova Scotia, eight in Quebec, 13 in Ontario, one each in New Brunswick, Manitoba, Alberta and British Columbia. Two new steel-casting plants were built during the year in Quebec and two in Ontario; at the close of the year a new merchant bar mill was under construction in Alberta.

### MISCELLANEOUS

Other production of finished material in Canada in 1912 was as follows, compared with the previous year:

| | 1911 | 1912 | Changes |
|---|---|---|---|
| Forgings, tons | 18,832 | 22,415 | I 3,583 |
| Rail joints | | 52,157 | |
| Nails, kegs of 100 lb | 652,861 | 788,190 | I 135,329 |

The production of rail joints was not reported in 1911. Of the forgings made in 1912 there were 21,548 tons of steel and only 867 tons of iron. All the nails made were of steel.

# Economical Fine Grinding in Pans

By M. G. F. Söhnlein*

*SYNOPSIS—Experiments with a grinding pan for producing fine material for concentrating. It was necessary to devise a method of forcing the sand to pass between mullers and dies of the pan. Grinding efficiency is a function of the muller speed and speed of pulp passing under them. A critical speed of highest efficiency exists in each case.*

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Some time ago I carried out a series of experiments to determine whether fine grinding of sand for concentration could be economically done by a grinding pan. A 5-ft. Allis-Chalmers combination pan was used, driven by a 7½-hp., 550-volt, direct-current motor. The material to be ground was middling and tailing from Overstrom concentrators and those grains which, after one passage through the pan, have not been sufficiently comminuted were returned to the pan through a Dorr duplex classifier via the Overstrom tables, as shown in Fig. 1. The overflow of the Dorr classifier contains 22% of +200-mesh material, which consists of the lightest, and consequently the poorest, fine sand. The quantity of sand separated by the Dorr classifier is 38 tons per 24 hr., without considering the sand returned from the pan.

The object is to grind all the middling and as much of the tailing from the Overstrom tables as possible, because even the poorest sand tailing contains an appreciable amount of cassiterite. The maximum capacity of the pan had to be determined to find out if the installation of more pans would be required. If the capacity of the pan had not come up to expectations a tube mill would have been erected. But tube milling is an expensive operation where the price of a ton of flint pebbles is as much as $80, delivered at the mill.

### PULP FED TO PAN THROUGH LAUNDER NEAR CENTER

The pulp was dewatered to about 20% solids and introduced into the pan as close to the central column as possible. To obtain any grinding at all it was found necessary to reduce the speed of the muller from 60 to 32 r.p.m. If the speed was greater the sand, being fine, was whirled to the circumference of the pan without coming between shoes and dies. Although the pulp was returned to the center by the deflecting wings, the centrifugal force was too strong to allow the sand to settle, and the grains were discharged without being perceptibly ground. The capacity of the pan when running at 32 r.p.m. was not more than 2½ tons per 24 hr., so only the richest middlings from the tables could be ground. The accompanying screen-test table shows the grinding work done:

TABLE I. PAN GRINDING AT LOW SPEED

| Classification | Feed pulp, per cent. | Discharge pulp, per cent |
|---|---|---|
| On 40-mesh | 2.0 | |
| On 60-mesh | 8.5 | 4.0 |
| On 80-mesh | 24.4 | 8.2 |
| On 100-mesh | 20.3 | 16.0 |
| On 150-mesh | 26.0 | 23.4 |
| — 150-mesh | 18.8 | 48.4 |
| | 100.0 | 100.0 |

Various heights of discharge were tried, but there was no important difference between a product discharged at 3 ft. and one discharged at 2 ft. above the shoes. The latter height was adopted, the pan requiring less power with a 2-ft. discharge. With a thicker pulp considerably more power was consumed, and the grinding improved only slightly.

### PULP FED THROUGH ANNULAR FEED BOX AND PIPES

To deliver the pulp as close to the shoes as possible and to prevent mixing the feed with material already ground, the pan was altered as shown in Fig. 2. A 2-in. wooden disk, made in halves, was clamped around the driver, and fitted with a sheet-iron rim. It served as a receiving box for the pulp, which thence was conveyed near the shoes through four 1½-in. pipes. These pipes were tightly fitted through holes in the disk, and clamped to the legs of the spider below. It should be said that the idea of this system of introducing the feed was from a pan manufactured by the Colorado Iron Works. By this modification the grinding was improved, so that the pan could handle 7 tons of sand per 24 hr. The speed of the muller could be increased to 40 r.p.m. With greater speeds the centrifugal force was so strong that most grains were drawn directly over the shoes to the circumference, and less grinding was done, as shown in the accompanying table:

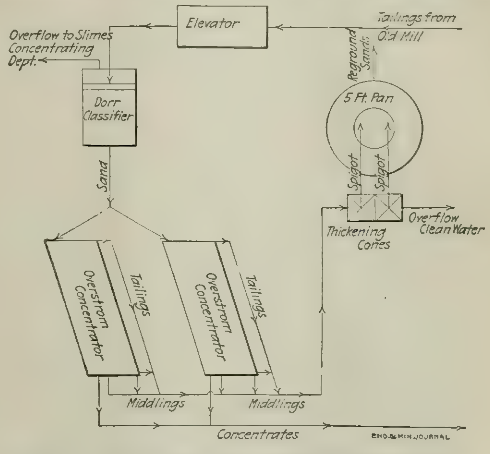

FIG. 1. FLOW SHEET OF CONCENTRATION PLANT

TABLE II. PAN GRINDING AT MIDDLE SPEED

| Classification | Feed pulp, per cent | Discharge pulp, per cent<br>40 r.p.m. | 50 r.p.m. |
|---|---|---|---|
| On 40-mesh | 6.2 | 1.5 | 3.0 |
| On 60-mesh | 16.8 | 6.5 | 9.5 |
| On 80-mesh | 27.0 | 10.8 | 22.0 |
| On 100-mesh | 19.7 | 23.0 | 20.5 |
| On 150-mesh | 18.3 | 20.2 | 16.5 |
| —150-mesh | 12.0 | 38.0 | 28.5 |
| | 100.0 | 100.0 | 100.0 |

It will be noticed that the feed is coarser than in the first instance. This is because the sand was tailing from another concentrating mill and the coarsest grains were the poorest. Consequently at the discharge end of the Overstrom concentrators the grains gradually increase

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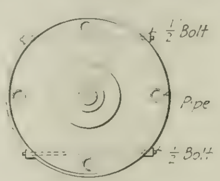
*Superintendent of concentrating works, Cia. Minera de Oruro, Machacamarca, Bolivia.

in size from head to tail, and if a larger quantity of middling is taken off the tables, it must necessarily be coarser.

### Pulp Feed through Cylinder around Central Column

It [illegible] that a more perfect grinding will be obtained if the grains are forced to pass from the center to the circumference between the shoes and dies. This has been accomplished by using annular wooden filling pieces fixed to the muller with setscrews so as to form a plain surface with the lower part of the legs of the spider, as show in Fig. 3. On top of the wood a ring of 1-in. angle iron is screwed, rubber packing being inserted between this ring and the plain surface referred to above. A $\frac{1}{8}$-in. sheet-iron cylinder is bolted to the angle iron. The space inside this cylinder communicates with the circumference of the pan only through the channels between the shoes, hence every grain entering this cylinder must pass underneath the shoes before being discharged, provided the muller revolves quickly enough to cause the grains to be caught by the shoes before they have again left the channels.



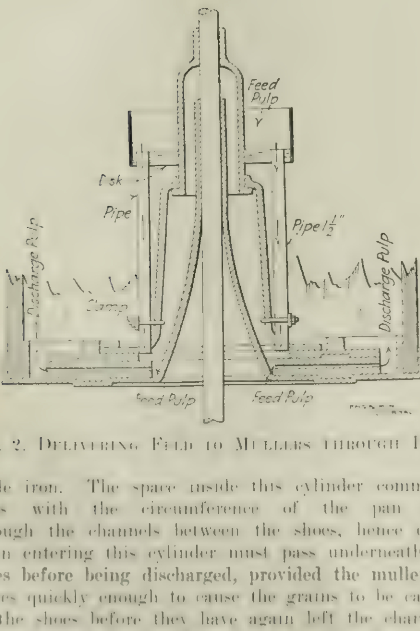


FIG. 2. DELIVERING FEED TO MULLERS THROUGH PIPES

The communications between the shoe-channels and the dovetail sockets, which hold the shoes, in the muller, leave a passage for the grains to escape grinding. Therefore, these sockets have been completely covered by pieces of $\frac{1}{8}$-in. plate, which are attached to the shoes by a setscrew. The returning of the pulp from the inner circumference to the center of the pan has been rendered [illegible] by the cylinder in the center, so the deflect[illegible] have been discarded. Grains, which have passed through the [illegible] cylinder to the circumference can never return between shoes and dies, and should, therefore, be discharged at a small height above the muller. If the discharge is at a higher level, power is unnecessarily consumed in moving an unnecessarily large quantity of pulp. On account of lack of fall in the discharge launder I could not place the outlet of the pan lower than 20 in. above the shoes.

The speed of the muller was first increased to 52 r.p.m. The capacity of the pan had been so considerably improved, that all the middling and the greater part of the tailing from the Overstrom tables could be ground. The pan actually ground 23 tons of sand per 24 hr. to pass a minus 150-mesh screen. When a speed of 60 r.p.m. was given to the muller, the pan ground all the sand from the Overstrom tables (38 tons) to such fineness that they finally passed into the overflow of the Dorr classifier. The quantity of sand actually ground to minus 200-mesh is about 30 tons per 24 hr., which is classified as shown in Table 3.

TABLE III GRADING OF GENERAL MILL SAND

| Classification | Without regrinding in pan, per cent | Reground by pan per cent |
|---|---|---|
| On 40-mesh | 20 0 | |
| On 60-mesh | 20 5 | |
| On 80-mesh | 16 5 | 1 2 |
| On 100-mesh | 10 5 | 5.6 |
| On 150-mesh | 8 5 | 4 5 |
| On 200-mesh | 5 5 | 10 5 |
| – 200-mesh | 18 5 | 78 2 |
| | 100 0 | 100 0 |

Quantity of tailing, 50 tons per 24 hr Ground by pan to —200 mesh. (0 782 – 0 185) x 50 tons = 0 597 x 50 tons – 29 85 tons

When grinding at this rate, sizing tests on feed and discharge are shown in Table 4. At one passage about 30% of the feed is sufficiently ground.

TABLE IV CLASSIFICATION OF MILL FEED AND DISCHARGE

| Screening | Feed pulp, per cent | Discharge pulp, per cent. |
|---|---|---|
| On 40-mesh | 20 0 | 1 0 |
| On 60-mesh | 21 5 | 12 5 |
| On 80-mesh | 24 0 | 22 5 |
| On 100-mesh | 9 5 | 9.5 |
| On 150-mesh | 13 0 | 11 0 |
| On 200-mesh | 7 5 | 11 5 |
| – 200-mesh | 4 5 | 32 0 |
| | 100 0 | 100 0 |

The grinding capacity is a function of the velocity of the pulp in the shoe channels, and the speed of the muller. The slower the pulp moves through the shoe channels, and the quicker the muller revolves the greater will be the chance of the grains being caught by the shoes. But the velocity of the pulp is determined by the centrifugal force which is proportional to the square of the number of revolutions of the muller. Therefore at a certain critical speed of the muller maximum grinding work is obtained. Any increase beyond this critical speed will result in giving the pulp such a velocity in the shoe channels, that the grains escape before they are ground.

The velocity in the shoe channels can be reduced by using a thick pulp, so that to obtain a high critical speed, i.e., maximum grinding, the feed should contain a small amount of moisture. The critical speed further depends upon the size and specific gravity of the material ground.

I am now feeding a pulp containing 18% solids, which is the thickest that could be obtained by dewatering through spigots. A thicker feed was not tried, because the pan grinds all the required material now. For the same reason no attempt was made to determine the critical speed. From what has been set forth it is evident that the maximum sliming capacity of the pan on the same material must be more than 30 tons per 24 hr. It should be mentioned that the reground sand is not hard. About half of it is quartz, feldspar and slate in equal proportions, and the remainder consists of iron oxides obtained by calcining the pyrite.

### Consumption of Material and Power

Up to this time ordinary cast-iron shoes and dies, 1½ in. thick, have been used, and 0.67 lb. of iron is consumed for every ton of sand ground to minus 200-mesh. Local casting costs about $0.14 per lb., hence the expenditure per ton for wear of iron amounts to $0.094. In future shoes and dies will be made 3 in. thick, so as to diminish the amount of iron scrapped and to lose less time in changing. It is planned to try hard iron and manganese steel, which it imported from Europe or the United States, costs less than the iron cast here. A set of shoes lasts only ⅓ as long as a set of dies of equal thickness.

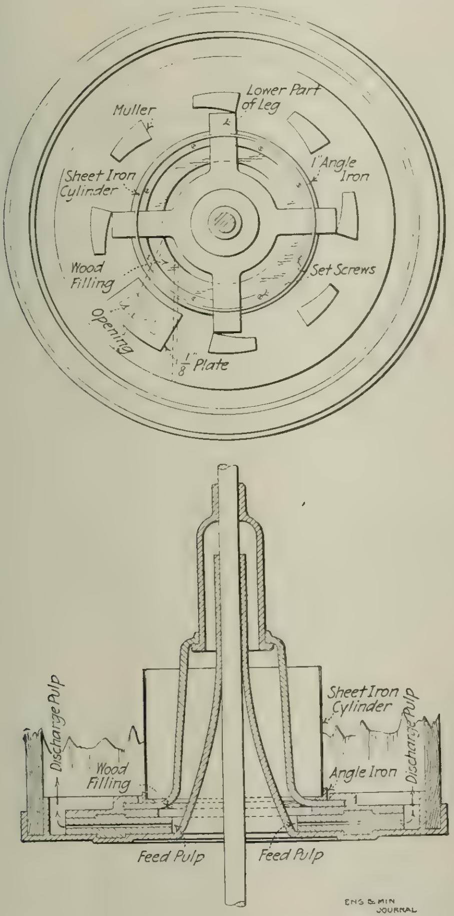


Fig. 3. Final Arrangement of Pan

When grinding 29.8 tons to minus 200-mesh, the pan requires 6.26 hp., or 4.76 tons are slimed per horsepower per 24 hr. The power expense for sliming one ton is $\frac{1}{4.76} \times 0.90 = \$0.189$. The cost of one electrical horsepower per 24 hr., generated by a producer-gas plant, is $0.90. The total cost, with labor and lubricating included, does not exceed $0.30 per ton. This might be considerably lower if the pan were run at its maximum capacity with a lower discharge level and with thicker shoes and dies of harder material.

I will not venture to say that sliming in the pan is cheaper than in a tube mill, because the work done by the latter machine on the same material has not been tried, but the failure of the pan to compete with the tube mill in so many other places may be ascribed to the fact that the ordinary amalgamating pan was used, without making the necessary changes in the construction. Of course, a machine designed more for amalgamating than for grinding cannot be efficient when only used for the latter work.

Small tube mills or Hardinge mills, used for sliming concentrate in cyanide plants, consume a great deal more power than a 5-ft. pan which will do the same work, if properly designed. This is especially important in places where the cost of power is high, as it is here. First cost and installation cost of tube mill are both considerably higher than with a pan.

I hope some one will continue these experiments with grinding pans in comparison with tube mills, to decide definitely which of the two is the most economical slimer for relatively small capacities.

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## Flotation Processes at Broken Hill

Development of flotation processes continues at Broken Hill, N. S. W. A recent advance is said to be contained in a process developed by James Lyster, mill foreman for the Zinc Corporation. According to Mr. Loring, of Bewick Moreing & Co., as stated in the *Mining Journal* July 19, 1913, this selective process for separating zinc and lead sulphides is important and is responsible for the high lead recovery being obtained at the South Blocks lead mine, of the Zinc Corporation. Since the introduction of the Lyster process for slime treatment, the recovery has risen to 87.6% of the lead in experimental runs, 85.3% being recovered in the primary treatment and an additional 2.3% from the zinc middling sent to the treatment department. Average recoveries in practice have been 84.2% lead and 70.7% silver. With lead at £15 per ton and a working cost of 5s. per ton under the Lyster process, the net profit per ton of slime is 16s. 10d.; with lead at £18 per ton the profit becomes 24s. per ton. Zinc can also be recovered by the Lyster process, but no attempt to accomplish this will be made until after the erection of a complete Lyster plant. This has just been commenced.

A working unit of the Horwood process is now in operation, treating high-grade mine-lead slime. Good metallurgical results are obtained but some mechanical difficulties will have to be overcome before it can be worked to full capacity.

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**Steam for Cleaning Filter Cloths** is an innovation introduced by F. C. Bowman, manager for the New Reliance Gold Mining Co., of South Dakota, according to "Metallurgical and Chemical Engineering," August, 1913. Steam under about 10-lb. pressure is used to disintegrate the limey incrustation on the canvas filter cloths from time to time and is introduced through the pipe ordinarily used for discharging the cake. That section of the filter through which the steam passes is slightly scrubbed with stiff brushes by which the scale is readily disintegrated and is thoroughly removed by a subsequent wash with hot water. Steam cleaning is practiced at intervals of about two weeks.

## Canadian Iron in 1913

The American Iron & Steel Association reports that the production of pig iron in Canada in the first six months of 1913, including ferrosilicon and ferrophosphorus, amounted to 545,981 gross tons. The output in the whole of 1912 was 912,878 tons. The production of pig iron in the two halves of 1912 is not available. Of the total in the first six months, 532,431 tons were made with coke and 13,550 tons with charcoal, coke and electricity, etc. The production of basic pig iron in Canada in the first half of 1913 amounted to 292,625 tons, bessemer pig iron to 125,052 tons, and foundry pig iron, ferrosilicon, ferrophosphorus, etc., to 128,304 tons. Forge pig iron was not reported. Of the 545,981 tons of pig iron produced, 345,810 tons were delivered to mixers, open-hearth furnaces, etc., in a molten condition, 141,680 tons were sand cast and 58,491 tons were machine cast.

On June 30, 1913, Canada had 20 completed blast furnaces, of which 13 were in blast and seven were idle. Of the total 16 furnaces usually use coke for fuel and four use charcoal. In the first half of 1913 two plants made ferrosilicon and ferrophosphorus in electric furnaces. During the first six months of 1913 the number of furnaces actually in blast during a part or the whole of the period was 15, of which 14 used coke for fuel and one used charcoal. The average number of days the 15 furnaces ran was 167.6, which would give an average make per furnace day of 217 tons.

One entirely new furnace was completed in Canada during the first six months of 1913, No. 7 coke furnace of the Dominion Iron & Steel Co., at Sydney, Cape Breton, Nova Scotia, which was first blown in on May 22. It has an annual capacity of 91,250 tons of basic pig iron.

Two blast furnaces were being built in the Dominion on June 30. One of these furnaces will be operated by the Canadian Furnace Co., Ltd., at Port Colborne, Ont. When completed it will be 85x19½ ft. and will have an annual capacity of about 125,000 gross tons of bessemer, foundry and malleable pig iron. Lake Superior ore and Connellsville coke will be used. It is almost ready to blow in. The other furnace is being built at Parry Sound, Ont., by the Standard Iron Co., Ltd., of Montreal. When completed it will be 60x12 ft. and will have an annual capacity of about 36,000 gross tons. Charcoal will be used for fuel. Hematite and magnetite ores from Michigan and Ontario will be used. The Standard Iron Co. also operates a charcoal furnace at Deseronto, in Ontario. The annual capacity of the 20 completed blast furnaces on June 30, 1913, was 1,391,550 gross tons, and of the two building furnaces 161,000 tons, a total of 1,552,550 tons.

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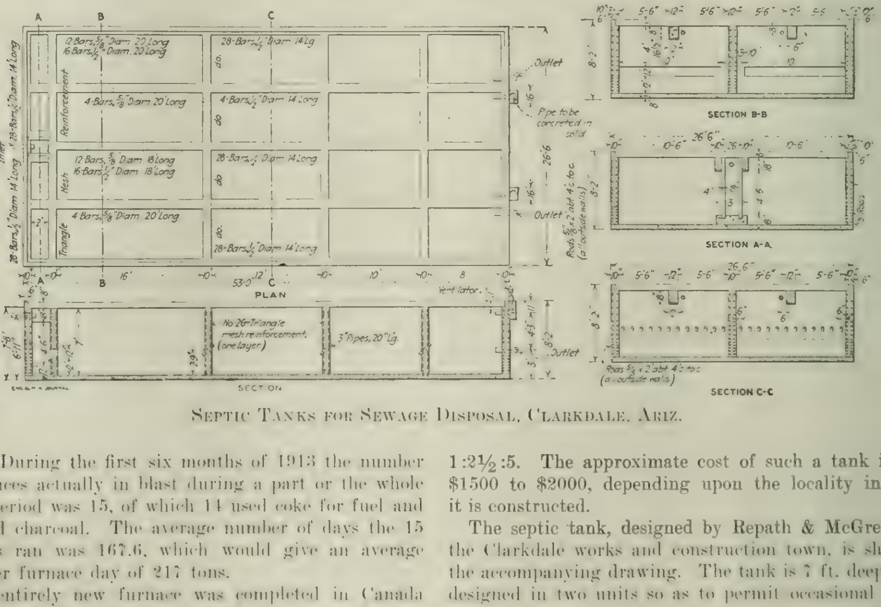
## Septic Tanks at Clarkdale, Arizona

To avoid pollution of the Verde River, the United Verde Copper Co. is constructing a septic tank to take the sewage from the new smeltery and from the present "construction town" at Clarkdale. Another septic tank of similar size will be constructed for the main residence portion of Clarkdale, which will be built on the mesa a short distance from the present construction camp, the latter eventually becoming the "Mexican town."

The septic tanks will be 53 ft. long by 26 ft. 6 in. wide, and will be constructed of reinforced concrete. Each septic tank will require 450 cu.yd. of excavation and 115 cu.yd. of concrete, the mixture for the latter being 1:2½:5. The approximate cost of such a tank is from $1500 to $2000, depending upon the locality in which it is constructed.

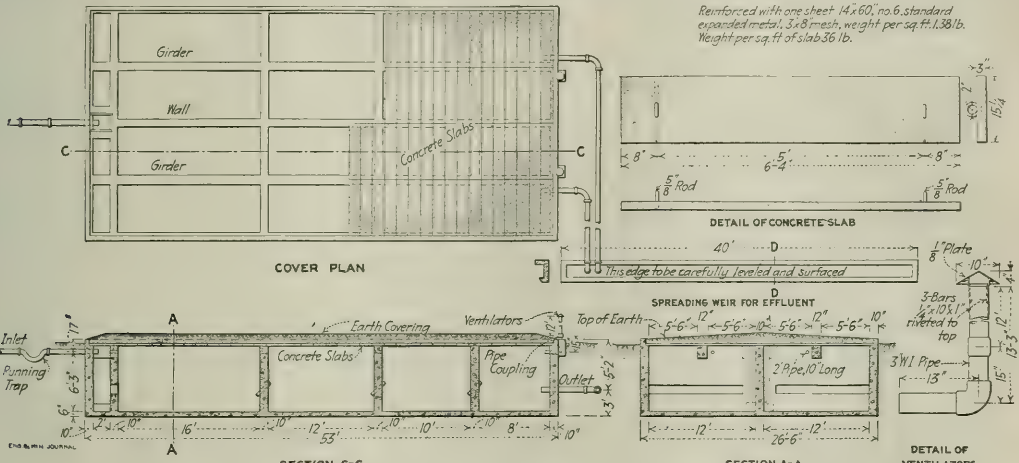


A
B
C
12 Bars, 5/8" Diam. 20 Long
16 Bars, 1/2" Diam. 20 Long
28-Bars, 1/2" Diam. 14 Lg
4-Bars, 5/8" Diam. 20 Long
4-Bars, 1/2" Diam. 14 Long
12 Bars, 5/8" Diam. 18 Long
16-Bars, 1/2" Diam. 18 Long
28-Bars, 1/2" Diam. 14 Long
4 Bars, 5/8" Diam. 20 Long
28-Bars, 1/2" Diam. 14 Long
Triangle Mesh Reinforcement
Inlet
28-Bars, 1/2" Diam. 14' Long
Outlet
Pipe to be concreted in solid
26'6"
Rods 5/8" x 2 abt 4' c. to c. (a. outside walls)
16'
12'
10'
8
53'0"
PLAN
Ventilator
No 26 Triangle mesh reinforcement (one layer)
3" Pipes, 20" Lg.
SECTION
SECTION B-B
SECTION A-A
SECTION C-C
5'6"
10'6"
8'2"

SEPTIC TANKS FOR SEWAGE DISPOSAL, CLARKDALE, ARIZ.

The septic tank, designed by Repath & McGregor for the Clarkdale works and construction town, is shown in the accompanying drawing. The tank is 7 ft. deep and is designed in two units so as to permit occasional inspection or cleaning. Following the receiving compartments, there are two series of four working compartments each. The first compartment is 16 ft. long, the second 12 ft., the third 10 ft., and the fourth 8 ft. The connection between the various working compartments is through twelve 3-in. pipes set in the partition walls about 3 ft. from the bottom of the tank and at an angle of 45° for the purpose of directing the flow to the top of the next compartment. The tank walls and partitions are 10 in. and the bottom 6 in. thick; the tank is covered with reinforced-concrete slabs, 6 ft. 4 in. long, 15¾ in. wide, and 3 in. thick. When for any purpose entrance to the tank is desired these concrete slabs may be removed, but during the normal operation the slabs are sealed by a covering of earth 12 in. thick at the center line of the tank and sloping to 8 in. at the sides. No air is permitted to enter the septic tank, but it is necessary to provide for the removal of gases formed within the tank, and this is accomplished by a 2-in. ventilating pipe in the partition walls of each compartment, the gases being removed through a 3-in. ventilator near the top of the last compartment.

The sewage enters the septic tank about 6 in. below the top through an 8-in. trapped iron pipe that delivers the material to a receiving box, a trough on each side connecting with receiving compartments, 2 ft. by 11 ft. 4 in. by 7 ft., from which the sewage passes through 12-in. slots about 2 ft. above the bottom to the two series of working compartments. The disintegration of the organic material in the septic tank is brought about by the anaërobic bacteria, i.e., those which live and act only in the absence of air. The material entering the tank separates into three portions: A solid portion which sinks to the bottom, a liquid layer in the center, and a portion which floats at the top of the liquid. By the action of the anaërobic bacteria the solid floating and settled portions are gradually converted into liquid and pass through the pipe connections in the partition walls to the succeeding compartments and out through a 4-in. pipe about 2½ ft. above the bottom of the last compartment. Most of the work is accomplished in the first compartment and the succeeding compartments are gradually reduced in length. The outlet pipe from each series of compartments leads to a spreading weir, 40 ft. long by about 2 ft. wide, over which the effluent passes in a thin layer to a gravel bed about 40 ft. square where purification is finally accomplished by aërobic bacteria and sun light. While the organic material in the sewage is rendered innocuous by this treatment, no attempt is made to deodorize the released gases. The septic tank should consequently be built at some distance from any residences or other inhabited buildings. There are many mining communities where sanitary conditions could be vastly improved at comparatively small expense by the installation of a system of this sort.



Septic Tanks for Sewage Disposal, Clarkdale, Ariz.

# Mining in Siskiyou County, Calif.

Special Correspondence

Siskiyou County mining has been especially active in the present season, both in production and development. The activity is particularly noticeable in the Salmon River quartz-mining region and in the placers of the Scott River region. The Salmon River region extends from Forks of Salmon east to Snowden and south to Black Bear, including the Russian Creek mines and the prospects around Tanner's Peak. The recent showings made by the Homestake mine, near Snowden, owned by R. S. Taylor, of Yreka, have attracted a great deal of attention to the Liberty (or Snowden) district. Some very rich rock has been taken out, and Mr. Taylor has sold $7000 worth of specimens and hand-mortared gold in the past year. The ore occurs in slate, the veins and pockets varying from 3 in. to 3 ft. wide. Development is in progress to determine the extent of the pay ore before deciding upon reduction equipment. Five hundred tons of ore are ready for treatment. Three tunnels have been driven and present work is chiefly confined to advancing one of the tunnels through the ridge to a point where water can be obtained from a ditch with a capacity of 150 in., which was completed last year. The Highland mine is employing 25 men in mine and mill and is operating steadily. It is owned by the Highland Mining Co., composed of Holland men, who are reported to have paid a large price for the property.

The Cub Bear, owned by the Siskiyou Syndicate, of which I. J. Luce, of Etna, is president and manager, is situated between the Homestake and the Highland. This mine is producing some high-grade ore, and recently sent a 10-ton lot to the Advance mill. This is exclusive of the ores sacked for shipping. The recent strike which disclosed a 14-in. vein has been expected, as the development has progressed steadily toward this point indicated by the cropping. The company expects to extract 1000 tons of ore before installing a mill, and proceed with the development of the orebodies. One hundred tons are now on the dump, said to average $25 per ton. The present work is driving into the hill that rises 1000 ft. above the tunnel level. There are three tunnels, all of which have shown good development. Charles J. Ritz is superintendent.

The [illegible] mine and mill, owned by J. Wood, of Denver, is operating. The Cliff mine, owned by H. B. White, is one of the large mines of the district; and the [illegible] is another promising mine. The Hickey mine in White Gulch has been leased to J. V. Kappler, [illegible] L. Younger and F. P. Dowling. The 5-stamp mill was put in commission July 14. There are 300 tons of ore ready for milling. The ore comes from a 9-ft. ledge.

Over the ridge on the east fork side in Sawyers Bar district, are a number of good properties: The Foster mine on Trail Creek, owned by Foster Bros.; the Uncle Sam, owned by J. Sheffield; the Excelsior, owned by Townes & Tebbe; the Kleaver, owned by I. Kleaver; the King Solomon, said to be owned by the Curtis Publishing Co. The old mines in this section that have records of production are: Dannenbrink, owned by G. A. Dannenbrink, which has produced about $1,000,000; Ball mine, owned by the California Consolidated Mining Co., W. H. Young, manager, with a record of $2,000,000; Black Bear, owned and formerly operated by John Daggett, which produced $3,000,000. This mine is being reopened by Farish Bros., who are unwatering it and will equip the mill with electric power. The properties in Tanner's Peak district are all in the prospective stage, and the results of prospecting and development are reported good for the amount of work done, which consists chiefly of tunnels of 200 ft. or less. These mines and owners are: Malloy, owned by Dan Malloy; Enterprise, by George E. Townes; Hennings, by J. Hennings; Kismet, by Kismet Mining Co.; Two Step, by Milton Dunphy. The postoffice of these mines is Sawyers Bar. In this district, and between the claims mentioned there is a large undeveloped territory, with abundant timber and water, that is reported on good authority to be well worth the attention of prospectors. The formation on the south side of Salmon River is slate; the formation of the Tanner's Peak district in diorite.

The Scott Bar hydraulic miners are interested in the enlargement of the San José ditch, which at the present time heads in Tompkins Creek. The extension will secure a flow from Kelsey and Canon Creeks. When completed this ditch will make possible longer seasons of operation in hydraulic mines, which at present is equal to about seven months in the year. The ditch will bring 3000 in. more water, which it is believed will extend the season to nine or 10 months. The Quartz Hill hydraulic mine at Scott Bar, and the Milne, situated about three miles below, have closed successful seasons. D. McCarthy uncovered a rich pocket on his property near Quartz Hill. The Sheeb Bros. have taken out a large quantity of gold, amongst which were some exceptionally large nuggets. The Siskiyou Mines Co., at Morgan's Point, taking advantage of recent heavy rains, will extend its season. The [illegible] is running to full capacity, with a good head of water. Reeves Davis, of Fort Jones, is also operating [illegible] full head of water, expecting to continue till late [illegible]. He is installing an undercurrent sluice for [illegible] black sand. The saving of black sand has not been [illegible] practice, but it is a growing one.

## Tin in Nova Scotia

It is reported that a new tin discovery has been made in Nova Scotia. We are informed that a tract of nearly 4000 acres has been taken up by prospectors in Lunenburg County, near Lake Harris, which is about 20 miles from Chester Basin, the nearest railway station, 40 miles southwest from Halifax. Such reports as have been received indicate that a series of narrow veins cross the entire property, the largest being probably about 4 ft. in diameter, the country rock being granite and slates.

In this vicinity there are one or more eruptive porphyry dikes, and the quartz veins follow fissures due to the intrusion of the porphyry, wolframite being found principally in the quartz, and the tin in altered, very feldspathic granite.

The tin, while largely cassiterite, is at least to some extent in the form of stannite, the latter being associated with some copper and iron pyrites. The tungsten occurs as wolframite. Scheelite has been before found and mined in Halifax County, but no wolframite, if we are correctly informed.

The property has just begun to be prospected by trenching through the heavy, overlying vegetable growth, and by two shafts which have reached a depth of something under 30 ft. It is said that the mineralization of these narrow veins is quite uniform; a large number of samples taken from widely separated points running from about 2% of metallic tin, as a minimum, to about 2.75% as a maximum. The average of tungsten has not been determined. Judging from specimens which we have seen, the coarse mica which usually characterizes the tin occurrence in the so called greisen or pegmatite veins is absent, and this would be an advantage in concentration, as it has been found in practice that in spite of the great difference in specific gravity, mica carries off mechanically a considerable portion of fine cassiterite.

It is stated that the property is largely controlled by wealthy lumbermen, who have abundant means to develop the property and determine whether or not the grade and extent of the ore justifies expenditure for the erection of a mill and power plant. Water power is available in the vicinity. The presence of tungsten and copper complicates the metallurgy for tin and *vice versa*, if tungsten should prove the more valuable constituent.

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## Ontario Mineral Production in 1913

The mineral production of Ontario for the first six months of 1913, according to the Bureau of Mines, amounted to about $18,600,000. This includes gold, silver, copper, nickel, iron ore, pig iron, cobalt, cobalt oxide and nickel oxide. Increases in every metal are noted except in silver and in cobalt and nickel oxides, which show slight decreases. The total net increase in value over the corresponding period of 1912 was about $3,350,000. The gold production for the period in question was $2,171,147; that of silver, 13,890,692 oz.; that of copper, 5873 tons; that of nickel, 12,104 tons; that of pig iron, 369,456 tons. The bulk of the gold, of course, came from Porcupine. The most substantial increases were those of gold, nickel and pig iron.

# Genesis of the Butte Ores

*SYNOPSIS—Butte ores derived from parent granite magma, along with quartz-porphyry dikes. A zonal arrangement of deposits. Factors governing distribution of ores. Alkali sulphides formed in rising solutions. Distribution of typical minerals. Order of formation of minerals. Only one period of deposition, not capable of division into epochs.*

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All geologic evidence in the Butte district points to the conclusion that the ores there were derived primarily from igneous rock. While sedimentaries may have overlain the granites of the district, there is no evidence that they played any part whatever in the formation of the ores, and at present no sedimentaries exist within a distance of 15 miles. Since the deposits are concentrated within a relatively small area, the source of their formation must be sought in close proximity thereto.

### ORE SOLUTIONS AND QUARTZ-PORPHYRY DIKES FROM THE GRANITE MAGMA

Distinctive of the Butte area as against other mining districts in the great Boulder granite batholith, are the quartz-porphyry dikes. Rhyolites, on the contrary, are found in other neighboring districts as well where practically no copper exists, and since at Butte they are later than the earlier vein systems and since the veins tend to become poorer near the rhyolite, it follows that the rhyolite played an unimportant role in the deposition of the Butte copper.

There are three or four well defined quartz-porphyry dikes in close association with the copper ores of the main central zone. These dikes extend in the easterly and westerly direction and coincide in a significant manner with the dips and strikes of the veins of the Anaconda, the oldest vein system. Their areal extent seems to be increasing in depth, their thickness becoming greater, their extent along the strike larger and new dikes unsuspected at the surface appearing.

### ZONAL ARRANGEMENT OF DEPOSITS

The ore deposits show a zonal distribution. The main or central copper zone occupies a large area of altered granite in the vicinity of the Mountain View mine, and in this zone sphalerite and manganese minerals are absent. An indeterminate zone surrounds this central zone in which the ores are predominately copper, but in which some sphalerite is found, together with manganese minerals near the boundary. Finally an outer or peripheral zone of undetermined width surrounds the intermediate zone and shows characteristic vein fillings of quartz, rhodonite, sphalerite, pyrite and rhodochrosite. In this zone are the manganese-silver veins. It is noteworthy that the quartz-porphyry dikes occur in the central copper zone. It is not to be supposed that the quartz-porphyry magma was the immediate and direct source of the ore minerals of the vein, but rather that the quartz porphyry as well as the ore solution had an original common source in the granite magma, and the principal part played by the quartz-porphyry was to open a way for the ore-forming solutions of deep-seated origin to reach the higher regions in which they now are found.

### MOST OF THE SOLUTION ELEMENTS WERE ORIGINAL

There is little doubt but that deep-seated, hot, aqueous solutions were the source of the ores, and judging by the minerals deposited from these solutions it would seem that the important constituents were original with the source of the solution and were not derived from the granite which the solutions traversed. Thus copper, sulphur, arsenic, zinc, manganese, lead, antimony, silver, tungsten, barium, fluorine, etc., which must have been in the uprising solution have been detected only in unimportant quantities in the normal granite rock. Since iron and silica are present in the original granite, it is unnecessary to assume that they were contained in the original solution, although they may so have been. The high temperature and vigorous chemical activity of the solution are evidenced by the strong alteration of the wall rock to which they had access.

### DEPOSITION INFLUENCED BY TEMPERATURE, PRESSURE AND SOLFATARIC ACTION

It is probable that the constituents of the ore-forming solutions were deposited largely through metasomatic replacements of the country rocks along fissures. The factors which influenced deposition at different horizons and the distribution of the ores, are believed to be chiefly those of temperature and pressure. Added to this is a certain solfataric action. Thus it is probable that at great depth hydrogen sulphide was a constituent of the solution. One phenomenon of alteration is the abstraction of sodium and calcium from the granite and the formation of pyrite. This would seem to be the result of the reaction of water, bearing hydrogen sulphide, with the iron, soda and potash minerals in the granite. It would seem thus that the pyrite and, by a similar line of reasoning, the quartz, present in the Butte veins were not primary constituents, but were abstracted from the granite by the solutions in their course of travel. Some of the iron taken from the granite was deposited within relatively short distances as pyrite and some was probably carried in solutions uncombined with sulphur until more favorable conditions for deposition were encountered. The sodium and calcium taken from the granite were not again deposited but had outlet on the surface in the form of mineral springs. As a result the solutions became increasingly alkaline toward the surface up to a certain point. This change in alkalinity bears a relation to the zonal arrangement of the ores. Chemical activity during the early stages was more intense, since the solutions were hotter than at later periods and had direct access to unaltered granite.

### A DECREASE IN ALKALINITY FOLLOWED AN INCREASE

From the state of maximum alkalinity, reached by the early high-temperature waters working on unaltered granite, there was probably a gradual return to a condition in which hydrogen sulphide was present in a greater ratio. Thus, after a certain length of time the solutions no longer reacted chemically with the granite, since this was already altered; in other words, a partial chemical

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Note—Excerpt from a paper by Reno H. Sales, entitled "Ore Deposits at Butte, Mont." "Bull." A. I. M. E., August, 1913.

equilibrium was established between the solutions and the contiguous layer of altered granite, which would prevent the further extraction of sodium, calcium and iron. Assuming then a fairly uniform hydrogen-sulphide content in the original deep-seated solution, that portion of the solution which was latest to leave its source, would find less opportunity to extract the alkalies and iron. The formation of solid vein fillings would have a similar effect in preventing contact between the vein-forming waters and the minerals. By this process of reasoning, if the vein pyrite, as supposed, was largely derived from the granite, in the later solution it would be less prominent and should be found in less quantity in the later vein filling.

### Occurrence of Chalcocite and Enargite

This series of chemical reactions between the uprising solutions and the granite are not to be assumed the only factors influencing the distribution of the ores in the districts, but to them must be added variations in temperature and pressure, changes in the original solution from time to time, and the mingling of unlike solutions. Concerning the possible influence of these various factors as affecting the distribution of ore types, many facts have been observed that are of particular interest. For example, primary chalcocite and enargite occur only in association with the intensely altered granite of the district. In the central copper zone or in veins where alteration has reached an advanced stage, these two minerals are commonly found in intimate association with other vein minerals formerly ores, and in addition small veins or stringers, largely chalcocite and enargite, can be found extending outward and replacing the wall rock, the granite being in actual contact with the copper minerals. In areas of unaltered granite the two minerals are confined to highly altered zones associated with the veins, and never extend into the unaltered granite itself. The solutions themselves did extend into the granite as is evidenced by stringers of other minerals therein, but the enargite and chalcocite are always associated with altered vein material.

### Distribution of Quartz, Pyrite, Sphalerite, Etc.

Quartz and pyrite are found abundantly in association with all stages of rock alteration and with all periods of primary ore deposition, although pyrite is more common in the central zone. It is less prominent in the Blue veins than in the Anaconda veins, and still less important in the Steward oreshoot, indicating that the later vein-forming waters either contained less pyrite or the conditions were less favorable for deposition, inasmuch as the Blue veins are later than the Anaconda and the Steward later than either.

Sphalerite is rarely found where alteration is intense. It is believed to have been deposited under conditions of alkalinity, similar to those under which enargite was formed, but at lower temperatures. Being more soluble it would more readily migrate than would enargite. Galena is a relatively uncommon mineral, associated usually with sphalerite and is not found in the central copper zone. Rhodochrosite is abundant in the veins of the peripheral zone but never occurs in the central zone. Chalcopyrite is not an uncommon mineral associated with sphalerite, quartz and galena in the manganese-silver veins.

### No Distinct Periods of Deposition

The evidence points to the fact that the ores of Butte were derived from one general centralized source and, speaking broadly, at one time. The hypothesis that the manganese-silver and zinc veins belong to an epoch separate from that of the copper veins will not hold good. Thus going outward from the central zone, there is no instance where an early copper vein is cut by later veins of different mineralogical character, as should be the case, if, for example, the Blue fissures were of a definitely later period than the east-west copper veins of the Anaconda system.

The suggestion also is untenable that the manganese-silver ores represent an invasion of an older copper area, or *vice versa*, for the reason that a later mineralization period could hardly thus completely surround a central core without showing its typical ores within the central core itself. Structural relations indicate that the east-west fractures of the manganese-silver area are of the same age as the Anaconda east-west fractures of the copper area. The Blue veins cut both sets of fractures and contain mineral typical of the zone through which they are passing.

Structural relations point strongly to the conclusion that the primary ores of the whole district are products of one great vein-forming period beginning immediately after the appearance of the Anaconda fractures, and ending with the completion of deposition in the Steward veins. While activity in vein formation unquestionably varied greatly at different times during this period, there can be no definite division into epochs. The fracturing of early-formed ore with subsequent filling of the fractures by new minerals did not mark distinct periods of action, but rather faulting movements during the deposition process itself.

### Sequence of Deposition of Noncupriferous Minerals

It is believed that the minerals in the veins were more soluble in strongly alkaline sulphide solutions than in hydrogen sulphide solutions under conditions of constant temperature and pressure, and also were more soluble in hot water than in cold. The areal distribution of the mineral types in the Anaconda system, which is the oldest, is believed to be largely due to the relative solubility of these various minerals in the original waters from which they were deposited. When the degree of high alkalinity was attained, following the extraction of soda and lime from the granite, quartz and pyrite were deposited in abundance while the temperature was high, thus forming the massive so called quartz-pyrite veins of the central and intermediate zones. Under high temperature conditions, sphalerite, rhodochrosite, galena and chalcopyrite, were more readily soluble and migrated outward to the intermediate and peripheral zones, where with quartz and pyrite they formed the manganese-silver veins. During this period of migration the solutions became cooler but lost none of their alkalinity. This is shown by the fact that no lime and soda were deposited, while probably some was taken up from the granite, inasmuch as some alteration is still visible, although relatively weak; furthermore, the abundance of rhodochrosite in the border zone indicates the probable presence of alkaline carbonates.

### Deposition of Copper

While these early solutions contained some copper, as is shown by its presence in the oldest known quartz-pyrite vein material, and in the disseminated pyrite of the altered granite, there were apparently no copper minerals deposited in quantity during this period, except possibly chalcopyrite, as mentioned. Enargite was deposited in the Anaconda veins after they were well formed, but before the Blue fissures appeared. Enargite is, therefore, regarded as a relatively high-temperature mineral, but is probably formed under less alkaline conditions. Copper was probably present in excess, or arsenopyrite would have formed in the cooler regions. The alkalinity of the solution prevented the formation of chalcocite. Some bornite was probably formed. During the later stages, when the Blue and Steward systems were formed, enargite, bornite and chalcocite were deposited in large quantities, both in the Blue and Steward veins, and in the older already formed Anaconda veins as well. In all these veins, however, the same order of deposition is noted: Pyrite, quartz, enargite, sphalerite, bornite and chalcocite.

The common Butte metals, such as iron, copper, zinc and manganese, are soluble in solutions of sodium sulphide, but hydrogen sulphide, when present in sufficient quantity, acts as a precipitant. Thus it is probable that chalcocite especially, was deposited only when the hydrogen sulphide was present in high ratio to the alkaline sulphides.

### Summary of the Process of Formation

In conclusion, it may be stated that the original source of the Butte ores was the granite magma which gave rise to the quartz-porphyry dikes and that the solutions followed the intrusion of the granite by these dikes. Heated waters and gases carried the metals to their places of deposition. Most of the metals found in the veins were present in the original solution, but others were added by extraction from the wall rock. This process of extraction, tending to vary the chemical composition of the solutions, is an important factor in the distribution of the different ores. The change in chemical composition was first an increase of alkalinity through reactions of hydrogen sulphide with soda and lime minerals in the granite, and later a decrease of alkalinity when the granite became insulated from the action of the solution by altered layers along the fissures. The presence of chalcocite in the highly altered areas only suggests that the more highly acidic conditions were necessary for its deposition. Similarly, the deposition of enargite is governed by the conditions of temperature and relative alkilinity in the solutions. The increasing abundance of sphalerite, rhodochrosite and galena, toward the peripheral zone, suggests their formation under conditions lower in temperature but of high alkalinity. Quartz and pyrite are abundant everywhere, but pyrite is more common in the central and intermediate zones. Quartz is more prominent as a gangue mineral in the peripheral zone. There is no good evidence to show distinct periods of mineralization; the process should be considered as taking place in one period, but with intensity varying.

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**The Metric Carat of 200 Mg.** will soon be almost universal in all dealings in precious stones. The latest country to adopt it is Belgium, where it is authorized from Sept. 1, and will be obligatory after Jan. 1 next.

# Minerals of the Tres Hermanas District

By W. Rogers Wade*

Twenty-one miles due south of the town of Deming, Luna County, New Mexico, and seven miles west from Tomberlin, on the branch line of the El Paso & Southwestern R.R., rising from the level plain, are three peaks called the Tres Hermanas. These mountains are composed of a medium-grained granitic rock, showing porphyritic structure, probably a quartz-syenite porphyry. This rock mass was intruded through a fossiliferous limestone series, belonging to the Mississippian (lower Carboniferous) age. The principal ore deposits occur on the northern side of the mountains in this limestone series, which forms gentle rolling foot-hills. On the southern side of the mountains is an area of altered andesite and gabbro. Some copper carbonate and silicate ores have been found here.

The first production of the district came from small fissure veins in the granite porphyry. The Cincinnati mine was the most important producer, having yielded $100,000 or more in silver-lead ore, running high in gold. On the nearby Hancock claim, a 400-ft. shaft was sunk and several thousand tons of rich lead ore shipped.

The principal deposits of economic value are zinc ores, occurring in the metamorphic-limestone area on the north side at the base of the mountains. Here a hard, blue limestone is underlain by a bed of white crystalline limestone which is composed of remarkably coarse calcite crystals and looks exactly like rock salt. These beds dip 10° to the northwest. The metamorphic area extends along the northern side of the range in crescent shape, having a length of 4000 ft. and a width of 3000 ft. at the widest point. Metamorphism has been strong along the contact and is marked by garnet bands. A hundred feet away from the contact the garnets disappear and the only metamorphic mineral in the crystalline lime is wollastonite.

Zinc ores occur in the crystalline-limestone bed around the border of the granite-porphyry intrusion and extend back about 2000 ft., as exposed by the present workings. The limestones are cut by a series of north and south fractures, along which there has been faulting, the greatest throw noted being 75 ft. vertically. They are also cut by a series of east and west fractures, and a series of northeast and southwest fractures. The fracturing is extensive, but practically no faulting has occurred except that caused by the north and south fractures.

Zinc occurs in vertical veins mostly in the north and south and the northeast and southwest fractures, and as bedded deposits extending several hundred feet to each side of the fractures along the bedding planes. They also occur as fillings in old caves and water courses. The deposits were originally operated for lead ores and the zinc was not recognized until 1905.

The zinc ores so far found are all oxidized and were probably derived from blende. Most of the zinc ore developed is in two rare zinc minerals, namely willemite (zinc orthosilicate) and zincite (red oxide of zinc). Willemite is the more abundant. Hemimorphite, smithsonite and hydrozincite are also present in the ore. The occurrence of willemite and zincite at Tres Hermanas is of considerable mineralogical interest, as they are rare zinc ores and are found in abundance in this country only at Franklin Furnace, New Jersey.

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*Mining engineer, Tyrone, N. M.

All the mine workings so far are confined to surface pits and shallow underground rooms, following the ore out along the bedding planes. With the exception of [illegible] 150 ft. long and sunk at an angle of [illegible], and one vertical shaft 100 ft. deep (still in crystalline lime), none of the workings extends below 20 to 30 ft. The orebodies so far stoped consist of flats of ore replacing limestone along the bedding planes. These flats start at points where the vertical fissures cut the limestone and extend out along the bedding planes for a distance of 200 ft. or so from the fissure. The ore is a replacement of the crystalline lime and the flats have an average thickness of 2 to 6 feet.

The majority of zinc outcrops are in a semi-basin area covering about 75 acres, scattered over which are 23 groups of quarries, underground rooms, shallow shafts, and nondescript workings. The dumps at these workings represent about one-third of the total material broken, the remainder having been shipping ore, or being left as walls underground to support the roof. There are 4000 tons of material left on the dumps which will average 12.2% zinc. The shipping ore ran from 36 to 41% zinc.

There has never been any intelligent development undertaken in the district. The crystalline lime exposed is only the top of the bed. If this crystalline limestone is identical with the zinc-carrying limestones of Kelly in the Magdalena Mountains, as it appears to be, the lower portion of the bed should be prospected by shafts and drifts or by drilling. At Kelly, the important orebodies occur in the crystalline limestone below the Silver Pipe bed. This Silver Pipe is a narrow bed, about 4 ft. thick, of hard, blue-gray limestone, occurring about the middle of the crystalline series. At Tres Hermanas no attempt has been made to develop any ore except that in the flats at the top of the crystalline bed, directly under the overlying limestone. The latter has been largely eroded and has left the ore exposed on the surface. The property is now idle, as with the present price of zinc the ore cannot be mined and hand-sorted at a profit. The wagon haul to the railroad costs $1.50 per ton and freight to the zinc smelters is $4.50 per ton.

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## Mineral Production of the Philippines

The following figures for the mineral production of the Philippine Islands in the year 1912 have been compiled and are published in the official *Journal of Science* at Manila:

| Products | Quantity | Value |
|---|---|---|
| **Metallic:** | | |
| Iron, metric tons | 141 | $24,636 |
| Silver, fine ounces | 7,121 | 4,322 |
| Gold, fine ounces | 27,582 | 570,212 |
| Non-metallic: | | |
| Coal, metric tons | 2,720 | 10,100 |
| Clay products | .... | 226,500 |
| Lime | | 16,013 |
| Sand and gravel | | 231,375 |
| Stone | | 325,524 |
| Salt, metric tons | 19,147 | 287,255 |
| Mineral water | | 27,925 |
| Total | | $1,756,872 |

The total value shows an increase of $343,667 over [illegible] 1911. The larger part of the gain was in the [illegible].

## Food Supply for Mining Engineers

By Dwight E. Woodbridge*

Coming out even is the great desideratum for prospectors and camping parties, and it is seldom that these parties so provide themselves with supplies, that at the close of their work there is a balance in what is remaining. The following proportionate list of supplies has been found to work out successfully by actual experience in a good many out-of-the-way regions, and is given in the hope that it may benefit some intending traveler in the roadless wilds where mining engineers sometimes go. It is based on what is required for one man per month, and multiplication or division will square it for any-sized party for any length of time:

| SUPPLIES | Lb. |
|---|---|
| Flour, cornmeal, hardtack, rice, grits, oatmeal, or similar foods, at least two-thirds of which should be flour arranged for self-raising | 42 |
| Clear mess pork, bacon and ham, say one-half pork | 27 |
| Beans and split peas, two-thirds beans | 7 |
| Sugar | 5 |
| Evaporated fruits, mostly apple | 4 |
| Butter | 3 |
| Canned milk | 2 |
| Cheese | 2 |
| Tea, coffee and chocolate | 2 |
| Salt, pepper, celery salt, mustard, two-thirds salt | 3 |
| Baking powder, if self-raising flour is not used | 1 |

This equals 3.3 lb. per man per day; it may be changed if the work is in a region where eggs, fresh vegetables and milk are to be found, or where game is plentiful, in which case the bacon and ham can be cut a little and the salt doubled, and a few onions, evaporated vegetables, capsuled soups, etc., may be added. These are of trifling weight and are palatable. I have found the "George Washington" coffee to be convenient, or better still, a certain coffee that is made in London, in which the coffee and the milk are combined. A little bottle of lime juice is of importance where one is away from fresh foods. There should also be a couple of pounds of soap, and four or five candles, preferably of the type called "carriage candles." These last need not be increased as the number of men in the party is added to.

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## United States Barytes Production

Crude barytes was produced in the U. S. in 1912 to the extent of 34,478 short tons. This was a decrease of 967 tons from the previous year's production, but an increase of $30,521 in value. Average price in 1912 was $4.09 per ton, according to the U. S. Geological Survey.

Of refined barytes, 38,225 short tons were reported sold. This movement is also a reduction in tonnage and an increase in value. Most of the barytes is obtained in Missouri, Tennessee, Georgia, North Carolina and Virginia.

Barytes, or heavy spar, occurs in veins as a gangue of metallic ores and also in veins in sandstone and limestone, or as a replacement of limestone. It is used principally as a pigment in mixed paints and in the manufacture of lithopone. It is also used in the manufacture of rubber goods and some wall papers. Its use is reported in Italy as a covering for Gorgonzola cheese. It also forms a useful admixture for many white powdered materials where a cheap, heavy adulterant is needed.

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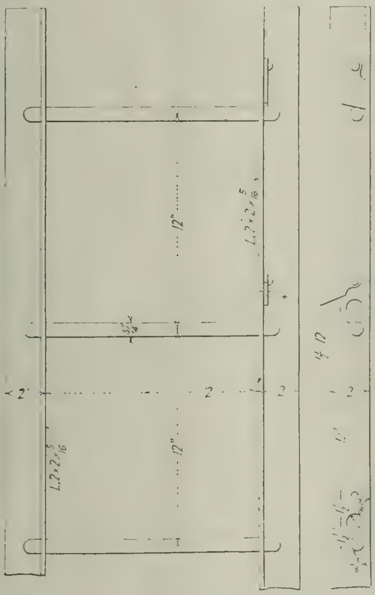
*Mining engineer, Duluth, Minn.

# DETAILS OF PRACTICAL MINING

## Isabella Knockdown Iron Ladder

By Leo H. P. Kneip*

The ladder shown herewith is one which is being installed in the new steel and concrete shaft of the Isabella mine, at Palmer, Mich., operated by the Cascade Mining Co. The ladder was devised by Francis H. Tippett, as a result of a competition promoted by the superintendent, Thomas J. Nicholas. The ladder uprights are $2\times2\frac{5}{16}$-in. angles, the rungs are $\frac{3}{4}$-in. iron. The rungs are inserted through $\frac{7}{8}$-in. holes in the angles and drop into a taper slot cut downward from the hole. A pair of grooves in each end hold the rung in the flange against turning and also brace the angles against side motion. The rung is locked in with a swing lug having a beveled bottom, as shown. If a rung should break, a new one can be inserted without taking down the ladder or springing it. The ladder contains no threads, bolts or nuts and can be made without special tools in any mine shop.



Isabella Knockdown Ladder

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**The Crushing of Pillars at the Mt. Morgan Mine** in Queensland, according to the annual report for 1912 of the Under Secretary for Mines, is largely avoided by mining the pillar section soon after the room. It was found that when the room section advanced too far ahead of the pillar that the latter was crushed, so as to render subsequent mining and filling operations extremely difficult. In some cases the room and pillar are removed concurrently.

## Safety Rules—Storing and Thawing Explosives*

(1) A magazine shall be provided for the storage of high explosives where more than a supply to last 72 hr. is kept on hand.

(2) This magazine shall be not less than 300 ft. distant from the shaft, adit, habitation, public highway, public railway, thawing house, or mine buildings. Where the distance between magazine and thawing house is less than 1000 ft., a barrier should be provided.

(3) The magazine should be provided with a ventilator at the roof, should have matched flooring, and shall be lighted from the outside only. The presence of any form of light or fire within a magazine is prohibited. Where steam or hot-water heat is used, wooden grates should be provided to prevent explosives coming in contact with hot pipes.

(4) A thermometer should be provided in magazine and thawing house.

(5) The magazine shall be waterproof and covered with a fireproof and bulletproof material.

(6) A lightning conductor supported on a vertical post standing clear of the magazine and not nearer than 18 in. to one of the walls thereof and rising at least 6 ft. above the highest point of the magazine should be installed. It should be carried to a properly laid earthplate, set in the ground below the permanent moisture line of the ground and at a distance of at least 1 ft. outside the walls of the magazine.

(7) "No Smoking" signs and "Dynamite" signs shall be placed on all magazines and thaw houses.

(8) All thawing of dynamite should be done in one of two ways: In a properly constructed thaw house by approved methods; or in a water-tube heater by means of warm water, no hotter than the bare hand can stand. Direct heat is not permitted.

(9) In all places where more than 100 lb. of dynamite or other high explosive is used daily, a thaw house shall be erected for this purpose. The heating apparatus of the thaw house shall be so arranged that the temperature cannot rise higher than 80° F. even if neglected.

(10) Where small amounts of dynamite are used, the thawing shall be done in a water-tube thawer.

(11) The thaw house may be heated only by hot water, steam or exhaust steam.

(12) Drawers in thawers should be changed at least once a year and oftener if they show signs of being saturated with nitroglycerin.

(13) It is forbidden to thaw dynamite on heated stoves, rocks, brick, metal, in an oven, near a steam boiler or fire, over steam or hot-water pipes or by any other method than those provided for above.

(14) While thawing, high explosives are extremely sensitive and should be handled with great care.

(15) Where high explosive for the use of not more

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*Cascade Mining Co., Palmer, Mich.

*From Inland Steel Co. book of rules.

than one gang of miners is stored not less than 50 ft. from any other powder or high explosive, a supply sufficient to meet the requirements of the succeeding 72 hr. may be stored [illegible], provided that caps are not kept in the same place with the explosive.

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## Choice of Mining Methods on the Mesabi

The orebodies of the Mesabi range are essentially flat deposits, of great area as compared to their depth. Taking the whole range into consideration, it may be said that they are generally less than 200 ft. thick, with a maximum of 500 ft. ("Mining Methods on the Mesabi Range," a paper presented at the Minnesota meeting of the Lake Superior Min. Inst., August, 1913). There are three general methods in use at the present time in mining these orebodies, viz.: (1) Underground mining, the ore being mined by hand and hoisted through a shaft and the underground openings supported by timber; (2) openpit mining, where the material above the orebody is first removed and the ore then mined by steam shovels and loaded direct into standard-gage railroad cars; (3) milling-pit mining, a combination of the two former methods, the material above the orebody being first removed, after which the ore is mined through underground openings and hoisted through a shaft.

The selection of the method of mining to be adopted involves a great many considerations and calls for experienced engineering and business judgment. Regardless of the method to be adopted, its selection should be preceded by thorough drilling to determine the limits and size of the orebody and the grades of the ore. Maps showing the top and bottom contours of the ore, and cross-section maps showing relative thickness of stripping and ore are indispensable.

In general, underground methods are used for those orebodies lying under slates or taconite, or deep glacial drift. It is an alternative method, adopted only when the other two methods are out of the question. About the only consideration in its favor is that production can be obtained quicker and with less initial cost than with [illegible] methods.

[illegible] mining is used for the larger bodies of ore lying under comparatively shallow surface material and in cases where the operating company is able to make the large initial expenditure in stripping. Besides permitting the lowest operating cost, it has many other advantages. The capacity for production from an openpit is enormous as compared to a shaft. One 40-acre tract operated as an openpit, provided the approach can lie on adjoining land, with two shovels and five locomotives, can send forward 9000 tons daily, while the same area, operated as an underground mine, hoisting through one shaft, would ordinarily produce about 2000 tons daily.

The milling-pit method is adopted generally for the smaller bodies of ore lying under comparatively shallow surface material. The amount of initial expenditure for stripping is much less than for an openpit, where the cost of the approach is a large item. The cost of production from a milling pit lies between that of openpit and that of underground mining.

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## Underground Blacksmith Shops

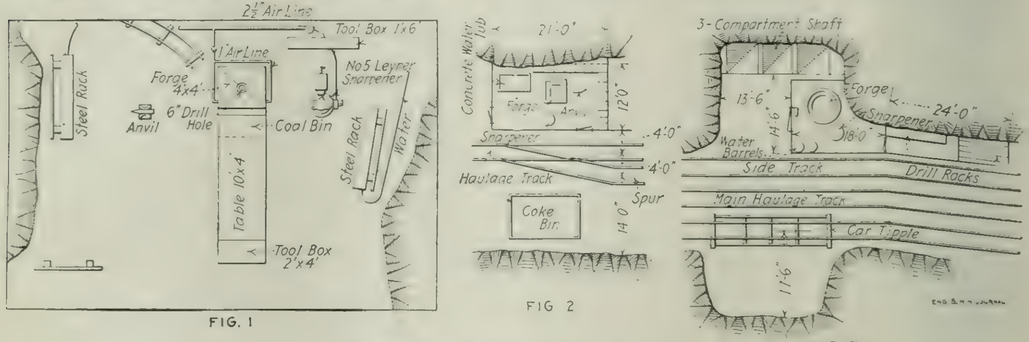

FIG. 1 FIG. 2 FIG. 3

Underground Blacksmith Shops

The idea of sharpening drill steel underground has always made more or less of an appeal to mine managers, and there seems a tendency lately to overcome the attendant difficulties, taking precautions against the dangers which may arise and to use underground shops to an increasing extent. In the *Compressed Air Magazine*, August, 1913, Ward Blackburn gives examples of several underground blacksmith shops and enumerates the advantages in their use.

The chief advantage is that transportation costs are reduced to a minimum. Getting steel from a surface blacksmith shop to the stopes underground is always a source of worry and expense. With shops located on the principal levels, hoisting and lowering are reduced to a minimum, and, if necessary, as in taking care of isolated stopes or levels, it can be conducted through openings not used otherwise. Another important factor is localization of sharpening. When different kinds of rock occur in different parts of the mine, it is of considerable advantage to vary the heat treatment of the steel to suit the various rocks. This is difficult to accomplish in one central shop, but it is relatively easy where several shops are placed at strategic points underground. It is an advantage to bring the blacksmith into more direct contact with the drill runners, thus keeping both up to their work and if it is easier for the drill runner to obtain his steel, there is less time lost, due to a lack of the proper lengths or gages. A more frequent turnover of the steel is possible and thus work may be carried on with a smaller stock. A blacksmith underground is available for incidental repair work and odd jobs. Finally, there is the element of safety. It is always a possible source of danger to hoist and lower steel in a shaft, and the manner of doing so is commonly prescribed in efficient mining regulations.

To install a shop underground, provision for ventilation must be made; for this reason a situation near a disused upcast shaft is ideal. A light, compact sharpening machine and an oil-burning forge offer peculiar advantages for underground work. The oil furnace being more easily controlled emits less obnoxious fume and consequently is safer. First-class lighting must be provided. For this purpose, either acetylene lamps or tungsten electric lights are satisfactory, since either gives a light suitable for judging the color of the steel in its heat treatment. When a machine sharpener is used, its exhaust provides ventilation to a certain extent, and helps to cool the shop.

Figs. 1, 2 and 3 show typical underground installations. That of Fig. 1 is for the Davey mines of the American Zinc, Lead & Smelting Co., at Carterville, Mo. Ventilation is obtained in this case by means of a 6-in. drill hole from the surface and a temperature of 67° F. is maintained underground. Fig. 2 is the underground shop at the Joker mine, of Witherbee, Sherman & Co., Mineville, N. Y. The temperature here is said to be about 60°. In Fig. 3, representing the shop at the Barton Hill tunnel property, a temperature of 70° is obtained, although a coke forge is used. In both these latter two stations, air circulation is maintained through a shaft near-by. Incandescent lights are used for illumination, a lamp being placed directly over and in front of the crosshead of the sharpener so that the operator can watch the forming of the bits.

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## Cleaving Granite with Compressed Air

Powder and compressed air are used by the North Carolina Granite Corporation for cleaving off horizontal layers of granite, at Mount Airy, according to *Mine and Quarry,* July-August, 1913. The granite forms a low hill, and the method of removing it consists of drilling a hole 3 or 4 in. in diameter, to a depth of 5 or 8 ft. in the center of the sheet which is to be lifted. The bottom of the hole is enlarged to a pocket with half a stick of dynamite. A handful of powder is then exploded in the pocket, which starts a horizontal crack out into the granite.

Charges increasing in size are set off in the cavity, the drill hole being plugged at each blast in order to confine the gases and thus exert a more constant force upon the stone. When the cleavage has extended to cover a circle 150 or 200 ft. in diameter, a pipe is cemented into the hole by the use of melted sulphur and is connected to the compressed-air line. Air at 70 or 80 lb. is gradually admitted and rapidly extends the cleavage until it appears upon the side of the hill in a thin edge. A sheet several acres in extent may be raised in this manner, leaving an excellent parting to which the quarrymen can work. Away from the edge of the hill the cleavage plane may not come out on the surface, and in this portion it is reached by the use of quarry bars or drills in the usual manner, the extent of the cleavage being determined by striking the surface of the stone with a sledge.

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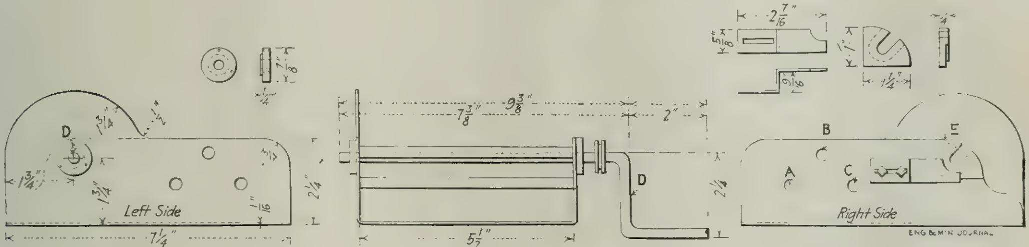
## First-Aid Bandage Roller

By E. W. R. Butcher

The accompanying sketch shows a bandage roller used by the Republic Iron & Steel Co. in its first-aid work. The different classes are required to do practice work in their course of training and the ordinary method of rolling bandages by hand was found too tedious for the large number which had to be rolled. This device was designed from a wooden one somewhat similar to it which was being used by one of the range hospitals.



First-Aid Bandage Roller

The bandage to be rolled is brought under rod *A,* over rod *B,* under rod *C,* and given about three turns around rod *D.* The left hand is then placed on the bandage, pressing it against the table to which the roller is attached, and it is rolled to any degree of tightness by regulating the pressure of the hand on the banadage. One edge is kept close to the far side of the frame. It can be removed by taking out pin *E,* which allows crank and rod to come out, and then sliding the roll off the rod.

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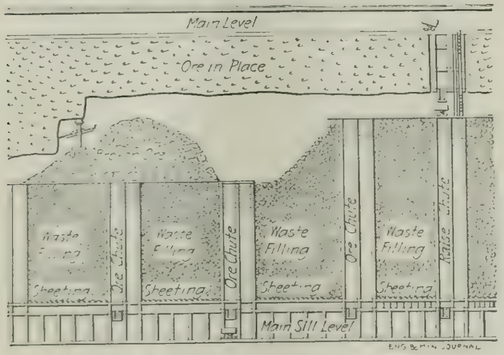
**A Stretcher for Carrying Injured Men Safely** has been devised, after years of experimentation by Dr. B. F. Stokes, Surgeon-General of the U. S. Navy. It marks an important advance. The stretcher is a basket of heavy iron wires, properly braced, long and wide enough to accommodate a man. The braces also serve as runners when drawing the injured, if that is the only way in which removal can be accomplished. Within the basket a partition extends from the foot and slopes toward the center. This keeps the legs well separatd and affords to each an extra support. Since the majority of accidents needing a stretcher require bandaging of either one or both legs, the advantage of this arrangement is obvious. The stretcher is described in an illustrated bulletin issued by the Kny-Scheerer Co., 404 West 27th St., New York City. The stretcher has found extended use among copper-mining companies.

# Butte Back-Filling Stoping Method

The "back-filling" method of mining is employed in the Butte mines wherever the physical conditions of the vein and wall rock are such that it is safe to do so. Both the ore and the country rock must be hard and free from faulting planes. The accompanying drawing gives a general idea of the system.

Its great advantage lies in the elimination of square-sets. From the drift on the vein, a raise is put through to the level above. The ore on the first floor is then mined, and chutes started about every 25 ft. along the drift. Between the chutes, sheeting, composed of small stulls cut in half and resting on timbers a few feet above the drift sets, is placed from the foot to the hanging (A. I. M. E. Bulletin, August, 1913).

Starting from the raise the miners begin to break the ore. After the ore has been broken across the entire face from foot to hanging for a short distance, the miners return, set up their machine on the broken ore, and again work their way forward. This is done two or three times until the broken ore is 15 or 20 ft. high; then the miners start again farther ahead and the shovelers begin to muck out the broken ore, shoveling it first into the raise chute, until they reach the next ore chute. When the space between the raise and the first ore chute is clean of ore, a temporary opening is made in the raise chute and waste, dumped into the chute from the level above, is allowed to run through this opening on the sheeting as long as it will. When it will no longer run, a track is started about 6 ft. from the top of the stope, the waste taken from the raise chute in a car and the filling of the stope continued to the first ore chute. The shovelers being now out of the way, the timbermen build up the ore chute one compartment wide and two in length to the level of the waste track, using small round stulls, 6 to 8 in. in diameter. The waste-men then continue filling the stope, following the shovelers.

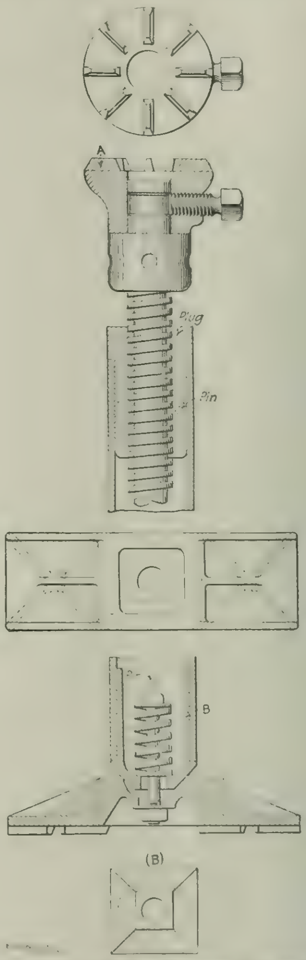


Back-Filling at Butte

When the miners have gone as far as the stope is to be [illegible], they return and start another floor on top of the waste filling, which has been covered with a floor of 2-in. [illegible] to keep the ore clean. If at any time the ground [illegible] heavy, square setting can be started on the waste filling; this is generally done when the stope has [illegible] out to within a floor or two of the level above.

# Leyner Flexible-Foot Drill Column

A column for rock drills invented by John George Leyner, of Denver, Colo. (U. S. Pat. 1,065,060), is arranged with the telescoping screw at the top and has a foot piece which allows a motion similar to a ball and socket, thus accommodating itself to a sloping wall or bottom. As illustrated, the column comprises a telescoping screw with an adjustable top piece *A* held on by a setscrew working in a turned recess in the end of the screw. The screw moves in a plug held in the end of the column by means of a pin. The other end of the column contains a plug *B* with a tapered, preferably four-sided, bottom held in a depression in the footpiece itself by means of a bolt and spring, as shown. The footpiece arrangement permits the column to be set at some angle with the wall instead of normal to it.



Single-Screw Column with Adjustable Foot Piece

# DETAILS OF METALLURGICAL PRACTICE

## Slater Lixiviation Process

A proposed addition to wet metallurgical methods is that of H. B. Slater, U. S. pat. No. 1,066,855, which is designed to beneficiate sulphide ores without previous roasting.

A 15% solution of sodium chloride in water is made, to which is added 1% of iron, preferably as ferrous chloride. This solution is placed in a two-part electrolytic cell, the cathode and anode departments separated by a porous, nonconducting diaphragm. The anode is of graphite; the cathode a copper plate. An electric current is passed from the anode to the cathode, liberating chlorine at the anode and sodium at the cathode. The chlorine combines with the ferrous chloride to form ferric chloride, while the sodium decomposes water with formation of sodium hydrate and liberation of hydrogen. The sodium hydroxide precipitates the iron of the ferrous chloride as ferrous-ferric hydrate. When all the iron in the anode compartment has been raised to the ferric state, a part of the product from the cathode compartment is added to the anode compartment. Sodium hydrate and chlorine will unite to form sodium hypochlorite and sodium chloride. The ferrous-ferric hydroxide will be dissolved by the ferric chloride of the anode solution, forming ferric oxychlorides, which will combine with a part of the chlorine to make ferric chloride. The oxygen liberated from ferric oxychloride, combining with another part of the chlorine and water, will form hypochlorous acid.

In following out this process, care must be taken that at no time may the caustic soda be added to the anode compartment in sufficient quantity to take part in the electrolysis, its office being only that of an agent to react with the chlorine which is being generated at the anode, and not that of an electrolyte.

After the iron in the anode compartment has been raised to the ferric state, the continued passage of the current will further enrich the anode solution in higher and more active forms of oxidizing compounds. The chlorine, upon decomposing the water, will combine with the oxygen and hydrogen to form chloric acid and chlorine oxide, which is recognized by its odor and the greenish-yellow foam upon the surface of the solution. When this condition is reached, the solution is ready to be added to the ore for extracting its metal contents.

The ore is to be ground to the necessary degree of fineness and the treatment solution added to it in the proportion of two parts of solution to one of ore, and the pulp agitated. The agitation will bring the sulphur to the surface of the solution and it may be skimmed off. When treating copper ores, the copper will be in solution as cuprous chloride in sodium chloride with ferrous chloride. The hypochlorous acid, chloric acid and chlorine peroxide have oxidized the mineral, liberating the sulphur and allowing the solution of the copper oxide in ferric chloride, reducing the latter to ferrous chloride. Silver will have been converted into sulphide and partly dissolved in the sodium-chloride solution. Gold will have been dissolved by chlorine, but reprecipitated by the ferrous salts, but is in such condition that another treatment with the original solution will bring away all the remaining silver and gold.

Precipitation may be accomplished by passing the solution over iron, removing the copper, silver and gold together. The solution remaining is ready for regeneration for further use in treatment. Or electrolysis may be used for precipitation. This process seems applicable, technically, to copper-gold-silver ores and may, if not valuable *per se*, serve as a hint toward more practical development.

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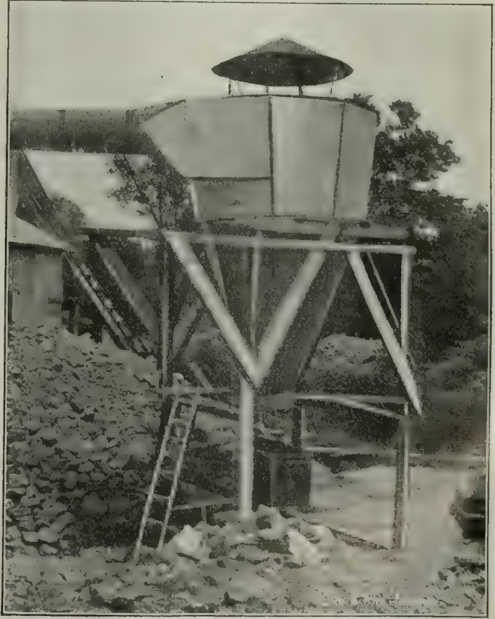
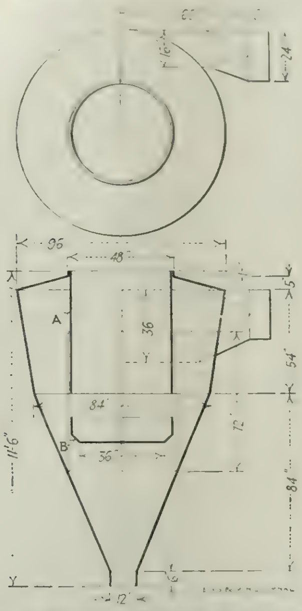
## Dust Collector for Dry Concentrator

At the property of the Mount Summit Ore Corporation, near Garrison, N. Y., a suction blower has been installed to take the dust out of the crushed ore at various points. The dust is discharged from the blower into the device illustrated. This is a dust catcher of the vortex type, usually applied to planing mills, lumber mills, etc. This is probably the first instance of its use in a dry concentrating plant. The air and dust from the blower enter through the tangential pipe and take a circular path around a collar *A*. This collar is open at the bottom



SETTLING APPARATUS ERECTED

and the top. The air enters it at the bottom and passes out through it; the dust settles to the bottom of the cone, whence it is removed through a bottom gate, as desired. A dished plate *B* under the collar can be adjusted for height, thus regulating the size of the opening through which the air is discharged. The device is made of galvanized iron and was assembled on the spot by the Buffalo Forge Co. It is reported to be satisfactory in service.



Plan and Vertical Section of Collector

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## Safety Rules—Structures*

(1) Stairs should not be built at a sharper angle than 50 degrees.

(2) Long flights of stairs should be interrupted at least every 20 ft. with a platform.

(3) Metal stairs with roughed or checkered surface should be provided wherever practicable.

(4) Wherever possible stairs should be provided instead of ladders. Where ladders are used they should be made of steel and securely fastened in position at least 8 in. from wall or column to give room for proper foothold. Where possible stationary ladders should be inclined, and should not extend over 20 ft. without a break.

(5) A hand line, consisting of light rope, should be provided at each ladder to be used in hoisting and lowering material.

(6) Metal points or rubber tips, spurs and, where practicable, hooks shall be provided at ends of portable [illegible]

(7) Runways used for walk or wheelbarrows shall be at [illegible] in. wide, and cleated underneath. Suitable bracing should be provided, to prevent spreading, teetering or springing.

(8) Cleats shall be provided, to prevent men slipping, wherever practicable.

(9) Railing and toeboard should be provided, wherever practicable, and on all runways that are 10 ft. above the ground.

(10) All platforms shall be provided with railings, toeboards, stairs or ladders.

(11) All permanent railings should be made of metal and properly braced.

(12) Trap doors, manholes and pit covers should be hinged if possible and so constructed that three sides of the hole should be guarded when the cover is up.

(13) Ladders on smoke-stacks should be guarded, if possible, and rungs should not be attached to the stack, but to side pieces anchored to the stack at regular intervals. To give proper foothold, rungs should be 8 in. from the stack.

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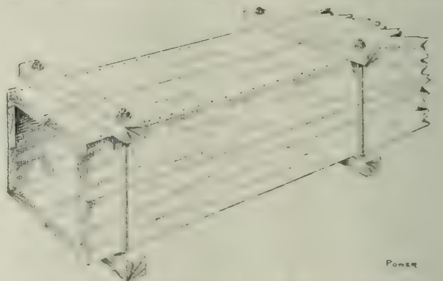
## Temporary Wooden Flume Cheaper than Iron Pipe

What seems to be a pipe-line stunt of use to the miner and smelter is described by L. Johnson in *Power*, Sept. 16, 1913.

A New England company decided to build a new penstock and dam for the water end of its power plant, and as the water for the boiler feed, condensers and industrial purposes all came through the waterwheel flume it was necessary to run a pipe line from the plant to above the dam, some 800 ft. Not having permanent use for piping of the size required it was decided to build a flume of plank with the thought that the lumber would be of use after the new penstock was put in operation.



Showing Construction of Wooden Flume

Two-inch planks, 18 ft. long, were used, costing (delivered) $30 per thousand feet. The clamps which held the flume together were 3x4-in. stock, and made of cheap hemlock lumber. The flume was 18 in. high and 16 in. wide. The wooden clamps were put on as shown, and spaced $1\frac{1}{2}$ ft. apart; the rods for the clamps were of $\frac{5}{8}$-in. common iron. The discharge end of the flume was connected to the main supply pipe in the basement of the engine room by cutting a square hole in the main pipe to receive the water from the flume.

The first cost of the flume was less than the estimate of a contractor who bid for the job of putting in a cast-iron pipe 18 in. in diameter. After the flume was taken apart the planks were sold in the company's yard for $15 per M., or half the price paid for them.

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*From [illegible] Steel Co.'s book of rules.

# COMPANY REPORTS

## La Salle Copper Co.

The result of operations for six months ended June 30, 1913, at the La Salle Copper Co., Lake Superior copper district, Mich., was as follows: Expense at the mines, $27,836; Eastern office, etc., $2472; construction at mine, $11,655; total, $41,963. From this expense $4108 was deducted for interest and miscellaneous receipts, making the decrease in assets $37,855. Assets reported consist of cash and accounts receivable at Boston, $205,267; cash and accounts receivable at mine, $932; and supplies and fuel on hand at the mine, $1310. Accounts payable at the mine amount to $4704, leaving $202,805 balance of assets at the end of the period.

The water in the mine was lowered to a point below the 17th level. A branch from the Mineral Range R.R. was built to No. 2 shaft. Stoping was begun on a small scale in July. During the period covered by the statement issued by the president it is stated labor shortage seriously delayed the unwatering of the mine and getting the surface equipment in shape for production. The rock will be treated at the Calumet & Hecla mill at Lake Linden. The management hopes to get the production up to the capacity of one stamp. It may be stated that the capacity of the stamps in use at these mills range from 400 to about 550 tons per day, depending whether the feed is conglomerate or amygdaloid.

## Copper Range Consolidated Co.

The report of the Copper Range Consolidated Co., operating mines in Michigan, for the year ended Dec. 31, 1912, shows that 34,584,627 lb. of copper were produced and sold on an average of 16.16c. per lb., making a total of $6,071,095. Interest increased this to $6,084,201. Mine expenses, including smelting, freight, marketing, etc., amounted to $3,661,837, leaving a gross profit of $2,422,364. Taxes, in Houghton County, Mich., amounted to $164,157, leaving a net profit of $2,258,207. To this is to be added the profit earned by the Copper Range Railroad Co., of $103,775, and by the Atlantic Mining Co., $40,386, making a net profit of $2,402,368. From this total is to be deducted interest, taxes and general expenses of the Copper Range Consolidated Co., $83,992, and one-half of the net mining profit of Champion Copper Co., which belongs to the St. Mary's Mineral Land Co., $625,810, making $709,802, and leaving a total net income of $1,692,566 for the Copper Range Co. Dividends paid amounted to $788,428, leaving a surplus of $904,138. 1,784,402 tons of rock were treated, yielding an average of 21.07 lb. of refined copper per ton. The cost of copper produced from the Baltic, Champion and Trimountain mines was 10.51c. per pound.

The reports of subsidiary companies include, first, the Baltic Mining Co., which produced 13,373,961 lb. of copper, sold at an average of 16.16c. per lb. This company shows a net profit of $697,394 for the year. The Champion Copper Co. shows a total of 17,225,508 lb. of copper produced and sold at 16.16c. per lb. The net profit amounts to $1,251,619. The Trimountain Mining Co. shows a production of 6,980,713 lb. of copper produced and sold at an average of 16.16c. per lb. The net profit shown is $308,473. The Copper Range Railroad Co. shows a profit of $103,775 for the year. The Atlantic Mining Co. shows receipts of $131,842 and expenditures of $90,736, leaving net gain from the year's operation, $41,106.

## Greene Cananea Copper Co.

The report of the Greene Cananea Copper Co. for the year ended Dec. 31, 1912, shows that notwithstanding the unsettled conditions prevailing in Mexico during the last year, the operating companies were able to produce at normal capacity for the greater part of the time. Recently, when, owing to the destruction of railway bridges, transportation of fuel and supplies was interfered with, production was slightly curtailed. For this reason, and also due to the somewhat uncertain future conditions, the dividends which would ordinarily have been paid by the subsidiary companies and disbursed to this company's stockholders on May 31, 1913, were omitted. Payment of dividends will be resumed as soon as conditions justify that course.

The company now owns 951,859 shares of the capital stock of the Greene Consolidated Copper Co. out of a total outstanding issue of 1,000,000 shares and all of the capital stock of the San Pedro Copper Co., S. A. Dividends received from the subsidiary companies during the year amounted to $292,025, and dividends paid were $606,668 on March 1, $606,592 on Aug. 31, and $606,918 on Nov. 30. There were 48,157,847 lb. of refined copper produced, together with 1,457,308 oz. of silver, and 7197 oz. of gold. The combined net income was $2,580,749. The average price received for copper was 16.0194c. per lb., and the average cost of producing it, after deducting values of precious metals and miscellaneous revenues, was from the mines of the Cananea Consolidated Copper Co., S. A., 10.31c., and 11.53c. from the mines of the San Pedro Copper Co., S. A.

On April 1, 1913, James F. Douglas was appointed general manager of all the companies' properties, succeeding Dr. L. D. Ricketts. Doctor Ricketts still retains the position of president of the Cananea Consolidated Copper Co., S. A.

The Cananea Consolidated Copper Co., S. A., produced 40,966,018 lb. of copper, which was sold at an average price of 16.0009c. per lb., the gross operating profits for the year being $2,280,799, after charging off expenses for improvements of $152,647. Dividends amounting to $1,500,000 were paid during the year by the Cananea Consolidated Copper Co., S. A., to the Greene Consolidated Copper Co., and the following dividends were disbursed to the shareholders of that company: Jan. 23, 60c. per share, $600,000; Aug. 30, 40c. per share, $400,000; Nov. 29, 40c. per share, $400,000; a total of $1,400,000.

There were 895,406 wet tons of domestic ore and 219,127 wet tons of foreign ores treated, together with 47,017 wet tons of Miami concentrates. There were 547,025 wet tons of domestic ore milled and 143,931 wet tons of foreign ore. The ratio of domestic ore concentrated was 3.157 tons into one and the corresponding ratio of foreign ore was 4.877 tons into one. The silver produced in bullion from domestic ore was 972,723 oz., and from foreign ore, 484,584 oz. Gold in domestic bullion amounted to 4528.86 oz. and that from foreign ore, 2668.3 oz.

During the year there were 72,403 ft. of development work done, of which 1392 ft. were shafts, 13,293 ft. were raises and winzes, and the rest drifts.

The cost of mining for the Cananea Consolidated Copper Co. for the year was $2.93 per ton, as against $2.46 for the previous year. This is partly accounted for by the increased amount of development work.

The San Pedro Copper Co., S. A., mined 215,300 tons of ore, treated 211,206 dry tons and concentrated at a ratio of 4.877 tons into one. The production of fine copper was 7,191,829 lb.; of silver, 484,584 oz.; and of gold, 2655.642 oz. The recovery of copper was 34.05 lb. per ton, or 1.703%; of silver, 2.29 oz., and of gold, 0.0126 oz. per ton. The cost of mining per wet ton was $2.80. The gross cost of producing copper, f.o.b. Cananea, was 14.740c. per lb., which, together with freight and export tax, refining, marketing, etc., amounting to 1.730c., makes a total of 16.470c. per lb. total cost of copper sold. The credit for precious metals of 4.9175c. and miscellaneous of 0.0175c., total of 4.93c., reduces the total cost of copper to 11.535c. per lb. The total development work at the San Pedro Copper Co., S. A., was 232 ft. of shaft, 3132 ft. of winzes and raises, and 9634 ft. of tunnels, drifts and crosscuts, a total of 12,988 ft. for the year.

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## Osceola Consolidated

The annual report of the Osceola Consolidated Mining Co., Lake Superior district, Mich., states that an operating profit of $1,163,289 was made on 18,413,387 lb. of copper at an average price of 16.52c. per lb., after crediting interest and silver sales to the amount of $30,411. The company sold stock holdings and real estate aggregating $46,786, making its total net income $1,210,075, from which three dividends totaling $1,153,800 were paid, leaving a surplus of $56,275 to be added to quick assets. The net balance of quick assets at the end of the year was $1,888,458. The dividends of the company to date (1878-1912) amount to $11,170,100. The mill treated 1,246,557 tons of rock, from which 24,282,312 lb. of mineral averaging 75.83% fine copper was produced.

The average yield of rock stamped was 14.8 lb. per ton in refined copper. Mining, transportation, stamping, and taxes cost $1.23 per ton of rock stamped or 8.34c. per lb. of copper; construction, 0.95c. per lb.; smelting, freight, commissions, Eastern office, etc., 1.07c.; total, 10.36c. per lb. of copper. The Tamarack mill stamped 77,937 tons of rock for the Osceola at a cost of 91.32c. per ton. Of the ore hoisted 1.955% was rejected by hand sorting, compared with 1.518% in 1911. The increased percentage in 1912 is due to the reopening of the Osceola branch.

At the Osceola branch 115,551 tons were stamped at a cost of $1.65 per ton for all expenses up to and including stamping. The net yield was 12.80 lb. of copper per ton at a cost of 14.55c. per lb., excluding construction. At the North Kearsarge branch 672,231 tons were stamped at a cost of $1.25 per ton for mining, transportation and stamping. The ore yielded 12.81 lb. of refined copper per ton at a cost of 11.44c. per lb., excluding construction. At a point about 1700 ft. north of No. 4 shaft the 8th level drift encountered a heavy flow of water and shortly afterward a second flow, with large quantities of sand, took place. This required the building of a concrete dam 900 ft. from the shaft and the abandonment of the balance of the drift. For the first six months of the year the copper contents of the rock from this branch was only 11.88 lb. per ton. At the South Kearsarge branch 458,651 tons were stamped at a cost of $1.01 for all expenses up to and including stamping.

The ore yielded 18.15 lb. of refined copper per ton at a cost of 6.79c., excluding construction. Fully two-thirds of this tonnage was mined from the foot-wall. This rock consisted in part of vein matter which extended back into the foot-wall, and in part of foot trap which was found to contain copper. It is hoped that a large part of the old stopes can be worked over in this way.

After two years' experiments with various types of drilling machines, the Leyner-Ingersoll one-man drill has been adopted as a standard, and these machines are being introduced as fast as practicable. The results are an increase in the wages of the miners and a decrease in the cost of drifting and stoping. Including 59 ft. of shaft sinking the development work at the three branches totaled 7130 ft. The depth of the shafts at the end of the year follow: Osceola branch, No. 5 shaft, 4623 ft.; No. 6 shaft, 4592 ft.; South Kearsarge branch, No. 1 shaft, 2820.5 ft.; No. 2 shaft, 1992.5 ft.; North Kearsarge branch, No. 1 shaft, 3873.5 ft.; No. 3 shaft, 3251 ft.; and No. 4 shaft, 1449 ft. from the surface.

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## Ohio Copper Co.

The report of the Ohio Copper Co., Bingham mining district, Utah, for period Aug. 1, 1912, to Dec. 31, 1912, states that 234,239 tons of ore were mined and concentrated. Operations were only carried on for about 3½ months of the five-month period on account of labor troubles in September and October. Metal production amounted to 2,343,439 lb. of copper, 1920 oz. of silver and 380 oz. of gold in concentrates shipped to smelter. The operating profit on this production was $104,935 from which sundry other expenses are deducted, leaving a net profit of $88,181. After allowing for smelter losses this would indicate a profit of a little less than 4c. per lb. of copper or a cost of something over 11.5c. per lb. of refined copper.

Mill unit No. 2 was ordered dismantled and the Wall rolls removed and reconstruction of this unit was not completed at the end of the year. The two units operated treated an average of about 2000 tons of ore per day, with the third in operation the daily capacity is expected to reach 3000 tons. The company ended the year with $281,208 cash, $273,127 accounts receivable and $122,986 accounts payable, and $1,216,000 of bonds outstanding, with $514,000 worth of bonds in the treasury.

# Influence of Flat Dike on Ore Formation

By E. A. Colburn, Jr.*

*SYNOPSIS—Dikes in Cripple Creek are intimately associated with ore deposits. Usually acted as dams to solutions. A permeable, basic dike, in this case, was intersected by an ore channel and conducted the solutions to form a distinct oreshoot at some distance to one side on the vein. One of the rare Cripple Creek cases where the faulting can be measured.*

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In the Cripple Creek district dikes are regarded with a great deal of interest because of the relation existing between them and the ore-bearing veins. The theory is that most of the dikes, being more impervious to percolating solutions than the country rock, act as obstructions to the flow of the gold-bearing solutions and thus allow time for the replacement of the surrounding country rock and the precipitation of the precious metals at or near their walls. Conditions tending to prove this theory may be found at many places in the district; oreshoots are found on the walls of nearly vertical phonolite and basic dikes, and flat dikes or sills are often known to be accompanied by ore where intersected by vertical or nearly vertical veins, the larger bodies of ore lying in or above the dikes. There is reason to believe, however, that the deposition of the ore on the dikes is limited to their intersections with oreshoots, other parts of the vein along its intersection with the dike being barren. Other dikes, however, mostly basic, being soft and easily permeable, act as channels for the movement of solution and are often replaced and mineralized by solutions derived from veins which cross them. A rather unusual occurrence of this type may be of interest and is therefore described.

### Breccia Country and Flat-Basic Dike

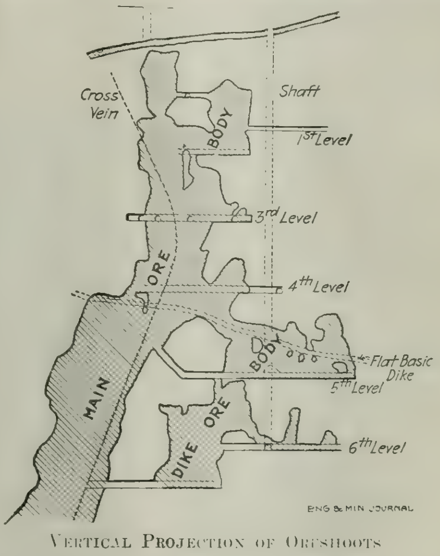
The country rock through which the vein and dike in question pass is volcanic breccia, showing fragments of andesite, phonolite, granite and other rocks, enclosed in a bluish groundmass and lying in pronounced strata which have a strike of about N30°W and an extremely flat dip to the south. These strata are from 4 up to 6 ft. thick and are usually of varying hardness, which accounts for pinches and bulges in the vein as it passes through them.

The accompanying figure shows a projection of the vein on a vertical plane N 10° 30′ W and also the position of the dike intersection in relation to the vein. The dike is a soft greyish-white trachy-dolerite locally called basalt. The strike of the dike coincides with that of the stratifications of the country rock, and its dip is also in conformity being approximately 18° south. The intersection of the vein and dike slopes a little to the south from the main oreshoot and seems to mark the lower limit of the oxidized zone, nearly 500 ft. below the surface.

### A Fissure Vein Faulting the Dike

The vein is a narrow fissure, having a width of 2 to 6 in., according to the character of the layers of breccia it traverses, striking N10°30′W and dipping about 70° south. It marks the position of a fault plane in which slickensides on the walls indicate that the movement was nearly vertical. Sheeting at various places in the vein often reaches the width of 2 ft. and is always on the foot-wall side of the fissure, never in the hanging wall. The fault has a normal throw of about 4 ft., a rather unusual occurrence for the Cripple Creek district in that faults are rare and seldom intersect dikes or other formations by which the throw can be measured.

The vein follows the fault plane closely and is filled with a fine, gray sand containing fluorite and quartz and often giving away entirely to bunches of these minerals which show crystals of calaverite and sylvanite in the vugs and cavities. Fluorite, as a rule, does not carry well in gold if the tellurides are not visible to the naked eye, and the ore in this vein is no exception. The more compact, even-grained fluorite and quartz does not seem to contain the amount of gold that the more coarsely crystalline varieties do, and seldom runs more than $2 or $3 per ton.



Vertical Projection of Oreshoots

### Two Oreshoots

The principal oreshoot in this part of the vein may be seen, by reference to the projection, to pitch slightly to the north in the vein below the fourth level and to be nearly vertical from that point to the surface. This shoot has been mined to a depth of more than 1000 ft. on the dip of the lode and was not bottomed at that point, thus showing a continuity far beyond that of most of the oreshoots of the same size in the district.

A crossvein, having a course of about N30°W, intersects the oreshoot of the vein from the lower levels almost to the surface, and was originally thought to have influenced the position of the shoot, but later developments proved this to be improbable, since the intersection leaves the shoot at its northern edge a little way above the 200-ft. level and carries no ore at its intersection with the vein at any point above. It is true that when the intersection is in the shoot the ore is richer and wider than at any other point, but this is probably due to the greater fracturing of the country rock, which would allow better circulation and mineralization.

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*Superintendent, Ajax Gold Mining Co., Victor, Colo.

The flat dike seems to have the same effect upon the oreshoot as does the crossvein, in that at its intersection the ore is of a better grade and is of greater extent than at other places.

The ore to the south of the main oreshoot may be described as the dike orebody, since the dike seems to have been the principal cause of its deposition. The ore does not extend more than 20 ft. above the dike at any point, and is connected with the main oreshoot only by a small amount of ore along the dike, a stringer that could have easily been overlooked by any other than an observant miner. The workings south of the shaft on the fifth level, which were at some distance from this connection, did not disclose any high-grade ore; this was also the case south of the shaft on the sixth level.

The better grade of ore was found between the dike and the sixth level at the north end of the shoot and almost directly below the connection between the two shoots. This ore was bottomed about 70 ft. below the sixth level, and as considerable work has been done at a still deeper level, and no ore found in the fissure, it is highly probable that ore will not be found at any greater depth upon the projection of this orebody. A glance at the projection will show the reader the spotted and irregular character of these shoots, a condition common to most of the Cripple Creek deposits, especially in the smaller veins.

The dike oreshoot is nowhere connected by pay ore to the main shoot except as mentioned above, and in all probability could not have derived the solutions, which made the ore, from any other source than the dike, as the fissure between the two orebodies is so tight as to be almost indistinguishable. The solutions circulating in the main ore channel of this vein, in either ascending or descending currents, as the case may have been, probably worked along the dike and percolated downward on the vein a little way south of the main channel, thus producing rich ore at points in the fissure where fracturing and the porous condition of the walls allowed free access to the solutions.

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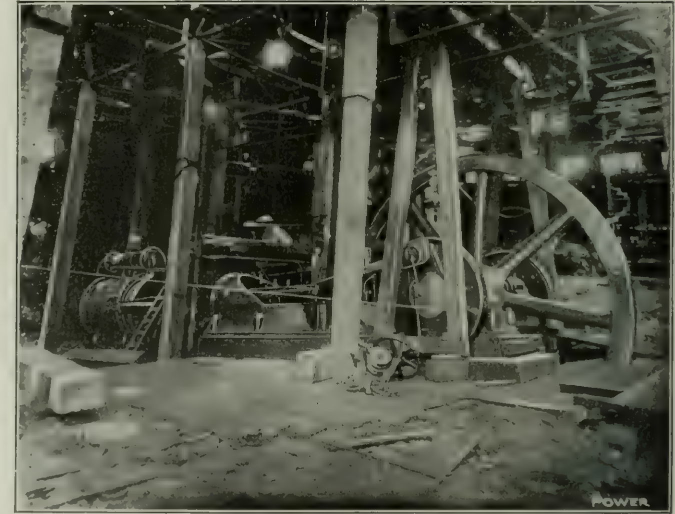
**Power Generation and Hydraulicking** are accomplished [illegible] the same water at the Pioneer tin mine in Tasmania. [illegible] powerhouse is situated 300 ft. above the mine ("Mining [illegible] Engineering Review," Australia, July, 1913) and generates electric current by the means of impulse turbines [illegible] under a head of 189 lb. per sq.in. During the [illegible] ended [illegible] 31, 1912, the mean power load was [illegible]. The power is transmitted at 6500 volts to the [illegible]. The water after leaving the turbines is conveyed [illegible] point 210 ft. above the mine where it is available [illegible] the pipe lines to the hydraulicking giants. The electric power is used for drainage and for elevating.

## Settled Ten Feet but Kept on Running

In the JOURNAL of Aug. 16, 1913, reference is made to the subsidence of the blowing engine of the United Verde Copper Co. A fuller description of the engine and its troubles is given in *Power,* Sept. 16, 1913, by T. Peacock, from which the following notes were taken

The blowing engine used for furnishing blast to the copper converters at the United Verde Copper Co.'s smelting works at Jerome, Ariz., is a cross-compound engine with duplex air cylinders, built by the Southwark Foundry & Machine Co., in 1902. The steam cylinders are 28- and 52-in. diameter by 60-in. stroke, while the air cylinders were originally 96-in. diameter.

In November, 1910, the air cylinders were changed to 60 in. At that time the engine was slightly out of level, but it was urgently needed, and there was no time to level it up. The cause of the engine being out of level was the subsidence of old mine workings under the power house, and several other large blowing engines and compressors were also more or less out of level. The Southwark engine was got ready for work in January, 1911, and was put on continuous 24-hr. service.



ENGINE STILL RUNNING AFTER SETTLING FROM A LEVEL 2 FT. ABOVE THE CHALK LINE

Shortly after the engine was started the subsidence of the power house increased to an alarming extent, the concrete floor and walls of the building cracking in several places. A boiler room containing 16 Scotch marine boilers stood next to the power house and the caving area extended under the boilers, causing considerable trouble from leaking steam pipes and connections.

It was then decided to move the whole of the machinery and boilers from the area of subsidence to a new site as quickly as possible. New compressors for the mine, driven by electric motors, furnished with power from a hydro-electric power plant were installed and it was only necessary to set up 10 of the Scotch boilers. These were moved to safe foundations, along with two Allis blowing engines for converter work. A new steam turbine-driven turbo-blower large enough to furnish blast for all the converters was ordered. Meanwhile another large Nordberg blowing engine was wrecked by the subsidence, and it was necessary to keep the Southwark blowing engine running constantly at a reduced speed, in conjunction with the Allis engines, in order to furnish sufficient blast to keep the plant going at two-thirds of its capacity.

The Southwark engine was run steadily until Mar. 26, 1912, when the new turbo-blower was put in operation, and it was kept in running order until Apr. 17, when the work of moving it to a new foundation was begun. It was run for a short time as late as Apr. 12, and during several months it was stopped only occasionally for a few hours to lengthen the steam, exhaust, or air-discharge pipes between the point of suspension on the roof of the power house and the engine, as the subsidence under the engine was greater than under the walls of the building, necessitating swing joints in the pipes to take care of the constantly increasing distance between the main pipes and the engine, in addition to the occasional insertion of 12 or 15 in. in each pipe.

The photograph was taken on Apr. 16, 1912, the day before the engine was dismantled for removal. The white line is a chalk line exactly level and set two feet below the original level of the floor.

The length of the engine is 41 ft. 9 in. from end to end of the bedplate, the width overall of the two bedplates being 19 ft. 6 in.

The crank end of the foundation had sunk 5 ft. 1 in. and the cylinder end was 9 ft. 9 in. below the original level, the difference in level over the length of the engine being 4 ft. 8 in. The shaft was 3 in. out of level, while the piston rods of the air cylinders were only ¾ of an inch different in level, the low-pressure steam side being down in both cases.

The engine foundation was one solid block of masonry with concrete top, the only opening in the foundation being a narrow pit for the flywheel. It is probably due to this solid form of foundation that the engine was kept running under such extraordinary conditions, as all the other engines in the same power house had separate foundations under each side of the engine, and most of them moved out of parallel during the subsidence, either by the separate foundations coming together or moving apart, a result which experience showed could not be prevented by any amount of timber struts or tie-rods.

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## Electro-Metallurgy of Zinc

For the chloride of zinc, hitherto usually employed in the electro-metallurgical processes of zinc recovery, G. Gallo substitutes fluoride, obtained by the action of fluoric or silicofluoric acid upon oxide of zinc (*Min. Journ.*, Aug. 16, 1913). Mixed with half its weight of chloride of sodium the fluoride of zinc can be melted undecomposed. The molten mass is able to dissolve a fairly large quantity of oxide of zinc. If the mass is subjected to electrolysis at 3 volts with carbon electrodes the metal is recovered (extraction about 70%) mostly as a molten layer at the bottom of the electrolytic cell. Trials on a large scale have given relatively good results. The metal obtained from four parts of oxide of zinc and one part fluoride was fairly pure, and could be further refined in the usual metallurgical way. The results would be even more favorable if the ores were previously treated by calcination and electro-magnetic reduction.

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## Progress on Minnesota Steel Co. Plant

The plant of the Minnesota Steel Co., a subsidiary of the United States Steel Corporation, is being built at the head of Lake Superior, near Duluth and Superior. It has been under construction for nearly four years, but it will be another year and a half before it is ready for operation. It is to be a much more extensive works than when originally projected. When it goes into commission it will embrace two blast furnaces of 500 tons daily capacity each; 90 byproduct coke ovens; 10 openhearth furnaces of 75 tons capacity each; one 40-in. reversing blooming mill; one 28-in. finishing mill; one 16-in. continuous roughing train with three-stand, 12-in. finishing, two-stand, 10-in. finishing and two-stand 8-in. finishing rolls; power house of 10,000-kw. capacity; 5 gas-driven blowing engines of 20,000 cu.ft. capacity each; a pumping station of 40,000,000 gal. daily capacity; machine, forge and structural shops; three reheating furnaces, designed to use 16-ft. billets, with a daily capacity of 1000 tons of ingots, and a cement plant of 4000 bbl. daily capacity.

The plant is on Spirit Lake, a widened basin of the St. Louis River, nine miles from the union station at Duluth. The site embraces 1500 acres, with two miles of water front. With the exception of those to house the cement plant, most of the buildings are now inclosed. All of the structures, which are of enormous size, have steel frames, the walls being of two-piece concrete blocks. The machine shop is in full operation, turning out work for the builders; the blast furnaces are nearly ready for the linings; the great engines are on their foundations and will soon be fitted out; the openhearth furnaces are all in place, but the big rail, plate and bar mills are without machinery. There have been vexatious delays in procuring material and equipment, deliveries having been slow. There has been an improvement of late, however, with the result that much larger construction crews are now employed and the work is progressing at a satisfactory rate.

The company is just beginning the erection of dwellings for its employees. Present plans call for the construction of 175 two-apartment houses, but these will be only a small portion of the dwellings that will be required. At present, with the exception of part of the laborers, who are camping in the neighborhood of the plant, and the executive force, who live in cottages on the shore of Spirit Lake, all the men engaged in the construction work are taken to the plant on the Northern Pacific Ry. from West Duluth and Duluth in the morning and are taken back at night. The Minnesota Steel Co. has itself built a belt line, connecting the plant with every railroad entering Duluth and Superior. A great transfer bridge, of steel, spans the St. Louis River from the Minnesota to the Wisconsin shore at "New Duluth" and another of similar kind is contemplated.

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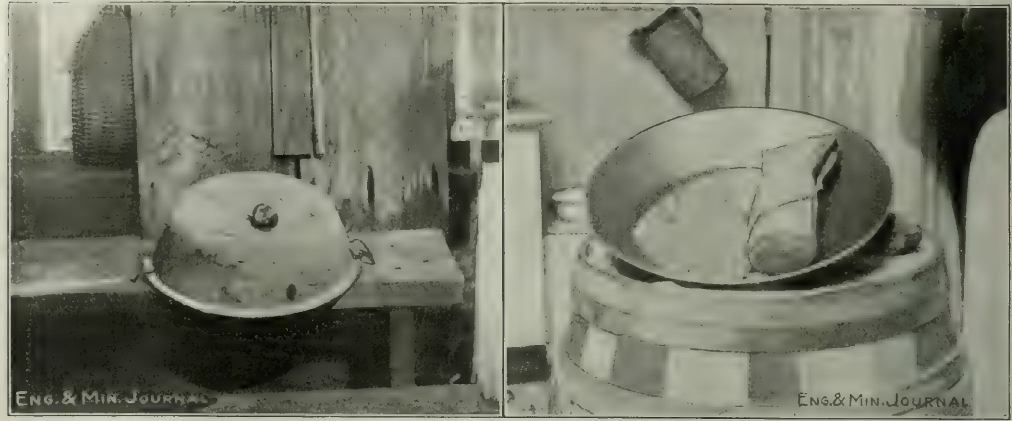
**In 1912, 10,536 Square Sets were Erected Underground** in the Mt. Morgan mine in Queensland, Australia, according to the annual report of the Under Secretary for Mines of that state. Of these sets, 10,302 were filled in, the total quantity of waste used as filling being 105,600 tons, about 10 tons per set. During this period, the quantity of ore obtained from the underground working was 193,476 tons, almost 19 tons per set.

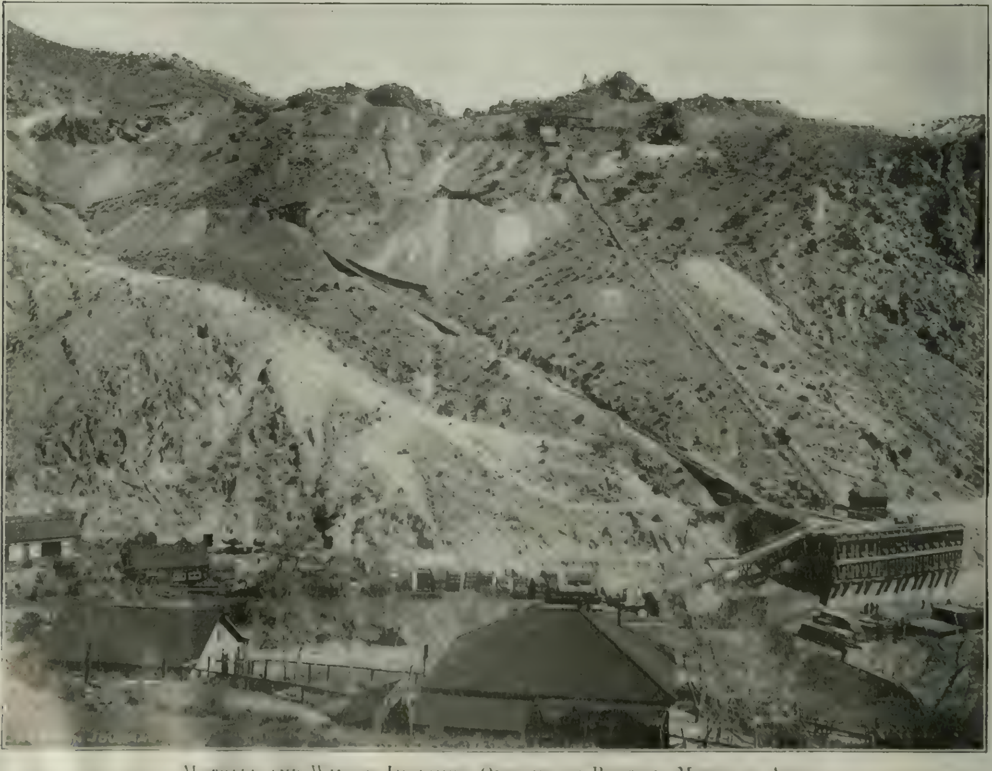
# PHOTOGRAPHS FROM THE FIELD



Gold from California and from Alaska

From Mineral Slide mine, near Magalia; weight, 10 oz. worth $183; found Aug. 2.

From Discovery claim, Chathenda Creek, 200 oz. worth $3200 brought to Dawson, July 23.



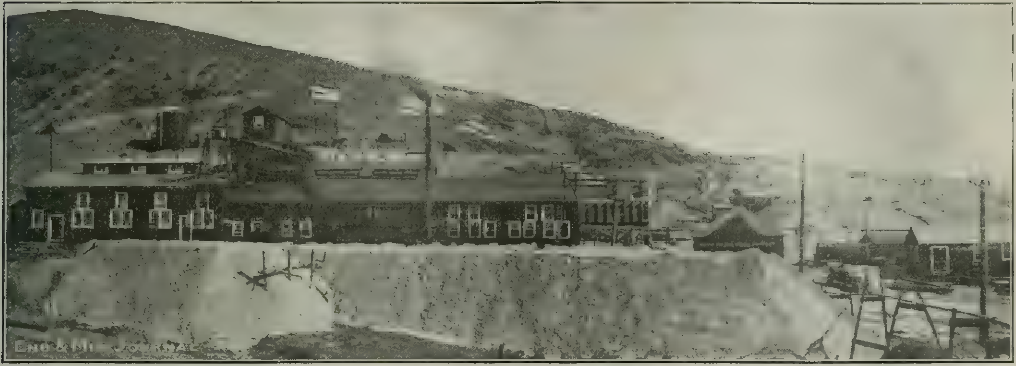
Metcalf and Wilson Inclines, Orebins at Bottom, Metcalf, Ariz.

Reduction Works at Great Falls, Mont.

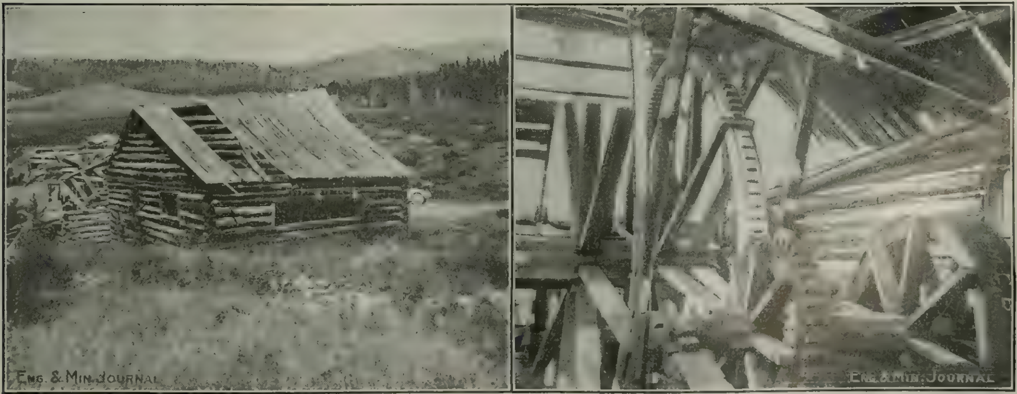
View taken from opposite side of the Missouri River. In the center of the picture the 220-ft. chimney is shown standing beside the newer 506-ft. stack.

High Ore Mine, Butte, Mont.

In the shaft, copper glance was lately encountered at a depth of 3270 ft., the deepest occurrence of that mineral ye known at Butte.



Butte & Duluth Leaching Plant, Butte, Mont.



The Old Cameron Stamp Mill, Near Philipsburg, Mont.

At the left, view outside of the building; at the right, view of part of the interior, showing especially the driving machinery (water power). The building is wholly a construction of logs and in the interior most of the parts, moving and otherwise, are of wood. The mill dates back to the '60s. It is one of the historic mining relics of the state. Steps ought to be taken to preserve it.

# Experiment in Smelting Titaniferous Magnetite

By L. O. Kellogg

A real test on titaniferous magnetite will be run early in the coming year; it is planned to smelt 30,000 tons of the Adirondack high-titanium ores. The McIntyre Iron Co. owns what is probably the most extensive and richest deposit of this nature in the Adirondack region, at Tahawus some 30 miles north of North Creek, the end of a branch of the Delaware & Hudson. The company already has ordered or has delivered on the ground sufficient machinery for erecting a separator capable of treating 24 tons of crude ore per hr. This material will average about 49% iron and about 20% titanic acid. With the magnetic separator it is planned to take out the magnetite proper and discard the nonmagnetic ilmenite so as to obtain a product running between 56 and 60% iron and 9 to 12% titanic acid. This concentrate will be transported to North Creek by logging locomotives of the caterpillar type, hauling trailers over the snow, and thence be taken by rail to Port Henry on Lake Champlain. The McIntyre company has there leased the local furnace for a sufficient period of time to permit of the completion of its experiment.

The method of work will be to begin with a mixture of the titaniferous concentrate and ordinary magnetite, in the ratio of about 1:7, and increase the proportion of the refractory material until it is no longer possible to smelt. Just how high a ratio can be handled is a question, but it is a fact that slags running as high as 4 or 5% titanic acid are not uncommon, and it seems reasonable to suppose that this can be substantially increased when the matter has been studied.

It is interesting to note what has been done along this line previously. At the Tahawus deposit between 1843 and 1857 there were built three charcoal furnaces. The last of these, still standing, is a substantial structure of stone, lined with firebrick and sandstone, 42 ft. high with a 3½-ft. hearth and a 9-ft. bosh. This furnace ran for 18 months, and during that time must have smelted a considerable amount of ore, but just how much and what the results were, is unknown, since all records have been lost. It is known, however, that part of the product was used to make crucible steel. Rather recently the owners of the Tahawus deposit sent 700 tons of the crude ore to the Bethlehem Steel works, and as a result were offered a contract for 3,000,000 tons, which, however, they did not feel like accepting because of certain contingent conditions. It would appear, however, that the Bethlehem company was sure of its ability to smelt such ores. It is stated that some time ago the Colorado Steel & Iron Co. by mistake bought some 10,000 tons of titaniferous magnetite, which was piled for discard when its true nature was discovered. However, a mistake was made in the weight of another lot of ore of entirely different nature, which ran a number of tons short when cleaned up. In order to take care of the discrepancy, the furnace man ran in the titaniferous material, and so far as known no difficulties were encountered. The work of [illegible] smelting titaniferous ores is well known, and it is an unquestionable fact that he made a good fluid slag and a good quality of iron.

The commercial possibilities of this smelting, however, are not yet known, and it is this that the McIntyre company intends to investigate. Nor is it bothered by the fact that in so doing it is pulling the chestnuts out of the fire for the other owners of titaniferous magnetite deposits. It seems to be the general consensus of opinion that the value of the deposits in the Adirondacks has been exaggerated. It is hoped to ship the residue from the separating operation, which will be high in titanium, to Niagara to make ferro-titanium; but under present conditions only a limited amount of this material can be absorbed.

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# Gold and Silver Production in 1912

The Director of the United States Mint has issued his corrected figures for the production of gold and silver in the year 1912. In the preliminary estimate given in the Journal for Jan. 11 there was necessarily some uncertainty in the apportionment to the several states, though the totals do not differ largely. As is usually the case, the corrected totals are somewhat higher than the preliminary estimate. The corrected figures for two years are given in the accompanying table.

GOLD AND SILVER PRODUCTION

| | Gold, Value | | Silver, Fine oz. | |
|---|---|---|---|---|
| | 1911 | 1912 | 1911 | 1912 |
| Alabama | $18,400 | $16,400 | $200 | $200 |
| Alaska | 16,665,200 | 17,198,600 | 468,300 | 539,700 |
| Arizona | 3,521,400 | 3,785,400 | 3,228,900 | 3,445,500 |
| California | 19,928,500 | 20,008,000 | 1,270,900 | 1,384,800 |
| Colorado | 19,138,800 | 18,741,200 | 7,331,200 | 7,933,100 |
| Georgia | 32,000 | 10,900 | 600 | 200 |
| Idaho | 1,357,900 | 1,401,700 | 8,184,900 | 7,862,900 |
| Illinois | .......... | .......... | 4,000 | 1,800 |
| Maryland | 100 | 1,200 | 100 | 700 |
| Michigan | | | 507,700 | 543,500 |
| Missouri | | | 49,100 | 30,000 |
| Montana | 3,649,700 | 3,707,900 | 12,163,900 | 12,524,000 |
| Nevada | 18,096,900 | 13,575,700 | 13,185,900 | 13,851,400 |
| New Mexico | 761,700 | 754,600 | 1,341,400 | 1,460,800 |
| North Carolina | 71,900 | 156,000 | 1,000 | 2,300 |
| Oregon | 634,200 | 759,700 | 44,800 | 54,000 |
| South Carolina | 20,100 | 15,400 | | |
| South Dakota | 7,429,500 | 7,823,700 | 200,300 | 205,800 |
| Tennessee | 11,900 | 11,500 | 107,000 | 112,000 |
| Texas | 3,900 | 2,200 | 444,200 | 379,800 |
| Utah | 4,486,200 | 4,312,600 | 11,630,600 | 13,076,700 |
| Virginia | 3,100 | 300 | 200 | 700 |
| Washington | 840,000 | 682,600 | 230,300 | 350,800 |
| Wyoming | 21,300 | 24,300 | 700 | 300 |
| Continental U. S. | 96,692,700 | 92,989,900 | 60,396,200 | 63,761,000 |
| Philippines | 195,350 | 461,608 | 3,100 | 5,800 |
| Porto Rico | 2,000 | | 100 | |
| Total | 96,890,000 | 93,451,500 | 60,399,450 | 63,766,800 |

There was a decrease of $3,438,500, or 3.5%, in the total gold production, which was due to the falling off of $4,521,200 in Nevada. In most of the other states the output was well maintained. The leading gold producers in order were California, Colorado, Alaska, Nevada, South Dakota and Utah.

In silver production there was an increase over 1911 of 3,367,400 oz., or 5.6%. The gain was pretty generally distributed, the only prominent increase being 1,446,100 oz. in Utah. The leading producers in order in 1912 were Nevada, Utah, Montana, Colorado, Idaho and Arizona.

In our insular possessions the Philippines show an appreciable increase in gold, mainly from dredging operations. Porto Rico, which produced a little placer gold in 1911, dropped out altogether last year.

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# Reported in New York

It is rumored that the American Smelting & Refining Co. is going into the zinc-oxide business.

# CORRESPONDENCE AND DISCUSSION

## Social Conditions in the Black Hills

The fact that Lead, S. D., where the Homestake mine is situated, is the see of a Roman Catholic bishop, has been brought before the public since the recent Milwaukee meeting of the Federation of Catholic Societies. Bishop Joseph Busch there made some statements regarding conditions at Black Hills mines which anyone familiar with the district will recognize as totally at variance with the actual state of affairs. Many of them were absolutely untrue, while in others the truth was so grotesquely distorted as to be unrecognizable. The most charitable explanation would be the suggestion that the prelate had been misinformed, but a residence of nearly three years in Lead ought to have been sufficient to put him in possession of the facts in the case.

Locally these statements were at first received as a joke, but when they were printed in various prominent newspapers, and given a wide circulation as the words of a dignitary of the church, amusement gave place to indignation, and the citizens of Lead prevailed upon the mayor to call a mass meeting for the purpose of protesting against such misrepresentation. That this indignation is shared by many members of the good bishop's flock is evident from the fact that one of the clergy resigned in protest at his utterances, and that many of the congregation attended the mass meeting, at which many hundred citizens of all creeds and nationalities were present. After several speeches, a set of resolutions was introduced, denying and condemning the statements attributed to the bishop, and expressing entire satisfaction with the existing conditions at Lead. After one of the leading Catholic citizens had suggested a slight correction, the resolutions were adopted unanimously. A letter of protest, addressed directly to the bishop by the Roman Catholics of Lead, and requesting him to deny the alleged statements, was also made public through the local papers.

The principal bone of contention has been the observance of the Sabbath at the mines and mills. All saloons and picture shows in Lead and Deadwood have been closed on Sundays, but labor has gone on as usual in the mines, except for one shift on the alternate "change Sundays"; baseball games have been a most popular form of Sunday amusement at the municipal park. To both the latter the bishop objected. As a matter of fact, those men who wished to lay off on Sundays in the Homestake mine have for many years had the privilege of doing so, provided due notice were given to the shift boss, but comparatively few have availed themselves of the privilege. Last year the experiment was tried of closing the mine entirely for several consecutive Sundays, but a great majority of the miners objected vigorously to the innovation, and the former system was resumed and is still in vogue, namely, working only one shift on alternate Sundays (change days), there being two 8-hr. shifts on every other day.

It may be added that the fact that nearly 10% of the present Homestake employees have worked for that corporation for over 20 years is not an evidence of their being "practically enslaved," but is a result of their being satisfied with their jobs, and of the policy of not "firing" men who have grown old in the service. A large number of these men own their own homes, and many own other property, Pacific Coast lands and Homestake mine stock being favorite investments.

The free kindergarten and library maintained by Mrs. Hearst, the free hospital system, the recreation building now being erected for Homestake employees and the "aid fund," bear testimony to the interest taken by the company and stockholders in the welfare of the people; while the local banks, carrying nearly $2,000,000 in deposits, are evidence of some degree of material prosperity among the mine workers.

A HOMESTAKE EMPLOYEE.

Lead, S. D., Sept. 8, 1913.

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## Miners' Strike on Vancouver Island

Some of the statements relative to matters connected with the strike of coal miners on Vancouver Island, British Columbia, published recently in the JOURNAL, are incorrect; others are incomplete.

On Aug. 30, the JOURNAL stated, in part, that:

> At Extension eight buildings, including the tipple and approaches to the mine, are reported burned, also three big motors, 35 cars and considerable equipment. One of the slopes of the mine is on fire, but the fire broke out before the riot.

The only valuable building burned was the superintendent's residence; other buildings destroyed were miners' houses, small and of little value. The tipple was not burned, only the approaches to the mine. No equipment was destroyed other than the electric locomotives and mine cars. There was not, nor is there, fire in one of the slopes of Extension mines.

"At Nanaimo they closed up the office of a newspaper." The *Nanaimo Herald* suspended publication for two days only, as a consequence of violence threatened by strikers.

> Since the strike commenced the Cumberland mines have been operated by the aid of Chinese miners, but fearing race riots, these men are reported to be quitting work. The disturbance is likely to lead to an investigation of the unionists' grievances, which the coal companies have been avoiding and which the provincial government has hitherto refused to grant.

As to Chinese miners—if one will refer to the "Annual Report of the Minister of Mines for British Columbia," 1912, p. K246, he will find a table showing the "number of hands employed" in the Coast collieries for the year, namely, 4720, of which number 4090 were employed at Vancouver Island coal mines, including: Japanese; miners 55, laborers 62; total 117. Chinese: miners 85, laborers 537; total 622. Total Orientals, 739, against 3351 whites, the latter including all white employees of the companies. It should be noted that 416 of the Orientals were employed above ground and but 232 underground, and of the latter 183 were laborers. Prior to the strike the white miners employed the Oriental laborers underground. Five years ago—in 1908—there were employed at Vancouver Island collieries 864 Orientals out of a total of about 3160 hands; ten years ago—in 1903—there were 865 Orientals out of a total of 2993 employed; twenty years ago—in 1893—there were 112 men employed at the Comox (now Cumberland) mines, and of them 150 were Orientals. It will be seen then that the employment of Orientals at Vancouver Island coal mines is by no means a new departure. It is true that there are now both Chinese and Japanese certificated miners, but there is no law in force in British Columbia, nor has there been, debarring Orientals from mining coal underground after they have passed the examination prescribed by law.

Then as to the investigation of the strikers' grievances—no specific charge has as yet been made by the strikers, nor the agitators who pose as their friends, of any breach of the Coal Mines Regulation Act—only indefinite allegations. Without doubt the provincial Department of Mines will prosecute whenever a specific charge be made of any offense under the act. The government, however, has persistently refused to be made a cat's paw of to settle an industrial dispute. There is a Dominion Industrial Disputes Act, and the Department of Labor at Ottawa is the proper department to go to if it be desired by the strikers that a Board of Investigation be appointed, and that is well known to the strikers and the agitators claiming to speak for them. It is probably quite true the provincial government has refused to grant an investigation, labor disputes not being under its jurisdiction; it is also true that the strikers have not taken the proper steps to secure a full investigation by the Dominion government, though it has all along been open for them to make the usual application for appointment of a Board of Investigation, as provided for by Dominion law.

Finally on Aug. 30 an editorial note was published as follows: "Later advices state that some of the mines are resuming operations, recognition of the union having been conceded." One small company, which in 1912 employed an average of 187 men and produced 88,253 tons of coal, has given in to the United Mine Workers of America. It first told two large companies that if they would lease or sell it some of their coal lands (it has less than 50 acres at Jingle Pot containing coal) so as to prolong its working life, it would stand out with them; if not it would give in to the union. Its conditions were not conceded by its big neighbors, so it accepted the union's terms. The companies that continue to refuse to come to terms with the U. M. W. of A. together employed an average of 3903 hands in 1912 and produced 1,169,955 long tons of coal.

Now as to the incorrectness of the JOURNAL'S news of Sept. 6. The statement that "the Western Fuel Co. is expected to make a similar settlement with its employees" to that made by the Jingle Pot owners is quite at variance with fact so far as the company is concerned. It persistently declines to have any negotiations with the U. M. W. of A. Neither is it true that "about 200 unionists at Cumberland have left, which will reduce still further the limited output which the Mackenzie & Mann mine at that place has been making." The JOURNAL has been misinformed. No such number of men have left the Cumberland mines since the militia was sent to quell the rioters. For several days at the end of August the average output of coal was rather above 2000 tons. Even on Sept. 1, Labor Day, it was about 1900 tons. On Sept. 8, 2290 tons was produced, and on Sept. 10, 2287 tons; the average for the six working days to Sept. 10, inclusive, was 2014 tons. The general average when conditions were normal, before the strike, was only about 2100 tons. Nor has the proportion of Oriental labor employed recently been appreciably larger than in past years.

Victoria, B. C., Sept. 11, 1913. E. JACOBS.

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## A Home-Made Acetylene Lamp

It is hard to understand the whyfor of the lamp described by A. Livingstone Oke, in the JOURNAL, Sept. 6, 1913. The consumption of so much ingenuity untempered with common sense seems a pity. Heaven knows, the commercial acetylene lamps are bad enough, but their faults lie not so much in their design as in their deplorably flimsy construction. This home-made lamp on the other hand, seems to have been worked out without regard to the purpose for which it is to be used. Thus there is no provision whatever for filtering the gas. Anyone who has used an acetylene lamp knows very well what hob will be raised by a small particle of dirt in the burner. Again, it would take extremely little tipping to spill so much water that that remaining would not have sufficient head to enter the carbide chamber. In the third place, the burner in the center of the top of the lamp casts its light exactly where it should not, namely, in the eyes of the operator, and casts a heavy shadow just where light is wanted, namely, on the bottom. Finally, not only does the manufacture of the lamp involve a large number of soldered joints, a thing which should be avoided, so far as possible, but it would cost, made up in small quantities in a mine shop, several times the price of a better commercial lamp.

New York, Sept. 8, 1913. ROBERT OLDS.

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## Measurement of Crushing Efficiency

In the JOURNAL of Aug. 23, you comment on the "Measurement of Crushing Efficiency" and say that A. O. Gates advanced a basis for calculations other than that proposed by Stadler and Del Mar. Professor Gates, after extensive testing, came to the conclusion that Rittinger's law, rather than Kick's, applied to crushing, in other words, the work done in crushing was proportional to the reduction in diameter. Now, what I propose is that every mine or mill manager who can possibly do so, will send to the JOURNAL the following data on all crushing machines used in their mills:

(1) Name and make of machine.
(2) Screen analysis of feed.
(3) Screen analysis of material after being ground.
(4) The amount of material ground per unit of time.
(5) The power consumed per ton of ore.
(6) The means taken to arrive at this data.

If the JOURNAL will print all answers, it will have taken the most direct step toward solving this problem.

ALGERNON DEL MAR.

So. Pasadena, Calif., Sept. 2, 1913.

# EDITORIALS

## Smelting at Miami

It is reported that the International Smelting and Refining Co. will build a smelting plant of about 270,000 tons annual capacity in the Miami district, especially for the treatment of the Inspiration and Miami concentrates. Those two mining companies will nearly supply a smelter of such capacity. This will be a logical development, being indeed one of the things urged when the Miami-Inspiration consolidation was being considered. The Miami concentrates by themselves lack sufficient iron for economical smelting and have to be shipped to Cananea, far away, whence the blister copper has to be lugged back over about the same road. On the face of things this is an economic crime, though under conditions still existing it is inevitable. The Inspiration concentrates probably will be better off in iron, and with them as a nucleus smelting at home will be possible. Presumably the Miami contract with the Greene company will be transferred. The recent concession that Miami is reported to have received, amounting to a saving of ½c. per lb. of its copper, may have something to do with this matter.

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## Mine Taxation

The tax gatherer is an official from whom but few persons are exempt, and no corporation. The taxation of mines is a peculiarly complicated problem for reasons so well known that we do not need to restate them. The mine owner is probably no more desirous of being a tax dodger than any other honest person, but no more is he desirous of paying more than his share of running the government, including the political waste, etc.

Mine taxation has recently been a very live subject in several states, including Michigan, Colorado and Arizona. Now it is one of the questions of the day in Montana, where the Anaconda company appears to feel that it is marked for extortion. The newspapers quote a statement by this company that from 1903 to 1913 inclusive the Anaconda and North Butte companies have paid $2,001,504 in taxes in the state on net proceeds of the mines alone valued at $83,053,068. This is about 2½% on the net output. Anaconda's assessed valuation this year is $26,550,000 and its tax in Silver Bow county alone is upward of $350,000. These are big figures, but it is a big company.

Compared with the rate of taxation in the City of New York, where nearly 2% is paid on valuations at 100%, the Anaconda does not seem to be badly off, but of course it does not get the returns in the shape of luxuries that the New Yorker does. Indeed we do not fancy it gets much of anything besides police protection, and the services of the courts when needed. It can not distribute its taxes among other persons in the form of rentals, etc., but has to pay the whole out of its own pocket, i. e. out of the pockets of its stockholders, most of whom live in other states.

However, the whole subject of taxation, whether it be of real estate, personal property, or incomes, is one of the most complicated and perplexing of all socialogical and economic problems. We shall not set out to discuss it lightly.

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## The Census Bureau

The letter from our Washington correspondent on another page informs us that the new director of the census, William J. Harris, has appointed a commission to take into consideration the present condition of the statistical bureau of the work. Besides several officers and former officers of the bureau, this commission includes Prof. Walter F. Willcox, of Cornell University. The object is first to consider some plan for completing the unfinished work of the thirteenth census and secondly, to arrange, if possible, for the better organization and administration of the bureau. The former is naturally the most pressing subject of consideration. The law required that all of the work in connection with the thirteenth census should be finished by July 1, 1912, but considerably over a year has elapsed since that time, the work is still unfinished and the regular annual reports with which the bureau was expected to supplement the information collected in the decennial census, have been seriously delayed and in fact have not been completed at all. We need hardly say that the value of the information collected in 1910 and of the supplementary work to be done each year depends largely upon the promptness of completion and publication. Only a short time ago, it seemed as if the work of the thirteenth census would hardly be fully accessible until it was time to make preparations for taking the fourteenth. The new director, however, seems to appreciate the situation and its requirements, and is preparing to bring the bureau under his charge into better condition, and this is a hopeful sign.

Two or three years ago, we heard a great deal of the elaborate card systems devised for compiling the information gathered and of the new and extraordinary machinery which was to be used in preparing this information for tabulation and publication. To judge by the results so far attained, the system and the machinery have been failures, and there is no sign that the work has been done by them more promptly or more correctly than by the agencies employed in previous years. It is quite possible, however, that the defects may have been as much in the manner of using these agencies as in the system itself. The latter is most probably the case; at any rate, it seems to need some investigation, and we think that the public has a right to know why the supposed valuable information, which was collected in the rough, over three years ago, should be still unattainable in concrete form.

One of the departments, or branches, of the census which is still far from finished, is that of mining and quarries. In order to complete this at the earliest possible moment, the commission recommends that the further work on this branch be abandoned at once and that the tables thus far completed be brought together and published, constituting the final report on this subject. This is probably the best that can be done at the present time.

Without saying anything about the methods of collecting the statistics on the mining industry—to which we have heard serious objections made—it is certainly very much to be regretted that nothing so far has come of all the work done three years ago. The publication of a mass of statistics, which are now promised by the end of the present year, and which relate to the mining industry of 1910, will be of very little actual use or benefit at a time when the substantially correct figures for the same industries for 1913 will be almost ready and when those for 1911 and 1912 are beginning to be almost ancient history. It is too late now to worry much about the figures of the thirteenth census beyond hoping that they may be nearly enough correct to afford some basis for a comparison. It is sincerely to be hoped that Director Harris and his commission will devise a practicable plan for expediting the fourteenth census. Surely if the bureau is put on a practical business footing, we may hope for better and prompter work in the future, and we think that all concerned should be willing to help in bringing about that result. The first step, however, will be to eliminate the political element as far as possible, and to reorganize the bureau into a real working force.

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## Transvaal Gold and the Strike

The effect of the miners' strike on the Witwatersrand upon the gold production was hardly as great as might have been expected. Nevertheless, there has been a perceptible falling off in the last three months. Up to the end of May there was a good increase over last year, and the maximum production of 794,306 oz. was attained in the month of May; and this was an increase of about 15,000 oz. over the corresponding month in 1912. In June, there was a decrease from May of 47,259 oz., the total production being about 6000 oz. less than in June of last year. The lowest point was reached in July, when the total output was only 655,389 oz., the smallest recorded for many months and 111,000 oz. less than last year. In August, production rallied to a total of 728,096, which is still 36,641 oz. less than a year ago, but shows a sufficient gain over preceding months to point to further improvement.

The changes were entirely in the Witwatersrand, the outside districts of the Transvaal, showing a pretty steady continuous production running not far from 30,000 oz. a month. The total gold production for the eight months, ended with August, was 6,023,906 oz. this year, against 6,073,982 in the corresponding months of 1912. The decrease of 50,076 oz. will probably be made up in the closing months of the year, but the gain in 1913 over 1912 will undoubtedly be very much smaller than the advances shown in the last three years.

The strike seems to have had some unfavorable effect on native labor, for during the month of August there was a decrease of 17,392 in the number of native laborers employed.

## Notes on Copper

There ought not to be any great mystery, respecting the importation of standard copper from England by American refiners. A large part of the copper reported in the European stock is nothing but furnace material, which must be refined in one place or another. Ordinarily it is refined in Europe, but American refiners have bought it and brought it hither for refining in the past and consequently have not lately been inaugurating any new thing. For a long time it has been hoped that there will be more of this kind of trade and some reason to expect it, American refiners being preëminent in their branch of metallurgy. This particular business is, of course, wholly a matter of dollars and cents. The interruption of copper production in Mexico, especially because of the cutting of railway lines, has reduced the supply of crude copper to a considerable extent. Cananea, Moctezuma and Aguascalientes are running well up to their capacity, but not fully, while on the other hand Tezuitlan and some of the smaller producers are idle. All told, there may be a deficiency of several million pounds per month in the Mexican supply.

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## Measurement of Crushing Efficiency

The somewhat incomplete condition of the argument referring to systems of measuring and comparing crushing efficiencies has already been mentioned in these columns. On another page we publish a communication from Algernon Del Mar, who suggests a comparison in the JOURNAL, each operator to furnish data of his crushing machines and their work. It appears to us that this suggestion is practical and valuable. The columns of the JOURNAL are always open to this kind of helpful discussion and we hope that the suggestion will be followed.

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The injunction against the Western Federation of Miners, which is now restrained in Houghton county, Mich., from "interfering with, molesting, or disturbing" in any manner the employees of the mining companies will probably break the backbone of the strike. Even if this turns out to be the case, however, it will be many months before the several mines can regain their normal rate of production, very likely not before next spring. Mines have had to be allowed to fill with water, organizations have been disrupted and miners have migrated to other districts, whence they will not easily be drawn back. After a long drawn out strike, there is usually a shortage of labor, whichever side wins, and the coming months of Lake Superior will without doubt bear out the experience elsewhere in the past.

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The New York labor commission has wisely decided to go more slowly in the adoption of new rules and regulations governing mining and quarrying, and consequently postponed the hearing which was scheduled for Sept. 17. New York certainly needs a revised code, but while the authorities are about it they will do better to get a very good one instead of one that is only pretty good. However, they are now proceeding with the right spirit.

## BY THE WAY

A recent story in the *Saturday Evening Post* talks about the "school of mines at Boulder." Colorado papers usually placing the University of Colorado at Boulder and the C. S. M. at Golden, please note and resolve to lead a better life.

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"One of the greatest discoveries of science displayed at the International Congress of Refrigeration in Chicago, is that of Dr. Kamerlingh Onnes, who has been making researches into the uses of liquefied gas," says the New York *Sun*. "It is announced that he has produced a temperature of 426 degrees Fahrenheit below zero, within 2 degrees of absolute zero, or the point of absolutely no temperature. With a liquid gas of that temperature, it is declared, the composition of atoms may be determined, and metals lose their electrical resistance, so that minute wires could carry any distance all of the electrical power generated by Niagara Falls." Quite so, and it would appear that the editor's science was nearer to absolute zero than two degrees.

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A prominent Irish mine official in Pennsylvania, whose early education was deficient, but who has made good through the use of great natural intelligence, good judgment, and quick wit, has under his jurisdiction a large mine opened by a shaft, says the *Colliery Engineer*. Some time ago the heavy oak collars originally put in at the foot of the shaft required replacement, and it was decided to use steel beams instead of timber. The mining engineers were busy calculating the size of beams required, and incidentally asked Jim a few questions regarding the condition of the strata to be supported. Finally Jim asked, "What are you doin'?" "Calculating the size of steel beams necessary to replace the oak collars," was the reply. Quick as a flash Jim asked, "Didn't the oak collars hold the load for over 20 years?" "Yes," was the reply. "Thin, what the h— is the use of calculatin', why don't you spicify bames of the same strength?"

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The new crystallography, which, within a few months, has developed into a demonstrated science, is among the most striking of recent achievements. Reviewing the details of progress in a Royal Institution lecture, Dr. A. E. H. Tutton showed the overwhelming evidence that the crystal is a homogeneous structure, made up of simple or complex molecular units that may be considered as points, and of "space-lattices," that may be conceived as unit cells or bricks with imaginary lines in three directions connecting similarly placed points. All crystals prove to be based on eighteen space-lattices and 250 point systems. X-ray photographs of thin crystal sections reveal symmetrically arranged spots, which are reflections of similarly placed atomic points, and indicate the planes of the space-lattice. This has made it possible to obtain angular measurements for 10,000 substances. The descriptions and chemical relations of these have been brought together in a book by Professor von Groth, and Professor von Fedorow has prepared a tabulated reference index for use in crystallo-chemical analysis.

The embers of nearly extinct fires sometimes burst into a last fitful flare. Such happened in Congress, a few days ago, out of the ashes of the silver question. It had developed that the language of the pending currency bill cast a shadow of doubt upon the integrity of the gold standard. Consequently an amendment reaffirming the latter was introduced. Immediately the wild men of Congress rose in rage. A howl reverberated through the hall of the representatives. That eminent economist, Mr. Witherspoon, of Mississippi, charged that the amendment was a "dirty goldbug trick." Mr. Wingo, the distinguished financier, from Arkansas, condemned the amendment as a "useless, childish, futile sop to Wall St." Then someone arose and said that he had talked with Mr. Bryan, and Mr. Bryan approved the measure. A riotous laugh spread over the House. The commitment of William Jennings Bryan to the single gold standard was too much for their overworked risibilities. Opposition subsided except from a gentleman whom the Washington correspondents call "Alfalfa Bill," and the resolution was adopted by a vote of about three to one.

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The estate of the late Peter Kimberly recently paid to W. T. Bailey, of Duluth and Virginia, Minn., $60,000 for five acres of land in Virginia, on the Mesabi range, and thereby hangs a story about the well known Pennsylvania mining man. Mr. Kimberly was a resident of Sharon, Penn., and he left an estate estimated at $11,000,000, a large part of which was won by mining operations and iron land deals on the Mesabi range. One of his transactions was with the Interstate Iron Co., a Jones & Laughlin company, and involved the transfer, among other valuable ground at Virginia, of a certain "40" at the edge of the city and close to the mill of the W. T. Bailey Lumber Co. Five acres of the land within the "40" was owned by W. T. Bailey. In his deal with the Interstate Iron Co., Mr. Kimberly was bound to deliver the land clear of any other claims, and he went to Mr. Bailey for a price on the five acres. That was 14 years ago. Mr. Bailey asked $11,000, and the price was accepted, but Mr. Kimberly was a busy man and neglected to pay for the land. Mr. Bailey met him in the Grand Pacific in Chicago a year later. "I will send you a check at once, when I get home," said the mining magnate, and of course he intended to. A year passed and the two men met again. The conversation was much the same as before, and then another year passed and still Mr. Kimberly neglected to close for the five acres. More time elapsed and Virginia was growing. Mr. Bailey advanced the price to $20,000. Mr. Kimberly found no fault with that, but still neglected to close for the land, and then he died rather suddenly. The administrator was given an opportunity to buy at the same price. There was some more delay, for this was a big estate and involved a bewildering mass of transactions and detail. The last time Mr. Bailey gave an option to the administrator it was for $20,000, and to advance in price $1000 per month until the deal was closed. This was a verbal option, and it was 32 months before the estate finally exercised it, and Mr. Bailey received $60,000 for the property in the end. Allowance was made for interest on the long pending deal, which eventually turned out to the advantage of the lumberman.

# Work of the Census Bureau

Washington Correspondence

The consulting committee lately named by Hon. William J. Harris, the director of the Census, and consisting of Hon. S. N. D. North and Hon. William B. Merriam, former directors; Prof. Walter F. Willcox, of Cornell University; Mr. W. S. Rossitor, formerly chief clerk of the Census, and Hon. Daniel C. Roper, first assistant postmaster general, and formerly an official of the Census Bureau, as special agents of the bureau to make studies of the present condition of statistical work, including particularly the unfinished work of the thirteenth census and plans for the better organization and administration of the bureau in connection with future annual and other inquiries, after several days' work occupied in inquiry and studies concerning the various problems assigned to them, has rendered a preliminary report which makes special recommendations as to mining.

It immediately became evident to these investigators that the problems before them in the bureau had best be treated in two separate divisions; first, and most pressing, the disposition of the much delayed work from the thirteenth census; and second, the plan for the future conduct of the bureau. The investigations thus far have been directed at the first division of the problem, namely, the overhanging work from the thirteenth census, and the following recommendations embodying the findings of these experts, have been submitted to the Director of the Census:

In pursuance of the instructions of the Director of the Census we have made a special study of certain branches of the statistical work in the bureau and in submitting the recommendations hereinafter enumerated we have had regard to the following conditions of facts:

(a) That the act authorizing the taking of the thirteenth and subsequent censuses requires that the reports of that census shall be completed and published on or before July 1, 1912; (b) that although three and one-half years have now elapsed since the enumeration, much of the thirteenth census work is still uncompleted; (c) that the regular annual reports and other work of the intercensal period have been greatly delayed because a large body of census clerks is still employed upon the delayed work of the thirteenth census; (d) that the value and usefulness of the annual and other reports required by law are largely dependent upon the promptness with which they are compiled and given to the public; and (e) that current appropriations are required for the purposes for which they are made

We, therefore, advise the Director to begin no new tabulations or analyses in connection with the unfinished branches of the thirteenth census namely, "Population" and "Mining and Quarries," and to readjust the work of those branches and on the delayed annual reports so as to insure their publication not later than Dec 31, 1913

To this end we submit the following recommendations:

(1) That the proposed second machine run of the cards for tabulating occupations be abandoned, thus expediting the time of production by about six months and reducing the cost of finishing that branch of the work by about $65,000; and that the tables yielded by the first run of cards be printed without derivative tables or text These tables give the number of persons of each sex in each occupation and classify them by race, nativity, and parent nativity, and five age periods, thus insuring the publication of the primary population or occupational data as reported at previous censuses

(2) That the report upon native tongue be limited to the chapter to appear in the forthcoming final volume on population.

(3) That the tables relating to "Mines and Quarries" now in the form of printed bulletins, proofs, or manuscript be sent to the Public Printer at once, the same to constitute the final report on mines and quarries, and that no further tables [illegible] or text be prepared in connection with that report

(4) That tables for the benevolent institutions, and for the institutional population, namely—prisoners, insane and feeble-minded, and paupers be prepared and published without percentage or other derivative tables and without analytical text.

(5 That the annual compilation of the statistics of forest products be abandoned. There appears to be no authority of law for an annual inquiry of this character, which the records show to have cost from $20,000 to $40,000 per year.

(6) That the annual report on the financial statistics of cities for 1912 be completed and published by Jan. 1, 1914, by curtailing the amount of detail to be included; that the schedules and report for 1913 be similarly curtailed; that the reports for the years 1912 and 1913 be printed without text, except such as is necessary for explanation and definition; and that until the annual reports on the financial statistics of cities are brought up to date, no attempt be made to prepare a report on general municipal statistics. This recommendation is based on the fact that delay in the compilation and publication of the annual municipal reports detracts seriously from their value.

(7) That the reports on mortality statistics for the years 1911 and 1912 be published before the close of the present calendar year. To make this possible, the text of these reports should be reduced to a minimum or omitted, the tables condensed, and no effort be made to publish a report on births until the mortality reports are published.

(8) That work upon the standardization of death rates, life tables, and occupational mortality be suspended until the above reports have been published There is no reason why the mortality report for each year should not be compiled and published prior to the close of the succeeding calendar year.

(9) That in view of the emergency presented by the delay in completing the thirteenth census the Director request the Secretary of Commerce to lay the matter before the President with the view of securing his instructions to the Public Printer to give precedence so far as practicable to the remaining publications of the thirteenth census and the long overdue annual reports.

Having made these recommendations, the special agents will now severally give their attention to the various questions submitted to each of them by the Director of the Census, and prepare further memoranda for his consideration at an early date.

It is probable that the inquiries of these census experts into the most important but least pressing subject; the organization and administration of the Bureau in connection with the present and future work and the statistical reports to be taken up during the remainder of the present decade will be the subject of another series of recommendations, to be made to the director within the next 30 days.

### Director Harris to Follow Experts' Advice

The businesslike and effective manner in which Director Harris has taken hold of the census problems inspires hope for extricating the Bureau from the deplorable condition in which the conduct of the thirteenth census work involved it. The group of experts which he has appointed to collaborate with him in working out present census problems and in outlining the future plans of the bureau are thoroughly conversant with census work as shown by their preliminary report. Their recommendations appear radical but it is evident that the conditions require radical treatment. Director Harris states that the recommendations of these special agents will be followed by him and the census reports given to the public without further unnecessary delay. He also expresses the hope and belief that the studies and recommendations of these former officials of the Bureau will result in a great improvement in quantity and quality of the census work, accelerate the reduction of expenditures, while at the same time preserving all valuable and useful data collected for the thirteenth census.

# PERSONALS

**Rush M. Hess** has returned to Guayaquil, Ecuador, from Telluride, Colorado.

**Charles Kirchhoff** arrived in New York Sept. 8, after a sojourn in Europe of several months.

**J. N. Curtis**, of Tucson, recently examined properties near Kelvin, Arizona, in which he is interested.

**A. L. Flagg**, manager of the Kelvin-Sultana Copper Co. properties was in Douglas, Arizona, recently.

**Bradley Stoughton**, secretary of the American Institute of Mining Engineers, was in Denver, Colo., last week.

**A. J. Proctor**, who recently returned from Chile where he has been conducting drilling operations, is in Ray, Arizona.

**J. P. Hutchins** is visiting the copper and platinum regions of the Urals in Russia, on his return journey from Siberia to St. Petersburg.

**Ed Hiatt**, resident engineer of the Ray Consolidated Copper Co. has returned to Ray, Arizona, after a month's vacation spent in Chicago.

**Francis P. Bray**, who has been spending two months in Australia, is returning to London by way of Manila, China, Japan, and across Siberia.

**E. Norris Hobart**, engineer of the Mina Tiro General of the American Smelting & Refining Co., of Charcas, S. L. P., Mexico, will be in New York in the early part of October.

**J. D. Galloway** has been appointed acting assistant to the Provincial Mineralogist of British Columbia, and will do field work for the British Columbia Department of Mines.

**Edward H. Benjamin** has severed his active connection with the Joshua Hendy Iron Works, and will resume his former practice as consulting mining engineer in San Francisco.

**Henry H. Armstead** and **Alex Smith Cochran** from New York are in Guanajuato, Mexico, making an inspection of the Colmena Mining Corporation, and the Mexican United Co. properties.

**J. D. McDonald** has resigned his position as superintendent of the Ray Consolidated Copper Co.'s concentrator at Hayden, Arizona. He is succeeded by **D. D. Moffat** who comes from Utah.

**Ernest B. Rose** has been appointed secretary of the new safety department and labor bureau of the Republic Iron & Steel Co., at Youngstown, Ohio. A new office has been built at the plant to house these departments.

**James Duane, Jr.**, superintendent of the Pittsburgh Crucible Steel Co., Midland, Penn., has resigned, to take effect October 1. He has made a remarkable record with one of the largest single-blast furnace plants in the country on basic iron.

**C. B. Lakenan**, general manager of the Nevada Consolidated Copper Co., has been visiting New York, but has now returned to Nevada to meet Messrs. Hayden, Jackling and others who are making a general tour of inspection of the properties in which they are interested.

**N. Lilienberg**, Betz Building, Philadelphia, Penn., has been appointed sales agent in the United States for the Stora Kopparberg's Bergslag Aktiebolag, Falun, Sweden, operating the Domnarfvet works, manufacturing electro steel under the Kjellin process. The company is the oldest organized mining company in the world.

**Stanley C. Sears** has resigned his position as general manager of the Utah-Apex Mining Co. at Bingham, Utah, to date from Oct. 1. Mr. Sears expects to be married on Oct. 8 to Mrs. Robert Holmes Officer, of Salt Lake City. He will have his office as mining engineer in the National Copper Bank Building, Salt Lake City.

At the Liberty Bell Mine, Telluride, Colo., **W. H. Staver**, resident superintendent, has resigned. **C. A. Chase**, consulting engineer of the company at Denver, has been promoted to the position of general manager in place of **Arthur Winslow**, of Boston, who vacates that position for Mr. Chase, but will remain president of the company as heretofore.

Captain **Alfred Martin**, who for some time past has been assistant general superintendent for M. A. Hanna & Co., with headquarters at Virginia, Mesabi range, has been transferred to the Menominee range, where he will be general superintendent of the Crystal Falls mines of the company. Captain Martin has had 38 years' experience in the Lake S iron country.

**J. B. Clark**, formerly assistant general superintendent the Shoenberger works of the American Steel & Wi Company, Pittsburgh, has been made general superintendent of the Donora works of the company, succeeding E. Bayard, deceased. **C. C. Hill**, formerly assistant superintendent of the Shoenberger works, has been made general superintendent of that plant, succeeding Mr. Clark.

**Ed. Dedolph**, for some time engaged in the metallurgical laboratory at McGill University, Montreal, in connection with zinc ore reduction experiments, that have been conducted there under the direction of the Mines Branch of the Canada Department of Mines, is now in British Columbia, Dr. Haanel having arranged to continue the experiments at the electrothermic works, once operated experimentally by the Canada Zinc Co., at Nelson.

# OBITUARY

**William R. Davey**, of Lake City, Colo., died at Portland, Ore., Sept. 11, from pneumonia, following an operation for appendicitis. He was 39 years of age and a graduate of the Colorado State School of Mines of the class of 1898. For several years he had been in the Federal government employ, at first in the Forest Service in Colorado, and for the past four years as a mineral inspector for the General Land Office, in the First Field Division, embracing Oregon, Washington and Idaho.

**Dr. Hermann Credner**, emeritus professor of geology and paleontology in the University of Leipzig, organizer and director of the Royal Saxon Geological Survey, died July 21, at the age of 72. He was a graduate of the Clausthal School of Mines, the University of Breslau, and took his degree of Ph.D. at Göttingen. In his younger years he was at one time connected with the mining-engineering firm of Adelberg & Raymond, New York, as an assistant. He was a splendid lecturer and of an amiable disposition. His death is much regretted by a large circle of friends.

**Henry Barriohlet Kaeding**, who died in Los Angeles, Calif., June 12, from heart trouble, was born in San Francisco in 1877. His early education was obtained in the public schools. His technical education was, with the exception of a year at the California School of Mechanical Arts, and a few months with Frank Green, then city chemist, obtained through personal study. After four years in the lode mines of Amador County, and a year in the placer mines of Plumas County, he made an extended trip, in 1896, to the South Pacific Islands in a small schooner, exploring the Galapagos, Guadaloupe and other islands, and making extensive collections of the flora and fauna for the Smithsonian Institution. He was an authority on Western ornithology. In 1898 he went to Korea for the newly organized Oriental Consolidated Mining Co., and was one of the first to treat concentrate by cyanidation successfully. He had charge of properties in Mexico and for two years was in charge of the Siempre Viva Mining Co. of Nicaragua. He was a frequent contributor to the scientific papers, and was a member of the American Institute of Mining Engineers, the California Academy of Sciences, the Cooper Ornithological club, and other scientific societies.

The death of **James Ross**, a noted financier and railway builder, and for many years president of the Dominion Coal Co., occurred at his home at Montreal, Sept. 20, from heart disease. He was born at Cromarty, Scotland, in 1848, and came to America in 1870. After filling some important engineering positions in the United States, he went to Canada, where he was engaged for many years in railway management and construction. In 1883 he took charge of the construction of the Canadian Pacific Railway west of Winnipeg, and was afterward engaged in completing the portion of the line east of Montreal. Mr. Ross took up his permanent residence in Montreal in 1888, and in addition to giving his attention to railway enterprises in the West and South America, associated himself with Sir William Mackenzie, in the building of numerous electric street railways. In 1901 he founded the Dominion Coal Co., the presidency of which he held until 1910, when he disposed of his controlling interest. He was prominently connected with many other financial and industrial corporations, and though during the last few years he retired from active business, he retained the presidency of the Dominion Bridge Co., and the St. John Street Railway until his death. Mr. Ross was an enthusiastic yachtsman and took an active interest in many benevolent and educational institutions. He leaves a large fortune and is survived by one son, J. K. L. Ross.

Ray H. Webb, assistant general manager of the Southern Department of the American Smelting & Refining Co., in the city of [illegible], Mexico, died June 21, of appendicitis. Mr. Webb was born in Howell, Mich., Aug. 16, 1875. Afterward the family moved to Sioux City, Iowa, where his boyhood years were spent, and where he was educated in the public schools. He entered the Missouri School of Mines and Metallurgy at Rolla, Mo., in 1898, but on account of ill health, remained at the University two years. Leaving the School of Mines, he entered the employ of the old Consolidated Kansas City Smelting & Refining Co., at Argentine, Kan., but only remained there a short time, leaving to take a position at the acid works of the United Zinc & Chemical Co., also at Argentine. In January, 1904, Mr. Webb went to Aguascalientes, Mexico, as metallurgical chemist. Here his subsequent brilliant career was marked by a remarkable degree of energy and intelligence which received prompt rcognition by the management of the American Smelting & Refining Co. He was rapidly promoted to the position of chief chemist, then assistant superintendent, and finally, on on June 1, 1908, became superintendent of the Aguascalientes plant of the company. On Nov. 15, 1911, he was appointed assistant general manager of the Southern Department of the company, devoting himself principally to the metallurgical end of the business. Mr. Webb was married on Jan. 15, 1904, to Martha Murray Birkofey, of Tyler, Tex. The untimely end of so promising a young man is a great grief to all his numerous personal friends and business associates. He leaves a wife and two children, at present residing with his father, at Covina, California.

## SOCIETIES

**Copper Country Mining Club**—It is announced that the first meeting for the season will take place at the Houghton Club, Houghton, Mich., the evening of Sept. 27. T. C. De Sollar, chief engineer of the Quincy, was to have read a paper at the October meeting, but this has been postponed till January, and H. E. Williams, chief construction engineer of the Calumet & Hecla, will be the feature of the October meeting. The program as newly arranged follows:

Sept. 27—"Proportioning Concrete," Prof. George L. Christenson, head of the mechanical engineering department of the Michigan College of Mines.

Oct. 18—"Draft Room Practice," H. E. Williams.

November meeting—Illustrated lecture on Panama canal, John T. Reeder, purchasing agent, the Tamarack-Osceola mines.

December meeting—"Electric Pumps," F. N. Bosson, chief electrical engineer, Calumet & Hecla.

January meeting—"Electric Haulage," T. C. De Sollar.

**American Institute of Mining Engineers**—The Colorado Section of the institute held a luncheon and business meeting at the Adams Hotel, Denver, on Sept. 16. Bradley Stoughton, secretary of the Institute, addressed the meeting and discussed favorably the desirability of local sections of the organization and pointed out the benefits to be derived therefrom. The first official election was held, resulting in the following officers for the ensuing year: William J. Cox, President; C. J. Moore, Vice-President; C. L. Colburn, Secretary. About 40 members of the Institute were present. Following the election, the meeting adjourned until November.

## INDUSTRIAL NEWS

The first section of the Stephens-Adamson Mfg. Co.'s general catalog No. 19, covering power-transmission machinery, is issued in connection with No. 61 of its magazine, "The Labor Saver." A complete list of illustrations and tables is given of all lines of power-transmission devices. Bearings, [illegible] pulleys, clutches, tighteners, etc., are covered [illegible] rope transmission receives special attention.

The Electro-Steel Products Co., of which [illegible] offices is [illegible] Miller Building, Scranton, Penn., has secured a tract of [illegible] near Connell Junction, within the city limits, and [illegible] a plant for the manufacture of high-grade steel [illegible] castings. A 3-ton Frick electric reduction furnace will be installed. The electric current will be secured from the Lackawanna & Wyoming Valley R.R. Co. Charles H. Pond, of the Scranton Forge Co., is president of the new company; J. D. Jenkins, of Pittston, is vice-president, and J. H. Hungerford, of Scranton, is secretary and treasurer. The general manager is H. O. Bernhardt.

## TRADE CATALOGS

Power & Mining Machinery Co., Cudahy, Wis. Bulletin No. 46. Cyaniding. Illustrated, 60 pp., 6x9 in.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y., Booklet "A Question of Drill Bits." Illustrated, 22 pp., 5½x3½ in.

The T. L. Smith Co., Milwaukee, Wis. Catalog No. 252. Rock-, ore- and gravel-handling machinery. Illustrated, 40 pp., 6x9 in

Hendryx Cyanide Machinery Co., 107-109 William St., New York. Catalog No. 8. Cyanide machinery. Illustrated, 22 pp., 5½x8½ in.

The Brown Hoisting Machinery Co., Cleveland, Ohio. Catalog K. Brownhoist locomotive crane with grab bucket. Illustrated, 56 pp., 6x9 in.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 34 R. Enclosed self-oiling type compressors. Illustrated, 8 pp., 6x9 in. Catalog No. 43. Rockford railway motor cars. Illustrated, 28 pp., 6x9 in.

De Laval Steam Turbine Co., Trenton, N. J. Improved Methods of Using Small Turbines. Illustrated, 36 pp., 3½x6 in

This publication contains descriptions of connecting small turbines for driving auxiliaries in large steam-power plants, also in connection with exhaust-steam heating and drying systems in isolated plants.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ROCK-DRILLING ENGINE. John George Leyner, Denver, Colo., assignor to the J. Geo. Leyner Engineering Works Co., Littleton, Colo. (U. S. No. 13,614, reissue; Sept. 9, 1913.)

TUNNEL-DRIVING MACHINE. George F. Speer, Fort Worth, Tex., assignor to the International Tunnel Machine Co. (U. S. No. 1,072,050; Sept. 2, 1913.)

DEWATERING DEVICE or Means for Separating Solids and Liquids. Wilbur Alson Hendryx, New York, N. Y. (U. S. No. 1,071,917; Sept. 2, 1913.)

FLOTATION PROCESS—Ore Concentrator. Henry Ellsworth Wood, Denver, Colo. (U. S. No. 1,071,850; Sept. 2, 1913.)

MAGNETIC SEPARATOR. Georg Ullrich, Magdeburg, Germany. (U. S. No. 1,072,276; Sept. 2, 1913.)

SLIMES FILTER. Ulysses A. Garred, Anaconda, Mont. (U. S. No. 1,072,111; Sept. 2, 1913.)

VALVE for Controlling the Flow of Thick Pulpy Material and the Like. Edward Hoit Nutter, New York, N. Y., assignor to Minerals Separation Ltd., London, England. (U. S. No. 1,071,784, Sept. 2, 1913.)

GAS PRODUCER. Emile Dor-Delattree, Liege, Belgium. (U. S. No. 1,072,098; Sept. 2, 1913.)

ROASTING—Automatic Charging Device for Roasting Furnaces and the Like. Ludwig Singer, Bochum, Germany. (U. S. No. 1,071,962; Sept. 2, 1913.)

ROASTING—Improvements in and Relating to Mechanical Roasting Furnaces. Helsingborg Kopparverks Akt., Helsingborg, Sweden. (Brit. No. 29,235 of 1912.)

DRY-ORE SEPARATOR. William W. Bonson, Dubuque, Iowa, assignor to Bonson Dry Concentrator Co., Dubuque, Iowa. (U. S. No. 1,073,069; Sept. 9, 1913.)

ORE TREATMENT—Improvements in the Treatment of Refractory Gold and Silver Ores. C. Butters, London, Eng. (Brit. No. 18,660 of 1912.)

PLACER MINING—Improvements in Means for Separating Minerals from Alluvial Wash. R. Hughes, Wilson's Downfall, N. S. W. (Brit. No. 20,190 of 1912.)

FINE ORES—Utilizing Fine Ores, Flue-Dust and the Like. Hartley C. Wolle and Edward F. Kenney, Westmont Borough, Penn. (U. S. No. 1,073,381, Sept. 16, 1913.)

LADLES—Nozzle for Ladles. Charles E. Michaels, Wilson, Penn. (U. S. No. 1,072,972, Sept. 9, 1913.)

LEAD AND ZINC—Process for the Separation of Lead and Zinc. Jules Babé, Honfleur, France. (U. S. No. 1,073,461, Sept. 16, 1913.)

ZINC—Improvements in or relating to Apparatus for the Continuous Removal of the Residues from the Reduction of Zinc Ores in Vertical Retorts. A. Roitzheim, Cologne, and W. Remy, Aachen, Germany. (Brit. No. 732 of 1913.)

DRILLING—An Improved Rock-Drill Chuck. M. T. Taylor, Cornwall, Eng., and J. F. Gardner, Mt. Chambers, Queensland. (Brit. No. 8560 of 1913.)

DRILLING—Improvements in Percussive Rock-Drilling Tools. G. A. Chalkley, Germiston, Transvaal. (Brit. No. 18,443 of 1912.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Sept. 17

**Expert Examination of Angels Camp Mines,** by M. B. Huston, of Los Angeles, and J. E. Spurr, of Philadelphia is reported to have been made in the interests of Tonopah operators. The properties included in the examination are the Angels, the Lightner, the Sultana, the Maltman and the Baumhogger, which may be operated as one property.

**The Forest Fire Record in California** for the first half of 1913, as reported by the U. S. Forest Service, shows a remarkably small acreage burned over and few fires, compared to former years. The total area burned over was 18,929 acres, entailing a total damage of $2620. There are 19 national forests in California and up to August 16, the total fires in these forests amounted to 609. The records show that 88% of the fires were extinguished before they had burned over 10 acres each. The average per fire was 31 acres.

**The Closing Down of the Zeila** at Jackson, Amador County, is expected at the end of the year; whether temporarily or permanently will probably depend solely upon whether or not the mine can be sold to men who have a disposition as well as the means to continue mining for the development and establishment of the property on a deep mining basis. Stock of the Zeila Mining Co. is held by a close corporation and none of it has ever been sold or offered for sale to others than the initial holders of the shares or their heirs or estates. The total production during its 34 years of operation is estimated to have been $10,000,000. The Zeila company is probably about the closest "close" corporation in the state. No information of any importance has ever been given out by the management. The superintendent has for years declared that the mine was worthless, but within the last two years he has been willing to have it examined by engineers for prospective buyers. On the 1500-ft. level, an oreshoot was disclosed in a winze this year. In order to develop this ore it will be necessary to install a new hoist and sink a 1500-ft. shaft, and the present owners are not disposed to enter upon this essential improvement of the property. The stockholders are mostly men past middle age and apparently have become satisfied with the results of the operation of the Zeila mine up to the present time, and like other old time California miners they are likely to abandon the mine entirely unless the energy and capital of more progressive men take hold of the property. The Zeila is on the East belt of the Mother Lode region or close to and adjoining the Central belt or Mother Lode proper, but this situation is not considered by mining engineers of large experience on the Mother Lode to be against the probability of the development of a deep mine at this point.

### DENVER—Sept. 20

**The Newlin Gulch Gold Placers** near the head of Cherry Creek, 32 miles southwest of Denver are arousing more than ordinary interest. A camp of 15 tents is established there, and visitors from Denver are going out daily. It is stated on good authority that F. B. Hughes is cleaning up from $15 to $20 per day with his line of sluices, and McIntyre took out $47 worth of gold in one day in a run of five hours. He used a wheelbarrow to deliver the dirt to his sluices. Sixteen men are busy planning or sluicing, and the gold appears to be widely and evenly distributed.

**The Convention of Southern Colorado Coal Miners,** held at Trinidad, Aug. 22, passed a resolution to the effect that, in view of the failure of their efforts to secure a peaceful solution of their differences with the operators and the fact that the operators have declined to meet or confer with them, a strike call be issued to all mine workers in Colorado, to take effect Sept. 23. About 9000 men are employed in the mines where the trouble is expected and 60 mines will be tied up. The demands of the miners are as follows: Recognition of the union; 10% advance in wages on tonnage rates, and a daily wage scale on the same basis as that of the State of Wyoming; 10% advance on the wages paid coke-oven workers; an 8-hr. day for all classes of labor in the coal mines and coke ovens; pay for all narrow work and dead work which includes, timbering, removing falls, handling slate, etc.; check weighmen at all mines to be elected by the miners without any interference by company officials; right to trade in any store, and the right to choose their own boarding place and their own physicians; enforcement of the Colorado mining laws; abolition of the guard system which has prevailed in the mining camps of Colorado for many years. Secretary of Labor Wilson has designated Ethelbert Stewart, chief clerk of Federal Bureau of Labor, as mediator. Stewart has started for Denver and Secretary Wilson believes that a strike may be averted through his efforts. President Welborn, of the Colorado Fuel & Iron Co., declares that under no circumstances will that company's officials meet representatives of union miners. He said: "If a strike is called it will be to the finish. What practical effect will be no one can forecast accurately. It is my conviction that far less than 10% will leave their places because of loyalty to their union." Officials of the Victor American Fuel Co. and the Rocky Mountain Fuel Co. have voted to hold out against demands of the miners. [From 80 to 90% of the miners went out on strike Sept. 23; the countries affected being Fremont, Huerfano, Las Animas, El Paso, Boulder and Routt. The Minnequa plant of the Colorado Fuel & Iron Co., it is expected, will have to close down within 24 hr. for lack of fuel, after 10 years of continuous operations.]

### BUTTE—Sept. 18

**The Butte Miners Union** has already sent $21,000 to the Michigan strikers and has assessed every member of the union one day's pay in October, by which means it is expected $28,000 will be raised. In addition to all this the miners have been collecting provisions by the carload, and subscriptions. Other Butte unions have contributed several thousand dollars to the strikers and have promised more.

**Butte, Wisdom & Pacific R.R.** surveyors are making good progress and report encountering less difficulty than had been anticipated. The road is to be built by the Boston & Montana Development Co., at the head of which is W. R. Allen, former lieutenant-governor. The company has also taken over mining properties in the French Gulch and Elkhorn districts, which it is thought can be profitably exploited when transportation is afforded.

**The Butte & Duluth** is making good in the eastern section of the Butte district, although copper has not been produced quite so cheaply as some people have been claiming. It has cost Captain Wolvin about 13c. per pound to recover copper by his leaching method, and in August the cost was $12\frac{7}{10}$c. per pound. However, the mill has capacity at present only for 100 tons per day and Captain Wolvin says that by increasing the capacity of the mill and tanks to 500 tons per day, he believes he can cut his present cost of copper one-half. He has so well demonstrated the value of the copper deposits on the east side that other interests, representing Thomas F. Cole and others, have bought up practically all of the mineral ground in that part of the district.

### SALT LAKE CITY—Sept. 18

**Dividends From Park City Mines** paid since the first of the year total $504,500. The Daly West has distributed $27,000; the Daly-Judge, $135,000; the Silver King Coalition, $187,500; the Silver King Consolidated, $155,000. Including the Ontario, Daly, Quincy, and other old-time producers, the camp has a record of over $100,000,000 gross production, of which $40,000,000 has been distributed in dividends.

**The Strawberry Tunnel Was Completed** Sept. 13 by the opening of the gates of the east portal. The tunnel was built by the U. S. Reclamation Service under the direction of J. L. Lytel, project engineer, to irrigate 60,000 acres of land in Utah Valley. The tunnel is four miles long, and brings the waters of the Strawberry River and Indian Creek on the Pacific drainage slope through the Wasatch range into the Great Basin, which has no outlet. The idea was conceived in 1902, and taken up by the Reclamation Service in 1904. Work on the tunnel was started in 1906. Beside the tunnel upward of 40 miles of diversion and lateral canals have been dug. There is a dam across the Strawberry River 71 ft. high, earth filled, with concrete walls. The Indian Creek dike, is 37 ft. high, 1400 ft. long, and of the same construction and material as the dam proper. The reservoir covers an area of 8200 acres, and has a capacity of 275,000 acre-feet.

### CALUMET—Sept. 20

**Federal Investigators** have been in the Copper Country for some time [illegible] investigated strike conditions and have prepared [illegible] report which will be submitted to the [illegible] of Labor. The latest move toward bringing about [illegible] the labor situation has been undertaken by the [illegible] Country Commercial Club, which comprises [illegible] men of Houghton and Keweenaw Counties. [illegible] three members has been appointed and has [illegible] data, as to wages, hours worked, etc., and [illegible] several trips underground to study actual working conditions. A temporary office has been established and [illegible] will be compiled from all available sources and [illegible] complete report of the investigation will be published. Governor Ferris is considering calling a special session of the Legislature and is taking the subject up with the individual members of the Assembly and Senate, but a special session is not considered likely. The strikers held several early morning parades in Calumet, augmented by the strikers and sympathizers from the North End district, most of these demonstrations were orderly and little disturbance was made throughout the strike zone until yesterday, Friday, when there were battles between strikers and loyal workmen at Calumet, Laurium, Hancock, Wolverine, Isle Royale and Champion. A militiaman at Isle Royale was shot through the arm and 20 arrests were made during the day. At the Quincy, a bunkhouse and cook shanty have been fitted up at the mine and outside men will be brought in to resume operations. The first lot of men, numbering about 33, have arrived and others will follow. The Calumet & Hecla is adding continually to its underground force and rock shipments to the mill are now running about 4000 tons daily. Several men from the subsidiary properties have applied for work and are being taken care of at the Calumet & Hecla. A small force of men is working in No. 5 and No. 6 shafts of the Osceola, but shipments to the mill have not yet been started. The Copper Range continues operating on a limited scale. The management served notice on the men some time ago to either return to work or vacate the company houses, but a restraining order was granted by the Houghton County circuit court. In the arguments and agitation put forth by the Federation and others regarding the wages paid by the mines of this district in comparison to the other copper mines, a significant fact seems to have been overlooked and that is that the mines of the district have operated at practically full force throughout periods of depression in the metal market and some of the properties have actually operated at a loss, having the welfare of their employees at heart they did not suspend operations. Hard times have heretofore been unknown in the copper country.

### HOUGHTON—Sept. 22

**An Injunction Against Picketing** has been issued against the striking copper miners. In fact the use of injunctions is becoming a feature of unusual interest in the copper-country strike. "Government by injunction" has been anathematized by labor agitators for many years, yet the lawyers of the Western Federation of Labor were the first to utilize here this legal procedure to accomplish their own ends. Early in the history of the strike the labor leaders applied to Judge Patrick H. O'Brien for an injunction to prevent the sheriff from hiring Waddell-Mahon men to assist him in the preservation of peace and order and to prevent the county from paying the bills for the employment of these men. That case is still pending in court. Two weeks ago, when the Copper Range Consolidated ordered strikers to go to work or move out of the company houses, the labor leaders applied to Judge O'Brien and secured an injunction preventing ejectment. The application of this injunction keeps these strikers in company houses, notwithstanding the fact that they have paid no rent for two months and do not expect to pay. They cannot be ejected without a 30-day notice, which notice now has been served. Up to this point the utilization of the injunction has been entirely in the hands of the strikers themselves and they made the most of every opportunity. The injunction against picketing was issued by Judge O'Brien this week and this move by the mining companies comes like a touch of [illegible] humor to the situation. The injunction is sweeping in its scope; it includes practically every labor agitator stationed here. One immediate effect of this injunction [illegible] to the petty disturbances and frequent "beatings up" of [illegible] by Federation strikers. The courts are crowded with [illegible] cases. Strike leaders assault men going to work. They [illegible] arrested, brought before a justice of the peace, released [illegible] of, say, $20, and the next morning they again beat [illegible] workmen. Their cases are all set ahead for trial [illegible] it is doubtful if they will ever be found guilty. The [illegible] of the injunction principle places the burden of proof [illegible] on the striker. Now when he beats up a workingman he is in contempt of court and must prove that he was not violating the provisions of the injunction. Answering the proposition of John H. Moffitt, representative of the Department of Labor, for arbitration of the strike, the mine managers have again declared that they will have no dealings whatsoever with any of the members of the Western Federation of Miners, or with any representatives of such men. The answer declares more emphatically than the statement previously made that the Federation will not be permitted to control any of the employees.

### GRAND FORKS, N. D.—Sept. 18

**Cheap Mining of Lignite** has been demonstrated by the Government in mining this material for the Williston reclamation project. The coal has been produced at a cost below that of private mine owners, and better wages are paid to miners. The coal miners are skilled in their work, and receive from $4 to $5 per day, working on the tonnage basis. They are provided with shower baths, private lockers, bunk rooms for single men and a restaurant where the miners can secure meals at 25c. each. As against an average cost in private mines of about $1.50 per ton, the Government is mining its coal at about $1.30, and the engineer in charge of the project, anticipates that ultimately the cost of mining will be reduced to $1. Delivered at the project station, coal mined by private owners would cost the government about $2.50 per ton.

### JEROME—Sept. 12

**Construction Work on the Clarkdale Smelter** is progressing rapidly, and work is being done on three shifts, shaft sinking and tunnel driving at the mines. Much heavy machinery is being hauled in to several of the properties, most of which will compare favorably with the best mining equipment in the state. New roads are being built to certain of the mines so they can be reached easily and on a good grade with auto trucks. Branch lines are being laid to other mines in order that ore and supplies may be hauled to and from the new Santa Fé railroad which was recently completed into the Verde Valley four miles below the town of Jerome. Work on the new custom smelter is well underway. Heavy machinery is arriving daily over the new railroad and is being placed as rapidly as possible. Brick cottages in the new town of Clarkdale about one-half mile from the smelter are now being built for the accommodation of the workmen. There are about 2000 men employed in the camp of Jerome and immediately surrounding it and at the new smelter at Clarkdale. On the United Verde Copper Co.'s narrow-gage railway, which connects with the Santa Fé at Jerome Junction, a new depot has been built at Jerome just north of the crushers. At the Cleopatra mine, which was recently bonded and leased to a Scotch syndicate by George W. Hull for a consideration said to be $300,000, a tunnel is being driven under what was locally known as the opencut, on top of and in the saddle of the mountain just in front of Jerome, locally called Smelter Mountain. The present smelter of the United Verde company is on this side of the same mountain. Some of the ore recently cut contains much native copper which shows up about the size of pin heads. The vein has maintained its course now for about 75 ft. with prospects of it going on through the mountain where there is a large outcrop which evidently is a part of the vein. Arrangements are being made to sink a shaft on this ore from the saddle near the opencut. A road is to be constructed up to this point so supplies can be hauled in. A hoist will then be installed.

### TORONTO—Sept. 22

**Production in Northern Ontario** from silver, cobalt, nickel and gold mines has just been received by the Government, the report being the first officially made since 1908. Dr. W. G. Miller, provincial geologist, who compiled the report, states that Cobalt besides being one of the world's greatest silver areas, controls the market for cobalt and has the largest output of arsenic and is also among the three or four areas that have the largest output of nickel. As a general rule, however, most of the nickel is lost in the smelting process. Statistics show that up to the end of 1912 Cobalt has produced 155,815,839 oz. of silver valued at $81,731,115. The quantity of cobalt, nickel and arsenic produced is not known. Up to the end of the year, the total dividends from Cobalt mines amounted to $39,834,740, which does not include the profits made by two or three privately owned properties. Adding the dividends which have been paid since the close of 1912, the total distribution is estimated at $45,000,000, which is approximately 50% of the value of the output. It is interesting to note that the discovery of the Cobalt district was due to the building of the Timiskaming & Northern Ontario Ry. and that while the mines have paid in dividends about $45,000,000, the railroad cost only $18,500,000.

# THE MINING NEWS

## ALASKA

McCANDLISH & SULLIVAN (Meehan)—Reports from Fairbanks Creek are that rich pay has been discovered on Claim No. 20 Below. Heretofore, practically no pay has been found on this creek farther down than No. 12 Below.

MacGILLIVRAY-ELLIS LEASE (Dome City)—A one-third interest in the MacGillivray-Treml lease on the Wild Rose claim has been purchased by H. I. Ellis. Ore for a test shipment to the Spalding mill will be mined as soon as possible.

FALLON MITCHELL & CO. (Fairbanks)—A laborer was killed July 28, by a cave-in; he, with two other laborers, was working in a timbered crosscut, when, without warning, the timbers were crushed by the overlying thawed gravel. The other men escaped uninjured.

NEWSBOY (Cleary)—July operations were carried on under difficulty, as all water for the boiler at the mine had to be hauled from Cleary Creek up a heavy grade. Sufficient water has been available since the heavy rains of early August to put the mill on a 24-hr. shift.

L. L. JAMES (Fairbanks)—L. L. James has secured a bond on 14 association placer claims, a total of 2240 acres, on Chena Slough a short distance below the town of Fairbanks. The price asked is $500,000 and the first payment, $28,000, is due Feb. 4, 1914. The balance is to be paid out of royalty. By the terms of the agreement, a dredge must be on the ground by Aug. 4, 1914.

HARDING & CO. (Dome City)—These lessees on No. 6 Below, third tier, right limit of Dome Creek, commonly known as the old Robinson ground, have discovered pay running from 3 to 20c. per pan. Bedrock was reached at a depth of 205 ft. Tunnels are now being driven to determine the width and continuity of the supposed paystreak, but no sluicing will be done until next season.

SPALDING & BRUMBAUGH (Dome City)—A contract has been let to drive the east drift on the 100-ft. level another 100 ft. It is planned to drive an adit to connect with the shaft on the MacGillivray-Ellis lease at a depth of about 250 ft. The adit will drain the workings, and will at the same time furnish water for the larger mill that is planned. It will also develop the 4-ft. Soo vein, the ore of which is too low-grade to be worked profitably with present equipment.

## ARIZONA

### Cochise County

CALUMET & ARIZONA (Warren)—Pending the actual closing of the options on the new steam-shovel property in the Ajo Mountains little information as to developments has been obtainable. It is stated, however, that the churn-drills have already placed in sight a steam-shovel tonnage of 27,000,000 and that the ore averages 1.7% copper.

### Maricopa County

RELIEF (Glendale)—The cyanide plant is in operation. Development work is under way. At a later date the mill is to be placed in operation.

RED ROVER (Phœnix)—It is rumored that Phelps, Dodge & Co. have taken an option on this mine. Sinking in the shaft has been discontinued until larger pumps can be installed. Many tons of low-grade ore are on the dump.

### Mohave County

GOLD REED—An electric hoist, pump and compressor are being installed at the Jupiter shaft, which is 235 ft. deep.

YELLOW JACKET—This property has been closed, development work requiring a greater expenditure than the operators were prepared to make.

GOLD ROAD (Gold Road)—Filter leaves have been discarded, due to the belief that a greater saving can be effected by a system of decantation, which is being tried out. The old filter tank is being used for a supplementary settling tank.

NEVADA-ARIZONA MINES CO. (Hackberry)—The mill is practically ready for operation. Some excellent ore has been found in the shaft below the 200-ft. level, and it is expected that sufficient water will be developed for milling purposes.

CONE MINING & MILLING CO. (Oatman)—This company, of Fresno, Calif., men, has taken a bond on property near Oatman. A road is being built from the Oatman-Needles road to facilitate delivery of mining supplies. There is a shaft, 90 ft. deep, and some good ore has been found.

WALKOVER—This property, near the Copper Giant, is being equipped with a hoist and pump. As soon as they are installed, sinking the main shaft will be continued. This property has been operated before and there is shipping ore on the dump, which will be sent to the United Verde smelter.

TOM REED (Oatman)—Two rich strikes have recently been reported on this property. One was made on the Ollie Oatman claim, north of the main shaft and the other on the Black Eagle, to the south of the present working shaft. The shaft on the Ollie Oatman claim has reached a depth of 400 ft. and a drift is being driven to intersect it from the main shaft of the Tom Reed property. Some of the ore discovered is said to be full of coarse gold, the average of the oreshoot, so far as sampled, being much higher than the average ore now being milled. In the Black Eagle claim, the oreshoot is 12 ft. wide. A hoist is being installed at the shaft on this claim, which is over one-half mile from the main shaft.

### Pinal County

RAY-ARIZONA (Ray)—Drilling operations are proceeding satisfactorily, the first hole having attained a depth of 220 ft. Little development work is being done.

KELVIN-SULTANA (Kelvin)—A winze has been started on the No. 2 vein from the 300-ft. level. At this point there is a streak of chalcopyrite 4 ft. wide. A tramway for carrying ore across the Gila River has been ordered from A. Leschen & Sons of St. Louis. Work has been resumed in the old Agnes shaft which is producing 3 tons of carbonate ores daily.

### Santa Cruz County

PROGRESSIVE (Ruby)—A recent flood in California Gulch destroyed the pumping plant and some of the houses, but the laboratory and the mill were not seriously damaged.

ORO (Old Glory)—Development work which has been going on for the last two years is about completed. The main shaft is 350 ft. deep, the deepest in the Oro Blanco district. The vein is 16 ft. wide at the bottom of the shaft with a 5-ft. pay streak. The ore is siliceous, carrying sulphides of iron, copper and lead, in which the gold occurs. G. B. Williams, of Rochester, N. Y., the owner, is now conferring with his associates about future developments.

AUSTERLITZ (Oro Blanco)—After nearly a year of idleness because of litigation, operations are to be resumed. The property has had a checkered career, the latest operations being the most disastrous. Immediately following a recorded production of $90,000 of shipping and milling ore, the mine was closed under numerous attachments. A. H. Noon, of Nogales, the original owner finally obtained control of his property, and has given a bond to William J. Partridge and others who have started operations; there is a 20-ton concentrator at the mine, and it is thought that with careful management it will be a successful producer.

## CALIFORNIA

### Amador County

HARDENBERG (Jackson)—The recent cutting down on the number of men employed was temporary, and has since been increased.

WEST EUREKA MINING CO (Sutter Creek)—A purchase bond has been secured on the Alpha, or Last Chance, west of the Central, or old Eureka, owned by Hetty Green, of New York. It is reported the property will be equipped for development.

### Butte County

SUCCESS (Oroville)—This gravel mine was flooded by the miners breaking into an abandoned tunnel. Two men were carried by the water through the drift tunnel they were working in and lodged against a ladder by which they escaped to an upper level.

### Calaveras County

LIGHTNER (Angels Camp)—Twenty stamps are dropping, and it is expected to start a second unit of 20 stamps soon.

ORO ELECTRIC CORPORATION (Oroville)—Rights-of-way in the Jenny Lind mining district have been acquired.

ECONOMIC (Esmeralda)—A portion of the new electric power line was destroyed by forest fire, Aug. 25. The line has since been fully repaired. Another forest fire put the telephone-line connection out of commission.

AMALGAMATED EXPLORATION CORPORATION (Esmeralda)—The installation of the electric power line is practically completed for the operation of the mine and mill. The lighting plant installation is completed and the mining property and the town are lighted.

### Inyo County

TRAMWAY is the new designation for the old mining camp of Swansea, adopted by the Saline Valley Salt Co.

TUNGSTEN ORE has been discovered in the foothills west of Bishop; both wolframite and scheelite are reported to have been found.

YELLOW MONSTER (Laws)—A 3-roll Huntington mill will be installed. The water for milling will be pumped from Coldwater Cañon.

### Kern County

KING SOLOMON (Randsburg)—The mill was closed down temporarily in August, to repair a concentrator.

GOOD HOPE (Randsburg)—Ten tons of scheelite treated at the Atolia mill, gave a net return of $80 per ton. The ore was mined near the surface by Harry and George Swarthout lessees.

### Nevada County

GOLDEN CENTER (Grass Valley)—It is reported that a 10-stamp mill will be built.

DELHI (Columbia Hill)—The pumps have been started after being idle more than two years. It will require about six weeks to unwater the mine. The shaft is 500 ft. deep. This shaft was sunk just prior to the suspension of work to await the completion of the 5-mile flume and ditch. This flume and ditch is now entirely completed. It is expected to put the 20-stamp mill in commission this autumn. The flume is running about 1000 in. of water. One-half this amount will be required.

### Orange County

A GYPSUM DEPOSIT, near Corona, is said to have been developed by [illegible] Bros., of Los Angeles. The initial shipment was recently made.

### Placer County

PACIFIC GOLD DREDGING CO. (Auburn)—The dredge under construction at Butcher ranch, on the middle fork of the American River, it is expected will be completed by Oct. [illegible]

### Santa Clara County

MORENO VS NEW GUADALUPE (Guadalupe)—Jessie Moreno has brought suit to recover $33,500 for the death of her husband Frederick Moreno on Aug. 16, 1913. The complaint alleges that Moreno was thrown from a skip to the bottom of the shaft by the careless operation of the hoist.

### Shasta County

GLADSTONE (French Gulch)—While the new hoisting plant is being installed it has been decided to retimber the shaft for a depth of 150 feet.

## COLORADO

### Clear Creek County

GOLDEN GLORY—A contract has been awarded to J. D. Burns to advance this tunnel an additional 100 ft. into Saxon Mountain. The tunnel is now 1400 ft. long.

LITTLE DORRIT—It is reported that recent operations of the new mill are gratifying, but that the management is considering the advisability of adding cyanide equipment.

IDAHO BRIDE—This mine on Seaton Mountain is shipping regularly to the local mills. Two carloads went out last week to the Newton and Combination mills and E. D. Payne, manager, says the output will be increased to two carloads per day.

FRENCH FLAG—Following a recent examination of this property in Gilson Gulch, it is reported that 11,000 tons of $10 ore is available above the 135-ft. level. The property has been equipped for operation and will probably resume production this month.

SIDNEY TUNNEL—Development is to be resumed at this property in the East Argentine district. The tunnel is now 2125 ft. long, and is being cleaned out and repaired preparatory to advancing it. It is estimated that the White vein will be intersected within 150 ft. The Ontario vein, which was cut 2000 ft. from the portal of the crosscut, will be explored by a drift.

### Teller County

LUCKY CORNER (Cripple Creek)—Seventy-one tons of smelting ore of high grade was recently shipped from this mine of the Doctor-Jack Pot company.

GOLD DOLLAR (Cripple Creek)—A shoot of rich calaverite ore has been opened. It was found in the 13th level from the Mable M. shaft and has already been exposed for 65 ft. in length. This rich streak is said to be 12 in. wide, accompanied by 5 ft. of milling ore.

EL PASO (Cripple Creek)—Robert A. C. Peterson, a mining promoter has begun suit against the company charging that he has been frozen out of 10% of property and profits due him because of his activity in forming mining properties into a corporation to control paving mining properties. He also began action against the Colorado Mines, Railways & Utilities Corporation for $600,000, which he declared to be due him for negotiating the purchase of the Golden Cycle mine, which is estimated to be worth $6,000,000.

## IDAHO

### Cœur d'Alene District

INTERSTATE-CALLAHAN (Wallace)—A 6-ton Jeffrey locomotive has been delivered for use in the main tunnel.

TAMARACK (Murray)—An 8-ton transformer is being installed at this mine by the Washington Water Power Co.

MOON CREEK—A contract has been let to drive 75 ft. When completed the crosscut will be in 300 ft. and within a short distance of the vein.

ST. LAWRENCE (Saltese)—A carload of high-grade copper ore has been shipped from this property. This is the first ore shipped from the mine.

SHERMAN—The drift will be continued to gain greater depth on the vein and to get to a point under the best surface showing. Good milling ore has been developed in the drift.

YANKEE BOY—A new vein was struck at this property on Big Creek by the leasing company which is driving a new tunnel. The strike was entirely unexpected. The ore at this mine is rich in silver.

CARBONATE (Mullan)—Samples from the vein which was recently struck show the ore to contain lead, silver and copper. The showing is encouraging to the owners and development work will be done throughout the winter.

ANTIMONY—This property on Pine Creek will be operated under lease. A large amount of ore was shipped from the property years ago. The mine was shut down when the workings under the creek were flooded. The orebody is about 300 ft. long and from 2 to 4 ft. wide. Only first-class ore will be shipped at present as the old mill is unfit for use. If developments warrant it a new mill will be built.

NABOB (Kellogg)—At a recent meeting of the directors it was voted to take over the Idaho and "V" group of claims, which adjoin the Nabob property and lie between it and the Federal mines. These claims are taken over on bond and represent an approximate value of $110,000. The development of the Nabob properties has led directly to the lease of the [illegible] Idaho claims. The oreshoot on the Nabob heads directly into the leased claims and the future of Nabob seems to point to the necessity of consolidation of the properties, thus giving the Nabob control of everything lying between it, [illegible] and the Federal groups.

## MICHIGAN

### Iron

COAL MINES NEAR BAY CITY were closed down Sept. 17 and will not resume operations until the labor troubles between the Handy Brothers' Mining Co. and their men are adjusted; about 3000 men are affected. Thomas W. Davis, commissioner for the operators of Michigan, in a statement said the trouble was due to the alleged refusal of the union officials to consent to arbitration of differences with Handy Bros. when 700 men recently struck, claiming that the operators had refused to pay what was due them under the working agreement made in April, 1912.

RICHMOND (Palmer)—This property in the Cascade district, will send out about 140,000 tons this year. The mine is the only open pit now in operation on the Marquette range; the ore is hard and difficult to mine.

VOLUNTEER ORE CO. (Palmer)—Three drills have been started to test the formation in order to find a suitable place for a new shaft. When this drilling is finished the drills will be moved to the big swamp near Palmer Lake, where it is believed that ore exists.

BREITUNG (Negaunee)—It has been announced that a total of 600,000 tons of iron ore will be shipped by these mines this season. The Mary Charlotte will ship 400,000 tons; the Breitung Hematite 100,000 tons, and the Barron 100,000 tons. The mines are not working with as large forces as at this time last summer but there was considerable ore in stock when navigation opened and most of the piles will be cleaned up before winter sets in.

## MINNESOTA

### Cuyuna Range

KENNEDY (Crosby)—The stockpile of over 90,000 tons has now been cleaned up. Total shipments for August were 24,000 tons and for the season to Sept. 1 over 100,000, not including stockpile shipments.

CUYUNA-MILLE LACS (Crosby)—Regular shipments are now being made, a train of ore going to the docks every day. The first ore left the docks only a few weeks ago and was the occasion of quite a celebration.

BARROWS (Crosby)—Ore is now being hoisted and it is believed that it will not be long before shipments will be made. Several thousand tons will probably find their way to the lower lake ports before the closing of navigation.

JAMISON & PEACOCK (Crosby)—The "40" now being drilled by the Cuyuna Realty Co., is showing up much good ore. One hole recently averaged 66.6% iron and approximately 0.01 phosphorus for a distance of 80 ft., which is the best ore yet encountered on the Cuyuna range.

IRON MOUNTAIN (Brainerd)—The three-compartment shaft on this property has been sunk to a depth of over 75 ft. and the orebody is near at hand. About 30 men are working but the force will be increased as soon as drifting is commenced. The ore in the Iron Mountain is high in manganese and there is a considerable quantity of it. It is predicted that the property will ship this year but this is doubtful.

CUYUNA IRON & MANGANESE CO. (Crosby)—This company has quite an acreage near the Pennington pit, where several drills are at work. A good body of manganese ore has been located at a depth of 50 ft. from surface. Continued drilling showed the ore to go as deep as 425 ft., and the management believes that it will have a large pit mine in the near future. Another drill will be added soon, so that the exploration work can be carried on more rapidly.

### Mesabi Range

EATON (Buhl)—This property, on which development was begun early in the season, is expected to ship 10,000 to 15,000 tons before navigation closes. The product is bessemer ore.

MISSABE DOCK (Duluth)—The entire concrete foundation for the new Duluth, Missabe & Northern Ry. Co.'s dock at Duluth will be completed before Nov. 1. The dock will be ready for the opening of the 1914 season; total cost estimated to be $2,900,000.

PENNINGTON (Crosby)—This company is now making regular shipments, one shovel being employed all the time loading ore, while the other is stripping. The ore now being loaded is exceedingly hard and blasting has to be resorted to frequently.

DULUTH-BRAINERD MINING CO. (Brainerd)—Sinking of a shaft has been started on the lands of this company, where manganiferous ore was discovered a short time ago. Several sets of timbers have been put in place, and it is figured that it will not take long to sink to the ore. Several mine buildings are being built and the boilers have already arrived.

### Vermilion Range

CONSOLIDATED VERMILION & EXTENSION CO. (Tower)—Ore is now being hoisted from both shafts and developments underground have been highly satisfactory. A substantial tonnage has been blocked out in No 1 and the shaft will be sunk another 100 ft., which will provide for two more levels. The No. 2 shaft is mainly an exploratory shaft but is bottomed in commercial grade ore which is being taken to surface for shipment.

VERMILION & MESABI IRON CO. (Tower)—The main drift east from the shaft was in ore for a distance of 15 ft. when work was stopped to drive a crosscut to the south. The shaft is vertical for a depth of 170 ft., and from that point to a depth of 210 ft., the bottom is an incline. The crosscut to the south will be swung around to a point under the vertical section of the shaft and behind the incline. A raise will be made to connect with the 170 level, which will enable hoisting to be carried on to better advantage. The shaft will be sunk another 100 ft. in the near future. The south crosscut has already cut 20 ft. of ore.

### Koochiching County

KOOCHICHING-VERMILION (Northome)—At a recent stockholders meeting it was decided to contract for the sinking of a shaft and begin operations at once. The property is a gold prospect 100 miles north of the Cuyuna iron range.

## MISSOURI

### Joplin District

BAILEY & CO. (Spring City)—Zinc, lead and calamine are being hoisted. The mine is on the St. Paul land, near the Delta, a good calamine producer.

R., L. & S. CO. (Lawton)—The new concentrator was started up a few weeks ago. A 20-acre lease is held by the company and two shafts are being operated.

HAWKEYE (Miami, Okla.)—This mill has been sold to O. J. McConnell and will be removed to a lease on Tar Creek, near Hattenville. It is to be remodeled and enlarged.

PRAIRIE (Miami, Okla.)—The mill is to resume operations after a shutdown to permit the mill shaft being sunk deeper and some repairs to the plant. It is on the Emma Gordon land.

POWHATAN (Thoms Station)—Five hundred tons of zinc ore were produced in August from this mine, which has been in operation two months. There is a 150-ton mill on the 10-acre lease. New ground is being worked.

DUNGLADE & CO. (Thoms Station)—A concentrator is to be built by this company, which hopes to be milling within 60 days. The shaft recently was sunk after several drill holes were put down, and a drift now is being cut to connect with another shaft.

ORNDUFF & CO. (Joplin)—Galena was encountered last week while sinking deeper for water. The ore was found at the 83-ft. level, a 12-ft. face being encountered. The company has another shaft near, which is producing zinc ore from a depth of 120 feet.

MURPHY LAND (Galena, Kan.)—Material is being removed from the bed of Short Creek, where work was started to clean out the bed at the end of a large flume. It was discovered that when milled this material yielded mineral. Much of the dirt has been run through a mill.

PORTLAND LEAD & ZINC CO. (Joplin, Mo.)—A good sheet-ground mine has been opened at Prosperity. A 300-ton concentrator is being built on a 40-acre lease. Several drill holes have been put down and a shaft has been sunk to a depth of 227 ft. with five drifts extending into mineralized ground. About 4000 tons of rich ore is on the dump awaiting completion of the concentrator.

### St. Francois County

ST. JOSEPH LEAD CO. (Bonne Terre)—This company will take over the Doe Run Lead Co. The $10,000,000 treasury stock of St. Joseph company will be offered in exchange for the outstanding $10,000,000 stocks and bonds of the Doe Run.

## MONTANA

### Butte District

DAVIS-DALY (Butte)—The Colorado mine is yielding about 100 tons per day and a little profit is being made.

TUOLUMNE (Butte)—The company is still just about breaking even in its operations. Shaft sinking is going on and about 100 tons of ore per day are hoisted.

ANACONDA (Butte)—The experimental plant, designed to treat slimes and tailings, as well as ore, by a leaching process perfected in the company's laboratory, is undergoing preliminary trials.

BELMONT (Butte)—The new orebins at this mine of the Anaconda company, which are nearly completed, are the largest in the Butte district, having a capacity of 10,000 tons. Through the Belmont shaft a large portion of the Anaconda Hill mines will be worked.

BUTTE & SUPERIOR (Butte)—According to the report for August the production of zinc concentrate was 11,167,270 lb., of an average assay of 49.41% zinc. The recovery, from 30,440 dry tons milled, was 90.9%. The profit for the month is given at $140,000.

RAVEN (Butte)—On orders from the East, Raven operations have been discontinued and pumps are being pulled from the mine. The treasury is exhausted, and results of development do not justify continuance of exploration or levying of another assessment. The company has been receiving about $2000 per month from ore shipped.

### Lincoln County

SHAUGHNESSY (Libby)—At this mine of the Hazel T. Mining Co. development work is being done and preparations are being made to ship a carload of ore to the smeltery. Officials of the company state that a concentrator will be erected in the near future. Silver and lead ore is produced.

### Madison County

BOSS TWEED (Pony)—Edward Smith is operating this property under a lease with a force of about 20 men. Recently a body of milling ore averaging about $10 per ton, was opened on the 600-ft. level, and drifting is being done on this ore. The mill at the mine is being operated steadily.

PONY MINING & MILLING CO. (Pony)—This company, a reorganization of the Garnet Mining Co., has been operating this property near Pony since June with a force of 12 men. The ore bins are full and ore is being placed on the dump preparatory to treating it in the mill, which will be started as soon as repairs now in progress are completed.

## NEVADA

### Comstock Lode

SIERRA NEVADA (Virginia City)—Techow & Waterhouse, lessees on croppings, have started the building of a 50-ton mill, to be completed by Oct. 15.

CROWN POINT (Virginia City)—Operations on this property as well as the Belcher and Yellow Jacket adjoining are being concentrated upon preparations for the installation of the new pumping plant in the joint incline in Belcher ground. The Yellow Jacket mill is being overhauled, and new foundations placed under the concentrator floor.

C. & C. SHAFT (Virginia City)—One of the Starrett pumps designed for use at the Consolidated Virginia winze on the 2500-ft. level to unwater to the 2700, has been overhauled and is ready for installation. A second pump of the same pattern and make, has been shipped from Salt Lake City. Two additional air compressors are being placed on the surface to furnish air to operate the pumps.

### Clark County

ST. ANTHONY (Goodsprings)—Considerable work is being done on the Columbia group, owned by this company. A new hoisting plant has been installed and occasional shipments of copper ore are made to Salt Lake smelters.

BULLION (Goodsprings)—This property is shipping five cars of crude lead ore per month to Salt Lake smelters, the ore being transported to the road by the new aërial tramway. Development work has proved the presence of large shoots of lead ore of too low grade to ship crude, and the company is contemplating the building of a concentrator.

### Humboldt County

ELECTRIC POWER FOR ROCHESTER will be furnished, it is stated, by the Woolsey-Lovelock Power & Light Co. A power line nine miles long will be required.

### Ormsby County

THE BULLION TAX QUESTION has been settled and an agreement has been made between the tax commission and the representatives of the mine owners, who met at Carson City recently, whereby about $100,000 back taxes will be collected from mining companies in Nye and Esmeralda Counties, and future levies will be made on only 60% of the net profits of the mines. This percentage to vary according to the assessment on other property. This is considered equivalent to the assessment on other property. Agreements in regard to costs chargeable against gross profits were: Cost of plants to be spread over life of mine, with annual depreciation allowed, to a limit of 20% of the original cost; charges for mine officials limited; interest charges excluded. Mine improvements are to be assessable on same basis as other property.

### Washoe County

PYRAMID MINE (Pyramid Lake)—Considerable damage was done recently by a cloudburst. The assay office was badly damaged, ore wagons washed down the gulch and the roads destroyed.

### White Pine County

NEVADA CONSOLIDATED (Ely)—The new strike of sulphide ore on the Ora claim of Giroux may prove to be of as great importance to Nevada Consolidated as it is to the Giroux. The Ora claim is practically surrounded by Nevada Consolidated ground, and churn drilling done by the latter company during the last few weeks has proved that the new orebody runs well over into Nevada Consolidated ground. One churn-drill hole sunk by the Nevada Consolidated on the Josie claim went down 150 ft. in ore reported to average 2% when water was encountered and the hole was lost by caving. Nevada Consolidated was never before in such good shape for a winter's campaign as it is this fall. Great quantities of ore in the Liberty and Eureka pits have been stripped of overburden and are ready for the shovels. Stripping of overburden has been pushed all during the summer, and August is reported to have broken all records for overburden removed.

CONSOLIDATED COPPERMINES (Ely)—General manager Gray has stated that ground may be broken for the company's new reduction plant this autumn. Citizens of Ely are desirous of having the plant built at Warm Springs, about 2½ miles northeast of Ely, and Mr. Gray has expressed himself as favorable to that site provided property owners will sign waivers of damages which might be caused by smoke or fumes from a smelter. Public sentiment is strongly in favor of building the plant at Warm Springs and it is probable that the majority of property owners will willingly sign the releases wanted. One steam shovel and two dinkey engines are on the road and it is probable that the first ore to be mined by the new shovel will be near Riepetown where there is a deposit of sulphide ore on Giroux ground demonstrated by prospecting with churn drills to contain upward of 4,000,000 tons of ore and with overburden not exceeding 40 ft. in thickness.

## NEW MEXICO

### Socorro County

MAUD MINING CO. (Mogollon)—A compressor is being installed to facilitate further sinking of the new shaft, now down a little over 500 feet.

SOCORRO MINING & MILLING CO. (Mogollon)—The Clifton tunnel, being driven on the mother lode of the district, is expected at any time to encounter and drain the large flow of water found on the 500-ft. level last year, and which was bulkheaded at the time.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—Work preparatory to resumption of sinking was completed and actual sinking started Sept. 13. This included timbering of tunnel and unwatering and lining shaft. A large pump is on the ground and will be installed as soon as additional power is acquired, the flow in the meantime being hoisted.

TRI-BULLION (Kelly)—At a meeting to be held Sept. 30, stockholders will decide upon whether or not the board's recommendation about the sale of the properties at Kelly will be followed. It is stated that the operations of the Kelly group of claims, and the plant at Kelly, have, since Jan. 1, owing to the deterioration of the grade of ore and the fall in the price of spelter, been operated at a loss. The plant has been closed for upward of 90 days, as the obligations of the company total $40,000, and there are no cash assets. As there is no power in the corporation to levy an assessment upon the stock and it is deemed unwise to attempt to liquidate the obligations by a mortgage which might sacrifice all of the properties of the corporation, the board recommends acceptance of an offer that has been made for the purchase of the Kelly group of claims, including the plant for $87,500. The proceeds of the sale are to be applied in full payment of the obligations of the corporation and the surplus to the operation of the Starlight group of mining claims in Arizona, owned by, and the Nit group of mining claims, near Kelly, held by the corporation.

## NORTH CAROLINA

### Rowan County

[illegible] (Gold Hill)—A crosscut is being driven [illegible] -ft. level to cut the Newman vein, that [illegible] level.

## OREGON

### Baker County

[illegible]—The management of this property is making [illegible] to secure patents on 20 additional mining [illegible], which, with the 21 claims already held by [illegible] is the group of mines. Benjamin B. Lawrence [illegible] York, is said to be one of the new owners of [illegible].

### Curry County

SALMON MOUNTAIN PLACER—This mine on the north [illegible] of Salmon Mountain, at an elevation of 2100 ft., has [illegible] passed to new ownership and will be operated at [illegible]. This mine is equipped with hydraulic machinery, using water at 200-ft. head. The mine has been worked at irregular intervals for a number of years and pays from $75 to $100 per day when worked with present equipment. When new machinery is placed it will be a big producer.

### Josephine County

STERLING (Jacksonville)—A large centrifugal pump has been installed on this placer property, and it is the intention of the company to continue operations throughout the year.

## PENNSYLVANIA

### Allegheny County

STANDARD CHEMICAL CO. (Pittsburgh)—Europe is now depending upon America for its supply of radium and America is furnishing it as fast as it can be produced. The Austrian government controls the output of radium-bearing pitchblende from Joachimsthal in Bohemia, and conserves it for home use. Consequently European orders are filled in the United States. A recent Dresden order calls for 500 milligrams, worth $60,000. It is to be delivered in five monthly shipments of 100 milligrams each. The company at present produces about one gram of radium monthly. This amount will be considerably augmented in the near future as additional equipment for production is now being installed.

## SOUTH DAKOTA

### Lawrence County

WASP NO. 2 (Lead)—The dividend for September is 2c. per share, meaning a disbursement of $10,000, and is the largest monthly dividend paid this year. Improvements have been made which have been paid for out of profits.

HEIDELBERG—This property, which is being developed by the Deadwood Business club, is showing up well, and the last month's work is highly gratifying. A crew of men is employed in road construction, and as soon as the road is finished, which will probably be before Oct. 1, the force at the mine will be increased.

OLD IRONSIDES MINING CO. (Squaw Creek)—A corporation under this name has been organized and has taken over the lease on the Ironsides property, held by Ringley and [illegible]. The lease runs until Jan. 1, 1915. The mine is being operated steadily, and has produced in the last few months several cars of smelting ore and some of milling grade. The company will drive a new crosscut tunnel to tap the ore, and it is estimated that this will be between 500 and 600 ft. in length.

GOLDEN REWARD (Deadwood)—The North Western and Burlington railways are building a joint track to connect the Astoria roaster with properties of the company lying north of the roaster, and when the connections are made it is expected that the plant will be started. The location of the new cyanide plant has not been agreed upon; the choice lies between Deadwood and adjacent to the roaster. Work is expected to commence at an early date after the engineers' report on the site has been made.

## UTAH

### Beaver County

MOSCOW (Moscow)—The new working shaft is down six sets and when the new equipment has been installed, sinking will be more rapid.

### Juab County

TINTIC SHIPMENTS for the week ended Sept. 12 were 151 cars. Shipments of zinc ore have been resumed by the Lower Mammoth, May Day, and other properties.

GRAND CENTRAL (Robinson)—A dividend of [illegible] per share, or $25,000, has been declared, payable Sept. 25.

MAY DAY (Eureka)—Owing to the rise in the price of spelter, work on zinc ore has been resumed. The recently erected cyanide mill is treating about 1000 tons of dump ore monthly.

TINTIC STANDARD (Eureka)—Arrangements for ventilating the 1000-ft. level have been completed, and the development of the ore recently opened here can proceed without hindrance.

### Salt Lake County

CARDIFF (Salt Lake City)—Work is being continued in the tunnel, 1350 ft. long thus far, which is being driven to [illegible] old workings. A streak of ore is being followed.

UTAH COPPER (Bingham)—The quarterly dividend of [illegible] per share has been declared payable Sept. 30. The copper production for August is expected to be about 1,000,000 lb. [illegible] of the [illegible] of July.

[illegible] COPPER (Bingham)—Shares can now be exchanged [illegible] those of the Utah Lead & Copper Co. The [illegible] is four shares of stock in the old company for [illegible] the new. [illegible] stockholders receive [illegible] in bonds bearing interest from Sept. 1, 1913 for [illegible] paid in assessment.

### Summit County

PARK CITY SHIPMENTS for the week ended Aug. 30 amounted to 3,472,980 lb., those for the week ended Sept. 12 to 3,372,980 pounds.

SILVER KING CONSOLIDATED (Park City)—The new three-compartment working shaft is down below the 1750-ft. level. This leaves about 50 ft. more of work in addition to a 35-ft. sump before the present sinking contract is completed. Dividend No. 1 of 25c. per share has been mailed to stockholders. Accompanying the dividend checks was a statement by President Spiro. This mentions the fact that the company has no debts, and that after the present dividend amounting to $155,000 is paid, there will be more than $500,000 cash in the treasury. The final payment of the judgment was made by the Silver King Coalition July 31. The total including accrued interest amounted to $908,453. When the shaft sinking has been completed, work will be started on the 1550-ft. level to reach the ore cut at 1470 ft. while sinking.

### Tooele County

HIDDEN TREASURE (Dry Cañon)—Lessees are working, and are opening zinc ore of good grade. Some shipments are being made.

EUREKA-OPHIR (Dry Cañon)—A new orebody has been opened near the surface. Ore is being mined from this deposit, and also from the 275-ft. level. About a car of ore per month, carrying copper, silver and lead is being shipped.

BULLION COALITION (Stockton)—The old Honorine mill is being overhauled and placed in commission to treat a limited tonnage of second-class ore from this property. The ore is lead sulphide with pyrite. Three to four tons will be concentrated into one, and 25 to 30 tons treated daily. The mill has been idle for a number of years.

## VIRGINIA

### Prince William County

CABIN BRANCH (Dumfries)—Shipments of pyrites have been resumed. Barges have been loaded for Norfolk and Alexandria. The present output is coming from drifts in the mine. It is proposed to sink another shaft.

## CANADA

### Ontario

BUFFALO (Cobalt)—A dividend of 20%, payable Oct. 1, and an extra dividend of 7%, payable Nov. 15, have been declared.

SENECA-SUPERIOR (Cobalt)—The regular monthly dividend of 10%, with an extra bonus of 2½%, bonus payable Oct. 15, has been declared.

RIGHT OF WAY (Cobalt)—This company has given up its option on the seven Flynn and Gordon claims in Labelle Township, having failed to make important discoveries.

NIPISSING (Cobalt)—This company has decided to ship its silver bullion from Cobalt to New York instead of to London direct as heretofore as the result of trial shipments which have been made on favorable terms.

QUAKER CITY (Cobalt)—Preparations are being made to resume operations at this mine, which adjoins the Cochrane. Deep-mining will be attempted; the shaft will be sunk several hundred feet deeper and the ground explored.

KERR LAKE (Cobalt)—Since the partial draining of Kerr Lake six new veins, all carrying native silver have been found on the rock uncovered by the receding water. The largest has been traced for 50 ft. and will run upward of 3000 oz. of silver to the ton.

LA ROSE—The August production of silver was 226,267 oz. valued at $133,497, and the net profit $80,145. The cash surplus to Aug. 31 was $1,500,148 and the value of outstanding shipments of ore and ore ready for shipment $306,055, which deducting current liabilities left a net surplus of $1,780,124.

McKINLEY-DARRAGH (Cobalt)—Owing to the decrease in the cash surplus due to extensive underground development and the heavy expenditures incident to the enlarging of the concentrator, the directors decided to cut the quarterly dividend from 3%, with a 7% bonus to 3% and 3% bonus.

HOLLINGER (Timmins)—Twenty stamps are to be added to the mill, making 60 in all and increasing the crushing capacity to 650 tons daily. Ground has been broken for the addition and the new stamps are expected to be in operation by the end of the year. Foundations are also being laid for the permanent central power plant, which will serve the Hollinger together with the Dixon, Gillies and Miller-Middleton mines.

BEAVER (Cobalt)—The quarterly report for the three months ended August 31 shows cash on hand and due from smelters and estimated value of ore ready for shipment amounting to $145,371, less accounts payable $17,460, leaving an available balance of $127,910. New veins have been encountered and new shoots opened up on some of the lower levels and plans are in preparation for sinking to 1500 ft. Some of the richest ore yet found in the mine is showing at the 700-ft. level.

### Quebec

QUEBEC GRAPHITE CO. (Buckingham)—A complete plant for the manufacture of graphite has been installed at the works of this company and is now being tested.

## MEXICO

### Puebla

AN UPRISING OF INDIANS is reported in a Press despatch which states: "An American named Barron in a telegram to the American Embassy from Teziutlan, says that more than 1000 Federals under Col. Alfredo Torres and Col. Alberto Guevara have been besieged by rebel Indians from the Sierra de Zacapoaxtla since Sept. 16 last. Barron says the Indians are 6000 strong and have artillery. Fifteen shells have been fired into the town from 80 millimeter guns. The Indians have tried to capture the town by assault several times. Barron says the Federals can hold the town, but reinforcements are urgently needed. Many Americans are in the besieged town."

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Sept. 24

The metal markets are still generally strong. Some recessions in price are noted, but they are small and do not amount to any real reaction.

### Copper, Tin, Lead and Zinc

**Copper**—Immediately following our last report, the buying demand, which had already relaxed, came nearly to a standstill. The antics of the London standard market disturbed the equanimity of some interests on this side, and certain of the smaller agencies, two at least, together with speculative second-hands began to try to find the market. In so doing they offered copper down to 16⅝c., cash, New York, at which price transactions have been made during the last two days, although their volume has not been large. In the meanwhile the larger agencies maintained their old asking price of 16⅞c., delivered, usual terms, although one of them at least has been apparently disposed to make concessions if such would result in the development of business. The fact is, however, that consumers have lately bought heavily and temporary cessation in buying is perfectly natural. American consumers are believed still to be short of covering their requirements for the near future, but in view of the momentary uncertainty are holding off in the hope of securing bargains.

The market for Lake copper continues wholly nominal. Aside from some driblets in second-hands the Calumet & Hecla has the only supply, and itself is probably unable to satisfy the requirements of its regular customers, many of whom for years have been unwilling to take anything but C. & H. copper.

At the close Lake copper is quoted nominally 16¾@17c.; electrolytic in cakes, wirebars or ingots is 16,35@16.40c. We quote casting copper at 16.20@16.25c. nominally, as an average for the week.

The London standard market has been nervous, and while fluctuations have taken place, the market has been subject to conflicting influences. On Thursday, Sept. 18, spot copper was £73 5s. and three months £73 2s. 6d. On Friday, the market advanced about 7s. 6d., but on Monday it declined again to £72 15s. for spot and £72 12s. 6d. for three months. On Tuesday spot advanced to £74 2s. 6d. and three months to £73 17s. 6d., but on Wednesday, Sept. 24, the market again declined, closing at £72 12s. 6d. for spot and £72 10s. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾@18c., carload lots at mill.

Exports of copper from New York for the week were 9120 long tons. Our special correspondent gives the exports from Baltimore at 2699 tons for the week.

**Brass Prices** are announced as follows to date from Sept. 15: Sheets, high brass, 17¼c. net per lb.; low brass, 19¼c. Wire, high brass, 17c.; low brass, 19¼c. Rods, high brass, 17c.; low brass, 20c. Tubes, brazed, or open seam, 21⅞c. Angles and channels, 21⅞c. Scrap allowances are 11¾c. net per lb. for high brass and 13¼c. for low brass.

**Tin**—Both the London and domestic markets were very dull throughout the week. Buyers fought shy, anticipating a further decline in price, in view of the pending Banka sale. At the lower level the tone of the market has hardened considerably, and that more confidence in its future is had is shown by the three months quotation, which is higher than spot, which has not been the case for a long time. The market closes firm at £191 5s. for spot and £191 12s. 6d. for three months and about 41.87½c. for September tin here.

Tin output of the Federated Malay States eight months ended Aug. 31 was 32,046 long tons in 1912 and 32,000 tons in 1913; decrease, 46 tons.

The exports from the Straits eight months ended Aug. 31, were 38,432 long tons in 1912 and 41,534 in 1913; increase, 3102 tons.

**Lead**—The market has been quiet and weakish. The demand has been small and some pressure to sell lead has developed. Prices in St. Louis have declined to 4.50@4.55c. and New York 4.65@4.70 cents.

The London market for Spanish lead is unchanged at £20 7s. 6d. for Spanish and English lead £1 higher.

**Spelter**—This market is also somewhat weaker. Buyers are not well covered but are holding back, and the little business that presents itself is eagerly competed for. In consequence, prices have suffered, and at the close St. Louis is quoted 5.45@5.50c.; New York 5.60@5.65 cents.

The London market is somewhat lower, good ordinaries being quoted £20 12s. 6d.; specials 12s. 6d. higher.

Base price of zinc sheets is now $8 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in August, at 1972 tons, of which only 9 tons were from South Africa, the rest being from Bolivia.

DAILY PRICES OF METALS

NEW YORK

| Sept. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb. | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 4.8545 | 61 | *16¾<br>@17 | 16.40<br>@16.50 | 42⅛ | 4.65<br>@4.75 | 4.55<br>@4.60 | 5.65<br>@5.70 | 5.50<br>@5.55 |
| 19 | 4.8560 | 61½ | *16¾<br>@17 | 16.40<br>@16.45 | 42⅛ | 4.65<br>@4.75 | 4.55<br>@4.60 | 5.65<br>@5.70 | 5.50<br>@5.55 |
| 20 | 4.8575 | 61⅝ | *16¾<br>@17 | 16.40<br>@16.45 | 42⅛ | 4.65<br>@4.75 | 4.55<br>@4.60 | 5.62½<br>@5.67½ | 5.47½<br>@5.52½ |
| 22 | 4.8580 | 62⅛ | *16¾<br>@17 | 16.35<br>@16.45 | 41¾ | 4.65<br>@4.70 | 4.50<br>@4.55 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 23 | 4.8570 | 61⅞ | *16¾<br>@17 | 16.35<br>@16.40 | 41¾ | 4.65<br>@4.70 | 4.50<br>@4.55 | 5.60<br>@5.65 | 5.45<br>@5.50 |
| 24 | 4.8560 | 61⅝ | *16¾<br>@17 | 16.35<br>@16.40 | 41⅞ | 4.65<br>@4.70 | 4.50<br>@4.55 | 5.60<br>@5.65 | 5.45<br>@5.50 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Sept. | Silver | Copper: Spot | Copper: 3 Mos | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
| 18 | 28 7/16 | 73¼ | 73⅛ | 79¼ | 191¾ | 191½ | 20½ | 21 |
| 19 | 28⅜ | 73 11/16 | 73½ | 79¼ | 192½ | 192 | 20¼ | 20¾ |
| 20 | 28 5/16 | | | | | | ... | ... |
| 22 | 28 11/16 | 72¾ | 72⅝ | 78¼ | 190½ | 191 | 20½ | 20¾ |
| 23 | 28 9/16 | 74⅛ | 73⅞ | 79 | 190¾ | 191¼ | 20½ | 20⅝ |
| 24 | 28 7/16 | 72⅝ | 72½ | 78¼ | 191¼ | 191⅝ | 20⅜ | 20⅝ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17¾c.; £15 = 3.26c. £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—The market is still dull, with only pressing business to be reported. Quotations are 22@22¼c. per lb. for No. 1 ingots, domestic. Imported metal is quoted at 18@18¼c. in bond.

The latest London quotation £84@87 per long ton—equal to 18.25@18.90c. per lb.—for ingots.

**Antimony**—The market is still waiting the tariff settlement. Business is slow and prices practically unchanged. Cookson's is 8.25@8.50c. per lb.; Hallett's 7.75@8c.; while 7@7.50c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business is better but prices remain about the same. New York quotation is $39 per flask of 75 lb. San Francisco, $39 for domestic orders and $36.50 for export. London price is unchanged at £7 5s. per flask, with £7 quoted from second hands.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

**Nickel**—Quotations for ordinary forms, shot, blocks, or plaquettes are 40@45c. per lb .according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 is paid for retail orders.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London remained at the Bank level 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was no special demand. Some gold is still coming from South America to London.

**Iridium**—There is no change in the position of this metal. The price remains high, $82@85 per oz. being asked for pure metal.

**Platinum**—The market is still unsettled. Sales have again been made as low as $43 per oz., but dealers claim that the price is gradually hardening and still ask $45 per oz. Hard metal continues to bring $47@50 per oz., according to the proportion of iridium.

**Silver** has had a sudden upward turn. This is believed to be owing to purchasers on India Government account. China selling has produced a reaction and at the moment there is no special feature in the situation

Shipments of silver from London to the East, Jan. 1 to Sept. 11, as reported by Messrs. Pixley & Abell.

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £6,953,200 | £5,128,500 | D. £1,824,700 |
| China | 933,500 | 592,000 | D 341,500 |
| Total | £7,886,700 | £5,720,500 | D. £2,166,200 |

The net imports of gold into India for the eight months ended Aug. 31 show a large decrease as compared with 1912. The total amount was £22,921,465 in 1912, and £12,688,932 in 1913; a decrease of £10,232,533, or 44.6%, this year.

Gold and silver movement in the United States eight months ended Aug. 31:

| | Gold | | Silver | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Exports | $43,159,972 | $73,583,242 | $46,336,725 | $43,166,040 |
| Imports | 34,589,111 | 41,572,860 | 32,652,869 | 24,331,964 |
| Excess, exp | $8,570,861 | $32,010,382 | $13,683,856 | $18,834,076 |

Merchandise exports for the eight months this year were valued at $1,515,085,773, imports, $1,156,575,670; excess of exports, $358,510,103 Adding gold and silver gives $409,354,559 as the total export balance

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Sept. 20

The high price of zinc blende is $50, the base per ton of 60% zinc $43@48 for choice grades. Ores that have been under contract for several months were secured this week at an advance over prevailing prices. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades of zinc is $43.90 Some lead sold up to $58 per ton of 80% metal contents, with a downward tendency at the week-end, all grades averaging $56.32 per ton

SHIPMENTS WEEK ENDED SEPT 20

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 10,677,700 | 831,320 | 1,723,340 | $301,265 |
| Totals 38 weeks | 408,905,050 | 30,573,470 | 67,322,110 | $11,370,599 |

Blende value, the week, $241,725; 38 weeks, $9,184,789.

Calamine value, the week, $11,010; 38 weeks, $391,121.

Lead value, the week, $48,530; 38 weeks, $1,794,689.

### PLATTEVILLE, WIS.—Sept. 20

The base price paid this week for 60% zinc ore was a point lower than last week, $46@47 per ton. Lead base for 80% ore was the same, $58@59 per ton.

SHIPMENTS WEEK ENDED SEPT. 20, 1913

| | Zinc ore, lb. | Lead ore, lb | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,701,220 | 223,000 | 1,218,610 |
| Year to date | 108,393,700 | 5,166,290 | 42,907,910 |

Shipped during week to separating plants, 3,022,570 lb. zinc ore.

## IRON TRADE REVIEW

### NEW YORK—Sept. 24

The iron trade has grown distinctly quieter the last week, both in pig iron and in finished-steel products, though some lines are holding up well. The slackening may possibly be only temporary, due to the fact that the tariff bill is now finally to be enacted, but steel manufacturers are clearly disappointed that September has brought a decrease in business instead of the increase which the August improvement presaged.

The most interesting event of the week in the matter of prices has been the increase in aggressiveness of the American Sheet & Tin Plate Co. in the sheet market. Hitherto on the decline in prices, which started several months ago, the independents have made the first cuts, the leading interest merely following, but within the past week it has named some prices lower than had been made by independents

In plates and shapes the market is hardly any weaker, though perhaps merely because there has been little important business to interest the mills. There is renewed shading in wire products. Tubular goods hold up very well, with bookings as heavy as in August, and mills comfortably fixed for practically the balance of the year.

Pig iron is reported quiet in the West. In Seaboard territory there is an improved demand for foundry iron, and manufacturers are reported to be carrying small stocks in their yards.

**Exports and Imports of Iron and Steel** in the United States seven months ended July 31 are valued by the Bureau of Statistics of the Department of Commerce as follows:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Exports | $164,963,425 | $179,703,454 | I. $14,740,029 |
| Imports | 15,960,533 | 20,872,124 | I. 4,911,591 |
| Excess, exports | $149,002,892 | $158,831,330 | I. $ 9,828,438 |

The increase of 8.9% in the value of exports was accompanied by a gain of 30.8% imports. The exports were the largest ever reported.

### PITTSBURGH—Sept. 23

Steel production is believed to be at a slightly lower rate than a fortnight ago, and it is freely predicted that as some departments have reached the end of their accumulations of orders, there will be a distinct decrease in the total output within two or three weeks. For months the excess of shipments over current orders has been maintained by the steadily diminishing amount of old business remaining.

**Pig Iron**—The market has grown still quieter. Two interesting inquiries for basic iron were withdrawn late last week, leaving nothing upon which to figure. In foundry iron inquiry is limited to very small lots, except that Standard Sanitary has asked prices on about 2500 tons. Bessemer is also quiet The furnaces have been talking higher prices on foundry and basic iron, $15.25, Valley, on foundry, and $14.50 on basic, but no sales appear to have been made above the old market of $14. We quote Bessemer, $15.75@16 basic, $14@$14.25, No 2 foundry, $14@14.25 malleable, $14.25 forge, $13.50@13.75, at Valley furnaces, 90c higher, delivered Pittsburgh. Prompt foundry coke is offered in a limited way at cut prices, but is largely, if not wholly, under grade Inquiry is beginning to develop for October coke, with standard grades still quoted at $2.50 It is reported that several operators who have been quietly holding $2.50 will openly join the ranks of the regular $2.50 operators

**Ferromanganese**—The tone of the market is weaker, with rumors that there may be a formal reduction in the English pool's price. Openly prompt lots are offered at $55, Baltimore, and there are rumors of less having been done Inquiry is light. We continue to quote the official asking price on prompt and forward at $56, Baltimore.

**Steel**—The market has been quite stagnant, with not enough inquiry to develop whether lower prices would be made. The larger mills appear to be standing well together. We continue to quote billets at $25 and sheet bars at $26, maker's mill, Pittsburgh. Rods have softened to $27, Pittsburgh.

### IRON ORE

Lake iron-ore shipments continue pretty well up to the mark. It is believed that the September shipments will about equal those of August. In the East the market is quiet, and little or nothing is being done with foreign ores.

**British Imports of Iron Ore** eight months ended Aug. 31 were 4,235,025 long tons in 1912, and 5,244,949 in 1913; increase, 1,009,924 tons. Imports of manganese ore were 211,762 tons in 1912, and 406,419 in 1913; increase, 194,657 tons.

**Imports and Exports of Iron Ore** in the United States seven months ended July 31, long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Imports | 1,180,053 | 1,408,170 | I. 228,117 |
| Exports | 498,950 | 521,497 | I. 22,547 |

Imports of manganese ore for the seven months were 120,310 tons in 1912 and 227,731 in 1913; increase 107,421 tons.

### COKE

Connellsville coke is now held steadily at $2.50 per ton for furnace coke. It is claimed that the cutting reported for two weeks past has ceased. Production decreased a little last week.

**Anthracite Shipments** in August were 5,369,000 tons. For the eight months ended Aug. 31 the total shipments were 38,958,723 long tons in 1912, and 45,709,606 in 1913; an increase of 6,750,883 tons this year.

**Coal Passing through Sault Ste. Marie** canals, season to Aug. 1, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 505,225 | 1,425,554 | I. 920,320 |
| Bituminous | 5,981,229 | 7,986,881 | I. 2,005,652 |
| Total | 6,486,454 | 9,412,435 | I. 2,925,981 |

The large gain in anthracite was due to the very light shipments in the early part of last season.

**Exports of Fuel from Great Britain** eight months ended Aug. 31 were: Coal, 42,501,446; coke, 599,275; briquettes, 1,223,046; coal sent abroad for use of steamers in foreign trade, 11,970,713; total, 56,294,480 long tons. The total in 1912 was 44,274,901 tons, showing an increase of 12,019,579 tons, or 27.1%, this year. Imports were, 179,398 tons in 1912, and 14,515 in 1913; a decrease of 164,883 tons.

### SAULT STE. MARIE CANAL TRAFFIC

The total freight passing through the Sault Ste. Marie canals in July was 12,278,124 short tons. For the season to Aug. 1 the total tonnage was:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| East-bound | 23,266,029 | 27,393,691 | I. 4,127,662 |
| West-bound | 7,366,045 | 10,279,796 | I. 2,913,751 |
| Total | 30,632,074 | 37,673,487 | I. 7,041,413 |

The number of vessel passages this year was 10,850, showing an average cargo of 3472 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 6,486,454 | 9,412,435 | I. 2,925,981 |
| Iron ore | 20,248,973 | 23,344,042 | I. 3,095,069 |
| Pig and manuf. iron | 296,648 | 198,762 | D. 97,886 |
| Copper | 46,938 | 46,967 | I. 29 |
| Building stone | 2,282 | 5,973 | I. 3,691 |
| Salt, bbl | 362,286 | 335,136 | D. 27,150 |

Iron ore was 62% and coal 25% of the total freight tonnage this year.

## CHEMICALS

### NEW YORK—Sept. 24

The general chemical trade shows marked increase in activity since the opening of September. The demand for raw materials has been particularly good.

**Arsenic**—The market is dull, with few sales. Quotations are $3@3.25 per 100 lb. nominally.

**Copper Sulphate**—Business is good. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The preparations for spring trade have not begun yet and the market is dull. The quotations are 2.40c. per lb. for both spot and futures.

### OTHER ORE MARKETS

**Manganese Ores**—The schedule of prices adopted by the Carnegie Steel Co. is as follows, for deliveries in the Pittsburgh district or at South Chicago: Ore containing 49% over metallic manganese, 25c. per unit; 46 to 49%, 24c.; 43 to 46%, 23c.; 40 to 43%, 22c. These prices are based on ores containing not more than 8% silica or 0.20% phosphorus. Deductions will be made of 15c. per ton for each 1% of silica in excess of 8%; of 2c. per unit of manganese for each 0.02% of phosphorus in excess of 0.20%. Ores containing less than 40% manganese, more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at buyer's option.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | April | May | June | July | August |
|---|---|---|---|---|---|
| Alaska shipments | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 |
| Anaconda | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 |
| Arizona, Ltd. | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 | 1,800,000 |
| Copper Queen | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 |
| Calumet & Ariz. | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 |
| Chino | 3,925,409 | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 |
| Detroit | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 |
| East Butte | 1,400,000 | 1,268,595 | 1,055,646 | 1,060,257 | ..... |
| Mammoth | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 610,000 | 610,000 | ....... |
| Mason Valley | 1,264,304 | 1,186,560 | 1,097,014 | 908,892 | ....... |
| Miami | .. | 1,943,900 | 2,612,000 | ....... | ....... |
| Nevada Con. | 5,650,000 | 5,933,275 | 6,344,863 | 5,403,919 | ..... |
| Ohio | 690,001 | 650,071 | 537,400 | 601,700 | ... |
| Old Dominion | 3,040,000 | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 |
| Ray | 4,379,128 | 4,384,400 | 4,392,612 | 4,097,000 | ... |
| Shannon | 1,238,000 | 1,080,000 | 924,000 | 880,000 | 1,248,000 |
| South Utah | 132,267 | 200,000 | 185,000 | 140,000 | 223,498 |
| Tennessee | 1,718,188 | §1,037,115 | 1,379,220 | 1,247,804 | ...... |
| United Verde* | 3,000,000 | 3,000,000 | 2,900,000 | 3,000,000 | . |
| Utah Copper Co. | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 | 10,302,251 |
| Lake Superior* | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 |
| Non-rep. mines* | 6,000,000 | 6,300,000 | 6,000,000 | 6,200,000 | ......... |
| Total prod. | 104,224,079 | 109,824,500 | 104,051,138 | 101,758,167 | ......... |
| Imports, bars, etc. | 25,578,297 | 22,205,942 | 18,255,267 | 29,029,990 | .......... |
| Total blister | 129,802,376 | 132,030,442 | 122,306,405 | 130,788,157 | .......... |
| Imp. ore & matte. | 7,177,363 | 10,528,562 | 7,497,002 | 8,527,046 | .......... |
| Total Amer. | 136,979,739 | 142,559,004 | 129,803,407 | 139,315,203 | ..... |
| Miami† | 2,312,900 | | .. | 2,890,000 | 3,097,500 |
| Shattuck-Arizona | 1,158,326 | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 |
| Brit. Col. Cos: | | | | | |
| British Col. Cop. | 794,000 | 618,076 | 634,238 | 618,379 | ....... |
| Granby | 1,857,452 | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,811,200 | 2,424,800 | 1,984,640 | 2,240,720 | 2,264,640 |
| Cananea | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 |
| Moctezuma | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 |
| Cape Cop., S. Af. | 586,880 | 387,520 | 414,400 | .. | ... |
| Kyshtim, Russia | 2,544,640 | 1,490,000 | 1,000,000 | 2,500,000 | ...... |
| Spassky, Russia | 974,400 | 721,280 | 835,520 | 660,800 | ....... |
| Exports from | | | | | |
| Chile | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 |
| Australia | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 | 6,720,000 |
| Arrivals–Europe† | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| | United States | | | Visible Stocks | | |
|---|---|---|---|---|---|---|
| Month | U.S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| VIII'12 | 145,628,521 | 78,722,418 | 70,485,150 | 50,280,421 | [illegible] | 163,579,621 |
| IX | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,[illegible] | [illegible] | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | [illegible] | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | [illegible] | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,45[illegible] | | .. | ........ |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | ......... | .......... | ....... | 38,314,037 | 63,716,800 | 102,030,837 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## ASSESSMENTS

| Company | Delinq. | Sale | Amt |
|---|---|---|---|
| [illegible] | Sept 22 | Oct 15 | 0 02 |
| [illegible] | Sept 18 | Oct. 18 | 1.00 |
| [illegible] | Sept 23 | Oct. 14 | 0 10 |
| [illegible] | Sept 14 | Oct. 14 | 0 01 |
| [illegible] | Sept 6 | Oct. 4 | 0 002 |
| [illegible] | Sept 15 | Oct. 11 | 0 005 |
| [illegible] | Sept. 19 | Oct. 18 | 0 005 |
| [illegible] | Sept 10 | Sept 30 | 0 0005 |
| [illegible], Nev | Sept 15 | Oct. 9 | 0 01 |
| [illegible], Ida | Sept 8 | Sept 29 | 0 000 |
| [illegible] | Sept 8 | Sept 30 | 0 02 |
| [illegible], Utah | Sept 11 | .. | 0 01 |
| [illegible], Ida, (postpo'd) | Aug 11 | Oct. 10 | 0 005 |
| [illegible], Ida | Sept 20 | Oct. 16 | 0 003 |
| [illegible] Gold, Ida | Sept 8 | Oct. 8 | 0 0005 |
| [illegible] Metals (Boston) | .. | Oct. 10 | 0.15 |
| Moonlight, Ida | Sept 30 | Oct. 3 | 0 005 |
| Oreano, Ida | Sept 1 | Oct. 1 | 0 0015 |
| Sierra Nevada, Nev | Sept 25 | Oct. 25 | 0 10 |
| Silver Flat, Utah | Sept 22 | Oct. 2 | 0 001 |
| Silver Mountain, Ida | Sept 15 | Oct 15 | 0 002 |
| Slavonia, Ida | Sept 10 | Sept 30 | 0 002 |
| St Louis, Calif | Sept 22 | Oct 4 | 0 01 |
| Sunset, Nev | Sept 2 | Oct 13 | 0 01 |
| Sunshine, Ida | July 1 | Oct 15 | 0 001 |
| Tidd, Ida | Sept 15 | Oct. 15 | 0 001 |
| Yellow Jacket, Nev | Sept 8 | Oct 8 | 0 10 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53 795 | 56 260 | 62 938 | 24 865 | 25 887 | 28 983 |
| February | 52 222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March | 52 745 | 58 375 | 57 870 | 24 324 | 26 875 | 26 669 |
| April | 53 325 | 59 207 | 59 490 | 24 595 | 27 284 | 27 416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24 486 | 28 215 | 27 199 |
| July | 52 630 | 60 654 | 58 721 | 24.286 | 27.919 | 27 074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28 375 | 27 335 |
| September | 52 440 | 63 078 | ..... | 24 209 | 29 088 | |
| October | 53 340 | 63 471 | ..... | 24 594 | 29 299 | |
| November | 55 719 | 62 792 | ..... | 25 649 | 29 012 | |
| December | 54 905 | 63 365 | ..... | 25 349 | 29 320 | |
| Year | 53 304 | 60 835 | .... | 24 592 | 28 042 | |

New York quotations, cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0 925 fine

### COPPER

| Month | New York Electrolytic 1912 | Electrolytic 1913 | Lake 1912 | Lake 1913 | London Standard 1912 | London Standard 1913 |
|---|---|---|---|---|---|---|
| January | 14 094 | 16 488 | 14.337 | 16 767 | 62 760 | 71 741 |
| February | 14 084 | 14 971 | 14.329 | 15 253 | 62 893 | 65 519 |
| March | 14 698 | 14 713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15 741 | 15 291 | 15.930 | 15 565 | 70 294 | 68 111 |
| May | 16 031 | 15 436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17 234 | 14 672 | 17 443 | 14 871 | 78 259 | 67 140 |
| July | 17 190 | 14 190 | 17 353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | | 17.698 | | 78 762 | |
| October | 17 314 | | 17 661 | | 76 389 | |
| November | 17 326 | | 17.617 | | 76 890 | |
| December | 17 376 | | 17.600 | | 75 516 | |
| Year | 16 341 | | 16 560 | | 72 942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46.832 | 192 619 | 213 615 |
| April | 43.923 | 49.115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | | 223 762 | |
| October | 50 077 | .. | 228 353 | |
| November | 49 891 | .... | 227 619 | |
| December | 49 815 | | 226 875 | |
| Year | 46 096 | | 209 322 | |

New York in cents per pound London in pounds sterling per long ton

### LEAD

| Month | New York 1912 | New York 1913 | St Louis 1912 | St Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4 435 | 4 321 | 4 327 | 4.171 | 15 597 | 17.114 |
| February | 4 026 | 4 325 | 4 046 | 4 175 | 15 738 | 16 550 |
| March | 4 073 | 4 327 | 4 046 | 4 177 | 15 997 | 15 977 |
| April | 4 200 | 4 381 | 4 118 | 4 242 | 16 331 | 17 597 |
| May | 4 194 | 4 342 | 4 072 | 4 226 | 16 509 | 18 923 |
| June | 4 392 | 4 325 | 4 321 | 4 190 | 17 588 | 20 226 |
| July | 4 720 | 4 375 | 4 603 | 4 223 | 18 544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | | 4 924 | | 22 292 | |
| October | 5 071 | | 4 894 | . | 20 630 | |
| November | 4 615 | | 4 463 | | 18 193 | |
| December | 4 303 | | 4 152 | | 18 069 | |
| Year | 4 471 | | 4 360 | | 17 929 | |

New York and St Louis cents per pound London, pounds sterling per long ton

### SPELTER

| Month | New York 1912 | New York 1913 | St Louis 1912 | St Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6 442 | 6 931 | 6 292 | 6 854 | 26 642 | 26 114 |
| February | 6 499 | 6 239 | 6 349 | 6 089 | 26 661 | 25 338 |
| March | 6 626 | 6 078 | 6 476 | 5 926 | 26 048 | 24 605 |
| April | 6 633 | 5.641 | 6 483 | 5 491 | 25 644 | 25 313 |
| May | 6 679 | 5 406 | 6 529 | 5 256 | 25 790 | 24 583 |
| June | 6 877 | 5 124 | 6 727 | 4 974 | 25 763 | 22 143 |
| July | 7 116 | 5.278 | 6 966 | 5 128 | 26 174 | 20 592 |
| August | 7 028 | 5 658 | 6 878 | 5 508 | 26 443 | 20 706 |
| September | 7 454 | | 7 313 | | 27 048 | |
| October | 7 426 | | 7 276 | | 27 543 | |
| November | 7 371 | | 7 221 | . | 26 804 | |
| December | 7 162 | | 7 081 | | 26 494 | |
| Year | 6 943 | | 6 799 | | 26 421 | |

New York and St Louis, cents per pound London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15 12 | $18 15 | $13.32 | $17.35 | $14.00 | $18 59 |
| February | 15 03 | 18 15 | 13 28 | 17.22 | 14.01 | 18 13 |
| March | 14 95 | 18.15 | 13 66 | 16.96 | 14.10 | 17 53 |
| April | 15 13 | 17 90 | 13.90 | 16.71 | 14.15 | 16 40 |
| May | 15 14 | 17 68 | 13 90 | 15.80 | 14.12 | 15 40 |
| June | 15 15 | 17 14 | 14 11 | 15.40 | 14 22 | 15 10 |
| July | 15 15 | 16 31 | 14 38 | 15.13 | 14.38 | 14.74 |
| August | 15 43 | 16 63 | 14 90 | 15.00 | 14 85 | 14 88 |
| September | 16 86 | | 16 03 | .... | 15 63 | |
| October | 17 90 | | 17 18 | | 17 22 | |
| November | 18 07 | | 17 09 | | 18 00 | |
| December | 18 15 | | 17 15 | | 18 73 | |
| Year | $16 01 | | $14 93 | | $15 28 | |

# STOCK QUOTATIONS

### COLO. SPRINGS Sept 23

| Name of Comp. | Bid. |
|---|---|
| Acacia | 02½ |
| Cripple Cr'k Con | .01 |
| C. K. & N. | .08 |
| Doctor Jack Pot | .05½ |
| Elkton Con | 11 |
| El Paso | 3 75 |
| Findlay | 02½ |
| Gold Dollar | 10 |
| Gold Sovereign | 02½ |
| Isabella | 10 |
| Jack Pot | 04½ |
| Jennie Sample | 05 |
| Lexington | ‡ 005 |
| Moon Anchor | ‡ 006 |
| Old Gold | 01 |
| Mary McKinney | .59½ |
| Pharmacist | 01½ |
| Portland | 96 |
| Vindicator | 88 |

### SALT LAKE Sept 23

| Name of Comp. | Bid |
|---|---|
| Beck Tunnel | ‡ 04 |
| Black Jack | 08½ |
| Cedar Talisman | 01½ |
| Colorado Mining | .11 |
| Columbus Con | ‡ 05 |
| Crown Point | 01½ |
| Daly-Judge | 6 10 |
| Grand Central | 48 |
| Iron Blossom | 1 25 |
| Little Bell | ‡ 10 |
| Lower Mammoth | ‡ 00½ |
| Mason Valley | 5 50 |
| May Day | 06 |
| Nevada Hills | ‡ 90 |
| New York | ‡ 03 |
| Prince Con | 30 |
| Silver King Coal'n | 3 40 |
| Sioux Con | 01 |
| Uncle Sam | 04½ |
| Yankee | ‡ 08 |

### TORONTO Sept 22

| Name of Comp | Bid | Name of Comp | Bid. |
|---|---|---|---|
| Bailey | 05 | Foley O'Brien | 20 |
| Coniagas | 7 20 | Hollinger | 7 00 |
| T. & Hudson Bay | ‡70 00 | Imperial | ‡ 02 |
| Timiskaming | 24 | Jupiter | 15 |
| Wettlaufer-Lor | 12 | Pearl Lake | 31 |
| Apex | ‡ 01 | Porcu. Gold | 08 |
| Big Dome | 12 50 | Preston E. D | ‡ 01 |
| Crown Chartered | ‡ 00½ | Rea | 15 |
| Dome | 10 | Swastika | 03 |
| Dome Exten | 05 | West Dome | 10 |

### SAN FRANCISCO Sept 22

| Name of Comp | Bid | Name of Comp | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc Nev & Cal | |
| Alta | ‡ 05 | Belmont | 7 37 |
| Belcher | 21 | Jim Butler... | 72 |
| Best & Belcher | 05 | MacNamara | 12 |
| Caledonia | 1 55 | Midway | 45 |
| Challenge Con | 07 | Mont - Tonopah | 1 15 |
| Chollar | 03 | North Star | 59 |
| Confidence | 35 | West End Con | 1 67½ |
| Con. Virginia | 60 | Atlanta | 14 |
| Crown Point | 19 | Booth | 02 |
| Gould & Curry | 03 | C. O. D. Con | 03 |
| Hale & Norcross | 06 | Comb. Frac | 04 |
| Mexican | 1 10 | Jumbo Extension | 12 |
| Occidental | 70 | Pitts.-Silver Peak .. | ‡.44 |
| Ophir | 23 | Round Mountain. . | 40 |
| Overman | 39 | Silver Pick .. | 04 |
| Potosi | 03 | Tramp Con ... | ‡.01 |
| Savage | 11 | Argonaut ... | 2.50 |
| Sierra Nevada | 03 | Bunker Hill ... | 1.75 |
| Union Con | 11 | Central Eureka .. | 12 |
| Yellow Jacket | 28 | So. Eureka . | 2 75 |

### N. Y. EXCH. Sept. 23

| Name of Comp | Clg. |
|---|---|
| Amalgamated .. | 77½ |
| Am. Agri. Chem | 46 |
| Am Sm & Ref com | 67 |
| Am. Sm & Ref., pf | 101½ |
| Am Sm Sec., pf B | 82 |
| Anaconda | 38 |
| Batopilas Min | 1 |
| Bethlehem Steel pf | 73 |
| Chino | 42½ |
| Federal M. & S., pf | 38 |
| Great Nor., ore ctf | 39 |
| Guggen. Exp | 46½ |
| Homestake | 105 |
| Inspiration Con | 16 |
| Miami Copper | 23 |
| Nat'l Lead, com | 47½ |
| National Lead, pf | 104 |
| Nev Consol | 17 |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf | 88½ |
| Quicksilver, pf | 3 |
| Ray Con | 19 |
| Republic I&S, com | 24 |
| Republic I&S, pf | 88 |
| Sloss Sheffi'd, com | 35 |
| Sloss Sheffield, pf | 89 |
| Tennessee Copper | 32½ |
| Utah Copper | 53½ |
| U. S. Steel, com | 64 |
| U. S. Steel, pf | 109½ |
| Va. Car. Chem., pf | 101 |

### N. Y. CURB Sept 23

| Name of Comp. | Clg |
|---|---|
| Ariz Belmont | 24 |
| Barnes King | 1 19 |
| Beaver Con | 33 |
| Big Four | 25 |
| Braden Copper | 7½ |
| B. C. Copper | 2 |
| Buffalo Mines | 2½ |
| Can G. & S | 19 |
| Con Ariz Sm | 25 |
| Davis-Daly | 2 |
| Diam'field-Dais | 2 |
| Ely Con | 05 |
| Florence | 23 |
| Giroux.. | 1 |
| Gold Hill Con | 25 |
| Goldfield Con | 1½ |
| Greene Cananea | 33 |
| Greenwater | 04 |
| Internat. S. & R | ‡115 |
| Kerr Lake | 4½ |
| Keystone | ‡1½ |
| La Rose | 2½ |
| McKinley-Dar-Sa | 1½ |
| Min Co. of A. new | 2½ |
| Nipissing Mines | 8½ |
| Ohio Copper | 50 |
| Pacific Sm. & M | ½ |
| Puebla S. & R | 2½ |
| South Utah M&S | ½ |
| Stand'd Oil of N. J | 409 |
| Stewart | 1½ |
| Tonopah | 4½ |
| Tonopah Ex | 2 |
| Tonopah Merger | 68 |
| Tri-Bullion | ½ |
| Tularosa | ½ |
| Union Mines | 06 |
| United Cop., pfd | 3 |
| West End Ex | 06 |
| Yukon Gold | 2½ |

### LONDON Sept 13

| Name of Comp | Clg |
|---|---|
| Camp Bird | £0 16s 0d |
| El Oro | 0 14 6 |
| Esperanza | 1 0 0 |
| Mexico Mines | 6 0 0 |
| Oroville | 0 7 6 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 6 |
| Tomboy | 1 6 3 |

### BOSTON EXCH Sept 23

| Name of Comp | Clg. |
|---|---|
| Adventure | 1½ |
| Ahmeek .. | 277 |
| Alaska Gold M... | 20½ |
| Algomah. ...... | 1½ |
| Allouez ...... | 36½ |
| Am. Zinc ... | 21 |
| Ariz. Com., ctfs . | 4 5/16 |
| Bonanza | 32 |
| Boston & Corbin | 75 |
| Butte & Balak... | 3½ |
| Calumet & Ariz . | 68 |
| Calumet & Hecla | 445 |
| Centennial. | 14½ |
| Cliff | 1½ |
| Copper Range | 39½ |
| Daly West . | 2 |
| East Butte. | 12½ |
| Franklin | 4 |
| Granby | 74½ |
| Hancock | 18½ |
| Hedley Gold | 30 |
| Helvetia | 45 |
| Indiana | 5 |
| Island Cr'k, com | 52½ |
| Island Cr'k, pfd | 85 |
| Isle Royale . | 20 |
| Keweenaw.... | 1½ |
| Lake | 8½ |
| La Salle | 4 |
| Mass | 2½ |
| Michigan . | 1½ |
| Mohawk. | 43½ |
| New Arcadian . | 2½ |
| New Idria Quick | 3 |
| North Butte | 28½ |
| North Lake | 1½ |
| Ojibway | 75 |
| Old Dominion | 52 |
| Osceola | 85 |
| Quincy. | 63 |
| Shannon | 7½ |
| Shattuck-Ariz | 30 |
| Superior | 26½ |
| Superior & Bost | 3 |
| Tamarack | 33 |
| Trinity | 4½ |
| Tuolumne | 50 |
| U. S. Smelting | 41½ |
| U. S. Smelt'g, pf | 48½ |
| Utah Apex | 2½ |
| Utah Con | 9½ |
| Victoria | 1 1/16 |
| Winona | 95 |
| Wolverine | 45 |
| Wyandot | 80 |

### BOSTON CURB Sept 23

| Name of Comp | Bid |
|---|---|
| Bingham Mines | 5½ |
| Boston Ely | 70 |
| Butte&Lon'nDev | 30 |
| Cactus | 02 |
| Calaveras . | 1½ |
| Chief Cons .. | 1½ |
| Corbin .. | 1 1/16 |
| Cortez . | 30 |
| Crown Reserve . | 11 |
| Eagle & Blue Bell | 1 1/16 |
| First Nat. Cop | 3½ |
| Houghton Copper . | 3½ |
| Majestic | 34 |
| Mexican Metals | 32 |
| Moneta Porc | ‡ 07 |
| Nevada-Douglas | 2½ |
| New Baltic . | 70 |
| Oneco | 80 |
| Raven Copper | 07 |
| Rhode Island Coal | 01 |
| Smokey Dev . | 1 |
| So. Lake | 3½ |
| S. W. Miami | ‡2½ |
| South Lake | 3½ |
| Trethewey | 28 |
| United Verde Ext | 55 |

‡Last Quotation

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# Pyrophyllite in North Carolina

By Claud Hafer*

*SYNOPSIS—Pyrophyllite is mined in North Carolina, but on a smaller scale than would seem justified. It is used as talc, although it is a silicate of aluminum, whereas talc is magnesium silicate. North Carolina is the only state in which this rock is mined, though New York is the seat of the principal talc industry. Several mills are in operation grinding pyrophyllite.*

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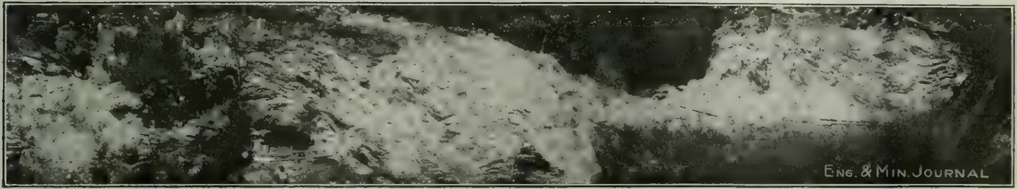
In the valley of Deep River, near Glendon, N. C., the mineral pyrophyllite occurs in such large quantities that its interesting features are not as a mineral, but as a rock formation of considerable area, as yet unexplored. Its extraction and preparation for commercial use is the basis of an industry that has been carried on since antebellum days when the "stone," as it was locally called, was carried down Deep River on flat boats to Fayetteville, where it was transferred to river steamers and shipped to northern markets.

### Sole Example of Pyrophyllite Mining in the United States

This is the only place in the United States where pyrophyllite is mined, and though its characteristics and uses are similar to those of talc, its composition is entirely different, being a silicate of aluminum, whereas talc is a magnesium silicate. Occurrences of the mineral are noted at the Brewer gold mine in South Carolina, and possibly at Gouverneur, N. Y., with true talc.[1] Dana's "Mineralogy" of 1857 mentions Cotton Stone Mountain, in Montgomery County, North Carolina, as a producing locality. Examination shows that this little mountain, which is a monadnock rising a few hundred feet above the surrounding country, contains an abundant quantity of mineral that at first sight seems to be wavellite, but may be radiating pyrophyllite. It is associated with quartz and is probably of no commercial value.

### New York Most Important Talc-Mining State

The U. S. Geological Survey states that talc is a definite mineral, of which soapstone, as the term is generally used, is an impure massive form. Talc contains 63½% of silica and 31½% of magnesia, with about 4.8% of water. It has foliated structure, with pearly luster on its glazed face, greasy feel, and may be easily scratched by the thumb nail. The total marketed production of talc and soapstone in the United States during 1912 was 159,270 short tons, an increase of 10.95% as compared with the production of 1911. Rhode Island produces soapstone alone. The other states, except Maryland, North Carolina, Vermont and Virginia, produced talc only. The production of talc in the United States, California excepted, is limited to the belt of crystalline rock which extends, more or less continuously, through the Atlantic States from Vermont to Georgia. The relative rank of the producing states as to quantity and value of their production in 1912 is: New York, Vermont, Pennsylvania and New Jersey, Georgia, Maryland and Massachusetts, North Carolina, Virginia and finally California, in the order mentioned. New York continues to be the leading producer with an output of more than 52% of the total production of the United States, and far outranking all other states except Vermont, which has in recent years greatly increased its production.



Pyrophyllite Deposits, North Carolina

### Pyrophyllite Resembles Sericite

The Moore County, North Carolina, deposits were described in 1900 by Dr. J. H. Pratt, the state geologist of North Carolina. He says "the mineral is associated with the country slates, but is not in direct contact with them, being separated by bands of siliceous iron breccia,

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*Mining engineer, Candor, N. C.

[1] J. S. Diller. "Production of Talc and Soapstone in 1912." U. S. Geological Survey.

100 to 150 ft. thick," and further that "the pyrophyllite rocks have a width of [illegible] ft., of which no more than 100 ft. constitute the workable deposits, with about 25% commercial pyrophyllite." In appearance and chemical composition this material does not differ greatly from the similar deposits that occur so frequently in the gold-mining districts of North Carolina, and they are probably of similar origin, both being alteration products of the feldspar or mica present in the unaltered schist. The pyrophyllite evidently represents the further stage of alteration and its decomposition should give kaolin. In fact, a number of deposits of kaolin do exist in the region southwest of the "stone" country.

The various openings in the formation give evidence of much metamorphism, accompanied by folding and mashing. Veins of quartz, similar to the gold-bearing veins in the Candor gold district nearby, occur in the pyrophyllite. There are lenses and masses of vitreous quartz, in some cases heavily pyritic, with a little copper. Nearly all of the work done in this field has been open to daylight, there having been only a few shafts sunk, and a few shallow drifts from the opencuts to explore new territory. When new "shoots" were encountered, they were stoped out to the surface. The mineral lies comparatively flat, dipping from 20° to 40° from the horizontal, and is from 12 to 30 ft. in width. Under such conditions, the small output has been obtained without getting below stream level, or no more than 50 to 60 ft. below the outcrops on high ground. The production seems entirely out of proportion to the magnitude of the deposits, which, with development should turn out hundreds of tons daily if conditions remain the same with depth. There is no reason to suppose that this mineral will be confined to any shallower regions than the metallic minerals which, in this country, are found at 800 ft., the maximum depth of exploration. There are three companies operating here and it seems that the present limited production is probably due to difficulties in marketing.

SOUTHERN TALC CO.'S MILL

### A STEAM-DRIVEN GRINDING MILL

The property of the Southern Talc Co. is situated on the southwestern end of the developed territory and is near Deep River. A 75-ft. shaft was sunk here and some drifting and crosscutting done tributary to it. In one of the crosscuts a belt of pyritic schist was cut, so heavy in sulphide that it suggests the possibility of commercial deposits of this mineral. Over a year ago high water from Deep River flooded and caved the underground works to some extent, and since then the product has been taken out of opencuts or purchased from outside sources.

The mill is steam driven and has a capacity of 10 tons of fine "talc" (as it is called in the trade after grinding) per 10-hr. shift. It is well adapted to handling the material it grinds, which contains some quartz. This is separated in the milling process as a finely comminuted powder and is incorporated into a scouring soap at the Boston factory owned by this company for working up the products of the plant.

The stone is delivered on the ground floor of the mill and fed to a Sturtevant crusher. From this it is elevated to a storage bin feeding a vertical emery and buhrstone mill that grinds the product to the fineness of flour. It is then raised to a separator, which in appearance is an octagonal tank with a funnel bottom. The fine material drops on the apex of a funnel-shaped spreader within the separator, and the coarser particles fall to the bottom and are returned to the mill to be reground. The suction of a fan, connected to the separator, draws out the lighter particles and passes them to a second or auxiliary separator, where the material discharged at the bottom is ready for shipment or, if required, can be ground finer. A lighter suction is applied to the second separator and the finer particles are withdrawn and carried to a collector which is made much larger on account of the particles having become exceedingly small and requiring more space to come to rest.

GLENDON MILL ON DEEP RIVER

The discharge from the hopper bottom of this collector is the regular product of the plant, and is bagged for shipment. The extremely fine powder passes out at the top of the collector and into a circular pipe from which hang tubes of porous cloth. These tubes catch the finest product made in the mill. The tailing from the second separator is reground in a pebble mill, which is a small tube mill lined with porcelain plates.

### TALC MINED IN OPENCUT

One-half mile northeast is the property of the Deep River Talc Co. This property consists of a long opencut provided with a track and cars that deliver the crude rock at the top of the storage sheds. Another line of track extends from the lower floor to the highest part of the mill. The plant is well built and is above the average seen at mines in this part of the country. Sturtevant grinding machinery is used and the sizing and separating is accomplished by a pneumatic process devised by J. J. Stockton, the local manager.

### GLENDON MILL DRIVEN BY WATER POWER

Adjoining the Deep River Talc Co. is the mine of the Glendon Mining & Manufacturing Co., which has been opened for a considerably greater distance along the strike of the deposit than any of the others. A long open crosscut furnishes the means of haulage from the open pits that have been excavated in the search for the talcoid mineral. Ordinary opencut methods are followed, deep holes are churned down with little effort, as the ground is soft, and hundreds of tons are broken and delivered to the loading bins at minimum cost. The rock is hauled in wagons two miles over a bad road to the mill on Deep River. Some attempt is made at sorting as well as selecting the better portions of the mineral in mining it. The merchantable material occurs in a somewhat erratic way and a heading that is today in first-class rock, may tomorrow have to go to the waste dump on account of small particles of hematite or grit. The crude stone is fed to a crusher at the top of the mill, and then goes to buhrstones and bolters, quite like those used in the earlier types of flour mills. The motive power at the mill is hydraulic, furnished by a wooden dam 250 ft. long and 15 ft. high.

The tailing from the bolters is reground in a revolving pebble mill. The larger and more massive mineral is cut into crayons and pencils by saws with which the mill is provided. It is the only one in the district so equipped. All of the milled product is shipped via the Raleigh, Charlotte & Southern Ry., through Glendon, and is hauled in wagons over a road that is inimical to profitable results with a material whose net value is as low as this. It is not easy to ascertain just what the ground pyrophyllite is worth, but it is probably between $6 and $8 per ton at Glendon.,

### GOLSTON PROPERTY WILL BE DEVELOPED BY SHAFTS

Near the station of McConnell, on the Randolph & Cumberland R.R., a few miles south of the producing territory, the Golston Mining Co. owns a large undeveloped deposit. It is its intention to explore by sinking shafts and if commercial mineral is found, a mill will be built on the railroad and the neighboring power site on Deep River will be developed to supply motive power. At present the bulk of the shipments is north, to the soap factories, toilet-power manufacturers, bleacheries, rubber works, makers of pipe covering, and for paper sizing. With the industrial development that is going on in North Carolina, there should, in a few years, be a good local demand for the products of these mines which will result in an industry whose commercial importance approaches that of the Gouverneur talc region in New York. The great amount of waste material that cannot be used on account of grit and particles of hematite, is one drawback to the local industry. It has been suggested that this be used for making firebrick, but although experiments have been carried on to that end, there is as yet no visible practical result.

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**A Patent on a Classifier** has been secured by James W. Shields, superintendent of the Quincy stamp mills. The machine has been in operation, in an experimental way, in the Quincy stamp mill for over a year, with exceptionally good results on Pewabic lode rock. It is compact, does the work of jigs, classifiers and tables with less power and less water and gets better results.

## Rhodesian Mining Notes

The prospects of the mining industry in Rhodesia are unfortunately not bright, despite the fact that several large mines will shortly become producers. The reason is to be found in the almost entire absence of new discoveries and the gradual exhaustion of the small mining ventures started on ancient workings or partly developed mines. Most of the country is easy to prospect and the ancients discovered almost all the payable orebodies. Several of the oldest and most reliable producers of the past have been exhausted or are showing signs of weakness. The Eldorado mine, which has been a consistent producer of 12- to 15-dwt. ore, for a 20-stamp mill, drawn from two shoots each 500 ft. long, and which has been paying £90,000 per year in dividends, is apparently rapidly approaching its end. One orebody has become unpayable and the other is rapidly contracting in length at the 10th level, being now only about 120 ft. long.

The Giant mine, which has been paying £100,000 per year in dividends, is also doomed, unless some unexpected discovery is made, as its large orebody terminates at the 7th level. The once famed Jumbo, Selewke, Bucks Reef, Beatrice and other mines are exhausted and in some districts the small worker has almost ceased to exist. The new producers will undoubtedly be able to raise the output for some years. On the Planet-Arcturus group, near Salisbury, 206,806 tons of refractory ores, valued at about 15 dwt., are developed. The Bell Reef mine has recently struck the reef at the seventh level, assaying 47.3 dwt. over a width of 33 in. and should have over 60,000 tons of ore available. The Shamva mine is developing well on the fourth level, the orebody having widened out.

The railway is now finished to the mine. As showing the burden of rail freight, it is estimated that the rail transportation alone on the plants ordered for the Shamva, Planet-Arcturus and Golden Koppie mines will total £250,000. Much of the ore from the Shamva mine can be quarried, as the orebody occurs in a hill 800 ft. high, and reaches a width of 200 ft. It is proposed to draw the ore from the adits, by means of petrol locomotives, to a large storage bin. A self-acting incline will deliver the ore to the mill grizzlies and the coarse ore will be broken by three No. 7½ Gates breakers. The reduced ore and fines are delivered on a belt to trommels which deliver ¼-in. material to the tube mills, while the oversize will go to the ore bins of fifty-six 2000-lb. Nissen stamps, crushing to ¼ in., the ore being crushed in cyanide solution. The pulp passes through feed cones to eight 22-ft. tube mills, using Osborne liners, to copper plates and over blanket tables and to a centrifugal pump to be elevated back to the cones. The overflow from the cones goes to another set of eight cones, four set over four others, for collecting the sand. The latter will be mixed with barren solution from the tails of the extraction boxes and will gravitate to eight 50x8½-ft. sand-collecting and leaching tanks for treatment and disposal to the dump by rope haulage. Slime and solution from the overflow of the sand cones will flow to five 38x10-ft. Dorr thickening tanks, part of the clear solution overflow of which will pass to extraction boxes and the balance to the mill supply tanks. The thickened pulp will be pumped to five 45x10-ft. Pachuca tanks, connected in series for air agitation, and subsequently transferred to the storage agitators of a Butters filter plant of 336 leaves. Zinc extraction boxes will be used. The water supply will be pumped eight miles through 12-in. pipe and the power plant will consist of six Babcock and Wilcox marine-type water-tube boilers, capable of evaporating 90,000 lb. water per hr. There will be three 1250-kw. Parsons turbo-generators to supply current to run the plant and water-supply pumps. Steam will also be supplied for a 5000-cu.ft. Pokorny & Wittekind turbo-compressor. The plant is expected to treat 50,000 tons per month and cost of treatment is expected to be 4s. 6d. per ton, coal and water being expensive items.

The ore reserves now amount to 2,320,000 tons of a recovery value of between 20 and 23s. In No. 4, the lowest level, the orebody is 80 ft. wide, assaying 5½ dwt. Last year the Lonely mine treated 37,655 tons of mine ore and 6331 tons of accumulated slime for a total yield of £160,180. Costs averaged about 33s. per ton. The ore reserves are 174,224 tons of an estimated value of 22.4 dwt. per ton. The 15-stamp mill with three tube mills is to be increased by five stamps and one tube mill. The Cam & Motor mine, for the half year ending 1912, developed 111,832 tons of ore, valued at 39s. 5d. per ton. The ore reserves are estimated at 1,016,240 tons, valued at 44s. 6d. per ton. Working costs, including treatment by roasting by West Australian methods, are estimated at 23s. per ton. The mill will treat about 200,000 tons per year.

All Rhodesian shares have recently fallen heavily on a report that the assays in gold and copper of the Falcon mine were incorrect and the sampling had been bad. It was later stated that these had been officially checked with favorable results. I have stated in these columns that the mine was over-valued, as the cost of reducing the copper-gold ore would be excessive, and recovery would be low.

In the far north in the Congo Free State, progress is being made in the Katanga copper mines. An enormous amount of capital has been sunk in developing these deposits. The railway from Lobito Bay, on the west coast, has alone cost £4,400,000, and has covered only 520 km. out of the 1000 to be constructed. It has, however, overcome its worst difficulties in reaching the high central plateau. At the recent meeting the chairman stated that 1000 tons of coke were being received every month from Wankies colliery, in southern Rhodesia and that by the end of the year, 41 ovens would be working on the mine, producing 3000 tons of coke per month. By washing the ore, 80% became available for smelting on more economical lines. Previously it took 3.44 tons of coke to produce one ton copper from 12% ore; now, it takes 2.65 tons of coke to produce one ton copper from 15% ore. The first blast furnace has produced 5000 tons copper. Two furnaces are now working and producing about 1000 tons copper per month at a cost of £42, delivered in Europe. This cost will be reduced by £7 when Benguela-Lobito Bay railway is finished. At the Star of the Congo, about half the area is developed to 80 ft. in depth and it can keep two furnaces going four years. Shafts and bores to a depth of 100 ft. below this "indicate the existence of valuable ore," but again the chairman is silent as to whether it is oxide or sulphide ore.

The railway is nearly finished to the Kambove mine, which is estimated to produce double what the Star can and two other mines on the line, Loshia and Sikasye, are estimated to be of equal value to the Star. The erection of four additional furnaces will be started in July and when these are finished an output of 30,000 to 40,000 tons of copper per year is confidently expected. Coke at present costs £5 per ton.

It would seem that in another 18 months or two years all the initial difficulties and mistakes of this vast enterprise will have been overcome and a new and serious competition in copper production must be reckoned with. Unfortunately for the shareholders, the capital expenditure and the cost of raising further capital have been so great that dividends are still far distant. However, the railway to Lobito Bay is paying its way and is, apart from the mines, a vast asset in opening up large areas to trade and settlement. There are also large tin deposits lying in the sleeping-sickness areas that will later, no doubt, prove an asset, and there are diamond interests on the Kundelunga tableland. It is said that 120 small diamonds have been discovered in the pipes, 29 of which weighed only five carats. Four white men and 80 natives are at work. A total of 12 pipes have been found. Machinery from Kimberley is being imported to test the pipes on a large scale.

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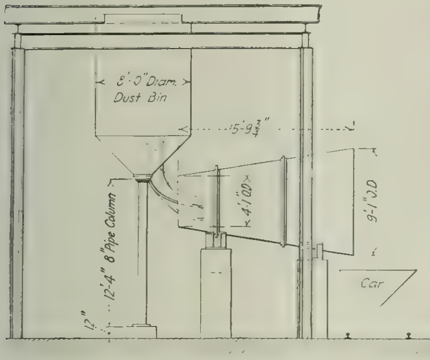
## Gold in the Shinarump Clays

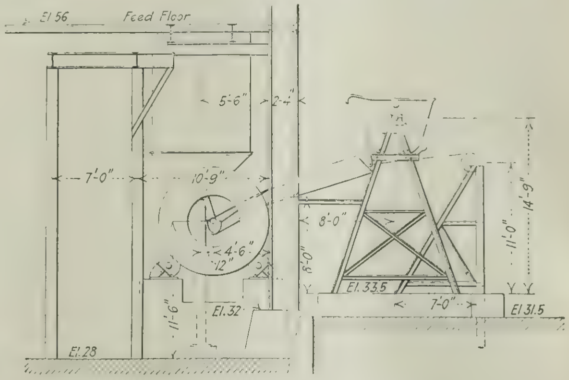
The Shinarump is a Triassic formation occurring in Utah. It contains certain beds of unusual clay. A description of the formation near Paria, where the Paria River cuts it, in the southern part of the state, is given by Andrew C. Lawson, in *Economic Geology,* August, 1913. The clay beds are soft and highly colored, and act most peculiarly in water. Although themselves containing considerable amounts of water, which may be driven off at 105° C., the addition of more water causes the clay promptly to disintegrate and to flow. A fragment immersed in water swells enormously and breaks down rapidly into an incoherent flat cone. Examined microscopically, this material appears to be composed almost wholly of a colloidal substance, with a small admixture of fine silt and concretions of lime carbonate and iron oxide. Swelling and slacking is probably due to the colloidal absorption of water. The mixture is so fine as to pass freely through filter paper. Its peculiar behavior is in marked contrast to other sedimentary clays. Chemical analysis shows an excess of silica over that necessary to account for pure clay, and since there is not sufficient quartz to furnish this excess, it is concluded that a large portion of the colloid is really silicic acid.

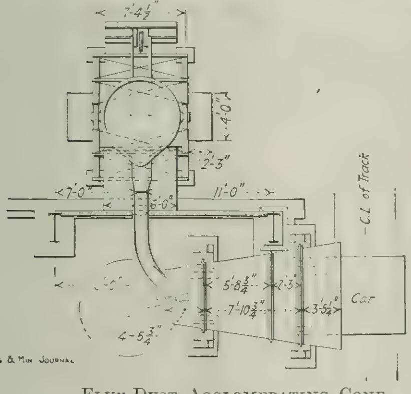
The clays are auriferous, and the beds have been staked with placer claims. Mr. Lawson sampled some of the exposures with considerable care, taking 25- to 30-lb. samples every 10 ft., measured vertically, in three trenches cut down across the formation. The average assay of all the samples he puts at 2½c. per ton, equivalent to 5c. per cu.yd. Similar results were obtained by an amalgamation test on large samples, using chemically pure mercury. The value is comparable with that of other low-grade deposits, and various attempts have been made to exploit the clays for gold. The possibility of commercial extraction is problematical, and only after a long period of experimentation could a project possibly be successful. Water must be cheap and overburden practically absent. Reckoning 5c. per cu.yd. of gold content, the total content of the clay would be $1,500,000,000,000.

# The Douglas Agglomerating Cone

At the Copper Queen smelting works at Douglas, Ariz., flue dust and converter slag were agglomerated for a number of months in a hollow revolving cone, following experiments initiated in June, 1909, first with a cylinder and afterward with the cone, by Forest Rutherford, then assistant superintendent.







Flue-Dust Agglomerating Cone

Owing to an increased amount of sulphide ore from its Bisbee mines, the Copper Queen company found it advisable to cease charging Moctezuma concentrates into the blast furnaces and installed McDougal roasters and reverberatory furnaces for treating this Nacozari product. With the establishment of this equipment, the reverberatory furnaces formed the natural outlet for flue dust and work with the agglomerating cone was discontinued. While the experiments with the cone were not carried to the final conclusions desired by Superintendent Rutherford, yet a good product suitable for blast-furnace use was made practically continuously for over four months, when the last run was made, and enough work done to demonstrate the availability of the cone for agglomerating. The equipment should be of interest to those smelting plants that do not make sufficient dust to warrant the expensive reverberatory installation.

Since the building of the Copper Queen reverberatory furnaces, the agglomerating cone at the Douglas works has been dismantled, and lest the arrangement of this equipment pass out of metallurgical history unrecorded, we present herewith a reproduction of the drawing, showing the arrangement of the equipment as originally installed at the Copper Queen works.

The work at Douglas was done in a cone or, strictly speaking, in the frustum of a cone having a length of 15 ft., a diameter of nine feet at the large end and a small diameter of four feet. The cone was made of ½-in. steel plate with cast-iron liners 1½ in. thick. The cone rested on two riding rings 7 ft. 10¾ in. apart, and between these was the rack by which it was revolved, a 50-hp. motor having been used for this purpose. The best results were obtained when the cone was operated at from six to eight revolutions per minute.

The flue dust was fed from an upright 8-ft. cylindrical hopper with conical bottom and the converter slag was poured from a ladle set in a tilting stand. The operating mechanism of the tilting stand, the flow of flue dust and the motor revolving the cone were under the control of one man at a central point, where a view could be had of the product and all operations. The streams of the flue dust and converter slag were adjusted to strike the interior of the cone at practically the same point. (In starting the operation, the flue-dust stream was permitted to flow on the cone before it was joined by the converter-slag stream.) The product was delivered from the cone directly into blast-furnace charge cars and taken by electric locomotives to the ore beds. The product was nodular and somewhat porous; the size of the lumps varied from ½ to 5 in. in diameter.

At times the flue dust fed amounted to 35% of the weight of the converter slag, but results with this amount were not satisfactory, and the practical operating limit was considered to be 25% of flue dust, the best product being made with between 15 and 20% of flue dust. Normally from 60 to 75 tons of flue dust were agglomerated with 350 to 400 tons of converter slag in twenty-four hours.

That the general idea of agglomerating fine material with converter slag in the hollow cone is likely to find further application is evidenced by the decision to install agglomerating equipment at the Arizona Copper Co.'s new smelting works at Clifton, where two cones will be erected for the purpose of agglomerating or coating siliceous-ore fines with converter slag, with the idea of obtaining greater fluxing efficiency from the converter slag when this product is charged into reverberatory furnaces.

Although the idea of using a truncated cone for this purpose was worked out at the plant of the Copper Queen Consolidated Co., the general idea of mixing fine material with slag or matte in a rotating machine or cylinder was, [illegible] as we know, first tried in Cerro de Pasco, by W. M. [illegible], but the difficulty of removing the crusts formed [illegible] great that the experiments failed. The cone shape [illegible] drum overcame this trouble and made the process a success.

The primary object of the experiments was to work up the flue dust and reduce metal losses, but the outcome was the development of a satisfactory slag-casting machine, using a small amount of fine material to facilitate the operation.

# Notes from the Mid-Continental Oil Field

By Erasmus Haworth*

The price of oil has advanced continuously throughout the year. The Prairie Oil & Gas Co. (the Standard) now pays $1.03 for all qualities and is prompt in extending pipe lines into new fields. Independent companies generally pay more, sometimes as much as 10c. in advance of the Standard, but generally about 5c. These prices contrast so strongly with the 42c. per bbl. which was the Standard's price for two or more years previously, that drilling operations are almost as active now as they ever have been in the history of the Mid-Continental field. It is excessively dry this summer and water for drilling is scarce and many drills are in forced idleness. Gas, also, is selling for more than ever before and the prospective demand is great, so operators are pleased to obtain either oil or gas.

The Kansas Natural Gas Co. is so badly tied up in litigation just now that no one knows what arrangements can be made for a winter's supply for Kansas City and other northern points. It is generally believed that the courts will have the legal difficulties adjusted so that the Kansas Natural will be enabled to do its best to serve its customers by the time winter sets in.

## KANSAS

Recent drilling has considerably increased the production of both oil and gas, principally by enlarging the old fields abandoned years ago when prices were so low that production was unprofitable. The new production is noticeable in almost every field, Wayside, Coffeyville, Neodesha, Cherryvale, and at different places in Chautauqua County. No remarkable discoveries have been made, but many paying ones. Clauss, Brown & Wolfe Co. has opened up a new gas pool a few miles northeast of Coffeyville, where at from 500 to 700 ft., they find wells ranging from 1,000,000 to 6,000,000 cu.ft. per day. They have a pipe line into Coffeyville and are selling gas at 10c. per M. cu.ft. to substantially all the factories there.

## OKLAHOMA

Many new discoveries of both oil and gas are reported from Oklahoma. Good gas is found near Wann, in supposedly dry territory, and occasional wells are found around the borders of old fields. Stubbs & Law brought in a monster well 5 miles northeast of Dewey, reported variously at from 20,000,000 to 46,000,000 capacity. It failed rapidly with use, however, and it is now reported to be almost gone, although but a few months old. Unusually strong oil wells have been developed in the Cushing field, southwest of Cleveland. The Waters-Pierce Oil Company is reported to have paid $480,000 for a single 80-acre piece, the east half of southeast fourth of section 8-17-7. It was then at high tide of production, it is said, and is now slowly declining. Strong gas wells are found around the borders of this oil pool especially to the east, very like the strong gas to the east of the Glen pool, previously developed.

Excitement is now strong over a new discovery at Lost City, just south of the Arkansas River, five miles west of Tulsa. The Gladys-Belle Oil Co. drilled a few good wells and sold 40 acres for $75,000 to the Gypsy Oil Co., which is the producing end of the Gulf Pipe Line Co. Charles Page has brought in a number of wells here, one of which flowed natural 90 bbl. per hr. for some time, and still is one of the biggest wells ever found in Oklahoma. Good development also is made around Okmulgee, both north and south, wells ranging from 50 to 500 bbl. production. It now looks as if the total production for the year would equal that of last year, and possibly surpass it.

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*State geologist, Lawrence, Kansas.

# Metal Trade of China

Notwithstanding the political disturbances of the past year in China the foreign trade seems to have kept up fairly well. The exports and imports of minerals and metals are given by the customs returns for two years past as follows, in long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1911 | 1912 | 1911 | 1912 |
| Coal | 19,441 | 40,507 | . . | ..... |
| Iron ore | 109,807 | 201,552 | . | . |
| Iron and steel | 68,639 | 7,978 | 151,320 | 96,778 |
| Copper | | | 5,533 | 8,204 |
| Tin | 5,960 | 8,645 | 1,955 | 2,389 |
| Tin plates | | | 21,334 | 20,690 |
| Lead | 553 | | 7,725 | 5,731 |
| Lead ore | 5,325 | 4,218 | . | . .. . |
| Zinc | 699 | 748 | 828 | 1,191 |
| Zinc ore | 4,648 | 7,085 | | . |
| Antimony | 6,817 | 13,313 | | . . |
| Antimony ore | 6,704 | 2,022 | | . . |
| Nickel | ...... | ...... | 32 | 49 |
| Quicksilver | 18 | 4 | 51 | 48 |

There were many sharp changes last year, chiefly due to political troubles. Iron and steel exports fell off on account of the temporary stoppage of the Hanyang iron works. On the other hand, there was a good increase in antimony, though exports of ore decreased.

Imports of mineral oils in 1911 were reported at 235,898,240 gal.; in 1912 they were 197,902,362 gal., a decrease of 37,995,878 gal., or 16.1%. Of the total last year 123,441,777 gal. came from the United States.

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**The New Mines Act of the Province of Alberta,** which went into effect Aug. 1, prohibits the employment of women and girls in or about mines. The age limit for boys working underground is raised to 16 years. Boys over 14 may be employed on the surface providing they have attained a certain educational standing. With a view to greater safety in mines the mimimum age of managers and pit bosses is raised to 25 years, and that of foremen to 23 years. Provision is made for the appointment of a provincial board of examiners, which may replace the district boards at present in authority. An important change in the law regarding the inspection of mines, enables the workmen to appoint an outside representative for this purpose instead of one of their own number, so that he will be able to present an unfavorable report without fear of dismissal. Pay days will be twice a month instead of every 30 days as formerly.

# Ores Amenable to Cyanidation

By Herbert A. Megraw

*SYNOPSIS—A discussion of the various ores upon which cyanidation has been tried. Success first achieved upon clean siliceous ores carrying free gold. The applications of the process have been carried to almost all kinds of ores, some manganese compounds carrying silver being about the only ones which have altogether resisted treatment. The most promising field for extension of the process is in those ores containing readily soluble base metals, which may possibly be precipitated and made to return their combined cyanide for further use.*

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Alkaline cyanides as commercial solvents for precious metals are said to have been offered to Western metallurgists in 1890, their first employment in the United States. Previously, they had been used on the Witwatersrand gold fields where their first practical application was made. In America, the process was received with suspicion and was strongly opposed by many prominent metallurgists. Its disadvantages were made much of and its possibilities for economy were not generally appreciated.

### CLEAN GOLD ORES THE FIRST CYANIDED

Although early experimenters asserted that both silver and gold ores could be beneficiated by cyanide, some even maintaining that gold ores containing no silver were not easily treated by the cyanide solution, the first applications were to free-gold ores, and it was in that field that its first success was attained. The simple reaction illustrating the solution of finely divided particles of gold in cyanide solutions is too well known to require repetition. It is upon this reaction, however, that the first practical applications of cyanidation were based. Purely siliceous ores, void of sulphides or base metals were originally considered about the only ones suitable for cyanidation, and were actually the ones upon which success was really established. Early attempts at application to refractory ores were accompanied by some discouraging failures resulting, in many instances, in a permanent prejudice against the process. In spite of its subsequent improvement and the expansion of its field of usefulness, the cyanide process has never been allowed to enter into these places and consequently many of them have overlooked economies which might profitably have been used. A notable example of such cases is found on the Motherlode mines of California. Here the process was early tried and failed for reasons which, though obscure at that time, are now thoroughly understood. Up to the present time, however, Motherlode operators have been exceedingly prejudiced against cyanide and cannot be convinced that it could, by any chance, be of benefit to them. The successful application of the process to similar ores in California may be influential in correcting this bad impression and in securing, at least, another trial.

### NOT ALL ORES MAY BE ECONOMICALLY CYANIDED

Speaking in the broadest sense, all ores are amenable to cyanidation, that is, the precious metals in any ore may be dissolved in cyanide solutions, and recovered if the proper procedure is followed. The necessary manipulations may be simple or complex, and complexity may reach such a point that there may be no profit in the operation. This brings us up into view of the deciding factor in cyanidation, which, as in all other industrial endeavor, is the factor of commercial profit.

There are only a few ores which may not be treated by cyanidation in some form, but many which cannot be economically beneficiated by that method. Metal in a pure state, occurring in large particles, is not economically dissolved by cyanide solutions, not because the metal is not soluble, but on account of the great length of time necessary for that dissolution. Very small particles of either gold or silver may be dissolved by cyanide solution of the requisite strength in extremely short spaces of time, depending entirely upon the degree of fineness of the metal. Relatively coarse particles require abnormally long periods of time for dissolution, so that ores containing mineral of this kind cannot be considered as amenable to economical cyanidation.

### PHYSICAL CHARACTERISTICS OF AN ORE INFLUENCE ITS TREATMENT

It must not be forgotten that the suitability of an ore for cyanide treatment does not depend altogether upon its chemical character, but also in large part, upon its physical properties. It is easy to see that some chemical combinations will be difficult to cyanide, but it has not always been recognized that the physical characteristics also have a great influence upon ore treatment. They may not go so far as to exclude it altogether from the possibility of successful cyanidation, but may certainly make necessary a different kind of plant from that required for ores more easily handled. It used to be considered that an ore which made a great quantity of slime was an embarrassing one to cyanide, but at present it may be said that such an ore presents facilities which make its treatment simple and cheap. At this stage of the metallurgy of gold and silver by cyanide, the greatest physical difficulties are presented by ores which cannot be readily reduced to extreme fineness, and in which that extreme fineness is necessary to liberate the contained gold and silver, so that cyanide solutions may have maximum opportunity to act. It is easy to see that the additional grinding required to subdivide finally an ore of this kind would cost a great deal more, and even require a plant of different character from that required by an ore which could be easily and cheaply ground to an extremely fine state.

It is by no means impossible that an ore should require practically no grinding at all to enable it to be successfully cyanided. Examples are on record of ores which have merely been put through a breaker, principally for the reason of making a product which would be rather simple to handle mechanically, dumping this product into a cyanide tank and subjecting it to a leach-

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Note—This is the second of a new series of articles by Mr. Megraw, the first of which appeared in the issue of Sept. 6, 1913, and which will deal with the comparative details of cyanide practice. The next article will treat of "Grinding Ores for Cyanidation," and will appear in the issue of Nov. 1, 1913.

ing process. The explanation of this situation is that the ore was an oxidized one and was largely porous, and that the gold, which was its principal valuable constituent, could be reached by the solution without difficulty. A comparatively high extraction might result in such cases. One example of a somewhat similar case in operation at the present time is that of the Wasp No. 2 mill in the Black Hills of South Dakota, where the ore is only passed through breakers and rolls as a preliminary preparation for cyanidation. The rock is reduced to 1/4 in. in size, delivered on belt conveyors to leaching tanks, and subjected to leaching for a protracted period. The explanation in this case is that the gold is almost entirely in the cleavage planes, and the breaking and roll-crushing undergone opens these cleavage planes, which are naturally the weakest points in the rock. By this coarse breaking most of the contained gold is exposed to the action of cyanide solution.

Ores which contain large proportions of clay or colloid material used to be considered objectionable because they interfered with easy leaching. Where it was necessary to grind ores down to pass a 30-mesh screen, or even a great deal finer, it was found extremely unsatisfactory to try to leach both sand and slime together. The clay, or colloid material formed impermeable, or difficultly permeable beds, which retarded or stopped altogether flow of solution through the tank. Great relief was felt when it became known that sand and slime could be separated. At first the sand portion only was treated and the slime either thrown away or impounded in dams for future treatment, should a process become available. Such a process has not only become possible, but sometimes is easier and cheaper to manage than leaching, so that now not only is the slime treated, but effort is made to get the whole of the material in the form of slime and treat it by agitation. Here the tendency has been to go to the other extreme, and many ores are being agitated which are really not sufficiently ground to justify that treatment. It takes a large amount of power and results in great wear on machinery and plant to try to agitate sand which is even comparatively coarse, and it is probable that if the situation were regarded philosophically, an effort would be made to separate sand, no matter how fine it is, and leach it. There is certainly no great difficulty about leaching a clean, granular sand, irrespective of the size of the separate particles.

An additional physical difficulty with some ores is the reluctance with which the slime, or finely divided colloid material, settles when in solution. This difficulty may be so marked as to require specially expensive treatment, different plant design, and even a different treatment system. During the days when the decantation system of slime treatment was in vogue, this objection to settling was a most serious difficulty. At the present time, however, when slime filters, together with continuous agitation, are so much in use, it is not necessary that the slime be easily settling, as it is not required to settle it all. It is agitated continuously throughout the extraction treatment, and when that is finished, it is passed through the filter which dewaters it successfully, without the difficulty of settling.

### Chemical Nature of Ore of Greatest Influence

The chemical nature of an ore is usually referred to when statements are made as to its suitability for treatment by the cyanide process. Interference, such as this, results from elements which occur in the complex ores, and which obstruct successful cyanidation either by destroying the cyanide solution, consuming all its available oxygen, or excessively consuming the cyanide itself by its dissolving the baser elements themselves to an excessive extent. An element like copper, for instance, which really has no detrimental effect upon cyanide solutions, is just as prejudicial to successful cyanidation as an element which might act in an entirely different way, because if it is in suitable form, it is entirely soluble itself and will use up excessive quantities of cyanide, producing no equivalent return. Purely copper ores are, of course, not treatable by cyanidation, because the amount of cyanide necessary to dissolve the metal is worth more than the metal recovered. Statements of this sort, of course, are subject to reservation, as methods may be discovered, and are entirely possible, whereby copper or any other element dissolved in excess by cyanide solution, may be recovered with a return of the entire amount of cyanide required to dissolve the metal, in which case these elements could no longer be considered as interfering with straight cyanide practice. The recent development of aluminum as a precipitant points to the entire probability of such methods coming into practice in the near future. At present they have not received a great deal of study, so far as the general public is aware of, but it is easy to see that if the cyanide used up in dissolving, can be returned to the solution with the extraction of the copper itself from the solution, there is nothing to prevent ores containing large quantities of copper being readily treated by the cyanide process. Other methods have been suggested for doing the same thing, among which may be mentioned the ammonia-cyanide process, which really presents probabilities for successful results.

### Iron Not Generally Harmful in Cyanidation

Metallic iron was formerly considered a great objection to cyaniding, as it was believed that it robbed the solution of oxygen, thus materially reducing the soluble effect of the solution on the gold. Now, however, it is well recognized that iron pipe, tanks, valves and other fittings have no effect whatever upon the cyanide solution. It is undoubtedly true, nevertheless, that finely divided iron, such as filings, abrasions from stamps, pan dies, and other grinding machines, does have a reducing effect upon the solution. Some iron ores are readily acted upon by cyanide solutions, and are injurious to treatment. The yellow oxide of iron, limonite, is not so much acted upon by solutions, but has a strong tendency toward making slime, and is somewhat objectionable for that reason. This slime is particularly pasty and is hard both to settle successfully and to filter.

Pyrite, the well known iron sulphide, and the one most generally found in both gold and silver ores, is acted upon by cyanide slowly, although it is not easily decomposed. White-iron pyrite, or marcasite, is not as soluble as pyrite, but decomposes more readily. The decomposition products of sulphides of iron are the products which are most harmful. Among these may be mentioned ferrous sulphate and oxide, and sulphuric acid, all of which consume cyanide. In this case iron enters solution as potassium ferrocyanide, and the alkaline cyanide is neutralized by the acid.

### SULPHUR FORMS WELL KNOWN OBJECTIONABLE COMPOUNDS

As is well known, alkaline sulphides are found in solutions where any appreciable amount of sulphur is contained in the ore. Sulphur acts to form alkaline sulphides, and does not directly influence the cyanide. The alkaline sulphides react with cyanide and oxygen and form sulphocyanides, or thiocyanates, or they may unite with oxygen to form sulphates, the result being abstraction of oxygen from the solution. Probably the most important and detrimental action of alkaline sulphide is to precipitate silver from cyanide solutions in which it is dissolved. The silver is precipitated as silver sulphide, and thus a cycle of operations is set up which prevents the successful recovery of the silver. When thus precipitated from cyanide solutions, silver is extremely difficult to redissolve, and in some cases it may be said to be impossible. There are remedies for the ill effects of sulphur, of course, the most popular of which is the use of lead salts, acetate or oxide, which unite with the alkaline sulphide and form insoluble lead sulphide which is precipitated, thus removing the sulphur from solution.

### COPPER DISSOLVES TOO READILY IN CYANIDE SOLUTION

Copper has already been mentioned as one of the elements which are objectionable in cyanide treatment of ores. The objection, as has already been mentioned, is not that the element has any particularly detrimental action upon cyanide, but is due to the extreme solubility of the metal itself in cyanide solution. Copper in many forms, such as sulphides, silicates and other well known copper minerals, is not readily soluble, and these minerals do not cause any great difficulty in cyanide treatment. When, however, one encounters soluble copper, such carbonates, oxides, hydrates, etc., they seriously disturb treatment by dissolving readily and using up too much cyanide to allow economical results.

Not only is the cyanide itself used in excess, but the action upon precipitation is also prejudicial. When precipitation is upon zinc shavings, copper covers and fills the shavings and prevents further precipitation of either gold or silver, thus causing a huge waste of zinc. This difficulty may be partly obviated by using a smaller quantity of zinc for precipitation, thoroughly covering it with lead acetate, or with a lead precipitate, before precipitating the copper-bearing solution, and by shaking the zinc so as to dislodge the copper already precipitated, every day. This process must be attended to with great regularity, otherwise the copper will form a hard, compact coating upon the zinc, and render it useless for further precipitation. If it were possible to precipitate the dissolved copper and return to the solution all the cyanogen used in dissolving the copper, these great objections to its presence in ores would not be found.

### MERCURY IS DESTRUCTIVE OF ZINC

Another element which presents serious difficulties in cyanidation is mercury. It has generally been stated that when this element occurs in a native state, it is not easily dissolved by cyanide, but this statement will have to be modified somewhat. It may be true that pure mercury is not readily soluble in pure cyanide solutions, but in working cyanide solutions which, as is well known, contain many other chemicals beside cyanide, even metallic mercury is rather readily dissolved. In old tailing where mercury exists as chloride, oxide, etc., it is dissolved quickly, even more quickly than gold or silver, and introduces complications. Its effect upon zinc is even worse than that of copper. It makes zinc shavings brittle, decomposes them until they fall to pieces, and induces an enormous waste of zinc. A little mercury in cyanide solution is beneficial to silver and gold extraction, as it precipitates the soluble sulphides in the same way that lead salts do, throwing down the insoluble sulphide of mercury. A great amount of mercury, however, has no particular advantage and has great disadvantages. It may be said with truth that both mercury and copper are much less objectionable in plants where zinc-dust precipitation is used, because these elements are removed from solution immediately by being precipitated on the extremely fine particles of zinc as they occur in the dust. The waste of zinc is not apparently large, and is considerably less than when shavings are used. It is altogether probable that the same conditions would obtain, were aluminum dust used for precipitation in place of the zinc. There are, however, no definite facts which are well enough known to be stated as such. Many gold or silver ores do contain small amounts of mercury, either in the native form or as oxides in cinnabar ores. A notable example of the occurrence of mercury-silver amalgam is in the rich silver ores of the Cobalt district, of Ontario, Canada.

### LEAD AND ZINC IN ORES MAY PREVENT DISSOLUTION OF PRECIOUS METALS

Lead and zinc are objectionable, to some extent, to cyanidation processes. Lead sulphide, galena, is very slightly attacked by cyanide and presents no particular obstacles to cyanidation except through the contained sulphur. Should the galena contain silver or gold, the combination is, of course, prejudicial to good extraction, as it is not attacked by cyanide solution. Lead in the pure state, especially when finely divided, is rather readily dissolved by cyanide, and also when in the form of carbonate or oxide, but to a somewhat less extent. Zinc acts very much as lead does in cyanide solution, the sulphide being only slightly attacked and the pure metal dissolved by cyanide solutions, in this case, much more readily than in the case of lead. As is the case with lead-sulphide ores, zinc sulphides are not prohibitive of successful cyanidation except where the silver value is held by the sulphide combination, in which case, of course, there is small chance for the cyanide to dissolve it.

Zinc-lead combination ores, in which the mineral occurs as sulphide or, in fact, in almost any other chemical combination, present one of the complexities which has so far resisted successful cyanidation. There are in existence a great number of mines containing lead-zinc sulphide ores, which carry small amounts of silver, which, if each of these metals could be recovered separately, would be of considerable value. Of course, in cases where the amount of silver is large, or where either lead or zinc is largely predominant, these ores can be concentrated and the product smelted with success. When all the metals are low in quantity, it is not a profitable operation, however, as it is difficult, if not impossible, to recover lead and zinc separately from such ores by smelting methods. It should not be at all impossible to make such ores amenable to a modified cyanide process by some preparatory treatment which would make the lead and zinc soluble in cyanide solutions, and then to devise some process by which exorbitant amounts of cyanide should not be lost. That such processes are, at least theoretically, not impossible is evidenced by the ammonia-cyanide treatment, whereby copper-zinc-silver ores may be treated with [illegible] recovery of each of the metals.

### Ammonia-Cyanide Method Possible

A possible method of handling this ore is to grind it fine and then roast at a low red heat, giving a sulphating roast. The product may then be slimed, dry, if possible, mixed with sufficient lime to make it alkaline, and then the whole pulped in water. These metals would then be in the form of hydrate, which might be then carbonated by treatment with $CO_2$ and dissolved in an ammoniacal solution, preferably made up of ammonium carbonate. The ammonia may be made up directly in cyanide solutions and recovered by distillation, whereby oxides of copper and zinc are precipitated without injury to the cyanide solution. This solution may then be handled by the ordinary methods for precipitating from cyanide solution and the precious metals recovered in that way.

As far as ammonia itself is concerned, its use in ore treatment has been attempted by a number of independent workers for many years past. Schnabel undoubtedly was the most successful. Hirsching made quite an effort eight or ten years ago, but, due to lack of practical experience and money, he failed. It was through investigations of the Hirsching process that the modern efforts to treat complex ores containing lead, zinc, copper and silver was thoroughly studied, and it may be said, developed. D. Mosher, of San Francisco, has done the most work in ammonia cyanidation, and is said to have successfully treated some zinc-copper ores containing precious metals by the process. It appears in no way extravagant, and there is reason to believe that with thorough technical investigation it might be made altogether practicable, if it is not already so.

### Arsenic and Antimony Objectionable But Not Prohibitive

Ores containing arsenic and antimony are generally supposed to be difficult to cyanide, but in many cases it is being successfully done. Neither arsenic nor antimony appear to react very strongly with cyanide, most objections to their presence coming from the decomposition products of the sulphide of either element. Arsenical ores usually give a good extraction when treated by the usual method, but in some cases may require extremely fine grinding to give up the maximum percentage of precious metals. Antimony acts very much the same, both elements exerting, apparently, a reducing effect upon solutions, robbing them of their oxygen and forming decomposition products which are destructive to cyanide. Strongly alkaline solutions are believed to be more effective in treating ores containing these elements. In some cases where cyanidation cannot be practiced directly on ores which contain arsenic and antimony, particularly in the sulphide form, some preliminary treatment may be resorted to, which will do away with the elements themselves or put them in some form which will not be particularly objectionable. Roasting or acid treatment, followed by alkaline wash, may be effective at times.

### Tellurides Now Successfully Treated

Great difficulty was originally experienced with the attempt to treat telluride ores by the cyanide process. The ores of the Cripple Creek district, in Colorado, are an example of this class. It seems that the telluride, while itself not particularly destructive to cyanide solutions, forms a combination with gold which is almost insoluble in straight cyanide solutions. Tellurium does not react with cyanide usually and perhaps only slightly in extremely alkaline solutions. Fine grinding of the ore seems to be beneficial in enabling an economically satisfactory extraction, but, for thoroughly satisfactory commercial results, bromo-cyanidation is usually resorted to. In fact, with Cripple Creek ores, this seems to have been the only means by which the gold telluride can be attacked and dissolved. As a matter of fact, in the present treatment of Cripple Creek ores, the process is mainly straight cyanidation after which a light bromo-cyanide treatment is given to the material which has resisted the action of ordinary cyanide. The additional extraction gained by the bromocyanide treatment, while extremely small in proportion to that gained with straight cyanidation, is important on account of the low grade of ores being treated, which require the recovery of all possible values in order that commercial success may be obtained.

Carbon or carbonaceous material is extremely objectionable in cyanide treatment, but, of course, this cannot be said to be an essential combination in any ore. As a matter of fact, it does occur in large numbers of accumulated stocks of ore and in tailing piles that have been standing a long time. In order that treatment of such material may be economically successful, the carbonaceous matter must be removed, or oxidizing agents must be used to minimize its reducing effect.

### Rare Forms of Sulphur May Be Objectionable

It is well known that both sulphate of magnesia and sulphate of lime decompose cyanide solutions. The mineral kieserite, having the composition $MgSO_4 + H_2O$, is not rare and is but slowly dissolved in cold water. Hydrated sulphate of calcium, or gypsum, is also common, but it interests us more because sulphate of calcium is produced when the acidity in tailings and slime is neutralized with lime. Alumina also is taken up in cyanide solutions to some extent, so that probably some aluminum sulphate or double sulphate exists in some ores. An ordinary analysis of a sample of the ore to be treated by the cyanide process is nearly useless. Analysis showing the content of iron, sulphur, magnesium, etc., is no help whatever to the cyanide manager, as his knowledge must tell him what will take place when the finely crushed ore comes in contact with an ordinary cyanide solution. The analysis of an ore may not show magnesium sulphate, for instance, although small quantities of magnesia may be found, and sulphur may be believed to be in form of sulphide, when it really exists in some form much more objectionable.

Ferric arsenate is not a rare mineral. It occurs often in conjunction with limonite, a hydrated ferric oxide. Possibly these minerals when formed together are the result of the oxidation of arsenical pyrites. Scorodite has the formula $FeAsO_4 + 2\,H_2O$. It is insoluble in water, but soluble in weak hydrochloric acid. $SO_2$ in solution also acts upon it. Finely ground mineral containing scorodite, left in contact with a weak caustic-soda solution, will form arsenate of sodium and cyanide of sodium or potassium acts in the same way, accounting for the slow and continuous decomposition of cyanide solutions when treating ores containing arsenates. The arsenates formed are reduced in the zinc box and remain in the precipitated gold. They may be dangerous in acid treatment.

### Some Manganese Ores Altogether Untreatable

Ores containing manganese have been the subjects of experiments in connection with cyanidation for a number of years. It is a strange thing, but, nevertheless, a fact, that many ores containing manganese in various combinations can be, and are, cyanided with greatest ease, while other ores of apparently the same composition resist treatment. Many of these ores do not contain any rebellious elements except the manganese, but many of them have absolutely defied successful treatment. They can all be so treated as to give good results in the laboratory by roasting, acid treatment, or by some other method whereby the chemical combination of silver and manganese, which is the principal occurrence, can be altogether changed, but these methods are by no means practical and have never been applied. Those ores which have resisted practical treatment are few in number, but at present there seems to be no hope of overcoming the obstacle. No one knows just exactly what the trouble is, as other manganese-bearing ores are rather easily cyanided, or at least, do not present insuperable obstacles.

### Nickel and Cobalt Ores Now Successfully Cyanided

Nickel and cobalt combinations have generally been considered difficult to treat. While there is no information at the present time to change that opinion, it is certain that such ores, however difficult to beneficiate, can be and are being treated successfully at the present time. Only a brief survey of the work accomplished at the Cobalt district of Ontario in cyaniding silver-bearing ores is necessary to demonstrate practically that these extremely complex ores carrying nickel, cobalt, manganese, and many other elements are being cyanided satisfactorily. As has been noted[1], many of these compounds are soluble and may be separated from the solution after precipitation in zinc boxes. Undoubtedly they are, to a certain degree, detrimental to the solution, as they must consume cyanide, but the consumption has not been so great as to prohibit successful work.

### Cyanide Field Has Widened Rapidly

In summing up the discussion of ores which may be amenable to cyanidation, the first thing which attracts the attention of those conversant with the history of cyaniding since its inception, is the enormous width of the field at present compared to what was originally expected. At first only gold was considered susceptible to cyanidation, and at that only free gold in clean, siliceous ores. Then more refractory gold ores were undertaken and successfully treated, the process passing gradually to silver ores. The halogen compounds of silver, such as chloride, bromide, etc., were always easy to dissolve in cyanide solution and their treatment has never offered any difficulties. The sulphide, however, did offer an obstruction to successful treatment for a long time, and it may be said that it is only within the past eight or ten years that it has been successfully done. As a matter of fact, most of the low-grade silver ores in Mexico, which is being treated by the cyanide process, is in the form of sulphide, and certainly the production from that source is extremely great at this time. Even the concentrated silver sulphide, which almost always contains arsenic and antimony compounds, is sometimes treated by itself with cyanide solution, maximum extraction being often obtained at less cost than if the material were shipped to smelters and treated in the blast furnace. With the remarkable progress of the cyanide process in sight, it is difficult to say where the end will be, and certainly we may not legitimately place any limit upon the class of ores which will probably be successfully handled by it within the not very distant future.

Probably the most promising line of improvement in the direction which will naturally suggest itself to every operator after having read E. M. Hamilton's article upon the use of aluminum dust in precipitation at the Nipissing mill, in Cobalt, Ontario[2]. What naturally occurs to the mind is that even the baser metals contained in many ores may be commercially extracted if it can be assured that after removing the metal from the cyanide combination, the cyanide will be returned to the solution for further use. This field seems extremely promising and I expect to see much development in it within a short time. Another development, which may be more or less combined with aluminum precipitation, is the ammonia-cyanide treatment of copper-, lead- and zinc-bearing ores, of which large quantities exist, now altogether useless to its owners. There is no reason why successful treatment of these ores should not be accomplished, and I fully expect to see it done at some time.

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## Mesabi Range Notes

Duluth Correspondence

Minnesota mining men confidently look for another good year for the iron industry in 1914. This will mean a fair degree of activity at the underground mines of the lake region, during the coming winter, and consequent extension of the present prosperity in the mining towns and cities, for an indefinite period. Prosperity has been more nearly uniform in the mining communities of this region ever since the Steel Corporation was established. There have been none of the occasional sharp reactions from great prosperity to almost absolute inactivity, or *vice versa,* which was characteristic of the iron-mining industry before the Steel Corporation was organized.

W. H. Harvey, inspector of mines for St. Louis County, and Capt. P. L. Ramquist, inspector of mines for Itasca County, both on the Mesabi range, have just issued their reports for 1912. A total of 30,101,451 tons of iron ore was shipped from St. Louis County, of which 16,651,773 tons were mined from underground, and 18,449,719 tons were mined from openpits. Including men on stripping, the industry in St. Louis County employed 16,048 men. There were 44 fatal accidents and 76 serious ones. Itasca County, that division of Minnesota in which the "Western Mesabi" is located, shipped 5,464,649 tons of iron ore in 1912. The number of men employed was 2306. The inspectors report that the Safety First policy of the mining companies is greatly reducing the number of accidents to employees. Many of the accidents are due to untrained foreigners. The mining companies have difficulty in getting sufficient trained miners.

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[1] Nipissing high-grade mill, "Eng. and Min. Journ.," Dec. 14, 1912.

[2] Aluminum Precipitation at Nipissing. "Eng. and Min. Journ.," May 10, 1913.

Steel for the construction of the new ore dock of the Duluth, Missabe & Northern R.R. is arriving in quantity, and work has been begun in placing it in position, at the western end of the great structure. This dock will cost, it is estimated, $2,750,000, and will be entirely of steel and concrete. The dock will be ready to go in commission the spring of 1915.

## New Laws and Transportation in Alaska

Special Correspondence

The new Alaska mining laws which went into effect Aug. 1, 1913, are causing no end of comment throughout the territory from the fact that but few copies of the laws were published and these are held by a few lawyers. Prospectors are doubly anxious at this time to become acquainted with the new laws on account of the new discovery on the Shushanna. It would be exceedingly inconvenient for a miner to stake a claim in that district and on coming out find that he would have to get another slab of bacon and "mush" back in order to do his assessment work before he could lay claim to his property.

Cruiser "Maryland" in Resurrection Bay, Alaska

The essential parts of the laws as passed Apr. 30, and in effect since Aug. 1, are as follows: That during each year and until patent has been issued, not less than $100 worth of labor shall be performed or improvements made on, or for each and every 20 acres or fractional part located; that the owner of the property shall make affidavit of such improvements setting forth the name or number of the claim, the number of days' work done and the character and value of the improvements, date of performance of such work, the place where such work was done, at whose instance the work was done, the actual amount paid for such work and by whom paid and such affidavit shall be filed with the precinct recorder not later than 90 days after the close of the calendar year in which the work was done. Upon failure to comply with this section the claim shall become forfeited and open to location by others. Furthermore it is provided that no person shall locate placer mining claims for more than two individuals under power-of-attorney or for himself in one calendar month. Within 90 days from the date of discovery, and prior to the filing of the certificate of location the locator, shall perform the equivalent of $100 worth of improvements for each 20 acres or fractional part. According to Sec. 17, the locator shall record with the recorder of the precinct where the claim is located, within 90 days after discovery, a certificate of location, which shall contain the name or number of claim, the name of the locator or locators, the date of discovery and posting of location notice, number of feet claimed in length and width and shall also set forth a description of the location of the claim with reference to some natural object, permanent monument or some well known mining claim. There are, of course, heavy penalties attached for false swearing to affidavit of location and of annual assessment work done. There will, no doubt, be much confusion as a result of these new laws from the fact that there are few in the territory who are aware of their purposes.

The poll-tax law is not the only measure passed by the late legislature that is being objected to and fought. Another measure, the tonnage tax, is causing complaint from the steamboat men that is being heard from Ketchikan to Nome. The legislature passed a bill which requires the customs service to assess a tax of 10c. per ton on all freight shipped into or out of Alaska. Collector Willis, of the Alaska customs service, raises the question that it is not in the province of his office to collect such a tax, and is accepting no cash from the companies, but is requiring the captains of each steamer to file an affidavit of the amount of cargo on board each vessel pending the decision by the department as to whether his office should collect the tax or not. While 10c. per ton does not seem much, still it will amount to fully $200 per month for each vessel operating in these waters, or probably $3000 per year. This, of course, the consumer will have to pay. However, all the freighting companies of Alaska are preparing to fight the law to the last court.

It is a hopeful sign that there are many men in all parts of the territory looking for gold and copper properties and is indicative of the revival of interest on a broad scale. Alaska has been under a cloud for some time, due in part to governmental policies, and the bottling up of the country in the cause of so called conservation. Some parts of the territory are going through a process of evolution; placer mining is being replaced by quartz mining and necessarily the development is somewat slow. For all that substantial progress is being made and there is a spirit of hopefulness abroad in the land.

But while this is undoubtedly true, it does not lessen the fact that railroad transportation is a prime necessity to the development, growth and permanent prosperity of Alaska. The opening of the interior regions by railroads would bring certain prosperity to a rich and fertile portion of Alaska and would incidently benefit the entire territory.

### Transportation Needs of Alaska

"Cheaper transportation is the greatest need of Alaska at present, and the solution of the transportation problem will do more for the development of this immense country than any other one thing. To this end I will urge the appropriation of $1,000,000 annually for 10 years, to be spent in building highways and trails. This is to supplement the trunk railroad line provided for in the bill now before Congress, and which I fully expect to see passed at the regular session." This statement was made by J. F. A. Strong, governor of Alaska, who had returned to Juneau, Sept. 1, on his way out to the States from the first official journey of inspection over the territory.

"I don't believe the railroad bill will be passed at this session of Congress, but we are all confident that it will be passed at the regular session next year. However, in my annual report to the Department of the Interior, I will urge the appropriation of this $1,000,000 for the construction of trails and highways annually for the next 10 years. We need roads and we need them badly. We must have highways leading from the main centers to the remote districts so the prospectors and miners can get their supplies in. When we get these roads there will be a big development. Immense areas known to contain minerals will be tapped, and the people of the United States will have their money returned to them ten-fold.

"Every bit of money obtained and spent in Alaska for roads by the Government has been obtained by subterfuge. There has been an annual appropriation through the war department for the building and maintenance of military roads and trails, with the result that we have some fairly good roads and some passable trails. I call it a subterfuge, as there will never be any need for military roads in Alaska.

"There are other things, such as the opening of the coal fields and a change in the land laws to make things easier for the farmer, that will be touched upon in my report to the Department, but I have not fully formulated these yet and I can say nothing about them. Transportation will get the most attention, for, in my mind, this is the greatest problem confronting us."

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## Geology of the Woody Copper District, California

By William H. Storms[*]

The Woody district is located in Kern County, Calif., in the low foot hills bordering the upper San Joaquin Valley, about 30 miles northeast from Bakersfield. Copper ore has been discovered and developed somewhat over an area about four miles east and west and two miles north and south. The country rock is granite, composed principally of quartz, orthoclase, plagioclase and biotite. One mile northeast of the postoffice at Woody is a large outcrop of black crystalline rock in which hornblende is the most conspicuous mineral, quartz and feldspar being present in only small amounts. There appears to be no relation between this rock and the ore. The granite is often extremely friable locally, particularly in the vicinity of ore deposits.

Numerous irregular intrusions of aplite intersect the granite, varying from small dike-like stringers to large bosses. This in some places is sufficiently siliceous to be termed alaskite, and in extreme instances is practically nothing but quartz. It is usually hard and firm and occurs in the vicinity of all the known copper deposits; in the Greenback mine an aplite dike cuts the zone of mineralized granite which it also faults. There may also be found large dikes of pegmatite, showing bluish watery quartz, cream-colored orthoclase and black tourmaline, with some muscovite. From one or two places this feldspar has been mined and shipped. One of these dikes may be traced for a distance of a mile on the surface.

The copper ore occurs in irregular masses, resulting from the impregnation of the granite by cupriferous solutions, which followed along the sheeting planes and fracture joints of the rock. All the granite is sheeted in an east-west direction with a south dip. The copper occurs where the sheeting is most pronounced. The aplite intrusions do not conform to the structure of the sheeting, but cut the granite usually in a north-south direction, although many other strikes can be seen.

The outcrops of the ore are not noticeable, nor does the ore extend strongly to the surface. Near the west end of the district is a shaft from which a shipment of several thousand dollars worth of ore is said to have been made. While the granite here is a little more decomposed, it is not highly differentiated from the granite in the rest of the district, showing no iron outcrop, and only the faintest copper stain. Many other places in the district which look more promising have not been developed.

The Greenback mine has a rusty-looking, somewhat siliceous outcrop, showing only a slight trace of copper. Of the two shafts on the property the most southerly was sunk in an opencut where a little copper stain appears. The other shaft struck ore at 60 ft. and has developed some copper. It is intended to connect the two shafts on the 200-ft. level, and either ship or mill the ore extracted. According to shipping receipts the mine has produced over $40,000 in high-grade copper ore. A little silver is always present. The principal copper minerals are malachite, a little azurite, cuprite, black oxide, and in depth chalcopyrite and bornite. Unquestionably, the normal mineral is chalcopyrite.

About a mile southwest of the Greenback mine on the north side of a high ridge are several iron outcrops. They take the form of veins from 10 to 20 ft. wide, occurring within a zone 200 ft. wide. They have been developed so far with only a few shallow pits. There is no showing of copper, except in one or two places where there are indications that the mineral is present under the leached zone. The iron minerals are limonite, hematite and magnetite, and several metaphoric minerals were noticed, notably, garnet, chloropal and opaline silica.

The mines at Woody are dry, the region being a semidesert. Certain points of similarity will have been noticed in the description between this district and the Butte district, particularly in the similarity of country rock, granite, which is highly fissured where ore deposits are found, in the pegmatite and aplite dikes, and in the lack of outcrops of the copper ores.

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## Deterioration of Firebricks in Service

G. Rigg has investigated the causes of the deterioration of firebricks during use (*Journ. Ind. Eng. Chem.*, p. 549, 1913), and concludes that other things being equal the resistance to the action of corrosive slags and gases is greater the more compact and close-textured the brick is. "Spalling" of close-textured brick is due to the use of unsuitable clay, or poor workmanship, or both. It is possible to prepare close-textured firebrick containing considerable amounts of coarse material, provided that sufficient care be taken in sizing the grog, so that the interstices between the larger fragments shall be filled as completely as possible by smaller fragments.

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[*] Mining engineer, 2437 Hilgard Ave., Berkeley, Calif.

# The Minerals of Bolivia

*SYNOPSIS—A résume of the geology of the mountain districts of Bolivia in which minerals occur. A note on the condition of the mining industry, mentioning the metals produced, and describing the various ores and their occurrence.*

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Among the countries which furnish minerals to the world's markets, Bolivia occupies an important place. Not alone the quantity of its minerals, but also their variety, attracts the attention of those who know its great richness.

There are two principal mountain ranges in the country, one on the coast and one, known as the Cordillera Real, in the interior. The latter is the only one which has any importance in connection with mineral production. Between these two ranges there is a high tableland which contains deposits of borax and nitrates.

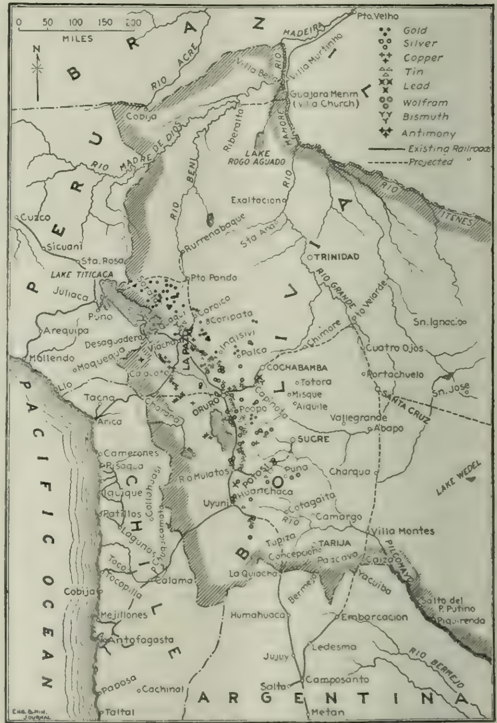
## MOUNTAINS FORMED OF FOLDED SEDIMENTARY ROCKS

The Cordillera Real was formed by different sedimentary rocks, which were originally laid down horizontally, or very nearly so. These rocks are the black, green and greenish slates, red and green sandstone, limestone and dolomite, and in some places marble. Less frequently there are deposits of gypsum, but these are rarely important. All of these sedimentaries belong to the Silurian formation, which has been deposited on top of Cambrian beds, and have for a base the older granite, which in some parts, as for example in the Illimani, are exposed at the surface.

The Silurian slates are overlain, in a few regions, by less heavy beds of Devonian and of the Carboniferous epoch, the latter at times occurring directly over formations much older. There is little doubt that more recent formations exist in the regions of Corocoro and Carangas. All of these beds are covered by alluvial deposits. The relative scarcity of fossils in all except the Devonian beds makes the determination of the age of the formations difficult, and only by careful and close study are the beds differentiated. The area which formerly was level and now constitutes the tableland and the chain of mountains in Bolivia and neighboring countries was completely transformed by two great movements which formed the mountain range and inverted many of the formations. The movements which occurred in all South America formed colossal mountains, valleys and cañons. Great masses of eruptive rock were thrown out from the interior of the earth and extreme and complex folding occurred. As disturbances grew less, the active volcanos became extinct one by one, and in the higher mountains snow accumulated and turned to ice. Here, then, glaciers were formed, which carried drift for great distances and formed the moraines and conglomerates which are found in all parts of the country. With the passing of the glacial epoch, the South American countries, including Bolivia, took on their present appearance.

## METAL-BEARING VEINS NEAR ERUPTIVE ROCKS

As a result of the eruption in the Cordillera Real, a number of volcanic rocks appear at the surface, especially trachyte, rhyolite, and in smaller quantities, andesite and dacite. The eruption also gave place to the formation of veins of mineral which are today so important to the Bolivian mining industry. Regarding the method by which these mineral deposits were formed, there is a difference of opinion. Some authorities adhere to the theory of infiltration from below, others that the filling came from gases and vapors, mineral-bearing waters, concentration from sedimentary rock, and in short, all the theories which have been proposed to account for mineral deposits in various parts of the world. There is very little doubt that many different causes are accountable for the mineral deposits of Bolivia, as it is clear that those of different regions have been formed by different agencies. The deposits vary in composition of their minerals as well as in their structure and form.



MAP OF THE MINERAL REGION OF BOLIVIA

The most important mineral deposits of Bolivia are those which contain tin, wolfram, bismuth, silver, gold and copper. Lead and zinc, although encountered in quantities, are important mainly for the silver they carry.

## TIN OCCURS PRINCIPALLY AS CASSITERITE

The tin deposits are in veins and the metal occurs in the form of cassiterite, pure and together with iron hydrate, pyrite, and more rarely with chalcopyrite. Cassiterite also occurs mixed with minerals of silver, such as native silver, and cassiterite associated with wolframite,

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Note—Abstract of an article in the "Boletin de la Sociedad Nacional de Minera," Chile, March and April, 1913.

magnetopyrite, arsenopyrite, marcasite, chalcopyrite and occasionally with native bismuth, lustre bismuth and also with scheelite. Very often the tin minerals occur practically pure in separate streaks, beautifully crystallized, especially in the upper part of veins. Other veins, on the contrary, contain very impure tin, due to the oxide of iron and other minerals which are mixed with it, more or less disseminated through pyrite, quartz and other rock. Some vein filling is brecciated, formed of quartzite or pieces of slate impregnated with the tin mineral. The true tin-bearing rock is generally sandstone and frequently quartzite also, and at times both of these are metamorphosed. It rarely occurs that veins or fissures are found in the eruptive rocks, or in the contacts between the slate and sandstone, but sometimes the country rock is partly impregnated with tin.

Sometimes tin minerals are found in veins in pure state, but the general opinion is that the existence of eruptive rock in proximity influences favorably the formation of veins of tin. The size of these tin veins is quite variable. Some of the smaller ones are only 1 or 2 mm. wide, while others are large and strong, up to 5 and 6 m. in width. Pockets of tin ore have been found having a width of 10, 20 or more meters, but they are usually nothing more than lenses diminishing in size in all directions. It may be said that the majority of the tin veins have a width of from 30 cm. to 1 meter.

### TIN AND SILVER MAY OCCUR TOGETHER

Tin is usually accompanied by silver minerals, and the ore is particularly rich at or near the surface, diminishing in content of that metal with depth. Tin sometimes contains from 0.6 to 0.10% of silver.

While in many cases there is no sign of pyrite on the surface of tin veins, it soon appears with depth and increases as depth is increased. The content of tin in ore varies greatly in different veins; some contain only extremely minute quantities, while others run from 4.5 to 12%. Some ores are known which carry as high as 20, 40, and even 60% tin. The majority of tin-bearing veins are formed of hard rock, especially those which have a brecciated structure, and those which are accompanied by quartzites, or which have impregnated the eruptive rock. Other veins, on the contrary, consist of an argillaceous mass in which large and small pieces of tin ore occur. The tin veins usually appear in groups or series of veins more or less parallel. More rarely, separate and distinct veins lie in contact with each other. The large and important mines are found in those parts of Bolivia which have an altitude of 3000 to 5000 m. above sea level, and are almost exclusively in the departments of Oruro, Potosí, La Paz and Cochabamba.

### SILVER IN PRACTICALLY ALL ITS KNOWN FORMS

Silver-bearing veins are of great variety. The metal occurs in galena, blende, pyrite or arsenical pyrite, chalcopyrite, antimonides, arsenides and ruby silver, native silver and other rarer combinations. It occurs frequently in combination with tin, and in this case, of course, is in connection with the rocks already described as tin bearing. Occurrences of independent silver deposits, however, are known, which have no connection whatever with tin and are in altogether different formations. To the purely silver-bearing formations belong the celebrated mines of Colquechaca and Pulacayo, which in their time produced colossal amounts of ruby silver, native silver, arsenide, antimonide and other silver minerals of extremely high grade. At the present time these veins contain principally galena, blende, chalcopyrite and pyrite, which has only a small quantity of silver. From time to time, pockets are found which contain small pieces of the very rich silver ores, which have already been mentioned. With depth, the amount of silver diminishes, so that very little is now produced. Their working depends upon concentration of these low-grade ores, the concentrate being treated by lixiviation, and the silver sulphide exported to Europe or North America for smelting.

There are in Bolivia a great many veins containing blende and galena altogether independent from each other, and frequently showing extreme strength and great richness in these minerals, although containing only a small amount of silver, which would not pay to work for that metal alone. The principal producers of silver at the present time are the Compañia Minera de Oruro, which also is one of the principal tin producers, Compañia Minera de San José, Compañia Minera de Huanchaca, and other mines in Colquechaca, Porco and Potosí.

### MUCH NATIVE COPPER EXISTS

Copper is found in Bolivia in veins and beds, both containing native copper. The vein deposits have been formed by a process analogous to that by means of which the veins of blende and galena were formed, but are much weaker. Copper veins are generally found in the slate and sandstone, and at present time are practically unworked. Of greatest importance to the country is the existence of native copper, especially in the region of Corocoro. At present, two large companies are working there, the Corocoro United Copper Mines, Ltd., and the Compañia Corocoro de Bolivia, in addition to other small mines. Copper occurs in gray sandstone, red clay, gray and red conglomerate, all of which contain more or less strong impregnations of gypsum and pyrite. Between the sandstones, clays and conglomerates, the contact deposits of copper are found, these rocks having been impregnated very frequently with native copper. Sometimes the copper-bearing rock is in layers of different widths, frequently from 2 to 3 and up to 10 or 12 m., and the native copper is often found in the image of plants or trees upon the rock, and also in large and irregular pieces. These latter are called *charquis*. The impregnations, especially in the sandstone and conglomerate, were evidently formed at the same time that the irregular pockets were being deposited in the red clay.

### RARE COPPER SPECIMENS OCCUR

Beautiful crystals and groups of crystals in aragonite have been found, and also pseudomorphs of native copper and aragonite. Many beautiful crystals of barite have been formed with metallic minerals, and little pockets filled with fine galena, cuprite, malachite and azurite are often found.

In Corocoro groups of different deposits of copper are found, distinct both in composition and in width. The average grade of native copper in these beds amounts to 2½ to 3%, but in parts the grade goes as high as 10 to 12%. Another important region of copper formation is the Province of Carangas, rich in native copper, copper-lead, and minerals of lead and zinc. In spite of its richness, the district is not being worked and has been very little explored.

### Bismuth Controlled by Monopoly

Deposits of bismuth occur in many parts of Bolivia, especially in the southern part of the department of Potosi. They are in the possession of Aramayo, Francke & Co., which firm has practically a world monopoly in the production and sale of bismuth. Bismuth formation is characterized by a very complicated vein filling which is a mixture of cassiterite, vitreous bismuth, wolframite, chalcopyrite and other copper minerals, some silver minerals, pyrite and magnetic pyrite. Sometimes native bismuth is encountered accompanied by native gold. The best minerals, those of greatest purity, consist principally of vitreous bismuth, mixed with chalcopyrite, and the former is really the greatest source of the present bismuth production. In the river beds of these regions there are encountered rounded pieces of native bismuth, mixed frequently with quartz crystals and occasionally accompanied by galena. Pieces of vitreous bismuth are also found, which have at times been converted, partly or wholly, into an ochre of bismuth, locally called *paco*. Aramayo, Francke & Co. has, in Quechisla, a large installation for the smelting of bismuth minerals. The bismuth, partly melted and refined, is shipped to Europe for final treatment and separation of its contained metals, especially gold, silver and copper. It is well known that other deposits of bismuth occur, but owing to the monopoly and the difficulty of marketing independently, many rich ones are idle at the present time.

### Tungsten a Recent Discovery

Wolfram veins have been discovered only recently and always in the neighborhood of tin veins. The mineral is almost always wolframite, sometimes ferruginous, and sometimes mixed with niobium and tantalum, containing occasionally a mixture of these rare elements running as high as 10 to 12%. The wolframite is always mixed with quartz and frequently accompanied by arsenical pyrite and rarely with native bismuth. The deposits of Chorolque and Tazna are accompanied by minerals of bismuth, tin, silver and copper, offering the best and purest veins of wolfram in Bolivia. Their width varies between 20 and 60 cm. The crude ore carries from 5 to 20% of tungstic acid, and the minerals, when concentrated for exportation, as is usually done, yield a product containing 60 to 70% of tungstic acid. This industry, relatively new, has not reached its highest development yet, and is widening its importance rapidly. The mineral is desirable and a great deal of prospecting for it is going on at this time. There are in existence from 25 to 30 mines, small ones, which export wolfram, these being situated in the different mineral districts.

### Gold and Antimony Worked on Small Scale

It might be said with truth that gold is found in practically all parts of Bolivia. It occurs both in placer deposits and in veins. Many of the Bolivian rivers carry gold in sand, and veins of gold-bearing quartz are well known in many districts. The antimony deposits, which are quite frequent in Bolivia, usually contain gold in chemical or physical mixtures. Some dredging industries are prosperous in Bolivia and quartz mining is carried on profitably, though on a small scale. The principal working for gold is in the departments of Oruro, La Paz, Potosi, Santa Cruz, Beni and Cochabamba.

Antimony occurs frequently throughout Bolivia and its deposits, as has already been mentioned, contain considerable gold. The present price of antimony, however, has been prejudicial to the mining of the metal in Bolivia and the condition of that industry is poor at present. Due to the fact that gold is contained in most of the antimony mines, some of them are utilizing that advantage to continue operations.

Other minerals exist in Bolivia but they have been very little in demand and have not been searched for. On a small scale, borax, saltpeter and rock salt are produced in various places. Petroleum is said to exist in several districts, but has never been definitely proved or commercially worked. Lignite also occurs, and while it is well known that these two products do exist, they have not been carefully studied and nothing can be said of the quantity in which they occur nor the future for their production. It is believed that Bolivia has a mineral future of exceeding promise as a great number of valuable minerals occur and the country has been very little searched. It is hoped that the future will bring an additional amount of prospecting and consequent development of the great mineral resources.

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## Metal Production in the Eastern States in 1912

A review of the metal production of the Eastern States for 1912 is given by the U. S. Geological Survey. The total output of gold, silver, copper, lead and zinc in the Eastern or Appalachian States, in 1912, was $222,496 of gold, $96,523 of silver, 19,265,945 lb. of copper, 561,026 lb. of lead and 144,699,863 lb. of zinc.

The gold output declined in all states except North Carolina, in which a substantial increase was made. Production of silver was 96,523 oz., a decrease from the 1911 output of 11,582 oz., but an increase of $2065 in value. This silver production is entirely from the refining of gold, lead and copper produced, and the bulk of it is from the copper ores from Ducktown district, Tenn., where there was a decrease of 16,767 oz. in 1912.

The great bulk of the copper production was, as usual, from the well known Ducktown district of eastern Tennessee, the remainder coming from Pennsylvania, North Carolina, Virginia and Maryland.

The lead production was chiefly from West Virginia, as usual, but 92,000 lb. were produced also in North Carolina. The zinc output of the Eastern States, shows a slight decrease from 1911. The production was mainly from New Jersey, as it has been for many years, but there was a large production also from Tennessee, where the output doubled in 1912, and there was considerable yield from Virginia and North Carolina.

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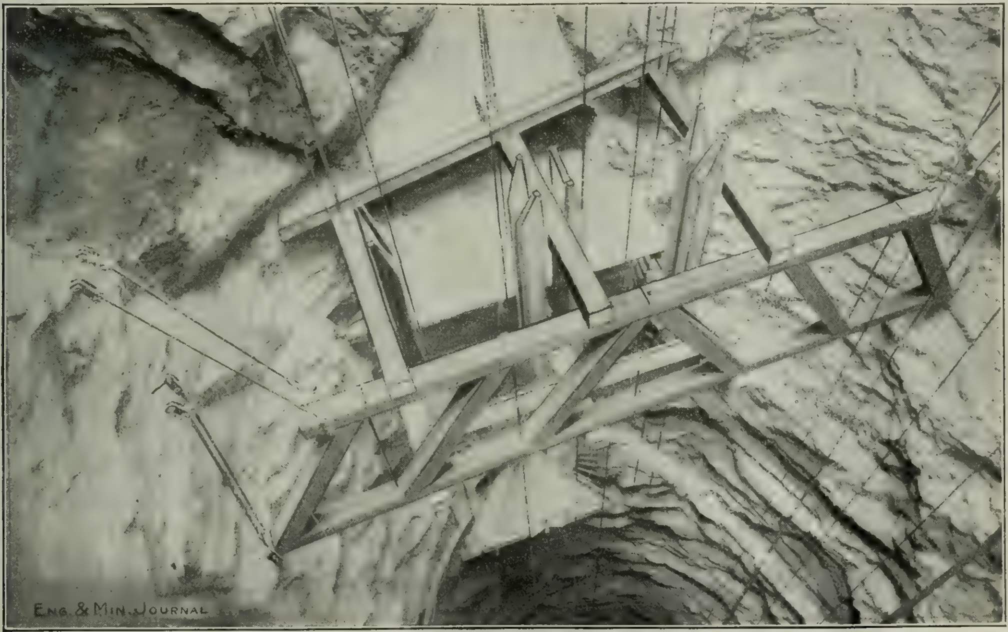
**A Rope Breakage Due to a Spinning Bucket** is reported by an inspector of the Queensland Department of Mines in the annual report for 1912. The accident itself was not serious, the bucket having been hoisted to the surface and the doors closed when the rope broke. The inspector states that, in his opinion, a spin was set up in the rope as the bucket left the bottom and this motion, being confined to a short space when the bucket reached the surface, was sufficient to cause torsion and shearing of the rope between the bucket and the sheave.

# DETAILS OF PRACTICAL MINING

## Station Suspended in a Circular Shaft

By Douglas Muir*

The photograph reproduced herewith represents a station of the Rayas shaft previously described in the Journal[1] and illustrated with a drawing. The picture was taken looking down from a position above the ore-pocket level. The upper opening in the rock is the crosscut to the ore pocket and the lower opening with the flaring platform is the manway. A wire-rope ladder can be seen connecting the two levels. The construction and method of support of the station truss is clearly shown, as well as the rigid wood guides for receiving the cage from the wire-rope guides. The manner of fastening the hangers in the rock is well exhibited. The bridge across the shaft mentioned in the previous article was built of two similarly constructed trusses, similarly supported.



Station in Rayas Shaft, Showing Suspended Truss

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**End Plates and Wall Plates are Often Cut 1 In. Short** at Butte, ½ in. being taken off the framed portion at each end ("Bull. A. I. M. E.," August, 1913). The object of this is to insure that the miter edges on the two plates will be drawn close together when the set is blocked. Thus a wall plate for a shaft 20-ft. long would be 19 ft. 11 in. The inside dimensions would remain the same. In order to hold the set together when it is being blocked, 1-in. wooden pins are driven at each corner in holes bored for that purpose. Such pins are made by driving 1-in. square blocks of wood through a 1-in. round hole in iron 1 in. thick.

## Combination Drill Carriage and Mucking Belt

In one of the headings run from the Maplewood Ave. shaft of the Mount Royal tunnel, which is being driven to admit the Canadian Northern to Montreal, a drill carriage is used and has given excellent satisfaction. The carriage is a rather massive affair, built largely of steel sections and carrying a crossbar of suitable dimensions for the 8x12-ft. heading, which is being driven (*Mine and Quarry,* July-August, 1913). Four heavy Sullivan water drills are mounted on arms which are themselves clamped to this crossbar. The crossbar may be advanced 20 ft. ahead of the frame of the carriage. The lower part of the machine comprises a belt conveyor, which may be advanced 8 or 10 ft. ahead of the frame. In use, after a round is fired, the muckers go ahead of the machine and clean the muck from the track, which is riveted to a steel plate. When the machine is brought close enough to the heading to position the bar carrying the drills, the drilling is begun and is finished with one position of the bar. Mucking goes on simultaneously with the drilling, the muck being shoveled on the conveyor, which can be brought forward so as to be always close to the muck pile. The belt rises at the rear end, and is arranged to dump the muck into the cars. For a period of five months in the spring of 1913, the average monthly advance was 344 ft. without a carriage. In the succeeding month, during the most of which the machine was in operation, the heading was advanced 510 ft. in 27 working days through extremely hard rock.

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*Mining engineer, Guanajuato, Mexico.

[1] "Bailing through an Untimbered Shaft," Eng. & Min. Journ., May 17, 1913.

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## Butte Shaft Guides

Originally in Butte the shaft guides measured 4x6 in. in section, but there is now a tendency to increase their size to 4x9 in. and 5x9 in., these being held to the sets by 8-in. or 9-in. lagscrews. A larger-size guide can stand a heavier load and greater shock, and furthermore two lagscrews can be used in each timber. The holes for the lagscrews are placed diagonally across the guide, and after a term of service another pair of holes can be bored diagonally across in the other direction, thus giving fresh timber for the threads to grip ("Bull. A. I. M. E.," August, 1913). In some cases, as exhibited in Fig. 1, vertical guide-posts are used behind the guides between the sets to give the guides more substantial support. These are framed into the dividers, or end plates, of the shaft. They are of the same width as the divider and usually 12 in. in the other direction. Guide girts, Fig. 2, are used for the same purpose, being set horizontally between posts and equidistant between the centers of the sets. In heavy ground the guide girts would seem to be more satisfactory than the guide posts.

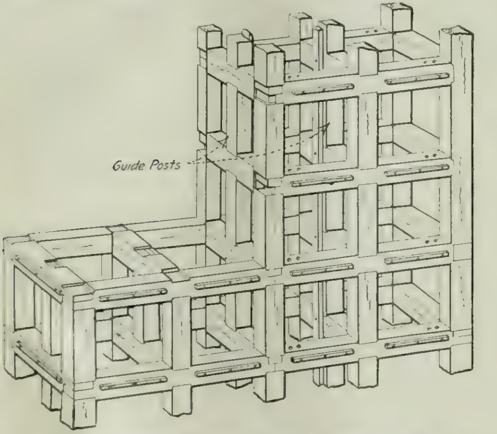

**Fig. 1.** Guides Backed with Vertical Posts

To allow for motion of the ground, which would push in the end plate of the set, the outside hoisting compartment is often made 2 in. longer. In such case, in order to keep the distance between guides in the two compartments the same, a 2-in. wood filler is placed between the guide and the end plate, and as compression takes place, it is cut down or removed so as to keep the proper distance between the guides. Sometimes the filler may be a vertical post carried up the shaft against the end plates and bolted with 7/8-in. bolts to the guide post.

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**Lack of Cementing Material Makes Better Grindstones,** according to Wilbur Greeley Burroughs, in "Economic Geology," August, 1913. Such stones remain sharp even after continued use. The presence of cement nearly always causes a stone to glaze and lose its cutting power, since the pores become filled with the cement. The excellence of the Berea grit, for grindstone purposes, is largely due to this lack of cement.

## Don'ts for First-Aid Men

The following rules for first-aid workers are published by Allen S. Snyder, in *Coal Age,* Sept. 13, 1913:

Don't touch a wound with the hands.

Don't disturb blood clots.

Don't be rough with the patient.

Don't probe for a bullet or any other body imbedded in the flesh.

Don't wash wounds unless you sterilize the water.

Don't pull or tear off clothing—cut it away.

Don't attempt to remove pitch, varnish or wax from a burned surface.

Don't bring ammonia too close to the nostrils.

Don't touch the eye with dirty fingers or an unclean cloth.

Don't put bandages on too tight.

Don't let the patient know his condition is serious.

⁂

## Classified Causes of Overwind Accidents

Overwinding accidents in the Rand shafts for 1912 are described and analyzed in the annual report of the Mines Department of the Union of South Africa. The causes have been carefully considered, and it has been found that, apart from accidents of comparatively rare occurrence caused through failure or breakage of plant, at least five distinct classes in which carelessness is wholly or mainly the cause exist. These are:

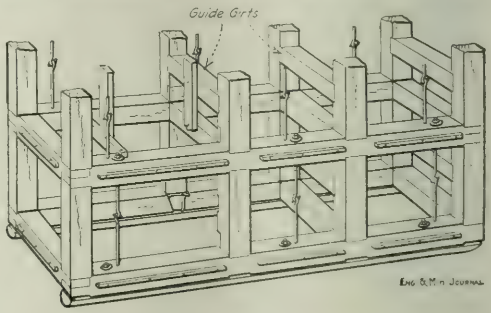
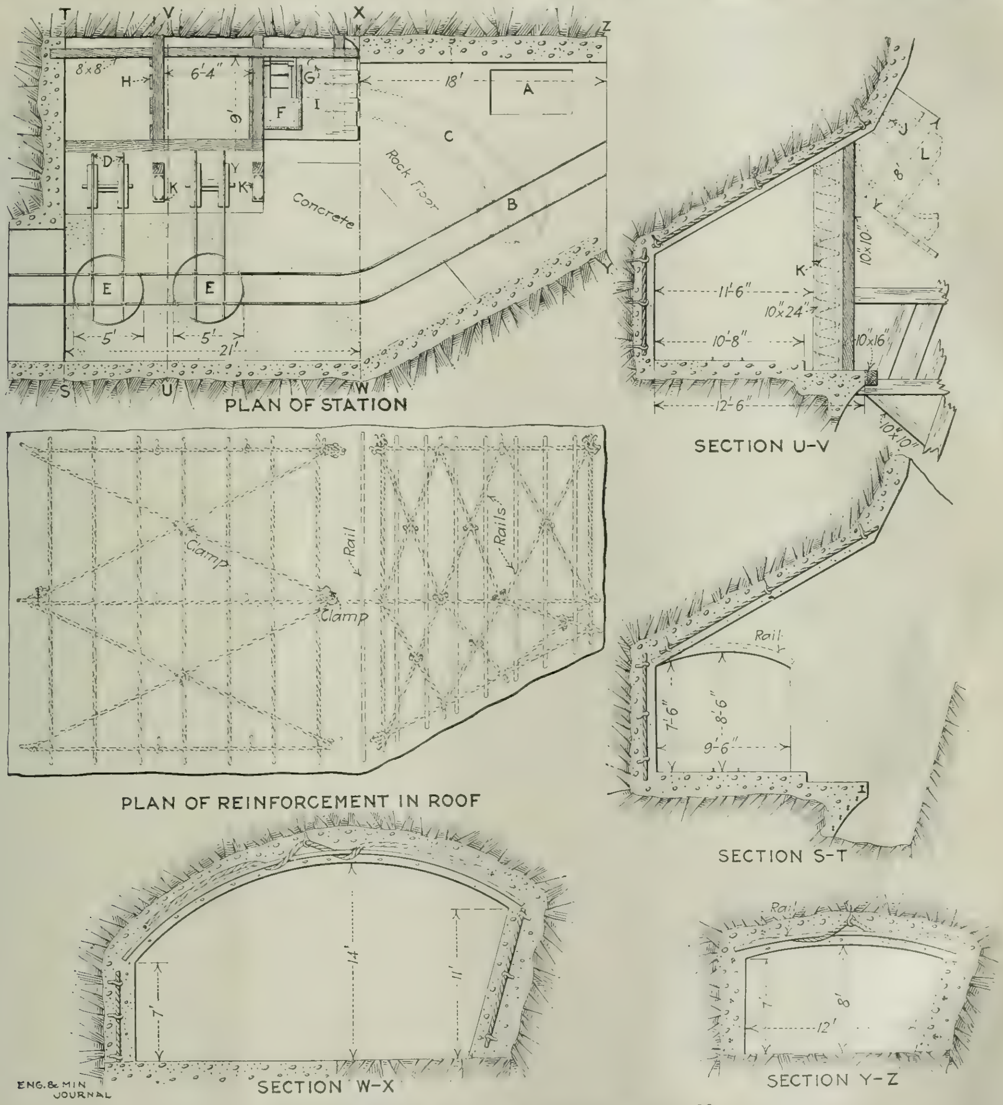


Fig. 2. Guides Backed with Horizontal Girts

(1) Starting to lower with the reversing lever in the position for raising. (2) Changing hoisting from a lower to a higher level; engineer forgetting the fact and watching the indicator of descending side. (3) Changing from skip to cage, and engineer forgetting the fact, or forgetting that persons are being raised in the skip. (4) Lowering unbalanced with electric winder on counter-current, too great speed developed, or too sudden application of reverse current, failure of resistance control of rotor, tripping of switch of stator current, and failure of single brake to control runaway drum. (5) Lowering on "compression" with reversing lever against the motion, too much compression created, cage stopping too soon or descending too slowly, and driver puts reversing lever over to the other position without safeguarding the motion with the brake.

# Concrete Station at Champion Mine

The large stations of the Champion mine sometimes require concreting of the back where rather large areas are exposed. Such a station is illustrated in the accompanying drawings in plan and section. The wood timbers here shown are replaced in later stations by concrete beams or pillars. The peculiar shape shown in the plan is rendered necessary in order to provide for sinking, the hoist for that purpose being situated at *A* and a temporary turntable at *B* for a temporary track *C*. The permanent turntables *E* and the cradles *D* are placed as illustrated. The mainway is covered with 10-in. timber shown at *I*; a trap-door *F* sets in this and the 8-in. air pipe *G* passes through it. Between the skip compartments, a brattice of planks *H* is built to prevent miners from stepping off the cage into the empty compartment.



Concrete Shaft Station at the Champion Mine

The reinforcement in the concrete roof of the main part of the station, as seen in the sections and in the plan of the roofs, consists of 1¼-in. rope. Some of this is threaded through eye-pins in the back, these being disposed as shown. This cable is drawn as tight as possible, and the ends and the crossings clamped. Above it are placed six pieces of the same cable extending in the direction of the shaft. The roof is about 18 in. thick.

Similar reinforcement is used for the station sides, which are from 10 to 18 in. thick.

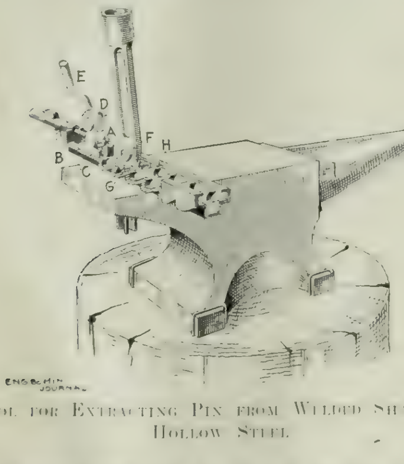
In section *UV* can be seen an eye-bolt *J*, in the brow over the shaft. One of these in each skipway is used to hold the blocks for unloading heavy timbers. The two supporting posts *K*, opposite the shaft dividers, are built of four 4-in. angles in the corners, wrapped continuously with ¾-in. wire rope, the wraps about 12 in. apart. These posts are 10x24 in. The divider in the shaft, seen at *L*, is of concrete, reinforced with 1¼-in. rope as shown.

The side extension of the station has an arched roof and includes eight 25-lb. rails in its reinforcement. These are bent to the arch of the station. Eye-pins are also set in the rock and a network of 1¼-in. cable laced through them over the rails, except that where it passes through the center pins, it is taken under the rails and up through the eye-pins again. The opposite side of the station also has a rail reinforcement in the back of the drift.

⁂

## Puller for Hollow-Steel Welding Pins

A device for pulling from the shank end of hollow-drill steel, the pin which is inserted to preserve the orifice during shanking and welding has been invented by John Q. Grant, of Denver, Colo. (U. S. Pat. 1,065,-125). Ordinarily, this pin has to be driven out by a chisel, which is slow and laborious and injurious to the pin. The device as shown consists of a trough arrangement, in one end of which a slot permits the entrance of the pin *A* while opposing the entrance of the drill shank *B*, which is considerably larger. The pin *A* is gripped in a block *C*, the upper surface of which is grooved to approximately the curvature of the pin, the gripping being performed by a grooved cam *D*, the groove of which is knurled to obtain a sure grip. The cam handle *E* is bent to one side so as to pass the pulling lever. The block *C* is connected by a link *F* to a pulling lever which terminates at its lower end in a transverse pin *G*; *G* can be slipped behind the teeth *H* on the sides of the trough, which thus form successive fulcrums for the lever. The teeth slope in such a way that by reciprocating the lever handle, the pin *G* naturally slips from one set of teeth to another and the extraction of the pin is thus almost continuous. The trough in its simplest form as shown is fitted with a projecting horn below for insertion in the hardy hole of an anvil.

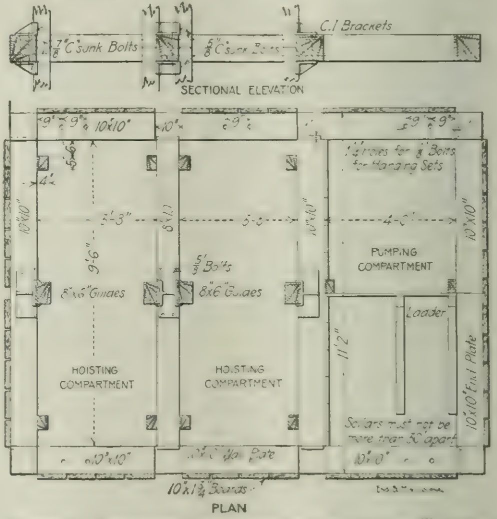


Tool for Extracting Pin from Welded Shank of Hollow Steel

⁂

## Shaft Set with Powellized Guides

The accompanying illustration shows the set in use at the main shaft of the Broken Hill South Silver Mining Co., Australia. The details of the set construction are apparent from the drawings. The sets are 6 ft. 8 in. between centers. Originally, guides of Oregon pine were used, but these were found to wear excessively, and since all the hoisting was done through this one shaft, it was a matter of annoyance and expense to interrupt operations in order to replace guides. In order to avoid this difficulty, it was decided to adopt for the guides a native Australian timber called tallow-wood: this is hard, tough and close-grained. The variation in humidity conditions in shafts naturally causes swelling and shrinking of all timbers, including the guides; it was decided to minimize this by treating the guides by the Powellizing process and sawing them to gage immediately before placing them in the shaft. The shaft is downcast, and when ventilating conditions are less stable in the summer, the draft is maintained downcast by the aid of a motor-driven fan.



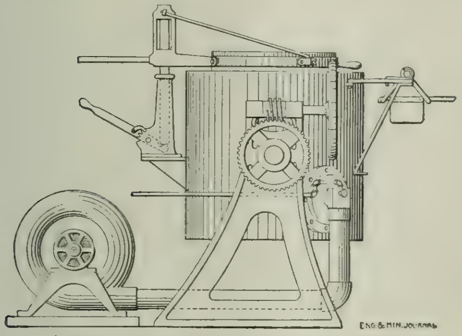
Sections Showing Arrangement of Shaft Timbers

The Powellizing process is a method of wood treatment developed in England and consists essentially of impregnating the wood with a solution of saccharine. This is performed by the usual open-tank treatment method. The saccharine has the faculty of hardening the wood considerably, rendering it impervious to attacks by decay and by boring insects. Furthermore, it probably fireproofs the wood to a certain extent, or at least does not render it more inflammable, as does creosoting. This effect of hardening and fireproofing the timber treated should render the Powellizing process especially available for shaft guides.

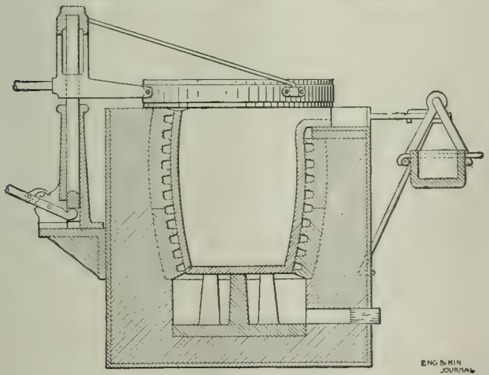
# DETAILS OF METALLURGICAL PRACTICE

## The Case Metallurgical Furnace

A furnace for general metallurgical uses, such as melting precipitate, bullion and other metals, has been invented by W. W. Case, Jr., of Denver. The object of this new furnace is to decrease the cost of operation, decrease loss by breakage of crucibles, and injury to the furnace lining and to obviate the usual roaring noise of such furnaces. The furnace is constructed, as is usual with devices of this kind, with an outer inclosing wall of refractory material, surrounded by a sheet-metal casing to hold the fire-proof wall together. The whole is carried on trunnions which rest in side supports, and one of these trunnions is provided with worm gearing operated by a hand wheel for tilting the furnace when pouring out its contents.



Side Elevation of Complete Device



Section of Furnace Proper

The interior of the furnace wall may be built as is shown in the sectional view presented, the advantages of which are obvious. The liner plates fit close around the crucible and are removable at will. The corrugations in these lining plates are not continuous but are arranged in a kind of checkerwork which does not oppose the passing of flame or heat about the crucible. At the top of the crucible a curved lip projects, meeting a corresponding depression in the top of the furnace wall which is designed to carry off the molten metal. The crucible bottom rests on supports, or legs, so arranged as not to obstruct the flame passage. Flame for heating is delivered tangentially with the combustion chamber. A bullion mold may be suspended from the furnace in front of the lip. The oil burner is operated by a small blower delivering blast at about a 6-oz. pressure, thus avoiding noise.

⁂

## Safety Rules—Machine Shop and Machinery*

(1) Safety switches should be provided on all machinery where men are compelled to work out of view of the operator, or where it may be necessary for them to stop machinery independent of the operator while adjusting or repairing.

(2) Machines which might turn over or accidentally start should be equipped with safety locking devices.

(3) A locking device should be provided on levers operating machinery.

(4) To guard against a lever's coming off, a lock nut or cotter pin should be provided.

(5) All machines should, where practicable, be equipped with start and stop buttons, or a device easily reached by hand or foot, whereby the machinery can be instantly stopped in case of accident.

(6) All machines which are set in motion with a tripping device, when not in use, or when being adjusted or repaired, should have the power shut off or be securely locked or blocked.

(7) Do not use celluloid eye-shields, cap fronts, collars, etc., as celluloid is inflammable and is liable to ignite and cause serious injury.

(8) Goggles with mica or heavy glass lens should be provided for chippers, men working at emery wheels and whenever necessary to protect the eyes.

(9) When chipping, provide yourself with a mask and eye-shield and see that the tools are not battered; thereby you may prevent chips from injuring you.

(10) When working around machinery, do not wear gloves, ragged sleeves, loose coats, ties or jumpers, as there is danger of their getting caught in the machinery.

(11) After repairing machinery, always replace safeguards before leaving the job.

(12) Before going in an engine or pump, block the flywheel or crosshead to prevent a leak of steam from starting the engine.

(13) All oilers should know the condition of platforms and railings, and if not in safe condition, they should report the matter at once to their foreman.

(14) Avoid striking your tools on trolley rails and wires, causing shocks and flashes. Tape the handles of tools used in such work.

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*From Inland Steel Co.'s book on rules.

(15) Men working on machines of all kinds should inspect them every day before starting to work and report any defect to their foreman.

(16) When removing drillings or shavings from a drill or lathe, be careful not to get caught. It is safer to stop the machine or use something other than your hand.

(17) Operators should not attempt to repair machines but should call their foreman. All machines should be stopped before oiling, wiping or repairing.

(18) Wire-mesh or perforated-plate covers shall be provided over all gears; guard should extend over both sides low enough and far enough from the gear so that no one can get caught between the gear and the guard. Provision should be made for inspection and lubrication.

### GRINDING WHEELS

(1) Fine-grained wheels with a bond having a high tensile strength have a greater factor of safety than soft and coarse wheels. To avoid excessive centrifugal stress and possible bursting, wheels should be run within certain speed limits.

(2) The factor of safety is greatly increased by ordering wheels shaped for beveled, shoulder or ring flanges. The flange should always extend to within at least 2 in. of the wheel edge, and be of the same diameter on each side. A safety taper of ¾ in. to the foot is required on wheels over 8 in. in diameter.

(3) Axle holes in grindstones should be round; as the process of cutting square holes is to cause slight radial fracture.

(4) Wheels must be handled with the greatest care in unpacking, storing, delivering, etc., and should never be left standing on the ground or stored in wet places.

(5) Great care should be used in mounting wheels. Never force a wheel on the arbor. Use relieved flanges, compressible washers between wheel and flange, and obtain a perfect bearing at outer edge. Vibration should be avoided at all times.

⁂

## Preparation of Baryta

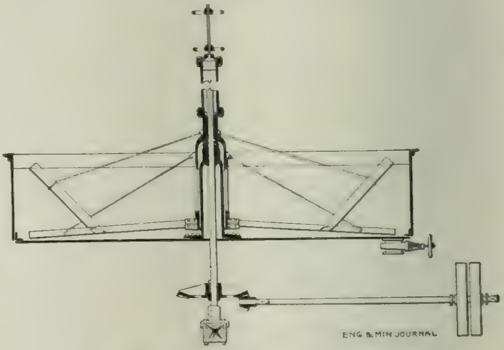
Preparation of baryta was studied by L. Marino and D. Danesi, *Gaz. Chim. Ital.*, 1913, according to the abstract in *Journ. Soc. Chem. Ind.*, June 30, 1913.

The object of the investigation was to devise a method for the conversion of barium sulphate at a low cost into baryta for use in the desaccharification of molasses. The communication deals with the conversion of the barium sulphate into sulphide. It is shown that reduction may be effected by various gaseous reducing agents and that per ton of barium sulphide produced, the cost of fuel (for reduction and for maintaining the requisite temperature) is Lire 18.25 (14s. 6d.) less when water-gas (at 600° to 625° C.) is employed than by the known method of reduction with solid carbon. Moreover, with the gaseous reducing agent, a purer product is obtained in a shorter time, and less labor is required. It is recommended that a long rotary furnace of iron, lined with refractory material, and slightly inclined to the horizontal, be employed, water gas freed from carbon dioxide being used both as reducing and heating agent. (A detailed description of a small experimental furnace of this type is given.) Working at a temperature of 600° to 650° C., the size of the discharge opening and the speed of rotation of the furnace are so regulated that the barium sulphate remains in the furnace for 1 hr.; a yield of 95 to 98% of barium sulphide is obtained. The escaping gases contain only traces of hydrogen sulphide. Strontium sulphate and calcium sulphate can be reduced in a similar manner, but somewhat higher temperatures are necessary, and in the case of calcium sulphate small quantities, and in that of strontium sulphate, traces, of oxide and thiosulphate are formed in addition to sulphide.

⁂

## Wright-Jaentsch Slime Agitator

Economical agitation of slime is an important part of cyanide treatment and the great number of types in use testifies to the difference of opinion as to superiority. In the accompanying drawing, the details of the Wright-Jaentsch device, as used at the Great Boulder Perseverance mine, in West Australia, are shown, as described by H. B. Wright in the *Monthly Journal* of the Chamber of mines of West Australia, June 30, 1913.



CENTRIFUGAL SLIME AGITATOR

The operating principle is centrifugal force, the speed of the inclined-pipe members causing a suction in the bottom of the pipes and a discharge from the top, a speed of about 350 ft. per minute having proved most satisfactory from all points of view. The pipes should have an inclination of 45° from the horizontal, anything less being subject to settling.

In trials with this agitator in competition with simple mechanical agitators, it is claimed that a material increase of extraction was obtained.

⁂

## Starting-Sheet Preparation

In making starting-sheets for electrolytic copper refining, the blank on which the light starting-sheet is deposited, and from which it is later stripped, should be placed in the electrolyte when current is passing. Neglect of this precaution may cause the deposited copper to "burn" on the blank, so that it is impossible to strip it off, and the blank is ruined.

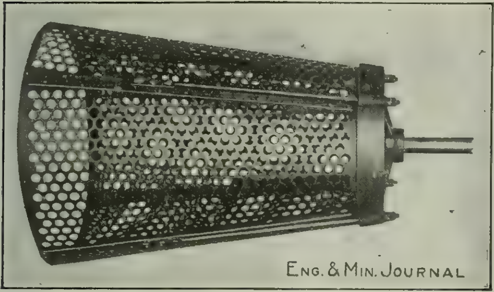
⁂

**The Dwight-Lloyd Process Combined with an Edwards Furnace** is in use for roasting at the Chillagoe smelting plant in Queensland, Australia, according to the annual report of the Under Secretary for Mines for that state. The Edwards furnace is used to roast a portion of the ore, in order to obtain a blast-furnace feed sufficiently low in sulphur after treatment once over the Dwight-Lloyd machine.

# MINING AND METALLURGICAL MACHINERY

## Conical Screens

Conical screens, which in recent years have received extensive use in rock-crushing and gravel-washing plants, have not been widely adopted in mine work, though it would seem that these screens were well adapted to certain screening problems. The screen illustrated herewith represents the type recently installed by Natomas Consolidated in its new Fair Oaks washing plant, described in the JOURNAL of Sept. 13, 1913. These screens were made by the Meese & Gottfried Co., 55 Main St., San Francisco, and certain advantages are claimed over the ordinary conical screen.



CONICAL GRAVEL SCREEN

The simplicity of the conical screen recommends it over that of the cylindrical screen in many installations, in which it shows economy in power consumption and in repairs by reason of having fewer wearing parts. The conical screen illustrated herewith is built upon a cast-iron head into which the driving shaft is pressed and keyed. The screen proper is made in four sections riveted together to form the frustum of a cone; this fits into a recess in the head casting and is held in place by four stay-rods. The screen is usually driven by a chain-and-sprocket drive keyed on the shaft at a suitable point between the bearings, one of which is placed close to the head casting. The shaft is, of course, longer than shown in the illustration; it is usually made long enough to suit the building framework, the additional shafting tending to balance the screen weight.

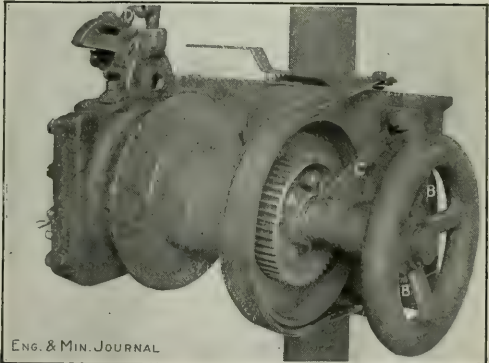
In older forms of conical screens it was necessary to remove the bearing caps, shaft and cast-iron head in order to change the screen. This has been overcome in later types and it will be seen from the accompanying illustration that the screen may now be readily removed or attached by means of the stay-bolts. Having stay-bolts attached at some distance from the head casting permits this screen to be readily attached, as the spring of the rods will compensate any trifling misfit that is annoying in some makes of screen where the stay-bolt end or attachment is close to the head casting with which it must register.

In gravel-washing plants, where the quantity of water used is immaterial, a nozzle sprays the oversize just before it leaves the screen to remove thoroughly all adhering dirt. The material to be screened is fed by a chute that delivers the product near the head of the screen. At the Natomas installation a steel lining disk, ½ in. thick by 48 in. in diameter, was placed in front of the cast-iron head to take any wear resulting from the rush or rapid flow of the rounded boulders. The chute which delivers the material to the head of the screen does not terminate in a square end, being cut off at an angle so as to distribute the feed in more than one spot. This obviates undue wear near the head of the screen; the greatest wear then usually occurs where the nozzle water strikes and churns the departing oversize. In some installations the latter is overcome or reduced by using a movable nozzle.

⁂

## Portable Column Hoist

A small, light hoist, suitable for mounting on a drill column and for use in stopes, winzes and raises, is shown in the accompanying illustration. It consists of a Dake engine, to be described later, shown on the left end, a drum in the middle and a flywheel or handwheel on the right. The drum is loose on the shaft of the engine, which extends clear through the device. The gear *A* is fastened to the drum, and is driven by a pinion, not visible, under the housing *C*. This pinion has mounted on its shaft another gear *B*, which is driven in turn by a pinion on the main engine shaft. The flywheel or handwheel revolves with the engine shaft, but is mounted on a feather so as to have a motion of about ¾ in. along the shaft. By this means it serves to throw in or out of mesh the pinion on the shaft and thus clutch the drum in or out. It is held in either position by a spring ball catch. The shaft is really only a bearing for the drum, but when the drum is in clutch, it revolves in the same direction as the shaft, although at a lower speed. The engine is reversible and the drum can be driven in either



COMPACT HOIST FOR USE ON DRILL COLUMN

direction, but it is usually more convenient to lower with the drum out of clutch, using the brake alone.

The frame on which the hoist is mounted is a section of steel channel, the mounting being central so as to avoid any cramping or unbalanced condition. The drum is carried on bronze bushings; the main gear is of cut phosphor bronze, and both pinions are steel forgings, machine cut. The end of the shaft is also carried in a phosphor-bronze casting. The gears where necessary are provided with guards and there is a relative scarcity of cogs, levers, etc. The control of the device is extremely simple, being effected with a single lever *D*. The brake band is lined with Gandy belting. The engine is rated at 2 hp., operating on 80 to 100 lb. of air. The diameter of the drum is 6 in., and its length 7 in., being designed to hold 625 ft. of $\frac{1}{4}$-in. steel rope. The machine will hoist 500 lb. at the rate of 80 ft. per min.; it weighs 270 lb. and has a length over all of 22½ in. The clamp usually furnished is made for a 4½-in. column, but a 3½-in. column clamp can be had.

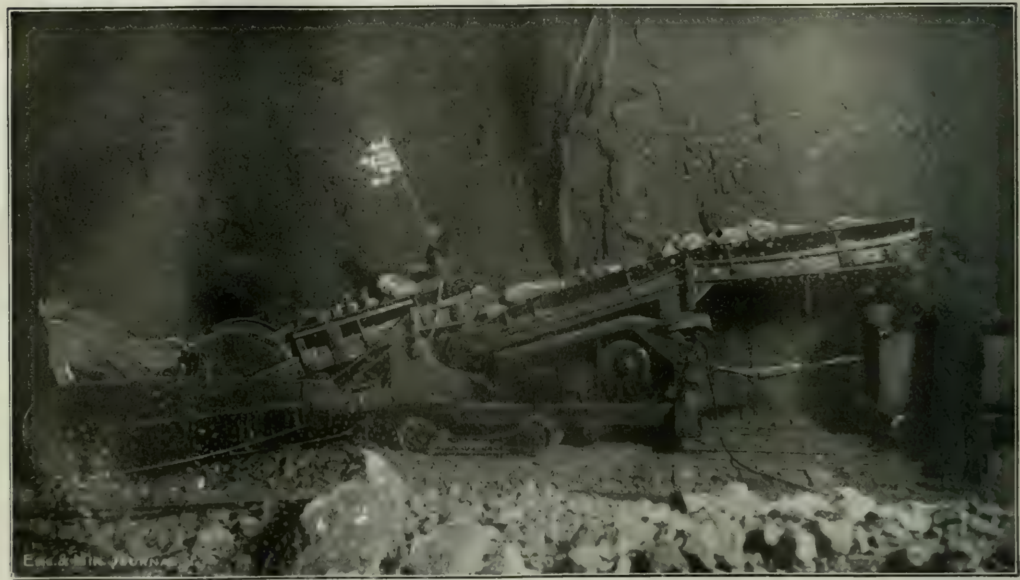
The Dake engine is a machine that has been on the market for at least 22 years. A description can be found in *Power* for December, 1891, page 11. It consists of the rather thin box shown in the drawing, in which a piston moves horizontally at right angles to the main shaft. This piston is a rectangular frame, containing another inner piston which has also a vertical motion. The crankpin of the shaft passes through the center of the inner piston and thus the combination horizontal and vertical motion of the two pistons is converted to the rotary motion of the shaft. The inner piston contains ports on its outer face, which register properly with ports in the cover of the box and serve to conduct the steam or air from the outside connection through four vertical and horizontal passages in the inner piston to the four faces of the pistons, these faces being long, narrow rectangles. The mechanism is thus evidently extremely simple.

The strength, compactness, simplicity and relative lightness of this hoist are to be highly commended. A device of this nature is of the greatest use in both raising and sinking and in stoping, not so much for handling ore or water, as for delivering such supplies as timber, steel, etc. The device is put on the market by the Hendrie & Bolthoff Mfg. & Supply Co., of Denver, Colo.

⁂

## Shoveling Machinery

A Myers-Whaley No. 4 shoveling machine was recently installed in the mines of the St. Louis Smelting & Refining Co., Flat River district, Mo. This machine loaded 449 tons in two shifts. It is now shut down, owing to the strike. A similar machine, installed by the Retsof Mining Co., of Retsof, N. Y., is successfully loading an average of 250 to 300 tons of rock salt per 9-hr. day.



Shoveling Machine in a Flat River, Mo., Mine

⁂

## New Sullivan Drill Models

A recent bulletin of the Sullivan Machinery Co. describes the new line of "Hy-Speed" and "Liteweight" rock drills. The two types are alike in several features, having automatic lubricators, side-rod valve chests, equalizers for the side-rod springs and reversible shells. The "Liteweight" machine is especially designed for work where speed and convenience are paramount. It has a simple differential spool valve with interchangeable hardened-steel valve-chest bushings. The cylinder is steel lined. The "Hy-Speed" is a machine for hard rock, high air pressures and rough usage. It has a combination rocker and spool valve, so designed that the air for throwing the spool valve is used and not wasted by exhaustion to the atmosphere, as in the ordinary type of spool valve.

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# Leaching of Copper Ores

SPECIAL CORRESPONDENCE

After a lapse of a number of years the leaching of copper ores is becoming a subject of increasing interest, and extensive experiments are being carried on by various companies, especially in the Southwest, where several properties have developed important tonnages of low-grade oxidized ores not amenable to concentration or to smelting. Experiments, however, are not being confined to the treatment of oxidized copper ores. Some typical concentrating ores, for which a few years ago the usual wet-concentration plant would have been erected, are now being subjected to tests with a view to leaching them. In the North, the Anaconda company is experimenting with a similar product, the sand tailing from its concentrating mill.

Leaching is by no means a new process in copper metallurgy. It has been applied in Europe for many years; in the Western Hemisphere there have been isolated operations, most of which were of short duration. The leaching plant of the Arizona Copper Co., however, is a noteworthy exception, having been in continuous operation for nearly 20 years. Exhaustion of the richer orebodies has directed attention to the treatment of certain classes of ore that had previously been neglected and leaching is again to the fore. While in most cases the details of processes have not been completed it will be of interest to enumerate the general trend of the experiments of some of the important companies. It should be borne in mind that the outlines given are in many cases merely tentative and do not necessarily represent the final methods that will be adopted by these companies.

For the Calumet & Arizona interests Stuart Croasdale is experimenting on a leaching process for treating the oxidized ore of the isolated Ajo property in southwestern Arizona. It is expected that leaching will be done with sulphuric acid made by roasting Bisbee sulphides. Precipitation will be accomplished by iron, which will probably be obtained by reducing the calcined Bisbee ore with coke or coal dust; it is understood that the company has also considered as commercially possible the use of pig iron, notwithstanding the fact that the Ajo property is distant 40 miles from the railroad.

Phelps, Dodge & Co. control several properties in Arizona, having important tonnages of low-grade ore for which leaching will possibly be adopted. In the Copper Queen mine, at Bisbee, it has been developing, during the last year, a body of disseminated ore in the porphyry-limestone breccia. The latter is the immediate subject of leaching experiments which have been conducted by G. D. Van Arsdale, at Douglas. A Wedge furnace is used to produce a sulphate roast with the idea of obtaining a large portion of the copper in water-soluble form; dilute sulphuric acid resulting from the electrolytic deposition of the copper will be used to complete the leaching. Electrolytic precipitation is being experimented with, $SO_2$ gas being introduced into the electrolyzing tanks as a depolarizer.

At the New Keystone property in the Miami district, experiments have been begun for the treatment of its ore by R. C. Canby, and it is quite possible that some form of leaching, or leaching in combination with some other process, will be adopted. Experiments have only recently been begun, however, and have not progressed to a point yet where it is possible to outline the general trend of the probable process.

The Arizona Copper Co., at Clifton, treats the tailing from its oxide-concentrating mill. Leaching is accomplished here with sulphuric acid, made by roasting sulphide ore, the fines being roasted in Herreshoff furnaces, and the lump ore in regular pyrite burners. Much of the copper is in carbonate form, resulting in a neutral precipitating liquor, from which the copper is precipitated by wrought scrap. The leaching solutions vary in strength from 10 to 17% $H_2SO_4$ and the iron consumption in the precipitating tanks is about 1.08 lb. per lb. of copper.

In Montana several small leaching plants have been built in Butte, during the last few years, but probably the most important work is the experimenting of Thomson and Laist at the Anaconda works. Here it is proposed to leach the sand tailing from the concentrator carrying about 0.65% copper. This product will be roasted in McDougal furnaces with enough salt to roast the copper to an oxide and the silver to chloride; leaching will be accomplished with dilute $H_2SO_4$ made from the gases of the McDougal roasting the rich concentrates. Precipitation will probably be done with $H_2S$ obtained from an iron matte; it is understood that scrap iron is also being considered as a precipitant. Following tests in a 10-ton plant, a trial plant of 80 to 90 tons capacity is now being built for the purpose of trying the process on a larger scale.

In South America, the Chile Exploration Co. is undertaking an important leaching operation at Chuquicamata, where it has a large copper deposit of peculiar character, the principal mineral being brochantite ($4\,CuO.SO_3.3\,H_2O$). This ore is to be coarse crushed, leached with dilute $H_2SO_4$ and precipitated electrically. The consumption of acid is expected to be small, as part of the copper is present as sulphate. The ore contains some nitrates, however, and some free nitric acid will be produced. It is understood that the metallurgical difficulties have been overcome in the preliminary experimental work. Power for this operation will be produced at the seacoast and transmitted 41 miles to Chuquicamata.

⁂

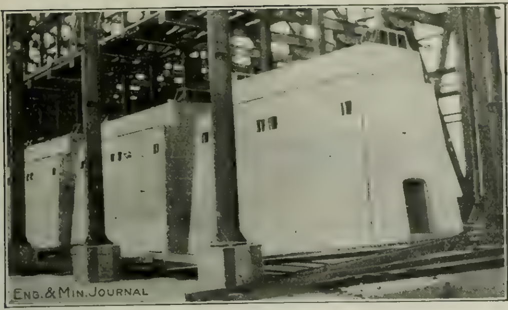
# Queensland Mineral Production in 1912

The value of the mineral production of Queensland for 1912, according to the annual report of the Minister for Mines, was £4,175,355, including coal. The increase over the preceding year was £514,292, due to the stimulating influence of high prices for metals, together with a noticeable advance in the yield of copper, tin and other minerals. The value of the gold yield for the year was £1,477,979, less than that of copper, and a decrease from 1911. Mount Morgan continues to be the leading mine. Of the copper mines, the Cloncurry is the foremost producer, making a contribution of 10,435 tons. The total copper production was 23,120 tons. While prospecting for tin was active, there were no new discoveries of importance made during the year. The tin-ore production was 3230 tons, valued at £364,503. The silver production was 569,181 oz. Lead, tungsten, manganese, bismuth, molybdenite, opal and other gems were also produced.

# PHOTOGRAPHS FROM THE FIELD

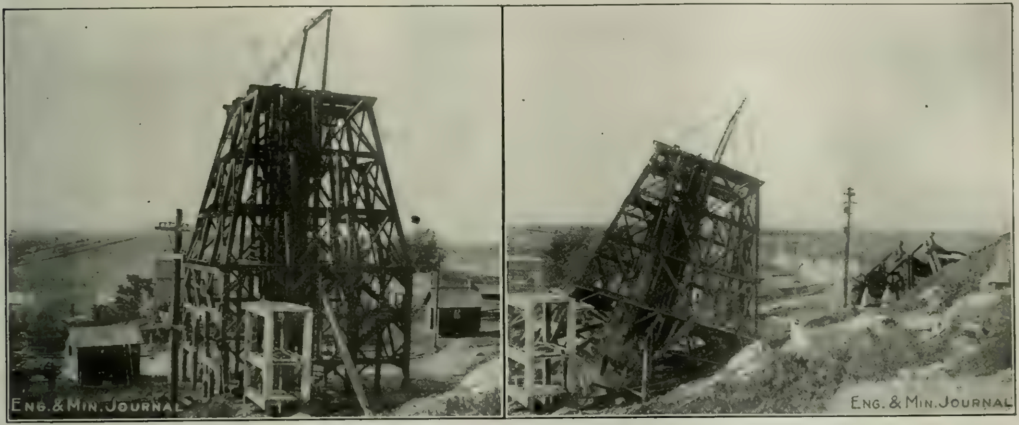
New Kleinfontein Cyanide Plant, Benoni, Transvaal
It was here that the strike was started early in July

The Pennington Openpit of Tod, Stambaugh & Co., the Only
This mine is one mile west of Ironton. The overburden is

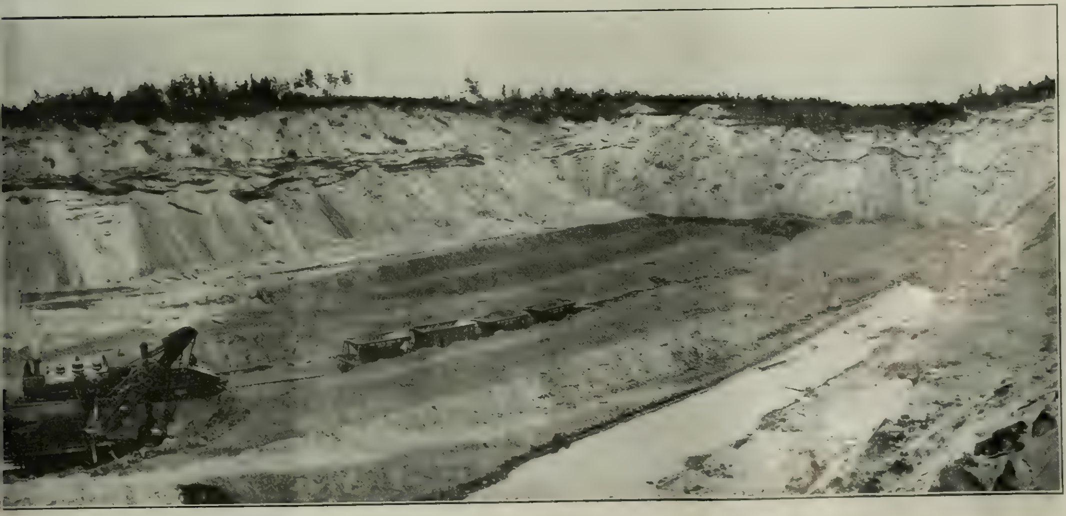


VAN RYN DEEP MORTAR BLOCKS, IN FEBRUARY

CASON MINE AND WORKS ON EAST RAND



DISMANTLING REPUBLIC NO. 9 SHAFT HEADFRAME, AT REPUBLIC, MICH.
The posts were cut through before the structure was pulled over. Both photograps were taken from the same position.



OPENPIT MINE NOW IN OPERATION ON THE CUYUNA RANGE IN MINNESOTA
deal, being entirely free from stratified material.

# Titaniferous Iron Ore Investigation

Dr. Joseph A. Holmes, Director of the Bureau of Mines, in the preface to Bull. 64, "The Titaniferous Iron Ores in the United States," by Joseph T. Singewald, Jr., says:

One of the problems that confronts American ironmasters is the efficient reduction of magnetite containing high percentages of titanium. From time to time the discovery of enormous bodies of workable titaniferous ore has been reported, and the available literature dealing with the geologic occurrence and the economic value of the titaniferous magnetite in the United States contains a mass of information that in part is based on incomplete observation and even on hearsay.

Although the supplies of nontitaniferous iron ore that are available in the United States are still to be measured by millions of tons, yet the approaching exhaustion of many high-grade deposits, the general acceptance by blast furnaces of ore lower in iron than those utilized ten years ago, and the probability of even lower-grade ores being used in increasing quantities indicate that some large deposits of ore would be contributing to the needs of the country were it not for their titanium content. In an attempt to ascertain just what the economic possibilities of the larger deposits of titaniferous iron ore may be, the Bureau of Mines took up the study of the possible utilization of these ores through some concentrating process. The conduct of this investigation was assigned to J. T. Singewald, Jr., and the results are presented in this report. Mr. Singewald was directed to pay especial attention to the possibility of utilizing titaniferous ores at a profit with present methods and devices and under existing conditions. He was authorized to study in detail the physical structure and chemical composition of the ores, as bearing on the problem of utilization, but not to undertake any detailed investigation of the origin and geologic distribution of the deposits.

It is to be regretted that the results of Mr. Singewald's careful study of the ores are chiefly negative. Some deposits of titaniferous iron ore are clearly not so extensive nor so high in iron as they were reported to be. Moreover, examination of many samples by metallographic methods has demonstrated that, although a large part of the titanium in these ores is in the form of ilmenite, much of this ilmenite is far more intimately associated with the magnetite than has generally been supposed. Part of the magnetite and ilmenite occurs in such large and distinct aggregates that their separation by a magnetic concentration after fine crushing is practicable, but in by far the larger number of samples examined and in practically all the orebodies that are known to be large enough, and rich enough in iron to be of much importance, most of the ilmenite occurs as such fine intergrowths in the mass of magnetite that a complete separation of the two minerals by any process based on difference of physical properties still seems impractical. Crushing even to 200 mesh would not insure a clean separation of the two minerals. Consequently, the problem of utilizing titaniferous magnetites involves the application of chemical rather than physical methods. In short, the problem is not one of eliminating the titanium by milling, but of reducing the ores directly by some smelting process.

Iron ores containing over 1% of titanium are troublesome to smelt in the blast furnace. Though Rossi and other investigators have demonstrated the possibility of eliminating titanium through the formation of relatively fluid slags consisting of complex titanosilicates, there seems to be no inclination on the part of the ironmasters to adopt furnace practice to these conditions. However, as Mr. Singewald points out, it is practicable to use in blast-furnace mixtures small proportions of the concentrates from a magnetic separation of the titaniferous ores with little change in present methods and without danger of choking a furnace. The use of electricity in smelting offers other possibilities. The reduction of titaniferous ores in electrically heated furnaces and the production of iron-titanium alloys by a direct process are problems of such importance that the Bureau of Mines, in connection with its investigations of the treatment of ores and of more efficient methods of smelting, is undertaking experiments with these ores.

# The Metal Tariff

WASHINGTON CORRESPONDENCE

The Conference Committee on the Tariff on Sept. 29 reported to the House of Representatives, on Schedule C. Some of the main items are as given below. They are not likely to be further changed.

104. Chrome or chromium metal, ferrochrome or ferrochromium, ferromolybdenum, ferrophosphorus, ferrotitanium, ferrotungsten, ferrovanadium, molybdenum, titanium, tantalum, tungsten or wolfram metal, and ferrosilicon, and other alloys used in the manufacture of steel, not specially provided for in this section, 15% ad valorem.

105. Muck bars, bar iron, square iron, rolled or hammered, round iron, in coils or rods, bars or shapes of rolled or hammered iron not specially provided for in this section, 5% ad valorem.

106. Beams, girders, joists, angles, channels, cartruck channels, TT, columns and posts or parts or sections of columns and posts, deck and bulb beams, sashes, frames, and building forms, together with all other structural shapes of iron or steel, whether plain, punched, or fitted for use or whether assembled or manufactured, 10% ad valorem.

107. Boiler or other plate iron or steel, and strips of iron or steel, not specially provided for in this section; sheets of iron or steel, common or black, of whatever dimensions, whether plain, corrugated, or crimped, including crucible plate steel and saw plates cut or sheared to shape or otherwise, or unsheared, and skelp iron or steel, whether sheared or rolled in grooves, or otherwise, 12% ad valorem.

145. Aluminum, aluminum scrap, and alloys of any kind in which aluminum is the component material of chief value, in crude form, 2c. per lb.; aluminum, in plates, sheets, bars, strips and rods, 3½c. per lb.; barium, calcium, magnesium, sodium and potassium, and alloys of which said metals are the component material of chief value, 25% ad valorem.

146. Antimony, as regulus or metal, and matte containing antimony but not containing more than 10% of lead, 10% ad valorem; antimony oxide, salts, and compounds of, 25% ad valorem.

147. Argentine, albata, or german silver, unmanufactured, 15% ad valorem.

148. Bronze powder, brocades, flitters, and metallics, bronze or Dutch-metal or aluminum, in leaf, 25% ad valorem.

149. Copper, in rolled plates, called braziers' copper, sheets, rods, strips, pipes, and copper bottoms, sheathing or yellow metal and composition metal, including brass, copper, and nickel alloys of which copper is the component material of chief value, and not composed wholly or in part of iron ungalvanized, 5% ad valorem.

150. Gold leaf, 35% ad valorem.

151. Silver leaf, 30% ad valorem.

152. Tinsel wire, lame or lahn, made wholly or in chief value of gold, silver, or other metal, 10% ad valorem, bullions and metal threads, made wholly or in chief value of tinsel wire, lame or lahn, 25% ad valorem; fabrics, ribbons, beltings, toys, or other articles, made wholly or in chief value of tinsel wire, lame or lahn, or of tinsel wire, lame or

lahn and india rubber, bullions or metal threads, not specially provided for in this section, 40% ad valorem.

154. Lead-bearing ores of all kinds, containing more than 3% of lead, ¾c. per lb. on the lead contained therein: Provided, That on all importations of lead-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of Government officers, who shall be stationed at such establishments, and who shall submit the samples thus obtained to a Government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.

155. Lead dross, lead bullion or base bullion, lead in pigs and bars, lead in any form not specially provided for in this section, old refuse lead run into blocks and bars, and old scrap lead fit only to be remanufactured; lead in sheets, pipe, shot, glaziers' lead, and lead wire; all the foregoing, 25% ad valorem on the lead contained therein.

156. Metallic mineral substances in a crude state, and metals unwrought, whether capable of being wrought or not, not specially provided for in this section, 10% ad valorem; monazite sand and thorite; thorium, oxide of and salts of; gas, kerosene or alcohol mantles treated with chemicals or metallic oxides, 25% ad valorem; and gas-mantle scrap consisting in chief value of metallic oxides, 10% ad valorem.

157. Nickel, nickel oxide, alloy of any kind in which nickel is a component material of chief value, in pigs, ingots, bars, rods, or plates, 10% ad valorem; sheets or strips, 20% ad valorem.

161. Quicksilver, 10% ad valorem. The flasks, bottles, or other vessels in which quicksilver is imported shall be subject to the same rate of duty as they would be subjected to if imported empty.

162. Type metal and types, 15% ad valorem.

164. Zinc-bearing ores of all kinds, including calamine, 10% ad valorem upon the zinc contained therein: Provided, That on all importations of zinc-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of Government officers, who shall be stationed at such establishments, and who shall submit the samples thus obtained to a Government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.

165. Zinc in blocks, pigs, or sheets, and zinc dust; and old and worn-out zinc fit only to be remanufactured, (10) 15% ad valorem.

169. Articles or wares not specially provided for in this section; if composed wholly or in part of platinum, gold, or silver, and articles or wares plated with gold or silver, and whether partly or wholly manufactured, 50% ad valorem; if composed wholly or in chief value of iron, steel, lead, copper, brass, nickel, pewter, zinc, aluminum, or other metal, but not plated with gold or silver, and whether partly or wholly manufactured, 20% ad valorem.

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**The Rough Creek District in California,** this summer became the scene of a mining excitement which drew many prospectors and miners from Bodie, Masonic and Bridgeport. This old Mono County mining district was prospected in the early '80s and much work was done without commensurate return. It is reported that lately the main vein of the district which attains a width of several hundred feet has been uncovered, and that ore assaying as high as $17 per ton has been disclosed. Gold, silver and cinnabar were reported to have been found in various places along the creek. The prospectors and miners are not likely to continue exploration and development unless something of permanency and value is found.

# Tax on Mining Income

WASHINGTON CORRESPONDENCE

Probably the most important mining suit, with regard to the corporation tax, brought before the Supreme Court of the United States for a long time has been filed and briefs have been put in during the past week. The case comes on a certificate from the United States Circuit Court of Appeals for the eighth circuit. The statement of the case is as follows:

Stratton's Independence, Ltd., is a corporation organized under the laws of the Kingdom of Great Britain and Ireland, carrying on mining operations in the State of Colorado, and is the plaintiff in error in Case No. 3862 in the United States Circuit Court of Appeals, Eighth Circuit, from which court the questions herein are certified.

During all the time in question in said action this company has owned certain mining premises purchased by it for $335,000 on July 29, 1909, and its sole activities have been the mining and marketing of the ores therefrom. During the years 1909 and 1910 it mined ores therefrom and sold the metal contents for a price in excess of the cost of mining, extracting, and marketing the same. By stipulation in the case it is agreed that such excess represents the true value of the ores so extracted, when in place. The collector of internal revenue for the District of Colorado assessed, levied and collected from the company a tax of 1% upon such excess, without deduction, other than the arbitrary deduction of $5000 per annum, claiming that such excess represented the net income of the company, and that a tax was properly collectable thereon, under the provisions of section 38 of the act of Congress entitled "An act to provide revenue, equalize duties and encourage the industries of the United States, and for other purposes," approved Aug. 5, 1909 (36 Stat. at Large, p. 11).

The company laid proper foundation for the recovery of the tax, by the necessary appeals to the Commissioner of Internal Revenue, and by payment under protest.

Three questions are certified to this court, as follows:

I. Does Sec. 38 of the Act of Congress entitled "An act to provide revenue, equalize duties, and encourage the industries of the United States, and for other purposes" apply to mining corporations? II. Are the proceeds of ores mined by a corporation from its own premises income within the meaning of the aforementioned act of Congress? III. If the proceeds from ore sales are to be treated as income, is such a corporation entitled to deduct the value of such ore in place and before it is mined as depreciation within the meaning of Section 38 of said act of Congress"

In presenting the argument for these points the contestants make the following points:

First—Mining corporations are not included in general classifications of corporations, as such classifications are used in legislation. The fact that the natural enjoyment of a mining estate results in the waste of the estate, and the fact that the true value thereof is impossible of determination, have caused such properties to be considered as anomalous, and to be so treated in the general incorporation laws of the mining states, and the decisions of the courts relating thereto, in the laws establishing systems of taxation in the mining states, and by the decisions under the Federal Bankruptcy Act of 1898.

Second—In the administration of Section 38, the Commissioner of Internal Revenue at first recognized that the provisions thereof do not fit the conditions of a mining corporation, and attempted to make over the act of Congress by administrative legislation. (T. D. 1742, December 15, 1911.)

Third—Mining corporations are not engaged in carrying on business within the meaning of the act.

Fourth—The application of the act to mining corporations results in a tax upon the capital itself, while, as applied to corporations having an income, as distinguished from capital, it does not result in a tax upon capital. This inequality of operation is inherently unjust. Laying aside all questions of constitutional limitations, the act should not be so construed as to accomplish this unjust result, if there be a fair and reasonable construction to be given the act which will avoid it.

Fifth—The proceeds of mining operations do not represent values created by, or incident to, the business activities of such a corporation, and cannot be a true measure of a tax leveled at such corporate business activities.

Sixth—The measurement of the tax by the excess of the receipts for ore marketed over the cost of mining, extracting and marketing the same is equivalent to a tax upon the usual and ordinary incidents of ownership of such property—such a direct tax as is prohibited by the Constitution—and, further, is such a tax as Congress, by the provisions for the deduction of depreciation provided in the act, expressly intended to avoid.

Seventh—The proceeds of mining operations result from a conversion of the capital represented by real estate into capital represented by cash, are in no true sense "income." The act cannot apply to a corporation which has no "income."

Eighth—The act ought not to be construed to include mining corporations unless it clearly appears that Congress intended to include them. It is an established canon of construction in this court that "duties are never imposed on the citizen upon vague or doubtful interpretations."

Ninth—The fact that mining corporations come within the letter of the act, if true, does not conclude the argument; for, if mining corporations be not within the spirit of the act, it is not applicable to them.

On the second part the main argument is that:

Under the second subdivision of the argument on the first question, we refer to the attitude at first taken by the Commissioner of Internal Revenue, as disclosed by Treasury Decision No. 1742. In that decision, the Commissioner recognized that the tax ought not to be paid on all the net proceeds derived from the sale of ores mined. He expressly excluded what he called the "unearned increment" from the computation of "gross income." But this policy was only applied to mines purchased prior to Jan. 1, 1909. As to properties acquired after that date, no exclusion of "unearned increment" was permitted by the decision. As above stated, the Commissioner does not now follow that decision. Proceeds of ores mined and sold are now classed as "gross income." It is noticeable that in that decision, in two sections—Section 100 and 105—he speaks of the proceeds as arising from the sale of, disposal of, or profits arising from, capital assets." It must be the fact, as the Commissioner recognized by such language, that the business of mining companies consists primarily in the conversion of capital, and not in the creation of income. No doubt the Commissioner aimed to reach the "profits or gains" of mining operations and devised the scheme outlined in Treasury Decision 1742 to exclude "original capital investment cost" and catch the profits.

As we see the fallacies of the government's position they are these: First, it fails to recognize the results of the fact that the corpus of mining premises constitutes capital, and that such is the fact, regardless of cost price, present value, known or unknown value, increase in value, or extension or contraction of the corpus; second, it fails to recognize the fact that proceeds of the sale of capital assets can be nothing but capital; third, it confuses the meaning of the word "profits" with the meaning of the word "income."

On the third point the main argument is as follows:

The government apparently proceeded at first upon the theory that there must be a limit upon the depreciation to be allowed to a mining corporation. In the administration of the act, different ideas seem to have prevailed in different places. By some it was contended that the limit should be the cost of the mining premises and improvements. By others it was contended that the limit should be the capitalization of the company. Neither of these tests reaches the value of the substance of the corpus of the capital. There is nothing in the act which indicates that as to any corporation there shall be any limit of depreciation. The act provides for the deduction of "depreciation," and what is "depreciation" is a question of fact. When in any year the corpus of the capital has depreciated, then there has been depreciation to deduct. Capital is a tangible, definite thing—quite distinguishable from "cost of capital," or from "par value of authorized capital."

Deduction for "reasonable depreciation" is allowed. Nowhere in the act is any authority given for arbitrary administrative exclusion of that which is actual depreciation. And we contend that, if a part of the capital assets are removed and sold, the property, as it originally stood, is actually depreciated in value to the exact extent of such removal.

As an actual matter of experience, the original cost of the property must, from its very nature, be highly speculative. The values in the property are invisible and impossible of determination. They may be worth many times the cost or they may be worth nothing. We submit, therefore, that any such basis of capitalization is purely fictitious; and this contention is sustained by the manner in which mining companies are capitalized.

The brief goes on to state that a very large number of cases both of metallic and coal-mining corporations are awaiting the decision of the Court in this case and it is urged that the matter shall be settled as quickly as possible on that ground. In closing the attorneys say:

"First—That Section 38 of the act in question does not apply to mining corporations.

"Second—That the proceeds of mining operations are not 'income' within the meaning of the act.

"Third—That, if such proceeds are held to be income within the meaning of the act, then the value of the ores extracted, when in place, should be deducted as depreciation before the tax is computed."

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**The Molecular Heats of Formation** of ferrous and manganous silicates from FeO or MnO and $SiO_2$ were determined to be FeO, $SiO_2$, 5905; and MnO, $SiO_2$, 7725 cal. ("Comptes rend.," p. 121, 1913.)

# EDITORIALS

## The Halt in Copper

During the last fortnight the copper market has weakened materially from the highest point, about 16¾c., of the recent rise, and as is always the case during such relapses some nervousness is exhibited. However, the behavior of the market looks quite natural.

During the period of advancing prices a great deal more copper was probably sold at under 16c. than above that figure, but during the buying movement, as a whole, consumers contracted for a very large quantity. The manner in which the buying and selling of copper is conducted produces alternate periods of big business and little business. Manifestly, consumers cannot stock up and keep on buying all the time.

There comes a lull and the larger selling agencies, if their order books are well filled, stay out of the market, asking a price at which they are willing to make further contracts and remaining more or less unconcerned if nobody at the moment is willing to pay it. There are other sellers, however, who want a market all the time and who immediately offer copper down, trying to find a price at which buyers will be interested. The volume of business transacted in this way is apt to be relatively small. The trader is able to hedge by operations in the London market and the small producer, who is selling his own product, takes no risk. If he has anticipated a broad downward swing, he may realize an average for the year that is better than the general run. If he be wrong he does not lose anything.

In the early part of this year we had a receding market in much the same way as we are having now. One producer, commonly rated as a small producer, although it is not so very small, undersold its competitors right along, snapping up the small business that was offered and accepting prices that looked almost ridiculous at the time. These prices looked big a little later when the larger producers recognized conditions and cut their prices sharply, the time having come when they needed to sell copper.

In such circumstances the big sales are invariably made at the bottom—at the price which interests consumers and speculators in taking over large blocks. These are usually the Europeans. The Americans seldom buy much when copper is really cheap. They come in on the subsequent advance. In this respect their experience last summer was in no wise different from what has happened to them on many previous occasions. The inability of Americans to buy cheaply has indeed become proverbial in the trade.

After a smart advance there are always some belated buyers. The market sags off under the influences that we have above related. The belated buyer, who is usually looking for bargains, holds off to get copper a little cheaper, then a little more cheap. In his maneuvers he is very apt to overstay his market and end by paying a stiffish price after all.

It all depends upon the general economic trend. If business be turning bad, if consumption be on the wane, we shall have a repetition of previous experiences, viz., a constant fishing for the market by the small sellers, then drastic cuts by the big ones, then more fishing and more cuts, and finally the making of a bedrock price. On the last slump this was 13¾ cents.

If, on the other hand, business be holding good, if consumption continues large, the buyers will appear again in the market as soon as it seems wise to them to contract for the additional supplies that they will need and the market will rise sharply from the level created by the small sellers, because the latter will neither have much to sell nor will they want to sell what they have got if the fish are biting good.

Statistically, there has been no recent change in the copper situation. Consumption continues large and production continues checked. These conditions have led to a diminution of stocks to a figure smaller than since the early part of 1907 when the price of copper was 25c. What especially concerns the producers just now, however, is the selling of the copper that he expects to have ready for delivery next December, not that which he has got on hand. Consumers for the moment are reluctant to contract heavily for December copper, but there is no good evidence that they will be indisposed a little later on, inasmuch as the use of copper is apparently experiencing no falling off. Nor is there any reason to expect any material increase in production in the near future. The Mexican trouble is undoubtedly going to continue for a long time yet, while even if the Lake Superior strike should be settled today it will be next spring before the Michigan mines can regain their normal rate. The change in some quarters from high optimism to undisguised nervousness, if not real pessimism, during the last fortnight is too little supported by indications and in fact is to sudden to be very convincing. It seems rather to reflect qualms arising from the speculative markets in which anticipatory operations may have been overdone.

## The Lead and Zinc Schedules

We now know definitely what the new tariff on lead and zinc, and their ores, is going to be. The schedules are as follows: On lead, 25% *ad valorem;* on lead in ore, ¾c. per lb.; on zinc, 15% *ad valorem;* on zinc ore, 10% *ad valorem* on the zinc content thereof.

The present price of lead in the London market is about 4.35c. The duty on importations would be about 1.09c. The duty on lead in ore would raise the price of Mexican and Canadian lead, smelted here, to about 5.10c. The New York price for lead is now about 4.60c. Obviously no importations are threatened at present.

The European price for lead is, however, rather above the normal. We may see it happen some day that foreign lead will be entered for consumption here. Conversely, we may at some times find ourselves on the verge of exporting our own lead to Europe.

The broad effect of the reduction of the duty on lead will be to bring the American and European prices more nearly together, and to lessen the opportunities for corners and squeezes here. Our market will be more stable, our consumers will benefit, and we do not see that our producers will be hurt.

In spelter the new conditions will be similar to what we obtain in lead, but will be a little more pronounced. The New York price at present is about 5⅜c.; the London price about 4.56c.; the present rate of duty will be about 0.68c. Allowing 0.25c. for freight and charges the present cost of foreign spelter in New York would be about 5.50 cents.

If the New York price should rise to the European parity, however, it would only be the Atlantic seaboard markets that could be invaded. Geography would still protect the Ohio Valley, the great center of spelter consumption. This assumes that the London price would remain at 4.56c. In fact any overtures from here for the purchase of any large blocks of European spelter would probably put up the price over there. Last fall the conditions were different. The European convention was then willing to sell privately at large concessions from the openly quoted market and did so.

We shall no doubt see a repetition of these conditions both ways. We may not export any spelter to Europe so long as we are pinched for ore supply, but we venture the prophecy that we shall some day see zinc smelting done in our Atlantic seaports, importing ore from Australia, Asia and elsewhere, and then we may export spelter once more.

America has not always been helpless in the zinc and lead trade. Back in the '90s we used to export a lot of spelter, and in the '70s and in the '40s we used to ship abroad some big tonnages of lead.

The matter of the new tariff on zinc ore is the most complicated thing. In previous editorials we called attention to the original oversight of Congress and the attempt to correct it. The zinc-ore section now reads: "10% *ad valorem* on the zinc contained therein." How is this to be determined? Is the zinc content to be reckoned at the pound price *loco* St. Louis or New York? We fancy not, inasmuch as the duty so computed might be in excess of the total ore value, which would be a *reductio ad absurdum* and manifestly not the intent of Congress. The matter of ore value is no simple thing, however. Suppose a cargo of ore be imported from Vladivostock through Baltimore for Clarksburg, W. Va. Is the duty payable on the value at Vladivostock or at Baltimore? Anyway, the duty will vary according to the source of the ore or the port of entry and some places will have geographical advantages.

The zinc smelter will pay ¾c. per lb. on lead content of which he will not recover any, or at the best perhaps 70%, but he will be free of duty on silver value. How is the zinc value and the silver value to be separated in the case of many ores? Will the zinc smelters have to adopt settlement sheets similar to those of the silver-lead smelters? What will become of existing sliding-scale contracts? Here is a maze to be unraveled by treasury rulings, and by the courts. We prophesy that the latter will have something to do ere long. Barring some of these tangles, however, the smelters have gained an important step in the direction of free ore.

## The Situation in Spelter

The zinc smelters complain bitterly of their present predicament. The margin between the prices of ore and spelter leaves them but little profit anyway, in some cases no profit, and many of them are still operating at reduced capacity, which of itself increases their operating cost per ton of ore. Normally they would cause the ore producers to shoulder part of the burden, but of late there has been such a scarcity of ore supply that the miner has things his own way.

Amelioration of the situation would come naturally through the cessation of smelting by some of the less favorably situated concerns, which, by reducing the supply of spelter, would cause the price to rise and by reducing the demand for ore would cause the price of it to fall, thus restoring the normal margin.

However, the price for spelter cannot now be caused to rise much in this way, because only a little advance would bring in European spelter. On the other hand, the reduction in the tariff on ore is not going to help the smelters much right away, because their main supply of foreign ore, Mexico, is cut off anyhow and is likely to remain cut off for some time to come.

The outlook is apparently that the price for spelter cannot go materially lower, for the reason that any further reduction of ore supply would be unpermissible. On the other hand, there cannot be any material advance so long as Europe has got spelter to sell us at a little above the present price.

Probably there will be a market fluctuating within relatively narrow limits for a while to come, during which time our smelters will have to worry along in an uncomfortable way. The European convention has its restriction of output in effect now, which is causing things to right themselves over there. When its stocks have been absorbed it is likely that there will be an advance in price both there and here, providing that domestic demand does not go to the dogs in the meanwhile, which we do not anticipate.

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The Butte & Superior Co. is now reporting tons of ore milled, zinc content of concentrates, percentage of recovery and percentage of zinc concentrates. This is an improvement over former style of report and leaves little to be desired. The tons of concentrate produced might advisably be stated. However, anyone interested can, of course, figure it from the data given by the company. The Butte & Superior company now appears to be doing very well, upon which both its management and its stockholders are to be congratulated.

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The supply of crude copper for American refineries in July, 1913, according to our statistics was 139,315,-203 lb., which was about the normal monthly rate so far in 1913. This figure does not, of course, reflect the decrease in the Lake Superior production, which did not appear statistically until August.

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The Old Dominion-Hyams litigation drags on like the case of Jarndyce vs. Jarndyce. Some of the older generation may know what it is about; the younger certainly don't. We wonder if anybody does, except Mr. Hyams.

## BY THE WAY

The Sheep Creek Mother Lode mill illustration on the first page of the Journal of Sept. 20 shows a fine expanse of roof. A correspondent tells us it was a great error to let this get by without the inscription "Read the E. & M. J."

⁂

A Curb broker's market letter on mining stocks contains the following gem: "In this connection we repeat what we have many times said before: An outright purchase of almost any old stock on the Curb is far safer than a 10-point margin on the soundest issue on the Stock exchange." But neither way is our idea of "Safety First."

⁂

The newspapers report a peculiar accident at Clifton:

> A large force of men is at work chiseling and sawing out 500 tons of solid matte, "frozen" in the first furnace of the Arizona Copper Co.'s new smeltery. It is expected that at least six months will pass and many thousand of dollars will be spent before the smelter can be used. In the meantime the old plant will be operated.
>
> The furnace was lined with firebrick. Between each brick was a small space. It was supposed that the bricks would melt and run together as soon as a fire was started under the furnace. But the bricks were defective and did not melt. The molten metal ran into the interstices.
>
> As soon as this became known the fires were drawn, leaving the matte inside the furnace to cool and become solid. It is now a solid mass of 500 tons, 99% copper.

We get the impression that something in the way of a furnace mishap has occurred, but we certainly don't know what it is.

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The financial editor of the *Evening Post* recently summed up the commercial situation thuswise: "We have had the autumn beginning with easy money where stringency had been predicted, and the harvests turning out such as to encourage equanimity where disaster had been predicted. We have also seen the completion of the tariff legislation without any accompanying mercantile disturbance. On the basis of all this, prices have rather generally recovered all the losses incurred since the pessimistic view of things began to prevail in the early weeks of the year. Those predictions are now known to have been mistaken. There are left the usual autumn problems, such as always make the last three months of the year a period of more or less financial uncertainty, at home and abroad. But that is a different thing from the cataclysm which used to keep timid investors awake at night, between February and July."

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The following tale of romance was related in the New York *Sun,* as a letter from Glens Falls, N. Y., date of Sept. 18:

> "Uncle Jim" Chase, a well known resident of Fort Ann, acting upon instructions received in a two-night vision, has discovered on his farm at Fort Ann a gold and silver mine supposed to have been abandoned 250 years ago and a large cave, in which gold and silver bullion and coins were hidden there at that time.
>
> Samples of the gold ore sent to Albany for analysis have shown that they contain $2.60 in gold to the ton, while the silver ore assays at about the same ratio. The samples also contain a large percentage of nickel. Mr. Chase, who owns the farm upon which the mine and cave are located, has filed a miner's claim with the Secretary of State.
>
> Uncle Jim's statement rivals those of fiction. Uncle Jim, who is a veteran of the civil war, in which he served as a sergeant, and is a hunter, trapper, crack shot and man of his word, tells the following tale:
>
> An old Spaniard, one whose appearance was not altogether pleasing, appeared to him in a vision on two succeeding nights as he slept. The Spaniard told him to go to a certain spot on his farm back of Sly Pond, in the vicinity of Three Ponds in that part of the town of Fort Ann known as Michegann, and that he would find a cave there in which the Spaniard had mined and smelted and coined gold and silver 250 years ago.
>
> "This stuff was left there and you're the man we want to have it," said the Spaniard, according to Mr. Chase. The mysterious man left that vicinity 250 years ago, when he built a stone wall across the cave, a short distance from its mouth. Just back of this wall, he told Chase, would be found a large iron chest, containing gold and silver coins and a large amount of bullion, both refined and crude, all abandoned by the Spaniard two and a half centuries ago.
>
> Chase was considerably affected by the vision, but decided to await its repetition before he started out, and sure enough the same Spaniard appeared to him the following night.
>
> Convinced that an effort to locate the gold and silver would cost him nothing more than a little work, if he should be disappointed, Chase started out early the next morning. He went to the place indicated by the Spaniard and did some excavating. He then covered up the entrance, had some samples, which he brought away, assayed, and is now preparing to open up his mine and reap the harvest which has been bestowed upon him.

This carries the New York up-State gold myth back about 250 years. The mine at which gold is mined, extracted, refined and coined, all in the same place, is new to us. We'd like to see that kind of a mine, and may be we'll send a member of our staff to Fort Ann. Not, however, until we have been on the lookout for some promoter's literature.

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The prospector's burro or mule, has in some instances in the United States, given way to the more speedy automobile, but outside of the Kalgoorlie gold field, in Western Australia, the camel has not been thought of as a beast of burden, in connection with prospecting or the operation of mines. It is therefore of interest to note that T. H. Trimble, a prominent stockman of Texas, is the leader in a plan for importing 200 camels, trained in the Old World, to be beasts of burden. It is proposed to place the camels on a ranch on the Rio Grande, about 150 miles south of Cape Verde, where a breeding station has been established. All the states in the region once mapped as the Great American Desert, are thought to be rich in precious metals, especially gold, but owing to the lack of water it has been extremely difficult for prospectors to pack in supplies enough to last over a sufficiently long trip to explore the country well. It is thought with a camel caravan, longer journeys will be possible through the dry territory. The use of camels in this section, states the *Independent,* is not an original idea, for in President Pierce's day the plan was tried out under Secretary of War Jefferson Davis. Then about 40 animals with their native drivers were introduced. Just about when they were becoming acclimated and ready for the preliminary experiment, the Civil War broke out. Mr. Davis became president of the southern confederacy and partly through feeling against him and everything pertaining to him, partly because of the unsettled condition of the country and lack of suitable stocking places, the plan was abandoned. Some of the buildings remain that were used by the camels and their keepers, and on rare occasions prospectors, returning from the wildest, almost inaccessible sections where water is found in springs or in small mountain streams, report seeing one or two of the strange, uncouth beasts, the presence of which nearly always is a startling sight to one ignorant, as most people are, of the story of their introduction.

# Gold Production of the World

In our statistical number, Jan. 11, 1913, we presented a table giving the gold production of the world for 1912. At that date the output for the closing months of the year in those countries which make periodical returns, was necessarily estimated. This was done on a conservative basis in order to avoid possible errors. We now reproduce that table with such corrections as we are able to make from official and other reports received from the various countries. As corrected, it gives the gold production of the world in 1912, as compared with that for 1911, as follows:

TABLE I. GOLD PRODUCTION OF THE WORLD

| | 1911 | 1912 | Changes |
|---|---|---|---|
| Transvaal | $170,059,273 | $188,599,260 | I. $18,539,987 |
| Rhodesia | 12,986,000 | 13,166,230 | I. 180,230 |
| West Africa | 5,197,488 | 7,386,028 | I. 2,188,540 |
| Madagascar, etc | 2,706,639 | 2,925,000 | I. 218,361 |
| Total Africa | $190,949,400 | $212,076,518 | I. $21,127,118 |
| United States | $96,890,000 | $93,451,500 | D $3,438,500 |
| Mexico | 24,880,100 | 22,500,000 | D. 2,380,100 |
| Canada | 9,762,100 | 12,559,288 | I. 2,797,188 |
| Central America, etc | 3,399,000 | 3,632,500 | I. 233,500 |
| Total North America | $134,931,200 | $132,143,288 | D. $2,787,912 |
| Russia, inc Siberia | $32,151,600 | $27,635,500 | D. $4,516,100 |
| France | 1,707,100 | 1,847,000 | I. 139,900 |
| Other Europe | 2,584,900 | 3,615,000 | I. 1,030,100 |
| Total Europe | $36,443,600 | $33,097,500 | D. $3,346,100 |
| British India | $11,054,100 | $12,115,162 | I $1,061,062 |
| British and Dutch East Indies | 4,726,500 | 4,925,000 | I 198,500 |
| Japan and Chosen | 6,896,900 | 7,165,000 | I. 268,100 |
| China and others | 3,769,600 | 3,750,000 | D. 19,600 |
| Total Asia, not inc Siberia | $26,447,100 | $27,955,162 | I. $1,508,062 |
| South America | $10,421,800 | $12,425,000 | I. $2,003,200 |
| Australasia | 60,184,200 | 56,635,800 | D. 3,548,400 |
| Total | $459,377,300 | $474,333,268 | I. $14,955,968 |

The increase in 1912 over 1911 was 3.3%. As will be seen from the table the gain was entirely from the African mines. Outside of that continent no important producer except Canada made any considerable gain. The causes of most of the changes have been heretofore discussed.

The total for 1912 was $60,352,624 above the average of the past 10 years. The second table gives the world's production of gold for 20 years past:

TABLE II GOLD PRODUCTION OF THE WORLD FOR 20 YEARS.

| | | | |
|---|---|---|---|
| 1893 | $158,437,551 | 1903 | $329,475,401 |
| 1894 | 182,509,283 | 1904 | 349,088,293 |
| 1895 | 198,995,741 | 1905 | 378,411,054 |
| 1896 | 211,242,081 | 1906 | 405,551,022 |
| 1897 | 237,833,984 | 1907 | 411,294,458 |
| 1898 | 287,327,833 | 1908 | 443,434,527 |
| 1899 | 311,505,947 | 1909 | 459,927,482 |
| 1900 | 258,829,703 | 1910 | 454,213,649 |
| 1901 | 260,877,429 | 1911 | 459,377,300 |
| 1902 | 298,812,493 | 1912 | 474,333,268 |

It is rather early to make any prediction for the total of the current year, but it looks now as if there would be no increase over 1912. The Transvaal output has been kept down by the miners' strike and other causes. It does not appear probable that the United States will show any material change from last year. Australian production for the first half of the year showed a considerable decrease, and Mexican mining is still affected by the disturbed state of the country. On the other hand, Canada may be expected to gain, and some of the causes which brought about a decrease in Russia have been removed. It may be that the losses and gains so far known will nearly balance each other, but a total about equal to that for 1912 seems to be about the best that can be expected.

# September Mining Dividends

Dividends for September of United States mining companies making public reports amount to $6,475,567 paid by 31 companies; iron, metallurgical and holding companies pay $13,441,816; and Canadian, Mexican and Central American companies $1,612,804. This compares with 30 companies paying $5,956,294 in September, 1912; with $10,704,967 paid by industrial, iron and holding companies, and $1,610,181 paid by Canadian, Mexican and Central American companies. This increase is shown despite a decrease of $600,000 in Calumet & Hecla's dividend of this last and last September.

The effect of the strike in the Missouri lead region is shown in the 33⅓% cuts in Doe Run and St. Joseph Lead Co.'s dividends; Calumet & Hecla and Quincy reflect the Michigan disturbances. Grand Central, of Utah, takes this occasion to pay a belated July disbursement, and Bingham-New Haven pays for the first time since July, 1912.

| United States Mining Companies | Situation | Per Share | Total |
|---|---|---|---|
| Bingham-New Haven, c | Utah | $0 10 | $22,869 |
| Bunker Hill & Sull., l s | Ida | 0 20 | 65,400 |
| Bunker Hill Con., g | Calif. | 0 05 | 10,000 |
| Calumet & Arizona, c | Ariz | 1 25 | 745,441 |
| Calumet & Hecla, c. | Mich. | 6 00 | 600,000 |
| **Chino, c.** | **N. M.** | **0.75** | **583,194** |
| Doe Run, l | Mo | 1 00 | 65,749 |
| Federal Min. & Smelt., pfd | Ida. | 1 50 | 179,791 |
| **Fremont, g.** | **Calif.** | **0.02** | **4,000** |
| Frontier, z. | Wisc. | 2 00 | 2,500 |
| Golden Cycle, g. | Colo. | 0 02 | 30,000 |
| **Grand Central** | **Utah** | **0.05** | **25,000** |
| Hecla, l s. | Ida. | 0 02 | 20,000 |
| Homestake, g | S. D. | 0 65 | 163,254 |
| Nevada Consol., c. | Nev. | 0 37½ | 749,790 |
| New Idria, q. | Calif | 0 10 | 10,000 |
| North Star, g | Calif. | 0.20 | 50,000 |
| **Pittsburgh-Silver Peak, g.** | **Nev.** | **0.02** | **55,800** |
| Quincy, c. | Mich. | 1.00 | 110,000 |
| Ray Consol., c | Ariz. | 0.37½ | 542,757 |
| Saint Joseph, l | Mo. | 0.10 | 100,000 |
| Silver King Consol., s | Utah | 0.25 | 155,000 |
| Superior & Pittsburgh, c | Ariz. | 0 38 | 569,922 |
| Tennessee, c. | Tenn | 0 75 | 75,000 |
| Tom Reed, g. | Ariz | 0 06 | 54,573 |
| Utah Co | Utah | 0 75 | 1,186,627 |
| Wasp No. 2 | S D | 0 02 | 10,000 |
| Yellow Aster, g | Calif | 0 05 | 5,000 |
| Yellow Pine, l.z s. | Nev | 0 02 | 19,000 |
| Yosemite Dredging, g | Calif | 0 10 | 2,400 |
| Yukon, g. | Alas | 0 07½ | 262,500 |

| Iron, Industrial and Holding Companies | Situation | Per Share | Total |
|---|---|---|---|
| **Amer. Smelting & Refining, pfd** | **U. S.** | **1.75** | **875,000** |
| Amer. Smelting & Refining, com | Mex | 1 00 | 500,000 |
| **Crucible Steel** | **U. S.** | **1.75** | **427,638** |
| General Asphalt, pfd. | U. S. | 1 25 | 164,120 |
| General Chemical, com | U. S. | 1.50 | 128,382 |
| **Guggenheim Exploration** | **U. S., Mex.** | **0.75** | **623,799** |
| Harbison-Walker, com. | U. S | 0 50 | 90,000 |
| International Nickel, com | U. S. | 2 50 | 948,133 |
| Lackawanna Steel, pfd | U. S | 1 75 | 612,115 |
| National Lead, com. | U. S. | 0 75 | 154,915 |
| National Lead, pfd. | U. S | 1.75 | 426,433 |
| **Phelps Dodge, c.** | **U. S. Mex.** | **4.50** | **2,025,000** |
| Pittsburgh Steel, pfd. | U S | 1.75 | 112,500 |
| U. S. Steel, com. | U S | 1 25 | 6,353,781 |

| Canadian, Mexican and Central American Companies | Situation | Per Share | Total |
|---|---|---|---|
| Blanca y Anexas, g s | Mex | 0 90 | 63,000 |
| Chontalpan, g s.l z | Mex | 0 50 | 3,500 |
| Crown Reserve, s | Ont | 0 02 | 35,376 |
| Dos Estrellas g.s | Mex | 1 50 | 450,000 |
| Granby Con., c g s | B C | 1 50 | 222,721 |
| Hedley, g. | B C | 0 50 | 60,000 |
| **Hollinger, g.** | **B. C.** | **0.15** | **90,000** |
| **Kerr Lake, s.** | **Ont.** | **0.25** | **150,000** |
| Lucky-Tiger, g | Mex | 0 05 | 35,767 |
| Mexico Mines of El Oro, g s | Mex | 1 44 | 262,440 |
| N. Y. & Hond. Rosario, g | C A | 0 20 | 40,000 |
| Peñoles, l s. | Mex | 1 25 | 150,000 |
| Standard, s.l. | B C. | 0 02½ | 50,000 |

Dividends for the first nine months of the year are $51,015,894 for United States mining companies; $87,213, 660 for iron, industrial and holding companies; and $16,654,123 for other North American companies.

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**The Otavi Mines & Railway Co.**, German Southwest Africa, for the fiscal year 1912-13, reports that it has shipped abroad from one of its prospects in Otavital 200 tons of a copper-lead ore containing 10% vanadic acid. The latter occurs in the mineral "mottramite," which is a hydrous vanadate of lead and copper.

## PERSONALS

Franklin Guiterman left New York last week for Denver.

G. W. Crane will spend about a year in the Tintic district, Utah.

E. A. Holbrook has been appointed assistant professor of mining engineering at University of Illinois.

C. T. Griswold of the Associated Geological Engineers is engaged in examination work in eastern Idaho.

Sir Alfred Mond, head of the Mond Nickel Co., sailed from England Sept. 23 for a two-months visit to Canada.

Albert G. Wolf has recently been appointed chief mine engineer for the Mason Valley Mines Co., Thompson, Nevada.

Charles Kingsley, formerly manager of the Colonial mine, Cobalt, is making an inspection of gold mining properties at Kirkland Lake, Ontario.

Godfrey Doveton is in the Mezquital del Oro district of Zacatecas, Mexico, making extensive tests on the Mezquital and San Carlos gold ores.

John Hare, a British financier, is on his way to Canada to investigate several Cobalt properties in the interest of prospective English investors.

S. O. Andros has been appointed associate in mining engineering at the University of Illinois. He was recently with the Illinois Geological Survey.

John T. Reid has been appointed consulting engineer and general manager for the Buffalo Valley Gold Mining & Leasing Co., operating mines at Volney, Nevada.

H. C. Miller, mining engineer and geologist, until recently with Daniels & Osmont, San Francisco, has opened an office of his own at Bishop, Inyo County, California.

Stanley N. Graham, manager of the Peterson Lake mine, Cobalt, Ont., has been appointed professor of mining engineering in the Technical College, Halifax, Nova Scotia.

L. E. Young, recently with the Missouri School of Mines, is now part-time instructor in mining at the University of Illinois, and at the same time is carrying on some graduate work in economics.

W. A. Rose, formerly chief engineer for the Oliver Iron Mining Co. in the Hibbing district, Minnesota, has been appointed chief mining engineer for Pickands, Mather & Co., with offices at Duluth.

C. M. Smith, who has been secretary and treasurer of the Colonial Iron Co. operating the blast furnace plant at Riddlesburg, Penn., has been made president of the company, succeeding H. H. Adams, resigned.

Capt. Bernier, the Canadian Arctic explorer, who returned on Sept. 25 from Baffins Land, reports there is no gold in that region, and that previous statements attributed to him that gold had been discovered were incorrect.

Clyde H. Jay, vice-president and mine manager of the Giant Eclipse Consolidated Mines Co., operating near Salida, Colo., has been appointed also consulting engineer for the New Discovery Mining & Milling Co. in the same district.

John T. Fuller has opened an office in Little Rock, Ark., for the practice of mining engineering and is prepared to report on, perform the engineering work, and act as agent for mines and mining properties in that state and section.

John M. Boutwell, consulting geologist for Phelps, Dodge & Co., having finished his report on the property of the Detroit Copper Mining Co., has left Santa Barbara for Globe, Arizona, where he will make an examination of the Old Dominion Copper Mining & Smelting Co. property.

W. M. Brewer, who at the time was traveling in Lillooet district, investigating mining conditions for the British Columbia Department of Mines, lost his horse, which slipped off a trail and fell down a steep mountain side, fully 1000 ft. Fortunately Mr. Brewer was not riding the horse when the accident happened.

Adolph Greiner, since 1887 general director of the Société John Cockerill, Seraing, Belgium, was elected president of the Iron & Steel Institute at its autumn meeting at Brussels. His whole career has been with the Cockerill company, which he entered as a chemist. Under his management the company adopted the basic bessemer process and through his leadership it has been foremost in the utilization of blast-furnace and coke-oven gases for the generation of power in iron and steel works.

## OBITUARY

Morris Doblin, a prominent mining man of Baker City, Oregon, was shot and killed at the Highland mine, near that place, on Sept. 22 by an Austrian miner, who escaped.

Robert C. Neal, Harrisburg, Penn., died September 21, aged 66 years. He was a founder of the Harrisburg Rolling Mill Co. and had been connected with the Eleanor Iron Co., Hollidaysburg, Penn.; Tyrone Forges, Tyrone, Penn., and Lochiel Iron Works, Harrisburg, Penn. He was the son of William Neal, a prominent iron manufacturer in his day.

Otto Dolling, of Angel's Camp, Calif., died in San Francisco, Sept. 3. Mr. Dolling had been in ill-health for several years. He was taken to San Francisco for possible treatment about a week before his death. Mr. Dolling was the owner of the Angel's Hotel and was interested in mining. He was one of the owners of the Dolling mine, which is sometimes known as the North Star, at Angels. He was born in Holstein, Germany, in 1849, and went to California in 1869, and was located at Knight's Ferry. In 1888 he bought the Angel's Hotel and conducted it for about 20 years, and then leased it out. About two years ago he resumed the management. He was still interested in the mining enterprises at the time of his death. In 1886 he was married to Mary Stickle, daughter of the late George Stickle, an Angel's Camp pioneer.

Jabez Burton Stubbs, formerly vice-president of the Struthers Furnace Co., Cleveland, O., died Sept. 19, aged 82 years. He was born in Poland, O., and started his career as a railroad telegraph operator. Called to Chicago, he met W. C. Runyon, now president of the Struthers Furnace Co. Together they organized a commission business to deal in pig iron under the name of Stubbs & Runyon. While residing in Chicago he was a member from 1886 to 1891 of the Cleveland firm of Runyon, Stubbs & Mack, but did not take an active part in the business. In 1895 Mr. Stubbs removed to Cleveland and again formed a partnership with Mr. Runyon under the name of Runyon, Stubbs & Co. While this partnership was in existence the Struthers Furnace Co. was formed with Mr. Runyon as president and Mr. Stubbs as vice-president, which connection he held until six years ago, when he retired from active business. He leaves a widow and a daughter.

William Armstrong Ingham died at his home in Philadelphia, Sept. 23, aged 87 years. He was born in Pennsylvania and graduated from the Rensselaer Polytechnic Institute at Troy, N. Y., also studying law as well as engineering. He was for a number of years connected with the Pennsylvania Geological Survey, being associated for a long time with the late Professor J. P. Lesley. He also made many geographical studies for the state. He took an active interest in the development of the Broad Top coalfield, and was one of the organizers of the East Broad Top R.R. & Coal Co. He took much interest in many public movements for economical improvement. In spite of his age, he continued actively in business until a few days before his death. At the time of his death, he was president of the Highland Coal Co., the Broad Top Improvement Co., and the Beverly Ore Co. He was also secretary of the Geological Survey Board of Pennsylvania and a member of the American Philosophical Society, the Franklin Institute and the American Institute of Mining Engineers.

## SOCIETIES

**Mining & Metallurgical Society of America**—The San Francisco section held a meeting in Oakland, Sept. 15, and discussed the proposed affiliation with the American Institution of Mining Engineers. The meeting was attended by H. Foster Bain, E. B. Kimball, Robert E. Cranston, Philip R. Bradley, of San Francisco; Mark L. Requa, E. L. Oliver, of Oakland; Prof. S. B. Christy, Prof. A. C. Lawson, of the University of California, and C. W. Merrill, of Berkeley.

**Utah Society of Engineers**—At the first regular meeting following the summer vacation, Sept. 19, papers dealing with the smoke problem of Salt Lake City were given. A. H. Thiessen, director of the United States Weather Bureau presented a paper, "Data on the Atmospheric Conditions in Salt Lake Valley." Mr. Thiessen said that observations on smoke-haze and fog had been tabulated since 1891. It is frequently difficult to distinguish between these two. Haze is generally supposed to consist of minute dust particles in the air, but also of minute particles of water on dust near the earth's surface. The haze prevalent in autumn is probably due to the [illegible] leaves adding to the dust. Mr Thiessen called attention to smoke as distinguished from haze or fog, and explained the conditions under which fog and clouds are brought [illegible]. The records of the Weather Bureau show that [illegible] ranges from as high as 83% in July to as low as [illegible] in December and January. A tabulation of the [illegible] smoky and foggy days since the station was established shows the greater number to be in November, December, January and February. From April to September inclusive there is practically no fog or smoke. The hazing effect of water vapor is intensified by its association with dust particles which are thrown into the air by combustion and other means, and give the water a surface on which to condense. A paper by O. W. Ott on "Possibilities of Reducing the Smoke Production in Salt Lake City," called attention to estimates of the loss through smoke in some cities, varying from $8 to $12 per capita annually. The theory of combustion was discussed, together with furnace construction and operation. Prof. E. H. Beckstrand gave statistics showing the coal consumption of the city to be 350,000 tons annually, the greater part of this being consumed during six months of the year. About 2% of the total weight of the coal goes up in smoke, setting free 40 tons of soot daily. Stoves and furnaces in private homes were responsible for a great deal of this amount. A system of community heating plants was suggested as a remedy. Heat could be supplied from these plants at a saving over that from individually operated furnaces. The feasibility of a municipal heating plant to overcome a large part of the smoke nuisance is to be looked into by a committee named at a meeting of the Salt Lake Municipal League.

## INDUSTRIAL NEWS

The Bury Compressor Co., Erie, Penn., is starting the erection of an addition to its plant, extending the main plant 100 ft. This is necessary on account of increase in their business.

The Hardinge Conical Mill Co., 50 Church St., New York, report orders from the National Copper Co., Wallace, Idaho for grinding machinery which includes machinery for preliminary granular fine crushing as well as the final regrinding and from the Atbasar Copper Co., of Russia for six of the largest size mills to be equipped with Hardinge type manganese steel liners.

F. K. Brewster, Inc., has been incorporated under the laws of the State of New York, with a capital stock of $500,000, to manufacture blasting caps, electric blasting caps and fuse. Its plant and factory, now in course of construction, is to be located near Port Ewen, New York. The officers of the company are president and treasurer, Frank K. Brewster, secretary Roswell S. Nichols. The other directors of the company, are Paul Butler, of Lowell, Mass., John J. Heney, of Ottawa, Ontario, and Oscar S. Phillips, of Suffield, Connecticut.

A new type of rotary power pump has just been developed by the Goulds Manufacturing Co., Seneca Falls, N. Y. This pump differs from the rest of the line of pumps of the same capacity in that gear cams have been substituted for the three-toed cams used in the remainder of the line, and the gears on the cam shafts have been eliminated. Two sizes are built: No. 1 has a capacity of 25 to 50 gal. per min. at 225 to 450 r.p.m. and No. 2 has a capacity of 50 to 100 gal. per min. at 225 to 450 r.p.m. Both pumps are suitable for pressures up to 100 lb. or 230 ft. elevation.

The Ingersoll-Rand Co. of New York, has received an order from the Inspiration Consolidation Copper Co. for a heavy-duty cross-compound compressor to supply air for mine use at 95 lb. pressure. It will have a displacement capacity of 8500 cu.ft. and will be direct connected to a 2200-volt three-phase, 25-cycle Westinghouse synchronous motor. They also received the order for the heavy-duty four-stage compressor that will be used to furnish air at 1000 lb. pressure for operating the H. K. Porter compressed-air locomotives to be used for mine haulage; this compressor will have a displacement of 1325 cu.ft. and will be operated at 107 r.p.m. being direct connected to a 2200-volt three-phase 25-cycle General Electric synchronous motor. The company has also received an order for a 900-cu.ft. Imperial cross-compound belt-driven compressor for the Calumet & Arizona Mining Co. to be used at its development operation near Superior, Arizona.

## TRADE CATALOGS

**Atkinson & Sill, 515 Hollingsworth Building, Los Angeles, Calif.** Catalog. Overstrom classifier. Illus., 30 pp., 6x9 in.

**Morris Machine Works, Baldwinsville, N. Y.** Catalog. Centrifugal pumps, hydraulic dredges, steam engines. Illus., 126 pp., 6x9 in.

The Westinghouse Electric & Mfg. Co. report the publication of the following:

Folder 4187 covers the type KB Section Insulator. The iron parts of this device are sherardized, and wearing parts are renewable. It is said to be an unusually strong and light weight insulator.

Leaflet No. 3569 describes and illustrates the shipment of transformers in tanks with oil. This method has become prevalent in the shipment of large transformers enabling them to be installed immediately upon arrival at destination.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

DRILLING—Improvements in Valve Apparatus for Percussive Rock Drills and the Like. G. Rayner, Abbeydale, Sheffield, Eng. (Brit. No. 8320 of 1913.)

MUCKING APPARATUS. Walter E. Trent, Reno, Nev. (U. S. No. 1,073,184; Sept. 16, 1913.)

ORE-CLASSIFIER. James W. Shields and Albert C. Thielmann, Hubbell, Mich. (U. S. No. 1,073,367; Sept. 16, 1913.)

SEPARATION—Ore and Like Separating Means. Pierre Jubien, San Francisco, Calif., assignor of one-half to P. A. Brangier, Agnew, Calif. (U. S. No. 1,072,732; Sept. 9, 1913.)

FEEDING TUYERE FOR ORE-TREATING FURNACES. Ernest Edmund Banes, Strathfield, near Sydney, N. S. W. (U. S. No. 1,073,463; Sept. 16, 1913.)

ORE TREATMENT—Process for Treating Ores. James Ainsleigh McLarty, Toronto, Ont. (U. S. Nos. 1,072,752 and 1,072,753; Sept. 9, 1913.)

ROASTING—Improvements in Furnaces for Roasting, Smelting or Otherwise Treating Ores. E. Buchholtz, Wealdstone, Eng. (Brit. No. 10,564 of 1912.)

ROASTING FURNACE. Francis Albert Curnow, Pittsburg, Kan. (U. S. No. 1,072,920; Sept. 9, 1913.)

SMELTING—Furnace for Smelting and Refining Ores. Willie Martin Bowles and Charley Osker Allen, Shawnee, Okla. (U. S. No. 1,073,468; Sept. 16, 1913.)

TUNNEL FURNACES—Process of and Apparatus for Feeding Cars into and through Tunnel-Furnaces. Alfred H. Cowles, Sewaren, N. J., assignor to The Electric Smelting & Aluminum Co., Sewaren, N. J. (U. S. No. 1,073,219; Sept. 16, 1913.)

CYANIDING—Agitating and Mixing Apparatus. Walter E. Trent, Reno, Nev. (U. S. No. 1,073,878; Sept. 23, 1913.)

BLAST FURNACE—Air-Cooled Blast Furnace. Richard H. Stevens, Munhall, Penn. (U. S. No. 1,074,097; Sept. 23, 1913.)

BLAST-FURNACE GASES—Apparatus for the Process of Purifying Blast-Furnace and other Gases and Freeing them from Dust Particles. Smith and Bagley and M. E. Feilman, London, Eng. (Brit. No. 10,311 of 1913.)

FURNACE-DOOR FRAME—(Water-Cooled). Luther L. Knox, Niles, Ohio, assignor to the Knox Pressed & Welded Steel Co., Niles, Ohio. (U. S. No. 1,073,144; Sept. 16, 1913.)

INGOT MOLDS—Apparatus for Handling Ingot-Molds. Samuel T. Wellman and Horace W. Lash, Cleveland, Ohio, assignors to The Liquid Forged Steel Co., Cleveland, Ohio. (U. S. No. 1,073,196; Sept. 16, 1913.)

PIG IRON—Improvements in Making Dephosphorized High-Grade Pig Iron. P. L. T. Heroult, New York. (Brit. No. 25,974 of 1912.)

PORTLAND CEMENT—Production of Portland Cement and Iron in a Single Furnace Operation. Joseph W. Richards, South Bethlehem, and Walter S. Landis, Bethlehem, Penn. (U. S. No. 1,073,820; Sept. 23, 1913.)

SIEMENS-MARTIN FURNACE. Kurt Albert, Wiesbaden, Germany. (U. S. No. 1,073,653; Sept. 23, 1913.)

ALUMINUM ALLOYS—Improvements in or Relating to Alloys of Aluminum. T. A. Bayliss, Warwick and B. G. Clark, London, Eng. (Brit. No. 19,152 of 1912.)

SUBLIMED WHITE-LEAD—Process and Apparatus for Treating Sulphide Ores. Ernest Edmond Banes, Strathfield, near Sydney, N. S. W. (U. S. No. 1,073,462; Sept. 16, 1913.)

STEAM SHOVEL. Thomas Schock, Eugene, Ore. (U. S. No. 1,074,018; Sept. 23, 1913.)

ORE CONCENTRATOR. Marion L. Porter, Silverton, Colo. (U. S. No. 1,073,928; Sept. 23, 1913.)

SEPARATING TABLE and Process of Separation. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,073,644; Sept. 23, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Sept. 24

**The Dumping of Tailings from Quartz Mines** on the Mother Lode in Amador County is again complained of by farmers on Dry Creek, near Galt, in Sacramento County. The complainants in the present case are Hugo and Martha Loll, who are not new complainants. The special attack at present appears to be against the Kennedy Mining Co. The Kennedy is nearing the completion of tailing wheels and it is expected that the plant will be in operation by Oct. 1.

**Geological Survey Work** in California includes a study of the area covering the Inyo range and the eastern slope of the Sierra Nevada with special reference to the ore deposits. Adolph Kopf has been assigned to the Bodie district of Mono County and the Darwin district of Inyo County. The copper mines in the foothills will be examined by B. S. Butler for the purpose of noting developments. The Panamint valley will be examined for potash deposits. J. D. Northup and R. W. Pack are assigned to the oil fields for the purpose of more detailed and geologic mapping. The primary purpose of this work is the classifying of lands and will probably result in the preparation of an economic report on the areas studied. F. C. Calkins and F. E. Mathes will visit the Yosemite Valley and make a detailed geologic study in preparation for the issuance of an educational bulletin describing the scenic features of this national park, explaining their origin and outlining the geological formations and history of the region. This will be illustrated with maps and photographs. Such a bulletin should be of great service as a guide to tourists visiting California. The water resources branch of the survey is continuing the investigation of the water resources. This work is done in coöperation with the state and others. The state and survey maintain 211 gaging stations. The determinations of water flow thus obtained are used in the design and construction of water-power plants.

### DENVER—Sept. 27

**The Moffat Tunnel Contract** between the city of Denver and the Denver & Salt Lake R.R. for the joint construction of the tunnel has been turned over to attorneys representing both parties to be recast.

**The Suit against the Mid-West Oil Co.**, which was scheduled to be heard by the U. S. Court of Appeals this week, will establish a precedent in establishing title to millions of acres of oil land, the value of which is almost inestimable. Technically, the suit involves title to 160 acres of oil land in Wyoming valued at $1,500,000 to $4,000,000. In reality, it involves the validity of an order issued by the President of the United States, Sept. 27, 1909, withdrawing from all forms of entry 3,041,000 acres in California and Wyoming, much of which is estimated to be worth $10,000 to $25,000 per acre.

**The Colorado, Wyoming & Northern Ry. Co.**, with a capitalization of $6,000,000, has filed articles of incorporation. The company proposes to build a railroad from a connection with the Denver & Salt Lake R.R. at Craig to a connection with the Union Pacific at Rawlins, Wyo., a distance of 120 miles; and articles have also been filed for the United Yampa Collieries Co., with a capital of $4,000,000, to develop coal mines and properties in Routt and Moffat Counties. The two companies are backed by large Belgian interests headed by Camille Perin, managing director of the Société Generale des Charbonnage of Brussels.

**The Outcome of the Coal Strike** is yet in doubt, but it seems to be generally believed that the strike will not last long, or at least it is thought that the fuel supply will not be seriousy affected. In support of this opinion the fact is cited that in the northern coal field the strike, which was called three years ago, is still in effect, but Denver's supply of coal from that region has not been affected and has been supplied at normal prices. The killing of Marshal Lee, at Segundo, Sept. 24, widened the gap between miners and operators. The head of the union says, "Violence will not be countenanced," but still it continues. Three negro strike breakers were taken, Sept. 26, by 100 union men and their fate is still unknown. Governor Ammons says he will call out the militia if necessary to preserve peace.

### BUTTE—Sept. 26

**Taxing Gross Earnings** is the object of a bill proposed by a committee of the Direct Legislation League and in spite of the arguments of representatives of the Anaconda company, the Montana Power Co. and other large corporations, the committee having in charge the initiative legislation for the League, decided to go on with the petitions for a vote on the proposition of taxing the mining and other companies on their gross earnings in addition to the general property tax they pay, and in addition to the heavy tax the mining companies pay on their net profits. It is curious to note that the members of the committee having the matter in charge for the league are all hostile to the Anaconda and allied interests. The bill to be proposed will place the tax on gross incomes as follows: Mining companies, ¼%; power companies, 1½%; express companies, 4%; telegraph companies, 2%; sleeping car companies, 4%; telephone companies, 2%. Based on last year's mineral output of $64,000,000 the mining companies will contribute $160,000 more in taxes, the power companies about $74,000, and other companies enough to bring the total up to $400,000 a year. The great danger in the proposed measure is that, in taxing gross output, it will discourage mining development in the state as few companies for years can show net profits.

### SALT LAKE CITY—Sept. 25

**The Secondary Enrichment of Copper Ores** is to be studied at Bingham by several mining geologists under the direction of L. C. Graton, secretary and treasurer of the Copper Producers Association. The field work is being done by Augustus Locke, A. M. Bateman and E. H. Perry. Bingham is the second camp to be taken up, the party having visited Butte. Other districts in the southwest are to be studied. The Utah Consolidated and the Utah Copper in Bingham will receive especial attention.

**Granite from Little Cottonwood** is to be used in the new Utah state capitol. This was selected some time ago by the capitol commission, and Sept. 18, a contract to furnish this material was signed. Work has been started at the quarries, and the forces will be increased. Shipments are to begin by Nov. 15, but will probably be made before that, possibly within the next few weeks, or as soon as the Salt Lake & Alta R.R. has been completed. This line runs from Midvale to the quarries, and is awaiting the laying of the rails on the last part of the road. There are 10,000 cu.ft. of granite already quarried, and arrangements for machinery including derricks, boilers, drills, etc., have been made. The granite will be used from the base of the capitol building to the dome in place of the terracotta previously specified. The capitol commission is considering Utah marble, which compares favorably with marble from outside of the state, for the interior.

### CALUMET—Sept. 27

The effect of the injunction, restraining the strikers from interfering with the men desirous of returning to work, has been to induce more men to apply for work. At the north end of the district, where operations have been suspended since the beginning of the strike, a back-to-work movement has been started. At the Ahmeek the pumps have been started and a force of men is working in the shafts making preparations for the resumption of operations. The Mohawk is taking on men and the North and South Kearsarge properties are clearing out the shafts, getting ready to hoist. The strike undoubtedly is wearing itself out, but in all probability it will never be officially declared off. The Federation is making a determined stand and the issue of recognition will be fought out. Several of the agitators have left for a tour of the Minnesota iron ranges to hold meetings and endeavor to secure financial aid for the strikers. Funds from various sources have been received by the Federation, but with a Lake Superior winter only a few weeks away, it will be necessary to give the men benefits of more than $1 per day. [The injunction against picketing and parading was dissolved Sept. 29, Judge O'Brien warning the Federation against violent tactics. On Sept. 30, Ahmeek detectives were fired on and violence among strikers broke out again.]

### MARQUETTE—Sept. 27

**Harnessing of the Black River** is being considered by the U. S. Steel Corporation, already the owner of a large waterpower [illegible] the mining fields of Upper Michigan, the hydraulic [illegible] the Menominee River which supplies compr[illegible] and electricity to the big Chapin mine at Iron M[illegible]. The Black River is a stream in the country trib[illegible] Marquette iron range. In the event of the d[illegible] a waterpower in that locality, the electricity [illegible] will be utilized at the mines of the company at [illegible] Negaunee, Gwinn and Beacon, the machinery at [illegible] is now turned by steam. The Black River is [illegible] miles south of Ishpeming. It is a large stream, cap[illegible] supplying much power. Engineers have been in the [illegible] for several weeks, engaged in making a survey and estimates. Two hydro-electric plants are already serving mines on the Marquette range, one the big plant of the Cleveland Cliffs Iron Co. on the Carp River near Marquette and the other and smaller plant that of the Cambria Steel Co. on the Michigamme River at Republic. The latter has been in operation for many years, furnishing power only to the Republic mine. Electricity from the Carp River plant, which cost $1,000,000 or more, is transmitted over extensive stretches of country, serving the Cleveland Cliffs mines in the Negaunee, Gwinn, Ishpeming and North Lake districts, at all of which steam has been superseded almost entirely. The Black River is a larger stream than the Carp. It is understood that the cost of the plant will run into the hundred thousands of dollars.

### ISHPEMING—Sept. 26

**The Michigan State Tax Commission** visited the Marquette range this week and gave the operators in the district a hearing on the suggested valuations on the companies' real and personal property. State Geologist Allen and his assistants have spent the last three months on the range looking over the mines and getting figures from the mine managers in order to have reliable data for deriving the valuations. All of the mining companies were represented at the hearing but there were few objections to the valuations of the mines, which have been placed on the tax rolls at lower figures, with one or two exceptions. The valuation has been raised on the American mine at Diorite, in which there is a large deposit of soft hematite. The greatest objection was made on the personal-property tax, especially the taxing of ore in stock, which is considered double taxation by the companies. Stockpiles are due mainly to climatic conditions and the contention is that it is an injustice to tax ore in the ground and then again when it reaches surface. Examples were cited where low-grade ore has been in stock for 10 years because there is no market for it, yet taxes have to be paid on it just the same. Many ores will be left in the mines and lost forever if the state is going to make a practice of taxing the poorer grades of ore at a high price when they reach the stockpiles. Lake Erie ore prices are taken as the basis for taxing ore in stock but this is objected to because the managers claim that if they have a pile of ore that cannot be sold because it is not wanted and of no use, that it is not worth the price quoted in Eastern markets and so should not be valued on that basis. Development work has been slow since the Finlay appraisal a few years ago and it will continue so if the state is going to do what the companies claim is unfair. The commission has not given any decisions as yet but will give out the valuations of mines and opinions concerning taxing stockpiles in the near future.

### SWASTIKA—Sept. 26

**The New Gold District of Kirkland Lake** seems destined to become the graveyard of a great many disappointed hopes. While the earlier developments of the camp were of great promise, the results of later work are not so encouraging, and it would now appear as if there was little chance for more than two or three small properties. The Tough-Oakes property, formerly known as the Foster, has reached a depth of [illegible] ft and has good ore all the way. It is learned, however, that the porphyry was encountered at the lowest level and while it is not definitely known what effect this may have, it is the general opinion that the small high-grade veins such as are found throughout this district will not persist into that formation. Drifting is being done at the [illegible]-ft level and the results to date have been satisfactory. It is now assured that this property will become a profitable producer although it is not expected it will ever be a [illegible]. In sinking the Burnside shaft the porphyry was encountered at a depth of 35 ft. The shaft was continued [illegible] to a total depth of 100 ft and a crosscut is now being driven to determine if the ore continues to that level. The results of this development will decide whether or not the property will be taken over by those holding the option, as the present terms of the option call for a heavy payment to be made in a month's time. Several other veins, which in places carry good ore, have been found on the surface, but so far, sufficient work has not been done to justify any opinion as to their ultimate value. On the Wright-Hargraves, high-grade ore is being bagged, but little sinking has been done, so that this property, while exceedingly promising in its present state of development, must be considered as an unknown quantity. On the Teck-Hughes, at the West end of Kirkland Lake, development on the 100-ft. level of the No. 1 vein which was found in the porphyry, has proved disappointing, and it has been decided to abandon this working and concentrate work on veins Nos. 2 and 3, where ore of satisfactory grade has been found on the surface. The oreshoots however, appear to be quite short and it is doubtful if a sufficient quantity of ore to give a reasonable return on the capital which would have to be invested, can be developed. Nothing of importance is being done on the other properties throughout the section and results, on a good many properties which at first seemed to hold considerable promise, have been disappointing.

### FAIRBANKS—Sept. 1

**J. A. Holmes, Director of the Bureau of Mines** is visiting this city in order to ascertain what can be done by the bureau to better conditions in Alaska. He will soon start on a circuit of the creeks. He will later go over to the Nenana coal fields, and make an investigation of the deposits and of the transportation facilities, there. As soon as he has returned from the creeks he will leave for the mouth of the Wood River, and from there go up to the Nenana River. From the coal deposits he will go east to Donnellys to see how far the field extends, and thence down the Valdez trail and over to the Matanuska coal fields. There is a large government party at work there now and it is expected that they will have complete data which will be at the disposal of Congress at the next session.

### GUADALAJARA, MEXICO—Sept. 10

**The Smelting Works at San Luis Potosi** was shut down in August because of inability to secure fuel. Coke now is being received, and it was expected to have three furnaces in operation before the end of September. The Teziutlan smelter of the Teziutlan Copper Co., has been able to operate up to this time. Fighting has been reported recently around Teziutlan, which is in the state of Puebla, but there has been no report of interference with operations. The Sombrerete Mining Co., was forced to abandon operations in the Sombrerete district of Zacatecas several months ago. Rebels now are working the dumps at the mines.

**The Tonopah-Belmont Interests of Nevada** have surrendered options on three antiguas in the Bolaños district of Jalisco, due to unsettled conditions in Mexico. The mines are the Zuloaga, Rosario and Condesa, and the options involved about $275,000. The price of the Zuloaga was $200,000. The properties, which were big producers in the days when Bolaños ranked as one of the most important districts of Mexico, now are owned by Americans. A favorable report was made by the Tonopah-Belmont engineer sent to examine the mines, but in view of the present situation in Mexico, it was concluded that it might be a long time before extensive operations could be carried on. The famous Bolaños group of mines, taken over three years ago by the Bradbury interests of Los Angeles, were shut down a few months ago because of rebel activity in that section of Mexico.

**Rebels Recently Burned Eight Bridges** on the Southern Pacific R.R. of Mexico in Sinaloa, putting a stop to railroad traffic in that state. For several months trains have been operated between Culiacan and Mazatlan and Mazatlan and Rosario, no attempt being made to operate north of Culiacan or south of Rosario. The bridges recently burned were between Culiacan and Rosario. The traffic interruption affected the big Minas del Tajo at Rosario. The rebel government of Sonora is operating the Southern Pacific line in that state. The only portion now being operated by the company is that in the state of Jalisco. A big shipment of machinery for the 250-ton reduction plant of the Cinco Minas company in the Hostotipaquillo district of Jalisco is being hauled from the Magdalena station to the camp. The shipment recently entered through the Pacific port of Manzanillo, and amounted to 14 carloads. Construction work is being rushed, and it is expected to have the plant in operation by the end of the year. The option on the Mezquital and San Carlos gold mines in the Mezquital del Oro district of Zacatecas held by the Mezquital Mining Co. of Philadelphia, has been extended by the British interests owning them.

# THE MINING NEWS

## ALABAMA

### Mobile County

U. S. STEEL CORPORATION, it is reported, has purchased property near Mobile involving the expenditure of $800,000. The corporation is to utilize the land thus purchased in connection with its Cuban iron-ore holdings.

## ALASKA

THE KENAI RIVER VALLEY from the lower end of Kenai Lake to Skilak Lake, a distance of 20 miles, has been bonded and will be prospected. Representatives of B. L. Thane, general manager for the Alaska Gastineau Mining Co., of Juneau, are said to have been working on the deal since early spring prospecting, and negotiating for options, and now that all of the ground between the two lakes has been procured, a crew will be put to work at once. If the drilling tests confirm the surface prospects, it is planned to operate five large dredges on the Kenai River next summer. The work of prospecting the ground will cost $250,000 and will be done under the supervision of H. T. Tripp.

GOLD FROM THE SHUSHANNA, worth $8000, was brought to Dawson, Sept. 10, from James' properties. William James, Mrs. James and Nels Nelson, discovers of the camp, brought in the gold. They report the camp frozen for the winter. The first shipment of Shushanna gold has been made to the States and the assay showed fineness in gold to be about the same as the placer gold of the Nome district, or $18.22 per ounce, the Nome gold running $18.25. There is some silver and a little copper in the native metal, copper being found in all of the Copper River district gold. James brought down word that a new discovery had been made in the district, 20 miles from the original discovery, by George Pocin, of Seattle.

RICH PLACER GROUND has been found by Duncan McCormick on Alfred Creek, a tributary of Cariboo Creek, 120 miles from Knik. The strike was made in August, and McCormick and his partner Joe Palmer recently brought out 50 oz., all coarse dust. The discovery is claimed to have been made in a low, rolling country with plenty of water, and no timber. The pay is in schist. There is a good government trail the entire distance. The strike was made at the headwaters of the Netchina River, a tributary of the Tazline, which in turn empties into the Copper River. The U. S. Geological Survey Bull. No. 327, contains a report on the country. The gold field is about 4000 ft. above sea level, and, consequently, above the timber line. Reports from Knik state that about 200 prospectors have passed through that place on the way to the new strike.

## ARIZONA

### Maricopa County

A PLACER DEPOSIT NORTH OF PEORIA, on the Agua Fria, is being tested by drills. The claims are near the Relief mine.

A SHIPMENT OF HIGH-GRADE COPPER ore from the property of Charles Francis, west of Morristown, was recently made. Other shipments are to be made at an early date.

MAX DELTA (Phoenix)—Work is to be resumed at an early date.

RED ROVER (Phoenix)—Shipments of ore have been discontinued until the wagon road is repaired; a cloud-burst recently washed out the road near Camp Creek.

### Mohave County

PIONEER (Vivian)—It is reported that good ore has been opened on the 200-ft. level. If the ore proves to be as extensive as anticipated, a mill in the district will be moved to this property.

KINGMAN COPPER CO (Mineral Park)—The second drill hole has reached a depth of 600 ft. and the third has been started. It is understood that the holes have shown the ground to be copper bearing, although no rich deposits have been encountered.

COPPEROSITY (Casa Grande)—Work at this property, in the Vekol district, has been begun. A contract has been let for 128 ft. of drift and 40 ft. of raise to connect Shaft No. 1 with the Daggs winze, sunk from the Dance Hall level. Other work is contemplated.

UNION BASIN MINING CO. (Golconda)—A 6-ton Saurer truck has just been received and is to be used to haul concentrates, ore and supplies between the mine and the railroad, four miles away. The new truck is provided with a hydraulic dumping attachment, which facilitates unloading.

BI-METAL (Kingman)—It is understood that this mine is to be opened up. There is already a small mill on the property, but the ore is low-grade and will require treatment of a large tonnage to make operations profitable. It is reported that the present mill is to be enlarged to about 300 tons daily capacity.

COPPER GIANT (Hackberry)—The first carload of ore has been shipped to the United Verde works, and it is expected that regular shipments will be made henceforth. The shaft has reached a depth of 300 ft. and drifts are being driven in the ore in both directions along the vein. At this depth the ore is said to be 9 ft. wide.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—This company has recently ordered three 6-ton Saurer auto trucks, to be used for freighting between the mine and the railroad at Yucca. One of these trucks has just been received. After the new mill is started, the company expects to operate five trucks, the one which has been in use for the last year having given excellent service.

## CALIFORNIA

### Amador County

CENTRAL EUREKA (Sutter Creek. Deepening the shaft is in progress. A drift has been started toward the South Eureka, which adjoins the south end line of the Central Eureka. It is expected to develop a 600-ft. oreshoot by this drift.

### Humboldt County

BONNEVILLE (Blue Sky)—The main tunnel is in 400 ft. from the portal, and follows the vein. Development will be continued during the winter. The question of installing milling equipment will not be decided until next spring.

### Inyo County

SKIDOO MINES CO. (Skidoo)—The new 10-stamp mill will run on company ore for the first month, then lessees' ore will be crushed by a steady run until all the ore now mined is cleaned up.

### Mariposa County

MOUNT GAINES (Hornitos)—Three 8-hr. shifts are being worked in unwatering the shaft and preparing for extensive development.

COLORADO (Mariposa)—Peter Mulas, who claims this property under a homestead entry, has begun action just as the owners, Charles H. Weston and P. W. Judkiss, had begun building a stamp mill. The entry of Mulas is of recent date.

### Nevada County

VICTOR MINING CO. (Nevada City)—This is a new incorporation, organized in Honolulu to develop and operate mining properties in Nevada County. W. G. Motley, of Nevada City, is vice-president and manager. The other officers are residents of Honolulu.

### Plumas County

FOUR HILLS (Johnsville)—A small force of men is employed doing prospecting and repair work. The electric power house was badly damaged by a snowslide last winter.

MONITOR (Quincy)—This mine, formerly known as the Plumas National, at the head of Soda Creek, is under bond. Six men are employed in development. The property has 900 ft. of tunnel and prospects are good for resumption of production.

JUNE DAY MINING & MILLING CO. (Greenville)—The mine has recently been examined by Bert Strock, formerly superintendent of the Marysville Gold Dredging Co., at Marigold. It is believed that this district will be opened up and some producing mines developed.

### San Bernardino County

BARSTOW GREEN MARBLE CO. (Barstow)—A cutting and polishing mill will be installed. The marble will be hauled by team from the quarries near Barstow.

### San Diego County

MONTEZUMA (Warren Springs)—Twenty-five men are employed at this mine, which has been undergoing development for the last year. It is believed the mine will prove a profitable producer.

OWENS (Julian)—The 10-stamp mill is being overhauled and will be put in commission in the spring. The mill has been idle for five years. The mine is filled with water, but will be pumped out by the time the mill is ready. Good ore is said to have been produced in former operations.

### Shasta County

SYBIL (French Gulch)—Litigation extending through a period of 15 years has been terminated by an agreement, which provides for a release of all claims to the property by the original owner, G. A. von Kruze, and for the sale by his daughter of certain interests. The Sybil Gold Mining Co. failed to pay the state license tax, but it is understood this will be settled and that the reopening of the mine will follow.

BALAKLALA CONSOLIDATED (Coram)—The installation of the Hall process on one Macdougal furnace is complete, except for the gas-manufacturing plant. An enlarged gas holder is still to be built, and other features of the gas plant are incomplete. Owing to the approach of the time limit of the option, which the Balaklala has on this process, further negotiations are necessary looking toward an extension of time before actual tests can be continued.

### Sierra County

SIERRA DEL ORO (Downieville)—A Nissen 1500-lb. stamp, with two concentrators, are being installed with gasoline-engine power. These will in time be replaced with machinery adequate to handle the large tonnage now being developed in this rehabilitated mine, in which several rich strikes have been made in the last year.

### Tuolumne County

LONGFELLOW GOLD MINING CO. (Big Oak Flat)—This is a new incorporation, organized to take over the Longfellow mine. This mine produced a large amount of gold down to a depth of 500 ft. when a barren zone was encountered. No provision had been made by the owner for exploration and development and the mine was closed down. The present company has been advised by W. H. Storms, ex-state mineralogist, that the deepening of the shaft should develop as rich ore as was mined during the early operation.

## COLORADO

### El Paso County

UNITED STATES REDUCTION & REFINING CO. (Colorado City)—Recent sale of 20 shares of common stock at $3\frac{1}{8}$ represents a decline of [illegible] from previous sale and the lowest at which the stock has ever sold. The high figure, $44\frac{5}{8}$, was reached Sept. 8, 1902. The company has not been operating its plants for some time. Two of the plants were leased to Golden Cycle Mining Co., rent therefrom being only enough to pay fixed charges.

### Las Animas County

DISORDER AMONG THE STRIKING COAL MINERS first occurred at Segundo, near Trinidad, Sept. 24, when Camp Marshal Robert Lee was shot and killed. The shooting was done by a foreigner, name unknown, who, with two other strikers, had been detected by Lee in the act of tearing up a small foot bridge. Lee was shot from his horse, the bullet striking him in the breast and penetrating a lung. The foreigners made their escape to the hills, with a posse in pursuit. A reward of $1000 has been offered for the capture of the men.

### Park County

MOUNT BROSS MINING CO. (Alma)—The 50-ton concentrator and cyanide mill will be ready in October. The mill will derive its power from oil engines, which is somewhat of an innovation in this part of the county. A 32-hp. Fairbanks-Morse oil engine furnishes power for the grinding machinery, while a 12-hp. engine furnishes power for the Wilfley tables and for small dynamos for lighting the plant. The mine has ample resources opened up and a force of 25 miners will be put to work at once.

### San Juan Region

BROWN MOUNTAIN SMELTER CO. (Ouray)—The furnace was blown in Sept. 26.

### Teller County

GOLDEN CYCLE (Goldfield)—So far this year eight consecutive monthly dividends have been paid at the rate of 2c. per share, amounting to $240,000. For September, however, the dividend rate has been increased to 3c. per share, making the total amount paid this year, $285,000. The shaft is 700 ft. deep and all the working and properties are in good condition and making normal production. The main shaft is kept unwatered by electric pumps, as it was not affected by the deep-drainage tunnel. The Vindicator has a pumping agreement with the company, as its main shaft is also being drained by the Golden Cycle pumps.

## IDAHO

### Bonner County

LAWRENCE MINING & MILLING CO. (Clark's Fork)—Arrangements have been made to increase the scale of operations and to increase shipments from one to two cars of concentrates per month. A car containing 46 tons of concentrates was shipped to Murray, Utah, and returns amounted to $2251. The concentrate contained 71% lead and 14.6 oz. silver.

IDAHO-CONTINENTAL (Porthill)—It has been announced that shipments would begin not later than Jan. 1, 1914, and bids for a five-year ore-hauling contract have been advertised for. The contract will be awarded Oct. 10, and the successful bidder will be required to be ready to operate by Dec. 1. The output at first will be about 30 tons daily, but it is intended to increase this rapidly. Concentrator and other buildings will be under roof soon. The equipment for the 300-ton concentrator at the mine and the power plant at Boundary Creek, midway between the property and Porthill, is being installed and will be ready for a trial in a few weeks. The transmission line from the power station to the mine has been completed, and things are in such shape now that it is probable that operations will be commenced not later than Jan. 1.

### Cœur d'Alene District

STEWART (Kellogg)—At a meeting held Sept. 30, the old board, with the exception of one man, was defeated for reelection, F. A. Heinze thereby losing some of his power in the affairs of the company.

MAHER AND HEARN (Burke)—Extensive underground development of these properties has been started by Eugene R. Day, of Spokane. A year ago Mr. Day, who is one of the owners and managers of the Hercules mine, bought a controlling interest in the Maher and Hearn, for a cash consideration generally reported as $40,000. The ground adjoins the Imperial property, in which Mr. Day is a stockholder. The Maher and Hearn ground is not incorporated, though the claims are patented. A long drift has been started from the lower workings of the Imperial, which will be carried into the adjoining property, giving good depth. It is estimated that from 600 to 900 ft. of work will have to be done before getting out of Imperial ground, and stockholders in the company are counting on this work to develop considerable of the Imperial orebody, especially as the drift is to follow along the course of the vein.

CARNEY COPPER CO. (Mullan)—Russell F. Collins, of Spokane, has entered into an arrangement with this company whereby he is to take a bond on the property for two years at 3½c. per share net to the stockholders. He also has the privilege of purchasing within 60 days from Oct. 1, 600,000 shares of the stock of the company at the rate of 1½c. per share. Collins is to work 100 shifts per month at the mine during the life of the contract, which extends over a period of two years; 5% of the purchase price of 3½c. is to be paid in four months, 5% in 10 months, 15% in 15 months and [illegible] in two years. The Carney property is on the south side of Mullan near the "S" bridge on the Northern Pacific R.R., and is developed by two tunnels, the first of which shows an excellent shoot of copper pyrites. The lower tunnel has failed so far to open this shoot, and to locate this ore will be one of the first problems confronting Collins.

## MICHIGAN

### Iron

CASCADE MINING CO. (Palmer)—The Isabella shaft is now down 400 ft., and has yet to be sunk 500 ft. before drifting is started. Sinking has been in progress in a diorite dike for nearly a year.

AMERICAN (Diorite)—This mine, of the M. A. Hanna company, has been given a large increase in assessed valuation, due to recent discoveries of high-grade, soft ore in the lower levels. This old property, believed to have been exhausted years ago, is now in first-class condition, both as regards ore reserves and new equipment.

ZIMMERMAN (Iron River)—This property has been closed down and it will probably be some time before operations are resumed. There is considerable ore in stock and the management has not been very fortunate in making sales in the East. The property has had a varied experience and has been closed down a number of times since it was first opened.

SMITH (Gwinn)—The task of unwatering this property owned by the Cleveland-Cliffs Iron Co., was completed two weeks ago and men have been put to work putting the shaft in shape and clearing out the workings. The force will be gradually increased and it will not be many weeks before the mine will be producing ore. The Smith was closed down Dec. 1, 1911, when there was a general curtailment at all of the mines in the district.

CLEVELAND LAKE (Ishpeming)—A drift is being driven into the side hill at this property in order to intercept the present ventilating shaft, the object being to increase the draft in order to get better ventilation. The workings in this mine are extensive, and the air is quite warm, and often not very pure. The management is constantly making changes to better the working conditions.

ASHLAND (Ironwood—Orders were given by the Hayes brothers to reopen this mine, Oct. 1, so operations are again under way at the property. The mine was closed down in the spring because of the failure to dispose of the ore, but a large part of the stockpile has been shipped and the owners believe that they will experience little difficulty in disposing of the ore that will be stocked during the winter months. About 200 men are being employed.

AUSTIN (Gwinn)—The Cleveland-Cliffs company will soon cease work at this mine for some time, as there is considerable ore in stock and no market for it. The Stephenson, which was shut down two weeks ago, has 290,000 tons of ore in the piles, for which no market can be found. Preliminary work has again been commenced at the Gardner and Mackinaw, owned by the same company in the Gwinn district, where concrete shafts have been put down to the ore, but further sinking will have to be done and drifts driven to the deposits. It will be more than a year before these two properties will be ready to produce ore.

WAKEFIELD (Wakefield)—Butler Bros., the contractors, have commenced stripping a part of the Wakefield property for M. A. Hanna & Co., and it will require a long time to complete the work. The company is sinking two shafts; one has about reached the desired depth and the other will be down within a few weeks. The orebody is only 60 ft. from the surface at the deepest point, so it is safe to predict that ore will be shipped in 1914. An adjoining "40" will shortly be explored and the chances for getting ore there are excellent. The land is controlled by a party of Mesabi range men, while the Wakefield is leased by Selden Rose, of Marquette, to the Hanna company.

## MINNESOTA

### Cuyuna Range

PENNINGTON (Crosby)—A night shovel-crew has been employed. One shovel is working in ore and the other is stripping, in an 80-ft. section.

DULUTH-BRAINERD (Iron Mountain)—The shaft is 20 ft. deep and the headframe has been placed in position. The boiler has also been installed and the stack has been raised. It will not take this company long to get into the producing class.

PITTSBURGH STEEL ORE CO. (Riverton)—An order has been placed for two steam shovels, which will be put in operation as soon as the hydraulic stripping is completed. All of the overburden cannot be removed by hydraulicking and the shovels will have to dig the remainder.

mines

CUYUNA-SULTANA IRON CO. (Brainerd)—A drill has been started on the McAlpine "40," which was recently secured. Much is expected of this property, which adjoins the Cuyuna-Mille Lacs on the east, and the Section 30 property on the south.

MESABI-CUYUNA IRON LAND CO. (Crosby)—Ore has been encountered by the drill which was started a short time ago near the center of the four "40's" at a depth of 90 ft. and was still in ore at 120 ft. The orebody on this property has proved to be the widest on the range, as it is known to be at least 1000 ft. wide. A hole will shortly be put down to the north to ascertain if the north and south orebodies are the same or separate.

MANGAN IRON & STEEL CO. (Crosby)—Good results have been obtained from the drilling on the Mangan No. 2 property, the ore having been shown to exist across the entire "40," east and west; it is of a high grade. The overburden averages only about 50 ft. and so it will probably be stripped and mined with steam shovels. No. 1 property disclosed some fine ore a short time ago and a mine will also be opened there.

DELL DEVELOPMENT CO. (Aitkin)—The new Jones furnace will be ready for operation by Nov. 1. The management claims to have recently reduced manganiferous iron ore at their Iron Mountain, Mich., plant, with practically no loss of manganese. They have optioned and are now exploring several manganiferous iron properties on the Cuyuna range, with a view to reducing the ores at the Aitkin furnace now under construction. Due to failure of the process heretofore, mining men are skeptical of its success.

### Mesabi Range

THE SOO LINE RAILWAY will build a steel and concrete ore dock on ground recently purchased at Ashland, Wis., according to reports. The new dock will connect with the present dock by trestle.

STOCKPILES at the Pioneer A, Pioneer B, Zenith and Sibley-Savoy shafts have been entirely cleaned up. Small stocks remain at the Savoy and the Sibley-Jura shafts, due to the low iron content of the ore. The Chandler has a fair-sized stockpile yet, but is making strenuous efforts to ship it all before the season closes. The cleaning up of all stockpiles on the eastern end of the Mesabi range insures great activity at Tower and Ely the coming winter.

THE ASSESSED VALUATION OF MINES and mineral lands in Minnesota, for purposes of taxation, will approximate $275,000,000 for 1913. Last year's assessments amounted to nearly $260,000,000. The 1913 assessment will approximate 40% of the total real-estate valuation in Minnesota. Seven years ago the assessed valuation of mines and mineral lands was but 14% of the total. The increased proportion is due to the activities of the state tax commission. No extraordinary increases were made, and the additional $15,000,000 represents a nominal increase of 5% throughout.

GREAT NORTHERN ORE CO. (Hibbing)—A contract has been awarded to the Foundation Co. of New York to sink a concrete shaft on Section 16, between Calumet and Marble, and the work has already been commenced. The New York company will also sink other shafts for the same company in that district. It was not long ago that compressed air was used in sinking the Morton and Scranton shafts through the overburden.

### Vermilion Range

NORTH AMERICAN IRON MINING CO. (Tower Junction)—The officials of this company, a T. J. Walsh corporation, assert that blue hematite has been encountered at the 400 level, but not yet in large quantities.

NORTH AMERICAN STEEL & IRON CO. (Tower)—The drift being driven from the shaft to intersect the orebody has to go only about 40 ft. further. The drift passed through a large quantity of quartz porphyry, carrying gold from a few cents up to $200 per ton. The deposit is to the north of the iron-ore formation and it is believed that there is a considerable quantity of the gold-bearing material. As much of the deposit as has been disclosed has been examined by a number of geologists, who are of the opinion that a profit can be made by working the ore for gold in a small mill and the management may decide to build a mill after further developents have been made.

## MISSOURI

### Joplin District

R. L. MAGEE (Duenweg, Mo.)—Work on a modern concentrator is to begin soon.

BOGGESS-GIBSON (Thoms Station, Mo.)—A concentrator is to be built in a short time.

A NO. 1 (Joplin, Mo.)—This mine is to be reopened. Work of draining the ground now is in progress.

ATHLETIC (Webb City, Mo.)—Work of rebuilding the concentrator, destroyed by fire recently, will start soon.

ORNDUFF & CO. (Thoms Station, Mo.)—Additional equipment is to be installed to treat the ore from two shafts.

BALL & GUNNING (Lawton, Kan.)—A contract has been awarded for 1000 ft. of drilling. The company has a lease on 160 acres.

BIG THREE (Joplin, Mo.)—The concentrator and mine are in operation after being idle several months. The mine is to be known as the G. & F., in the future.

RED BIRD (Miami, Okla.)—The mill is being moved to the Gish lease on the Frosty Morning tract. It is of 150 tons capacity and is operated by the Lolita company.

COMMONWEALTH (Miami, Okla.)—A new company has taken over the mine and lease and soon will begin operations. The concentrator has been overhauled and placed in good condition.

IMPERIAL (Webb City, Mo.)—The concentrator was started recently and the company hopes to keep it in continuous operation. It is under new management, Weeks & Bigle of Webb City having assumed control.

## MONTANA

### Butte District

THE WASHOE SMELTER WILL BE CLOSED DOWN for two weeks, beginning Oct. 1, so that necessary repairs can be made. No repairs have been made on the large flue, nearly half a mile long, and which connects the smelting and converting plants with the main stack, since 1908. This will necessitate closing the smelting and converting plants for not to exceed 10 days. The concentrating department will not be closed and the mines at Butte will run as usual. The ore will be sent to the Great Falls smelter, and to the concentrator at Anaconda which will be kept running.

BUTTE-BALLAKLAVA (Butte)—The report of a settlement of the apex litigation of the Anaconda against the Butte-Ballaklava is denied by officers of the Anaconda.

PILOT-BUTTE (Butte)—A shoot of ore, assaying well in copper and silver, has been opened on the 2000-ft. level. The company has begun shipping ore to the smelters at the rate of about 50 tons per day.

RAINBOW (Butte)—The work of sinking the shaft is being carried on steadily at the rate of about 100 ft. per month, and a depth of 750 ft. has been reached. Crosscutting has been started on the 600-ft. level.

RAVEN (Butte)—Work on the lower levels of this mine has been stopped and the pumps have been hoisted, but mining is still being continued in a small way near the surface and some ore was recently shipped. There will probably be occasional shipments for some time to come.

CORBIN COPPER (Butte)—The shaft of the Gambrinus has reached a depth of 200 ft. Some plans for refinancing have been under consideration for some time but have not yet been announced. The assessment made under the reorganization and stock exchange plan has not brought in as much money as the management had hoped for.

BULLWHACKER (Butte)—The lease expired Sept. 25 and the company has taken the property over and will operate it. The overburden is being removed from a portion of the ore and the leaching plant is to be enlarged. President Clark claims that the company can, with the present system, produce copper at 7c. per lb. By a similar method the Butte & Duluth company has not yet been able to bring its copper cost much below 13c. per pound.

ANACONDA (Butte)—The main shaft at the Pennsylvania mine has been sunk three compartments wide, to the 2200-ft. level, where stations have been cut on both the north and south sides of the shaft. Crosscutting has been begun on the north. The electric pump on the 1800-ft. level has been remodeled to increase its capacity in order to handle the increased flow of water caused by the opening of the 2000- and 2200-ft. levels. A smaller, steam-operated pump has been installed on the 2000-ft. level, and this relays the water from that level and the one below, to the 1800-ft. level, from where it is pumped to the 1200-ft. level and transported by a flume through a crosscut driven for the purpose, to the Leonard mine pumps, about ¾ mile distant. Three to five carloads of waste are shipped from this property daily to be used at the Leonard mine for stope filling.

### Broadwater County

KEYSTONE GOLD MINING CO. (Radersburg)—This company has been organized by Butte men to operate the Barnato group of claims comprising about 100 acres between the Keating and Ohio-Keating mines. Two or more veins have been opened by surface cuts and tunnels, and considerable gold ore has been shipped from near the surface of the Keystone vein. The new company intends to continue sinking the two-compartment shaft from its present depth of 280 ft. to the 500-ft. level and develop the property at that depth.

### Fergus County

BARNES-KING (Kendall)—It is reported that the directors have decided to take over the Piegan-Gloster gold properties in the Marysville district, which the company had had under bond some time.

### Madison County

GOLD DREDGING OPTIONS are being sought, it is rumored, on bottom lands between Twin Bridges and Iron Rod. It is believed that placer gold exists in the gravels of this district at considerable depth, and the men behind the movement intend, in case the options can be secured, to thoroughly prospect the ground with drills.

MISSOURI (Virginia City)—The Elling brothers of Virginia City, who recently purchased two claims on north Meadow Creek, have organized the Missouri Mining Co., and begun operations there with a force of six men. Development work only will be done during the autumn and winter, and if sufficient ore is opened to warrant the expenditure, a mill will be built. Several new buildings have been built and a wagon road graded to the property.

## NEVADA

### Comstock Lode

PRODUCTION ON THE COMSTOCK LODE for the six months ended June 30, 1913, was 60,259 tons, the gross bullion yield being $624,210. The following mines produced tonnage and bullion yield as shown by the figures: Mexican, 10,058 tons yielded $246,307; Ophir, 11,045 tons yielded $108,068; Chollar (lease), 18,456 tons yielded $114,505; Crown Point, 8192 tons yielded $48,586; Comstock-Phoenix, 1812 tons yielded $33,762; Monte Cristo (lease), 5536 tons yielded $56,395; Belcher, 1914 tons yielded $7288; Hale & Norcross (lease), 322 tons yielded $4800; Yellow Jacket, 2924 tons yielded $4499; total, 60,259 tons milled and $624,210 total bullion yield.

### Clark County

HOWARD MINES CO. (Goodsprings)—This company was recently incorporated to take over the Singer group. A force of men is now engaged in building a 50-ton mill on the property to treat the low-grade lead ore, a considerable quantity of which is blocked out. The Stebbins dry concentrator will be installed, it already having proved successful in treating this class of material at the Hoosier mine.

### Eureka County

U. S. SMELTING VS. NEVADA-EUREKA R.R.—John M. Marble, of the Interstate Commerce Commission, has completed the hearing in this case. The railroad line taps the Richmond-Eureka mine at Eureka, and the United States company seeks to have the rates on ore reduced to the level that existed previous to the washout on this line over three years ago. The Nevada railroad commission has ordered this company to reconstruct its line to the Ruby Hill mine, recently torn up because the railroad company claimed that the traffic did not pay operating expenses. Commissioner Marble will present the case to the full commission in Washington.

### Humboldt County

BUCKSKIN-NATIONAL (National) New bunk houses are being erected.

EASTERN STAR (Gold Circle)—A mill, it is stated, may be built next spring.

LASHER MILL (Kennedy)—This plant was partially destroyed recently by a severe cloudburst.

### Lyon County

YERINGTON MOUNTAIN (Yerington)—Regular shipments are being made, and will be increased in the near future. Development on the lower level is progressing with satisfactory results.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Sept. 18, 1913, were as follows: From Mason Valley mine, 2216 tons; from Nevada-Douglas, 925 tons; from other mines 965 tons, total 4106, or a daily average of 586 tons. During the same week four cars of matte were shipped.

### Mineral County

**TENNESSEE** (Mina)—This mine was sold recently, bringing, it is reported, [illegible].

SILVERFIELD (Mina)—The new 25-hp. hoist has been installed, so that shaft sinking has been resumed. The inclined shaft is now 225 ft. deep, and is in ore most of the distance.

PINE GROVE MINES CO. (Pine Grove)—The power line extension from the Bluestone substation is rapidly nearing completion and will be ready to supply power when the mill is completed. A drainage tunnel is being driven to unwater a [illegible] portion of the mine.

### Nye County

VERDE (Manhattan)—Placer mining is being done on this property by lessees. A shaker, elevator and sluice boxes will be installed.

NEVADA CINNABAR CO. (Ione)—Brick for the new furnaces has been received, and it is expected that the furnaces will be in operation within 60 days.

BIG FOUR (Manhattan)—About 110 tons per day are being treated in the mill. Recent changes in the flowsheet and size of the plates have increased the saving and the capacity of the plant.

RILEY FRACTION (Manhattan)—The glory hole workings are producing an average of 115 tons per day. The ore is churn drilled and broken by large blasts. It is reported that an electric shovel will be installed for mining this large shoot.

## NEW MEXICO

### Santa Fé County

SANTA FE GOLD & COPPER MINING CO. (Santa Fé)—Operations are to be resumed on the ore now available. New blowers are to be installed and the smelter will be blown in. Further development work may be done. The ore contains 2 and 3% copper and a large tonnage is blocked out. The second-class ore, containing 2% copper, was formerly milled prior to smelting; matte containing 60% copper was shipped to New Jersey refiners.

### Socorro County

MAUD MINING CO. (Mogollon)—Installation of compressor plant was completed last week and machine drills are now used underground.

ERNESTINE (Mogollon)—The crushing capacity of mill was recently increased from 100 to 160 tons per day. Another oreshoot has been cut in sinking the main shaft.

MOGOLLON (Mogollon)—The Little Charlie mine, operated by a Los Angeles firm under lease and bond, has recently been shipping 50 tons per day, by burros, to one of local custom mills.

SOCORRO (Mogollon)—Approximately 1¼ tons of gold and silver bullion were consigned to the mint week before last, being the cleanup for first half of September. Several tons of rich concentrates were also shipped to smelter.

TREASURE MINING & REDUCTION CO. (Mogollon)—After being idle several months, work was resumed in mine on Sept. 21. A proposition is being considered for hauling ore to the mill, three miles distant from the mines, by motor truck instead of wagon, as formerly. An aërial tramway may eventually be installed.

## UTAH

### Beaver County

MAJESTIC (Milford)—Good progress is being made in sinking the Hoosier Boy shaft.

HORN SILVER (Frisco)—About four cars per week are being shipped from the old slag dumps.

SOUTH UTAH MINES & SMELTERS (Newhouse)—During August, the production was 230,410 lb. copper, on which a slight profit was made. Ore milled during the last few months averaged approximately 1.45% copper, and a 65% recovery was secured in milling. The output thus far in 1913 has amounted to 902,150 lb. copper, exclusive of January, February and March, when the property was closed. The annual meeting will be held Oct. 20.

### Salt Lake County

MICHIGAN-UTAH (Alta)—Shipments via the tramway, which has been out of commission will soon be resumed. A good tonnage is reported to be available.

BINGHAM-NEW HAVEN (Bingham)—Checks have been mailed to stockholders for the recently declared dividend of 10c. per share. The total distribution is $22,869, making the total to date $457,378. The last dividend of 10c. per share was paid July 12, 1912.

UTAH APEX (Bingham)—A new contract has been made with the American Smelting & Refining Co., by which 300 tons of ore or more can be marketed daily. This will allow greater output and earnings. It is stated that the company will be in a position to start dividend payments next year. Earnings of $40,000 per month are possible under the new arrangements. A party of Eastern stockholders visited the property Sept. 22. The Utah Apex has a large amount of ore developed, and ore in excess of that contracted for may be shipped to another smeltery.

### Summit County

SILVER KING CONSOLIDATED (Park City)—The Mellwee contract in sinking the main three-compartment shaft is expected to be completed by Oct. 10.

ONTARIO (Park City)—A strike on the 1500 level is reported. Drifting has been in progress for several months to reach this ore, which may open into something important.

DALY WEST (Park City)—On the 900- and 1700-ft. levels new ore is being opened and conditions are reported to be very promising. A substantial tonnage is indicated on the 17

### Washington County

THE NEW GOLD CAMP IN BULL VALLEY is being visited by Salt Lake men. Ore carrying gold has been followed over 100 ft. in one of the tunnels. High-grade specimen ore has been obtained.

## WASHINGTON

### Ferry County

SAN POIL (Republic)—A gold brick valued at $5667 was recently shipped from this mine, representing the first cleanup since the installation of the new engines.

MOUNTAIN LION (Republic)—Operations are to be resumed in the near future. An examination of the property has recently been made and the company is considering the installation of a cyanide plant.

### Stevens County

BIG BEAR (Marcus)—A double shift of men is to be put on the eight claims owned by this company, driving a crosscut tunnel.

## WISCONSIN

### Platteville District

BULL MOOSE (Benton)—Shaft sinking completed, a 100-ton concentrator will be built.

SANS SOUCI (Benton)—A new mill is to be built to replace the plant recently lost by fire.

WILKINSON (Benton)—Shipments of two to three cars of high-grade lump pyrites are made daily.

LAWRENCE (Hazel Green)—The new plant is about completed and shipments will be started shortly.

SAINT ROSE (Platteville)—The old tailing pile is being remilled. There are now only two producers at Platteville.

WINSKELL (Shullsburg)—This mine continues to be the heaviest shipper in the district averaging one car of concentrate per day.

NEW JERSEY ZINC CO. (Galena)—Plans are being completed for making the old Black Jack mine one of the largest producers in the district.

CLEVELAND (Hazel Green)—Heavy shipments are being made from mine No. 1 and arrangements are being made to develop the Scrabble Creek mine. The Square Deal and Murphy properties are also being prospected.

## CANADA

### Baffin's Land

NO GOLD HAS BEEN DISCOVERED in Baffin's Land, according to Capt. Joseph E. Bernier, the Arctic explorer, who has just returned from the North. The report that such a discovery had been made, was made to the Government by the second mate of the steamer "Arctic."

### British Columbia

THE HIDDEN CREEK SMELTER of the Granby company may be in shape for operation early in January, 1914. The daily capacity of the plant is to be 2000 tons.

### Ontario

PORCQUOIS, a combination of Porcupine and Iroquois, is the new sign that will appear on the Iroquois Falls station and in the new timetable of the Timiskaming & Northern Ontario Ry.

LA ROSE (Cobalt)—The regular quarterly dividend of 2½% payable Oct. 20 has been declared.

NIPISSING (Cobalt)—The regular quarterly dividend amounting to 7½% payable Oct. 20 has been declared.

HOLLINGER RESERVE (Timmins)—The Lewisohn interests have paid over the first installment of $20,000 on the purchase money for this property.

WISHMAN (Swastika)—These properties have been purchased by English interests and the company known as the Telluride Gold Mines, Ltd., will be formed to operate them.

CITY OF COBALT (Cobalt)—A special meeting was called for Oct. 1 to ratify a by-law increasing the capital from $1,500,000 to $2,100,000. The purpose for which this extra money is to be used has not been stated.

HOLLINGER (Timmins)—Stopes on the 300-ft. level are being timbered and a considerable tonnage can shortly be expected from these workings. Good progress is being made with the construction work for the additional 20 stamps.

KERR LAKE (Cobalt)—The annual report for the year ended Aug. 31, shows a total income of $1,182,493 and a surplus of $237,315 after paying dividends. The output of silver was 2,109,975 oz. and the ore reserves were approximately estimated at 6,000,000 oz.

HUDSON BAY (Cobalt)—The production for August amounted to $73,150. The holding company known as the Hudson Bay Mines, Ltd., has declared a dividend of 2½% which with the cash on hand, will permit the operating company to pay three dividends of 300%.

WETTLAUFER (South Lorrain)—The continuance of operations at this mine depends on the result of extensive diamond drilling work which is being undertaken and will be carried on until December in the hope of finding profitable ore. Practically the entire area will be prospected. So far the results have not been encouraging. A dividend of 5% payable Oct. 22 has been declared.

CANADIAN MINING & EXPLORATION CO.—This company has examined and rejected 700 properties in the United States and Canada to date. It was organized 18 months ago, with the primary object of investigation and exploration of Canadian mining resources but has not confined its attentions to Canadian properties only. The first report covering operations to the beginning of this year showed that 400 properties had been investigated and declined.

### Yukon Territory

YUKON GOLD CO. (Dawson)—Employees at Lovett Hill, three miles from Dawson, were held up, gagged, bound and thrown into a ditch by two armed men, who then robbed the sluice boxes, obtaining $20,000. The annual cleanup was to have been made Oct. 1. The holdup was made Sept. 29.

## PORTUGAL

ALLUVIAL TIN is reported to have been discovered near Guarda, close to the Spanish frontier. An American company is preparing to operate on a large scale.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Oct. 1

The metal markets have shown generally a fair degree of activity, prices remaining variable. There is, apparently, a strong undertone.

### Copper, Tin, Lead and Zinc

**Copper**—The last week has been one of the dullest, if not the dullest, of record this year. The electrolytic market has been made wholly by the traders and one or two small producers. They have sold copper as low as 16¼c., cash, New York, and copper has been offered from several quarters at 16⅜@16½c., delivered, 30 days. Some small sales to Europe were made at 16½c. All of these terms correspond to about 16.25@16.30, cash, New York. In the meanwhile the large producers have maintained their old asking price of 16⅞c., delivered, usual terms, and although making no sales have been entirely unconcerned, confident in the opinion that the market is speedily coming back to them. The sharp advance in the London market on Oct. 1 stimulated some inquiry and created a more hopeful feeling in the offices where but little business has been done for three weeks previous.

The producers are well sold up for October and consumers are thought also to be well covered for that month. It is believed that a good deal of the November requirements remain yet to be placed. Some December copper has been ordered, but so far not very much.

The Lake market remains the same as we reported last week, and quotations are scarcely more than nominal. In this kind of metal a natural corner substantially exists. However, there are a few carloads available here and there, and an occasional carload lot was sold at 16¾c. during the last week.

The history of the week may be summed up in the statement that buyers have continued to hold aloof and producers have not been pressing sales. Meanwhile, the statistical position of the metal has still further improved owing to the continued diminution of the visible supply abroad. The prevailing opinion in the trade is that as soon as any important demand makes itself felt prices are likely to be immediately affected upward.

At the close Lake copper is quoted at 16¾@17c., and electrolytic copper in cakes, wirebars and ingots at 16.25@16.35c., while casting copper is quoted nominally at 16.10@16.15c. as an average for the week.

The London market for standard copper has been dull and has fluctuated within narrow limits at around £72 5s.@£72 10s. for spot and about 2s. 6d. less for three months. On Wednesday, Oct. 1, however, when the statistics for September appeared, speculators began to take an interest again and a good business was done at advancing prices. The market closes at £74 for spot and £73 15s. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾@18c., carload lots at mill.

Exports of copper from New York for the week were 6602 long tons. Our special correspondent gives the exports from Baltimore at 1286 tons for the week.

**Tin**—While there was a fair business with consumers the middle of last week, this has subsided, due to the declining London market and the anxiety shown by dealers in anticipation of poor statistics to market the metal at concessions from the foreign price. The statistics which were published on the first of this month turned out even worse than expected, and had a rather depressing influence on sentiment.

There seems hardly any doubt that consumption in this country has fallen off and the decreased requirements of the tinplate mills, of which rumors were current all along, are a fact. The close is somewhat better at £187 15s. for spot, and £187 15s. for three months, and about 41c. in this market.

**Lead**—Lead has been freely offered at lower prices, and there does not appear to be enough demand to readily take care of the metal which is pressed for sale. On the afternoon of Oct. 1 the American Smelting & Refining Co. reduced its quotations to the extent of $3 per ton, and the close is weak at 4.40@4.45c., St. Louis, and 4.55@4.60c. New York.

The London market for Spanish lead closes at £20 12s. 6d., and English £1 higher.

**Spelter**—This market too, is quiet and lower, and consumers continue to hold off. At the close it is quoted at 5.35@5.40c., St. Louis, and 5.50@5.55c., New York.

Good ordinary spelter in London is quoted at £20 17s. 6d., and specials 12s. 6d. higher.

Base price of zinc sheets is now $8 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

**Cadmium**—German quotation is 750 marks per 100 kg., f.o.b. works in Silesia. This is equal to about 81c. per lb. at works.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 is paid for retail orders.

DAILY PRICES OF METALS

NEW YORK

| Sept.-Oct. | Sterling Exchange | Silver | Copper |  | Tin | Lead |  | Zinc |  |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 25 | 4.8560 | 61⅝ | *16¾<br>@17 | 16.30<br>@16.35 | 42⅛ | 4.60<br>@4.65 | 4.45<br>@4.50 | 5.55<br>@5.60 | 5.40<br>@5.45 |
| 26 | 4.8560 | 61⅞ | *16¾<br>@17 | 16.25<br>@16.30 | 41¾ | 4.60<br>@4.65 | 4 45<br>@4.50 | 5.50<br>@5.60 | 5.35<br>@5.45 |
| 27 | 4.8545 | 62 | *16¾<br>@17 | 16.25<br>@16 30 | 41¾ | 4.60<br>@4.62½ | 4.45<br>@ 4.47½ | 5.50<br>@5.55 | 5.35<br>@5.40 |
| 29 | 4.8530 | 61¾ | *16¾<br>@17 | 16.25<br>@16 30 | 41⅝ | 4.60<br>@4.62½ | 4.45<br>@4.47½ | 5.50<br>@5.55 | 5.35<br>@5.40 |
| 30 | 4 8555 | 61¼ | *16¾<br>@17 | 16.25<br>@16.30 | 41⅛ | 4.60<br>@4.62½ | 4.45<br>@4.47½ | 5.50<br>@5.55 | 5 35<br>@5.40 |
| 1 | 4 8560 | 61⅜ | *16¾<br>@17 | 16.25<br>@16.35 | 41 | 4.57½<br>@4.62½ | 4.42½<br>@4.47½ | 5.50<br>@5.55 | 5 30<br>@5 40 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Sept. Oct. | Silver | Copper |  |  | Tin |  | Lead, Spanish | Zinc, Ordinaries |
|---|---|---|---|---|---|---|---|---|
|  |  | Spot | 3 Mos | Best Sel'td | Spot | 3 Mos |  |  |
| 25 | 28 7/16 | 72¾ | 72⅝ | 79 | 192 | 192¼ | 20⅛ | 20¾ |
| 26 | 28 9/16 | 72¼ | 72¼ | 78¾ | 190 | 190½ | 20 | 21 |
| 27 | 28⅝ | .. | .. |  |  | .... | .... | .... |
| 29 | 28½ | 72½ | 72⅜ | 78½ | 189¾ | 190¼ | 19⅝ | 21 |
| 30 | 28 6/16 | 72⅜ | 72¼ | 78½ | 188 | 188¼ | 20¼ | 20⅞ |
| 1 | 28 5/16 | 74 | 73¼ | 79½ | 187¾ | 187¾ | 20⅝ | 20⅞ |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. £25 = 5.44c.; £70 = 15 22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—The tariff bill has finally passed putting the duty at 2c. per lb. on ingots. Business has been quiet, but promises to improve. Quotations are a little unsettled at 20@20½c. per lb. for No. 1 ingots, New York.

**Antimony**—Business is rather quiet at present and prices are [illegible] Cookson's is 8.25@8.50c. per lb.; Hallett's 7.75@[illegible] 7.50c. is asked for Chinese, Hungarian and [illegible] brands. Wtih the settlement of the tariff [illegible] improvement in business is looked for.

**Quicksilver**—Business is quiet. The New York quotation has been reduced slightly and is now $38.50 per flask of 75 lb. San Francisco, $38.50 for domestic and $36 for export. London price is unchanged at £7 5s. per flask, with £7 named by second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

**Nickel**—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

## Gold, Silver and Platinum

**Gold** on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. A total of £190,000 was taken for India and £1,100,000 for Egypt.

Exports of gold from New York week ended Sept. 27 were only $350. Imports were $640,591, chiefly from Cuba and Mexico.

Imports of gold in France in the seven months ended July 31 were 357,528,000 fr.; exports, 47,616,000 fr.; excess of imports, 309,912,000 fr., an increase of 163,366,000 fr. over last year.

Sales of gold bars from the New York Assay Office in August were $2,627,491, largely for use in the arts. For the eight months ended Aug. 31 the total sales were $18,730,651 in 1912, and 021,806,279 in 1913; an increase of $3,075,628 this year.

**Iridium**—There is nothing new to report. Prices are $83@85 per oz., New York.

**Platinum**—The market is still unsteady. Dealers hold for $45 per oz., but actual sales of metal have been made at $43@44 per oz., and it is said that plenty can be had at those figures.

**Silver**—The market demands for silver bullion at 28¾d. having been satisfied the price has receded to 28 5/16d. in London. It is reported that the India mint has been a purchaser, and as the crop situation in that country is regarded as very favorable, it is likely that present rates will be maintained.

Shipments of silver from London to the East, Jan. 1 to Sept. 18, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £7,365,700 | £5,148,500 | D. £2,217,200 |
| China | 933,500 | 592,000 | D. 341,500 |
| Total | £8,299,200 | £5,740,500 | D. £2,558,700 |

Imports of silver at New York, week ended Sept. 27, were $152,709 from Central and South America. Exports were $1,245,669, chiefly to London and Paris.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Sept. 27

The high price of zinc blende is $49, the base per ton of 60% zinc $43@47 for choice grades. Prices at the week-end were stronger and the demand increased for all grades. Several purchases of stock were made Friday at a $46 base for grades offered only $44@45 earlier in the week. Calamine sold on a base of $21@23, with a few choice lots at a $[illegible] per ton of 40% zinc. The average of all grades is $42.88 per ton. Lead is stronger, selling as high as $60.50 per ton on a base price of $58 per ton of 80% metal contents. The average of all grades is $56.12 per ton.

SHIPMENTS WEEK ENDED SEPT. 27

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 10,[illegible]85,760 | 847,640 | 2,2[illegible]310 | $307,900 |
| Totals 9 months | 418,490,810 | 31,121,110 | 69,5[illegible]750 | $11,678,199 |

Blende value the week, $234,222; 9 months, $9,119,011.

Calamine value the week, $10,938; 9 months, $405,059.

Lead value, the week, $62,740; 9 months, $1,[illegible]429.

### PLATTEVILLE, WIS.—Sept. 27

The base price paid this week for 60% zinc ore was $45@46 per ton. The base price for 80% lead ore was $56@57 per ton.

SHIPMENTS WEEK ENDED SEPT. 27

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,226,170 | 64,900 | 1,122,946 |
| Year to date | 11,619,870 | 5,231,190 | 44,030,856 |

Shipped during week to separating plans, 2,674,850 lb. zinc ore.

## IRON TRADE REVIEW

### NEW YORK—Sept. 24

Throughout the iron and steel industry buyers display a waiting attitude, doubtless due in part to the fact that the long discussed tariff bill is now finally being enacted into law, and partly to realization of the fact that the steel mills are now reaching the end of their accumulation of orders and may soon name lower prices.

Thus far there has been little definite restriction of steel output, but the majority of mills are operating under less pressure, and actual tonnages turned out are probably 5 to 10% less than 30 days ago.

The most active lines are wire products, in which specifications are 50 to 100% heavier than in August, due to the season, and tubular goods, in which specifications are substantially as heavy as in August. In all other lines there have been decreases. In sheets the decrease is least marked, additional business being brought out by lower prices lately named. In structural shapes there remains a large amount of unfilled specifications, and some mills are still about three months behind.

In general, the price situation shows little change from a week ago. The reduced pressure upon the mills, due partly to their catching up on old business and partly to the decrease in specifications in the past two weeks, enables them to make prompt deliveries on new business in nearly all branches, structural shapes being an exception, and thus the mills are somewhat more ready to shade prices, but there is no rush to do so. Probably the idea of the mills in that they can well acord to have a period of a few months of curtailed production, before they make any strong bid for business. It is clear that no large amount of new business could be developed at this time by price cutting. Reductions now would only encourage buyers to wait for further cuts. The tariff, moreover, while it suggests lower prices in a general way, presents a complicated problem, as the competition will be much keener on some products than on others.

The Pennsylvania R.R. Co., it is reported, is negotiating a sale of the stocks it holds in the Cambria and the Pennsylvania Steel companies, but nothing has been made public. The company is also preparing to sell its interest in several anthracite companies.

### PITTSBURGH—Sept. 30

While the steel mills are operating under somewhat less pressure, and actual tonnage output is thereby reduced a few per cent., there are no definite closings and it is hardly likely there will be any within a week or two. A continuance of present market conditions, however, would probably bring the steel industry down to working at 60 or 70% of capacity by some time in November.

In new business the brightest spot is steel passenger train cars, for which relatively large orders are being placed. Buying of freight cars is expected soon.

**Pig Iron**—The market continues absolutely stagnant. Sales are infrequent and cover only small tonnages. Occasional inquiry brings out prices substantially the same as formerly quoted. The local market has not declined thus far, but the expectations entertained by furnaces two or three weeks ago that advances would occur have been dissipated, at least until the market becomes much more active. We quote: Bessemer, $15.75@16; basic, $14; No. 2 foundry, $14; malleable, $14.25; forge, $13.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—Late last week the English pool made a reduction of $3.50 in its regular price on ferromanganese, from $56 to $52.50, Baltimore, subject to the old duty, which would make $50 under the new duty. The continued shading of the old price had presaged a drop but the reduction proves to be $3.50 instead of the $2.50 expected. The market continues quiet. We quote prompt and forward, subject to the new tariff admitting ferromanganese free, at $50, Baltimore, with $2.16 freight to Pittsburgh.

**Steel**—The market has grown visibly softer but is too inactive to enable prices to be quoted accurately. We quote billets at $24 and sheet bars at $25, either bessemer or openhearth, f.o.b. maker's mill, Pittsburgh or Youngstown. These quotations are $1 a ton lower than named last week, but probably do not represent the lowest that could be done on an interesting inquiry. Rods are nominally $27, Pittsburgh or Youngstown, with no activity.

## IRON ORE

Ore boats on the Lakes have been delayed by stormy weather. It is thought, however, that all the Lake ore still to come down can be handled by the contract vessels, and no wild boats are required to help out.

The Interstate Commerce Commission has authorized the Pennsylvania Co. to reduce its ore rate from Lake Erie ports to the Wheeling District from 88c. to 70c., to meet a rate made by the Wheeling & Lake Erie R.R. The order is temporary, pending the further investigation of the whole question of rates on iron ore from the Lake ports.

## COKE

**Connellsville Coke**—The market is the most complicated yet seen. The regulars adhere to their $2.50 price on furnace coke, while some outsiders are offering coke at lower figures, but neither party seems to make any sales, despite the fact that by this time there should have been developed considerable demand for October. One sale of about 6000 tons, delivery to the end of October, has been made at the full price of $2.50. While the trend of events has seemed to make the position of the regulars less secure, they seem to have scored a strong point, for this week the Producers' Coke Co., which acts as the exclusive agent of the regulars, announces a fresh list of operators for whom it acts. The Producers' Coke Co. states that the companies it now represents produce 3,500,000 tons of coke annually.

**Exports and Imports of Fuel in the United States** seven months ended July 31, long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Anthracite | 1,645,892 | 2,448,913 | 30 | 30 |
| Bituminous | 8,077,177 | 10,008,012 | 869,403 | 826,784 |
| Coke | 479,434 | 550,751 | 47,790 | 39,698 |
| Bunker coal | 4,319,514 | 4,291,801 | | |
| Totals | 14,522,017 | 15,299,477 | 917,223 | 866,512 |

The bunker coal or coal furnished to steamships in foreign trade is practically all bituminous. The larger part of the trade, both exports and imports, is with Canada.

**Coal Production in Germany** seven months ended July 31, in metric tons:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| Coal | 94,956,795 | 104,862,722 | I | 9,905,927 |
| Brown coal | 37,168,878 | 39,854,052 | I | 2,685,174 |
| Total mined | 132,125,673 | 144,716,774 | I | 12,591,101 |
| Coke made | 16,166,998 | 18,671,317 | I | 2,504,319 |
| Briquettes made | 13,710,896 | 15,612,860 | I | 1,901,964 |

Of the briquettes reported this year 12,209,736 tons were made of brown coal or lignite.

# CHEMICALS

### NEW YORK—Oct. 1

The general market is still active and improving, and a good quantity of business is reported.

**Imports and Exports of Chemicals** and raw materials in the United States, seven months ended July 31, were as follows:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Arsenic, lb | 2,983,425 | 4,880,388 | | 66,000 |
| Copper sulphate, lb | .......... | .......... | 5,504,879 | 3,481,639 |
| Bleach, lb | 41,520,981 | 40,615,405 | 400 | 13,260 |
| Potash salts, lb | 374,784,340 | 338,008,688 | 1,710,625 | 7,370,217 |
| Soda salts, lb | 7,187,205 | 7,515,014 | 300,808 | 238,960 |
| Acetate of lime, lb | .......... | .......... | 45,777,383 | 47,081,364 |
| Nitrate of soda, tons | 310,504 | 411,947 | 6,034 | 3,546 |
| Sulph. of ammonia, tons | 25,250 | 31,031 | 160 | .. |
| Phosphates, tons | .......... | .......... | 702,767 | 801,951 |
| Sulphur, tons | 15,377 | 4,514 | 24,962 | 52,214 |
| Pyrites, tons | 555,059 | 539,191 | | |
| Magnesite, tons | 57,481 | 96,875 | 593 | 607 |
| Chrome ore, tons | 31,566 | 35,559 | . | ... |

Exports include reëxports of foreign material. Some phosphate is imported, but it is not given separately in the returns.

**Arsenic**—The market remains dull. Quotations are $3@3.25 per 100 lb. and are rather nominal.

**Copper Sulphate**—Business is good. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The preparations for spring trade have not begun yet and the market is dull. The quotations are 2.40c. per lb. for both spot and futures.

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## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. **In computing the total American supply duplications are excluded.**

| | April | May | June | July | August |
|---|---|---|---|---|---|
| Alaska shipments | 1,730,252 | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 |
| Anaconda | 23,800,000 | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 |
| Arizona, Ltd | 3,100,000 | 3,200,000 | 3,000,000 | 2,600,000 | 1,800,000 |
| Copper Queen | 8,210,166 | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,401 |
| Calumet & Ariz | 4,500,000 | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 |
| Chino | 3,925,409 | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 |
| Detroit | 1,856,517 | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 |
| East Butte | 1,100,000 | 1,268,595 | 1,055,646 | 1,060,257 | .... |
| Mammoth | 1,450,000 | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 |
| Giroux* | 600,000 | 625,000 | 610,000 | 610,000 | |
| Mason Valley | 1,264,304 | 1,186,560 | 1,097,014 | 908,892 | 867,060 |
| Miami | | 1,943,900 | 2,612,000 | | |
| Nevada Con | 5,650,000 | 5,93[illegible],275 | 6,344,863 | 5,403,919 | |
| Ohio | 690,001 | 650,071 | 537,400 | 601,700 | |
| Old Dominion | 3,040,000 | 2,749,[illegible]00 | 2,511,000 | 2,526,000 | 2,524,000 |
| Ray | 4,379,128 | 4,384,400 | 4,392,612 | 4,097,000 | 4,269,519 |
| Shannon | 1,238,000 | 1,080,000 | 924,000 | 880,000 | 1,248,000 |
| South Utah | 132,267 | 200,000 | 185,000 | 140,000 | 223,498 |
| Tennessee | 1,718,188 | §1,037,115 | 1,379,220 | 1,217,804 | |
| United Verde | 3,000,000 | 3,000,000 | 2,900,000 | 3,000,000 | |
| Utah Copper Co | 9,539,847 | 10,003,227 | 11,637,949 | 9,849,043 | 10,302,251 |
| Lake Superior* | 17,000,000 | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 |
| Non-rep. mines | 7,000,000 | 6,300,000 | 6,000,000 | 6,200,000 | |
| Total prod. | 104,224,079 | 109,824,500 | 104,051,138 | 101,758,167 | |
| Imports, bars, etc. | 25,578,297 | 22,205,942 | 18,255,267 | 29,029,990 | |
| Total blister | 129,802,376 | 132,030,442 | 122,306,405 | 130,788,157 | |
| Imp. ore & matte | 7,177,363 | 10,528,562 | 7,497,002 | 8,527,046 | |
| Total Amer | 136,979,739 | 142,559,004 | 129,803,407 | 139,315,203 | |
| Miami† | 2,[illegible]12,000 | . | .. | 2,890,000 | 3,097,500 |
| Shattuck-Arizona | 1,158,326 | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 |
| Brit. Col. Cos. | | | | | |
| British Col. Cop. | 794,000 | 618,076 | 634,238 | 618,379 | |
| Granby | 1,857,452 | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 |
| Mexican Cos. | | | | | |
| Boleo† | 2,811,200 | 2,424,800 | 1,984,640 | 2,240,720 | 2,264,640 |
| Cananea | 3,581,690 | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 |
| Moctezuma | 2,753,240 | 2,695,881 | 3,438,793 | 2,693,306 | 3,542,047 |
| Other Foreign | | | | | |
| Braden, Chile | 1,512,000 | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 |
| Cape Cop., S. Af. | 586,880 | 387,520 | 414,400 | ........ | |
| Kyshtim, Russia | 2,544,640 | 1,490,000 | 1,000,000 | 2,500,000 | |
| Spassky, Russia | 974,400 | 721,280 | 835,520 | 660,800 | 1,048,320 |
| Exports from | | | | | |
| Chile | 7,616,000 | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 |
| Australia | 6,608,000 | 7,840,000 | 7,616,000 | 10,304,000 | 6,720,000 |
| Arrivals Europe‡ | 10,545,920 | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

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## STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U.S. Refin'y Production | Deliveries, Domestic | Deliveries for Export | United States | Europe | Total |
| IX, '12 | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | [illegible] | [illegible]0,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,3[illegible] | 63,065,5[illegible] | 107,408,0[illegible] | [illegible]473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,[illegible] | 103,80[illegible] | [illegible]546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,[illegible] | [illegible] |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | . | | ....... |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,8[illegible] | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,[illegible]23 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,69[illegible] | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,8[illegible]727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,[illegible] | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,[illegible] | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | | | | 38,314,037 | 63,716,800 | 102,030,837 |
| X | ........ | | .. | ... | ...... | ..... |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Alpha Con., Nev. | Sept. 22 | Oct. 15 | $0.02 |
| American, [illegible] | Sept. 18 | Oct. 18 | 1.00 |
| Belmont, [illegible] | Sept. 30 | Oct. 10 | 0.0025 |
| Big [illegible] | Sept. 22 | Oct. 7 | 0.05 |
| [illegible], Nev. | Sept. 23 | Oct. 14 | 0.10 |
| Copper [illegible], Ida. | Sept. 14 | Oct. 14 | 0.01 |
| [illegible] | Sept. 15 | Oct. 11 | 0.005 |
| [illegible] | Sept. 19 | Oct. 18 | 0.005 |
| [illegible], Ida. | Sept. 10 | Sept. 30 | 0.0005 |
| [illegible] Western Con., Nev. | Sept. 15 | Oct. 9 | 0.01 |
| [illegible]-American, Ida. | Sept. 8 | Sept. 29 | 0.004 |
| [illegible], Nev. | Sept. 8 | Sept. 30 | 0.02 |
| Lower Mammoth, Utah | Sept. 11 | .. | 0.01 |
| Lucky Calumet, Ida. (postpo'd) | Aug. 11 | Oct. 10 | 0.005 |
| Lucky Swede, Ida. | Sept. 20 | Oct. 16 | 0.003 |
| McKinley Gold, Ida. | Sept. 8 | Oct. 8 | 0.0005 |
| Mexican Metals (Boston) |  | Oct. 10 | 0.15 |
| Nabob, Ida. | Sept. 22 | Oct. 6 | 0.005 |
| Phoenix Copper, Ariz. | Sept. 20 | ... | 1.00 |
| Sierra Nevada, Nev. | Sept. 25 | Oct. 25 | 0.10 |
| Silver Mountain, Ida. | Sept. 15 | Oct. 15 | 0.002 |
| Slavonia, Ida. | Sept. 10 | Sept. 30 | 0.002 |
| St. Louis, Nev. | Sept. 22 | Oct. 14 | 0.01 |
| Sunset, Nev. | Sept. 2 | Oct. 13 | 0.01 |
| Sunshine, Ida. | July 1 | Oct. 15 | 0.001 |
| Teddy, Ida. | Sept. 15 | Oct. 15 | 0.001 |
| Yellow Jacket, Nev. | Sept. 8 | Oct. 8 | 0.10 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York |  |  | London |  |  |
|---|---|---|---|---|---|---|
|  | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53.340 | 63.471 | ... | 24.594 | 29.299 |  |
| November | 55.719 | 62.792 | ... | 25.649 | 29.012 |  |
| December | 54.905 | 63.365 | ..... | 25.349 | 29.320 |  |
| Year | 52.304 | 60.835 | ...... | 24.592 | 28.042 |  |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York |  |  |  | London Standard |  |
|---|---|---|---|---|---|---|
|  | Electrolytic |  | Lake |  |  |  |
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | 16.328 | 17.698 | 16.799 | 78.762 | 73.125 |
| October | 17.314 | ... | 17.661 | . | 76.389 |  |
| November | 17.326 | .... | 17.617 | .... | 76.890 | . |
| December | 17.376 | ... | 17.600 | ... | 75.516 |  |
| Year | 16.341 | . | 16.560 | .. | 72.942 | .. |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York |  | London |  |
|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.140 |
| March | 42.577 | 46.832 | 192.619 | 213.615 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | 42.41 | 223.762 | 193.074 |
| October | 50.077 |  | 228.353 |  |
| November | 49.891 |  | 227.619 |  |
| December | 49.815 |  | 226.875 |  |
| Av. year | 46.096 |  | 209.322 |  |

New York in cents per pound. London in pounds sterling per long ton.

### LEAD

| Month | New York |  | St. Louis |  | London |  |
|---|---|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | 4.698 | 4.924 | 4.579 | 22.292 | 20.648 |
| October | 5.071 |  | 4.894 | ..... | 20.630 | . |
| November | 4.615 |  | 4.463 | ..... | 18.193 |  |
| December | 4.303 |  | 4.152 | .... | 18.069 |  |
| Year | 4.471 | . | 4.360 | ...... | 17.929 |  |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York |  | St. Louis |  | London |  |
|---|---|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7.426 | . | 7.276 | .... | 27.543 | . |
| November | 7.371 |  | 7.221 | .. | 26.804 | . |
| December | 7.162 | . | 7.081 | .. | 26.494 |  |
| Year | 6.943 | .... | 6.799 | .. .. | 26.421 | . |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer |  | Basic |  | No. 2 Foundry |  |
|---|---|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.78 | 16.03 | 14.93 | 15.63 | 14.93 |
| October | 17.90 | .. | 17.18 | ... | 17.22 | ... |
| November | 18.07 |  | 17.09 | . | 18.00 | . |
| December | 18.15 |  | 17.45 |  | 18.73 |  |
| Year | $16.01 |  | $14.93 | . | $15.28 |  |

## STOCK QUOTATIONS

**COLO. SPRINGS** Sept. 30

| Name of Comp. | Bid |
|---|---|
| Acacia | .02¾ |
| Cripple Cr'k Con | .01¼ |
| C. K. & N. | .07 |
| Doctor Jack Pot | .02¾ |
| Elkton Con | .55 |
| El Paso | 3.50 |
| Findlay | .02¼ |
| Gold Dollar | .08¼ |
| Gold Sovereign | .02¾ |
| Isabella | .10 |
| Jack Pot | .04 |
| Jennie Sample | .05 |
| Jerry Johnson | .03 |
| Lexington | ‡.005 |
| Moon Anchor | ‡.006 |
| Old Gold | .01½ |
| Mary McKinney | .57¼ |
| Pharmacist | .01¼ |
| Portland | .97 |
| Vindicator | .88 |

**SALT LAKE** Sept. 30

| Name of Comp. | Bid |
|---|---|
| Beck Tunnel | ‡.05 |
| Black Jack | .10½ |
| Cedar Talisman | .00¾ |
| Colorado Mining | .11 |
| Columbus Con | .00½ |
| Crown Point | .01½ |
| Daly-Judge | 6.10 |
| Grand Central | .46 |
| Iron Blossom | 1.22½ |
| Little Bell | ‡.10 |
| Lower Mammoth | .02 |
| Mason Valley | 3.25 |
| May Day | .06¾ |
| Nevada Hills | .90 |
| New York | ‡.03 |
| Prince Con | .30 |
| Silver King Coal'n | 3.50 |
| Sioux Con | .01 |
| Uncle Sam | .03½ |
| Yankee | ‡.08 |

**TORONTO** Sept. 29

| Name of Comp. | Bid. | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .05 | Foley O'Brien | .21 |
| Coniagas | 7.15 | Hollinger | 17.35 |
| T. & Hudson Bay | ‡70.00 | Imperial | ‡.02 |
| Timiskaming | .23 | Jupiter | .16 |
| Wettlaufer-Lor. | .13 | Pearl Lake | .27 |
| Apex | ‡.01 | Porcu. Gold | .08 |
| Big Dome | 10.00 | Preston E. D. | .01 |
| Crown Chartered | ‡.00¼ | Rea | .12 |
| Doble | .10 | Swastika | .03 |
| Dome Exten. | .06 | West Dome | .10 |

**SAN FRANCISCO** Sept. 30

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| **Comstock Stocks** |  | **Misc. Nev. & Cal.** |  |
| Alta | .05 | Belmont | 7.25 |
| Belcher | .21 | Jim Butler | .67 |
| Best & Belcher | .05 | MacNamara | .11 |
| Caledonia | 1.55 | Midway | .42 |
| Challenge Con. | .11 | Mont.-Tonopah | 1.20 |
| Chollar | .03 | North Star | .41 |
| Confidence | .35 | West End Con. | 1.50½ |
| Con. Virginia | .15 | Atlanta | .14 |
| Crown Point | .20 | Booth | .01 |
| Gould & Curry | .03 | C.O.D. Con | .03 |
| Hale & Norcross | .05 | Comb. Frac | .04 |
| Mexican | 1.12½ | Jumbo Extension | .12 |
| Occidental | .70 | Pitts.-Silver Peak | .38 |
| Ophir | .23 | Round Mountain | .40 |
| Overman | .50 | Silver Pick | .04 |
| Potosi | .02 | Tramp Con | ‡.01 |
| Savage | .11 | Argonaut | 2.50 |
| Sierra Nevada | .11 | Bunker Hill | ‡1.75 |
| Union Con. | .11 | Central Eureka | .10 |
| Yellow Jacket | .38 | So. Eureka | ‡2.75 |

**N. Y. EXCH.** Sept. 30

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 73½ |
| Am. Agri. Chem | 45 |
| Am.Sm.&Ref.,com | 65¾ |
| Am. Sm. & Ref., pf. | 100 |
| Am. Sm. Sec., pf. B | 82½ |
| Anaconda | 36¼ |
| Batopilas Min | 1 |
| Bethlehem Steel.pf. | 74 |
| Chino | 39¾ |
| Federal M. & S., pf. | 38½ |
| GreatNor.,ore.,ctf. | 34½ |
| Guggen. Exp. | 45½ |
| Homestake | 105 |
| Inspiration Con | 16 |
| Miami Copper | 23 |
| Nat'l Lead, com | 44½ |
| National Lead, pf. | 106¼ |
| Nev. Consol. | 16¼ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf | 89¾ |
| Quicksilver, pf. | 3½ |
| Ray Con. | 19 |
| Republic I&S,com. | 21 |
| Republic I&S, pf. | 85 |
| SlossSheffi'd,com. | 30 |
| Sloss Sheffield, pf | 89 |
| Tennessee Copper | 31¾ |
| Utah Copper | 51½ |
| U. S. Steel, com. | 58⅞ |
| U. S. Steel, pf. | 108 |
| Va.Car.Chem.,pf | 96 |

**N. Y. CURB** Sept. 30

| Name of Comp. | Clg. |
|---|---|
| Ariz. Belmont | 19 |
| Barnes King | 1¾ |
| Beaver Con. | .33 |
| Big Four | .20 |
| Braden Copper | 7¾ |
| B. C. Copper | 2½ |
| Buffalo Mines | 2¾ |
| Can. G. & S. | .19 |
| Con. Ariz. Sm. | 3/16 |
| Davis-Daly | 2¼ |
| Diam'field-Daisy | 2 |
| Ely Con. | .07 |
| Florence | .20 |
| Giroux | 1 5/16 |
| Gold Hill Con | 1/16 |
| Goldfield Con | 1½ |
| Greene Cananea | 30 |
| Greenwater | .04 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 4 1/16 |
| Keystone | ‡1¾ |
| La Rose | 2½ |
| McKinley-Dar-Sa | 1 9/16 |
| Min. Co. of A. new | 2¼ |
| Nipissing Mines | 8½ |
| Ohio Copper | 7/16 |
| Pacific Sm. & M. | ¼ |
| Puebla S. & R. | 2¾ |
| South Utah M.&S. | 3/16 |
| Stand'd Oil of N. J. | 378 |
| Stewart | 1¾ |
| Tonopah | 4 11/16 |
| Tonopah Ex. | 1 13/16 |
| Tonopah Merger | .72 |
| Tri-Bullion | ¼ |
| Tularosa | .50 |
| Union Mines | .04 |
| United Cop., pfd | 3 |
| West End Ex. | .06 |
| Yukon Gold | 2 |

**LONDON** Sept. 20

| Name of Comp. | Clg. |
|---|---|
| Camp Bird | £0 15s 9d |
| El Oro | 0 14 6 |
| Esperanza | 1 0 0 |
| Mexico Mines | 6 0 0 |
| Oroville | 0 8 3 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 6 |
| Tomboy | 1 6 3 |

**BOSTON EXCH** Sept. 30

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1½ |
| Ahmeek | 280 |
| Alaska Gold M. | 22¼ |
| Algomah | 1¼ |
| Allouez | 36 |
| Am. Zinc | 19 |
| Ariz. Com., ctfs. | 4¾ |
| Bonanza | 32 |
| Boston & Corbin | .75 |
| Butte & Balak | 2¼ |
| Calumet & Ariz. | 66½ |
| Calumet & Hecla | 435 |
| Centennial | 14 |
| Cliff | 1⅞ |
| Copper Range | 40 |
| Daly West | 2 |
| East Butte | 12 |
| Franklin | 3½ |
| Granby | 71¾ |
| Hancock | 17 |
| Hedley Gold | ‡30 |
| Helvetia | 45 |
| Indiana | 4 |
| Island Cr'k, com | 51 |
| Island Cr'k, pfd | 84 |
| Isle Royale | 19½ |
| Keweenaw | 1¾ |
| Lake | 8½ |
| La Salle | 3¼ |
| Mass. | 2 |
| Michigan | 1¼ |
| Mohawk | 42½ |
| New Arcadian | 2 |
| New Idria Quick. | 2¼ |
| North Butte | 27¾ |
| North Lake | 1½ |
| Ojibway | 75 |
| Old Dominion | 51½ |
| Osceola | 78 |
| Quincy | ‡63 |
| Shannon | 6¾ |
| Shattuck-Ariz. | 28 |
| Superior | 25 |
| Superior & Bost. | 2¼ |
| Tamarack | 31 |
| Trinity | 4¾ |
| Tuolumne | .60 |
| U. S. Smelting | 40¼ |
| U. S. Smelt'g, pf. | 47¼ |
| Utah Apex | 2½ |
| Utah Con. | 9 |
| Victoria | 1 1/16 |
| Winona | 1¼ |
| Wolverine | 43 |
| Wyandot | 50 |

**BOSTON CURB** Sept. 30

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 5½ |
| Boston Ely | .60 |
| Butte&Lon'nDev | .31 |
| Cactus | .02 |
| Calaveras | 1½ |
| Chief Cons | 1¼ |
| Corbin | .75 |
| Cortez | .30 |
| Crown Reserve | 1 9/16 |
| Eagle & Blue Bell | .95 |
| First Nat. Cop. | 2 11/16 |
| Houghton Copper | 3⅜ |
| Majestic | .31 |
| Mexican Metals | .32 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 2¼ |
| New Baltic | .60 |
| Oneco | .80 |
| Raven Copper | .08 |
| Rhode Island Coal | .01 |
| Smokey Dev. | 1 |
| So. Lake | 3½ |
| S. W. Miami | 1¼ |
| South Lake | 3½ |
| Trethewey | .28 |
| United Verde Ext. | .51 |

‡Last Quotation

The Engineering and Mining Journal

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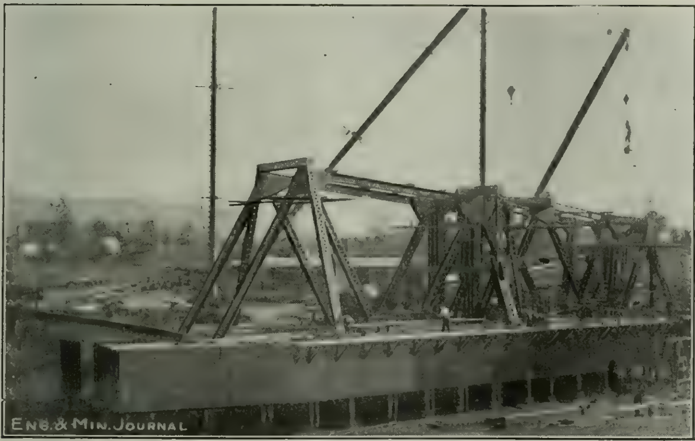
# Natoma No. 7, a California All-Steel Dredge

By Lewis H. Eddy*

*SYNOPSIS—Natoma No. 7 is the third all-steel California dredge. It is a reconstruction of Folsom No. 3, the largest dredge in America when built. In the first three months' working the only loss of time was due to the inability of the power company to supply electricity.*

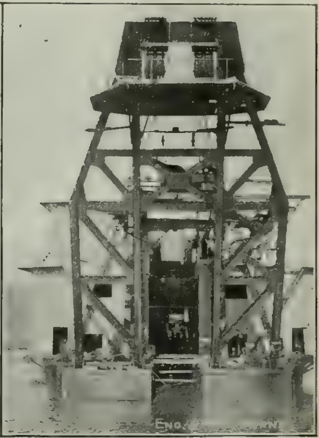
⁂

Natoma No. 7 dredge, equipped with 9-cu.ft. close-connected buckets, put in commission by the Natomas Consolidated of California in Blue Ravine field of American River district in May, 1913, is the third all-steel bucket-elevator dredge designed by S. L. G. Knox, manager of Natomas Consolidated, and built by the Yuba Construction Co. for gold-placer digging in California.



Steel Hull Completed

Installing some machinery prior to floating.



Bow Gantry

Ready for digging ladder.

This dredge was reconstructed from Natoma No. 7, a wooden-hull boat, which was originally Folsom No. 3, designed by George L. Holmes, of San Francisco, built in 1904 and reconstructed in 1908 by the Western Engineering & Construction Co. for the Folsom Development Co. The drawings for the original construction were started on Mar. 1, 1904, the hull was launched in August and the initial digging was begun on Dec. 13, 1904. No. 3 went into commission at Willow Hill on Jan. 1, 1905, and dug intermittently until May, 1908, when it was closed down and reconstructed, and recommissioned in July, 1908. On Jan. 1, 1909, this dredge and four others of the Folsom Development Co. were taken over by the Natomas Consolidated of California. Folsom No. 3 was renamed Natoma No. 7, and continued digging until November, 1912, when it was taken out of commission and dismantled for reconstruction. The reconstruction was begun on Jan. 2, 1913, and completed on May 12, 1913; total time 130 days.

The original hull dimensions of Folsom No. 3 were: Length, 120 ft.; width, 46 ft.; depth, 10 ft. The digging ladder was equipped with eighty 7-cu.ft. buckets, cast by the Taylor Iron & Steel Co., and designed to dig 35 ft. below the water line. The buckets weighed 2650 lb. each. The bucket pins were made of 3% nickel-steel by the Midvale Steel Co. In the reconstruction a 13-ft. section was added to the digging ladder, extending the digging depth to 45 ft. below the water line. The old bucket line was discarded and displaced by eighty-seven 8½-cu.ft. Bucyrus buckets. The tumblers cast by the Taylor Iron & Steel Co. were displaced by Bucyrus tumblers. The original winches built by the Link Belt Machinery Co. were displaced by Bucyrus winches. The shaking screens were discarded and a revolving screen 36 ft. long, 7 ft. diameter was installed. The dredge was equipped with the Holmes type all-steel gold-

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*3430 Peralta St., Oakland, Calif.

saving tables, the second set of these tables built in California. The total power of the original No. 3 dredge was 320 hp. The total power of the reconstructed No. 3 dredge was [illegible] hp. The total power of the No. 7 all-steel dredge is [illegible] hp.

At the time of initial construction Folsom No. 3 was the largest gold dredge in North America. The total displacement was 1,178,000 lb., which was one-half the total displacement of "narrow-gage" Southern Pacific ferry boats running between San Francisco and Alameda. At that time the Western Engineering & Construction Co. and the Bucyrus Company of South Milwaukee would not guarantee a dredge to dig more than 90,000 cu.yd. per month. Prior to reconstruction, No. 3 dredge frequently dug 50,000 cu.yd. per week. In the reconstruction the rated efficiency was increased from 70,000 cu.yd. to 180,000 cu.yd. per month. In the first four years this dredge turned over 81 acres of ground and handled 3,600,000 cu.yd. of gravel, which is about 95,000 cu.yd. per month for actual digging time, digging an average depth of 30 ft. below the water line. The present yardage of the reconstructed No. 7 dredge is about 180,000 cu.yd. per month digging 55 ft. below the water line.

dredges. The bow gantry has four legs rounded at the foot and set up in cast-steel footings, permitting a forward and backward swing of the gantry conforming to the movement of a digging ladder. The successful operation of this design of gantry is demonstrated in the three all-steel dredges now digging in this district, and will be adopted in the construction of Yuba No. 14.

The digging ladder is 122 ft. long between centers, designed to dig 55 ft., but having actual capacity to dig 58 ft. below water line. The ladder is of plate-girder type, riveted with 1-in. rivets and weighs without the bucket line, about 12,500 lb. The bucket line is composed of 97 close-connected Bucyrus type California buckets of 9 cu.ft. capacity. The buckets are cast in three pieces, manganese lips, nickel-chrome steel base and pressed-steel hood. They are 43 in. wide, 42 in. high, 33 in. deep and weigh about 2600 lb. each. The bucket pins are of nickel-chrome steel 31 in. long, 6 in. diameter and weigh about 260 lb. each. The tumblers are Yuba Construction Co. type, each cast in two pieces; six-sided and provided with six manganese-steel tread plates 2½ in. thick. The upper tumbler weighs 10 tons, the lower tumbler 8½ tons. The stacking ladder is 150 ft. 6 in. long between centers and is provided with a 36-in. conveyor belt 312 ft. long traveling over two drums.

Eng. & Min. Journal

NATOMA NO. 7, DIGGING LADDER

Eng. & Min. Journal

CONSTRUCTION CAMP

Natoma No. 7 all-steel dredge, compared to the original Folsom No. 3 wooden-hull dredge, is a fine example of the evolution in design and construction of gold dredges in California in the past 10 years. Compared to old No. 7 wooden-hull dredge the present yardage efficiency and extended digging depth are of engineering interest from the fact that a large proportion of the old machinery has been replaced in the present dredge, including the screen, winches, main-drive complete, screen-drive complete, tumblers, shafts and one 5-in. pump.

The new steel hull of Natoma No. 7 is 131 ft. 6 in. long, 9 ft. 6 in. deep. It is 46 ft. 6 in. wide on the water line, plus 3 ft. 3 in. overhang on each side, making a total width of deck of 53 ft. The sides and stern of the hull are built of ⅜-in. steel plates, double riveted with ¾-in. rivets. The well hole is built of ½-in. steel plates, double riveted with 1-in. rivets. The well hole is 37 ft. long and 6 ft. 10½ in. wide between chafing strips, which are made of ¾-in. steel 1½ and 2 ft. wide. The deck is built of 6x4-in. planking, calked with two strands of oakum.

The gantries are of the Yuba Construction Co. type, all-steel, the same as installed on No. 8 and No. 10

The situation of the spuds and stacker of No. 7 is similar to the plan of Natoma No. 10.[1] The digging spud of No. 7 is situated off the fore-and-aft center line 2 ft. 4 in. to port. The stacker is situated off the center line 2 ft. 9 in. to starboard. The stepping spud is situated off the center line 11 ft. 8 in. to starboard. The digging spud of No. 10 is situated directly on the center line, the stacker to port and the stepping spud to starboard. The digging spud of No. 7 is 70 ft. long, 34x54-in. section; the stepping spud is 60 ft. long, 34x54 in. section.

The revolving screen is 37 ft. 6 in. long, 7 ft. diameter; the perforations are ⅜ in. and ½ in. The gold-saving tables are double-bank Yuba Construction Co. type and have a surface area of 3600 sq.ft. The screen washer, hopper, saveall, grizzly, etc., are of the same design as installed in No. 10 dredge. The cleanup methods are the same as employed in No. 10 and other Natomas boats. No. 7 dredge is also equipped with an Ingersoll-Rand 8x8-in. class NE-1 air compressor for operating air hammer, drills, hoists, etc. This is the same type of compressor as used in Nos. 8, 9 and 10 dredges, but smaller. The housing, doors, windows, stairways, etc. are the same as in No. 10 dredge.

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[1] "Eng. and Min. Journ.," May 31, 1913, p. 107[illegible].

The dredge is electrically driven with Westinghouse machinery. The current is furnished by the Great Western Power Co. The wiring is all in conduit, in accordance with underwriters' specifications. The total power used is 778 hp., distributed as follows: Ladder hoist and main drive, 300 hp.; stacker, 50 hp; high-pressure pump, 100 hp.; low-pressure pump, 50 hp.; monitors, 135 hp.; two-step pump, 30 hp.; screen drive, 50 hp.; starboard winch, 30 hp.; compressor, 30 hp.; shop tools, 3 horsepower.

The reconstruction of Natoma No. 7 dredge was under the supervision and direction of W. R. Bassick, of San Fancisco, general manager of the Yuba Construction Co., and P. R. Parker, superintendent and engineer in charge of shops at Marysville. The construction work was begun on Jan. 2, 1913, under superintendence of O. B. Hart and completed under the superintendence of Paul E. Morse on May 12, 1913. The machinery was started at 4:30 p.m., May 12, and the actual yardage digging begun at 1 a.m., May 13. During the first 17 hours, to 5 p.m., May 13, the dredge dug 15¾ hours, a fine record for initial digging. In the first three months the only loss of time was due to the inability of the power company to supply electric power at the time of the strike of electricians.

⁂

## South Africa Mineral Output in 1912

The annual report of the South African Mines Department has just been issued and gives the following figures of production for 1912: Gold, 9,108,792 fine oz.; diamonds, 5,071,882 carats; coal, 8,117,078 tons; coke, 11,980 tons; copper (45.95% Cu), 18,570 tons; tin (66.64% Sn), 2932 tons; silver (contained in gold bullion and base-metal ores), 1,019,012 fine oz.; asbestos, 1220 tons; graphite, 40 tons; magnesite, 602 tons; lead, 2112 tons; mica, 5 tons; salt (including byproducts), 41,848 tons; lime, 78,114 tons; flint, 1404 tons; steatite, 7 tons; corundum, 111 tons.

The Transvaal produced 9,107,511 oz. of the total gold output, of which 8,731,969 oz. were from the Rand. The total gold production from South Africa represented 39% of the world's output, as compared with 37% for 1911.

In December, 1912, a total of 10,117 stamps and 288 tube mills were at work, as compared with 10,383 and 259, respectively, for December, 1911.

Of the diamonds, 4,887,053 carats came from mining, and 184,829 from alluvial washing. The Premier mine produced a total of 2,047,185 carats, or 40.4% of the output for the Union. The De Beers mine, which stopped actual mining work in June, produced 2,203,470 carats, or 43.4% of the total.

The Messina (Transvaal) Development Co. was the only copper producer in the Transvaal during the year. Its concentrating plant treated 15,391 tons of ore, from which was obtained a marketable product of 2075.8 tons, assaying 48.76% Cu. In Cape Colony, copper was produced by the Cape Copper Co. and the Namaqua Copper Co., these concerns having smelted 128,759 tons of ore during the year, resulting in an output of 14,299 tons of copper matte, assaying 50.60% Cu. In addition, 2145 tons of picked ore, assaying 13.79%, and 135 tons of precipitates assaying 71.62% were obtained.

⁂

## Experiences at Shushanna

A recent issue of the *Wallace Miner* contains interesting accounts of the experiences of two men who have returned from the lately discovered Alaskan gold district. One of these men was from the Cœur d'Alene district in Idaho, the other from Dawson. M. J. Sinclair, of Kellogg, was visiting at Katalla when the news of the strike reached the coast towns. He immediately started for the diggings. From Cordova he went to McCarthy, on the Copper River R.R., and from there reached the new camp, 100 miles distant. He was delayed in getting in, first in getting a pack horse. Later the horse was killed on the trail, and still later he paid $1 per lb. for packing his outfit into camp. He was on the road 12 days.

Asked as to the merits of the new camp, he said: "Discovery claim is yielding handsomely, but more work has been done on this than on other claims. Gold was first found there in the spring. Some months later, through grubstake connections in Dawson and the appearance there of some of the gold that had been taken out, the discovery leaked out, the news spread and the rush began from all parts of Alaska. It is high-grade placer gold, worth $18.30 per ounce. So far no big nuggets have been found; some are worth perhaps $18 or $20. Those who have gone in so far have been up against the grub proposition." Mr. Sinclair will return to Alaska at once and he and his brother will go to the new camp prepared to spend the winter there. Before leaving, he and his associates built a comfortable cabin for occupancy this winter. There were about 200 men in the camp when he arrived. Many were coming in as he came out.

Game is abundant. Mr. Sinclair said he saw 150 cariboo in one bunch. Ptarmigan, "the white grouse of the north," are to be caught almost without effort. Sugar, coffee, flour and such necessities were hardly obtainable at any price. He stated that he saw a man offer $5 for a teacupful of flour.

J. B. Isams, better known as "Jimmy, the Barber," returned from Donjek on a raft, after having "mushed" out from Shushanna. He went up on the first trip of the "Nasutlin," and mushed into the strike. After spending seven days there and running out of food, he bought a few pounds from an arrival from Cordova and came back to Dawson. Jimmy says he could find only two claims producing gold, and that they were James' Discovery and an adjoining claim.

"The Discovery claim is in a very narrow gulch," said Jimmy, "and I do not think the camp extensive. I started my barber shop but since I could get only cash for pay and cash is no good in that land where there are no supplies for sale, it did me no good. I wanted grub for the pruning service, and when none was forthcoming I had to hurry back to Dawson. I am not going there again this winter. I simply closed my shop by putting my razor in my pocket. The shop comprised two pronged stakes with a stick across the top for a seat, and another pronged stick back of the customer's head for a head rest. I started into the camp with six towels, but threw away five and had to do business with only one. I charged $1 for a shave and $2 for a haircut."

"Ptarmigan are so tame we killed them with clubs whenever we wanted them. For several days I lived on caribou meat and salt. On my way to the camp I was accompanied by Racco, Max, Sally and James. I do not know their other names. Two were Greeks and two Montenegrins. We fell in with each other and had a glad time. At one time 10 nationalities were represented on a rope, pulling a boat up the Snag. A woman called Brownie had hired a Japanese to take her supplies up. The Japanese and the woman fell out and he was left without supplies. I fed him for days and he got into the camp. Many were so near stranded in the diggings that they went around begging for enough to get out. One German fell on his knees and lifted his hands in petition, saying he had been without food 17 days."

"Five of us were lost in the Beaver valley on the way to the camp. The place is full of growth, and is not marked with posts, flags or otherwise. The Government trail blazers are working that way, and I hope they will put up posts or flags to indicate to the strangers which way to go. However, the trail is being defined gradually. On the way up we were lost one day on Ptarmigan Creek, one day on Lake Creek and one day on Horsefelt. We finally hired an Indian to pilot us to the boundary."

"We started back Aug. 20. The nights were beginning to get cold and there was ice in the sluice boxes in the morning. The pay on the creek where James is working is about a mile and a half long. Fellows are prospecting everywhere, but I know of none getting out pay."

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# Johannesburg Notes

Special Correspondence

The leaders of the Workers Federation of Trades having refused the government's challenge to call a general strike if they were prepared to face the consequences, industrial peace has been restored and I do not think another attempt at a general strike will ever be made. Owing to the shortage of labor, development work is nearly suspended and several developing shafts have been closed down, throwing numbers of workers out of employment. I have contended in these notes that 80% of the strike was due to fear and intimidation, and that there was no widespread feeling of dissatisfaction among the mine employees. One must remember that half the 20,000 workers are surface employees, who work under conditions of employment and remuneration that are not equaled anywhere in the world. The bulk of the underground workers had no grievances. It is true that the terrible harvest of phthisical cases, the result of bad conditions in the past, is still being reaped; but the condition of the majority of the mines today is such that no careful man need fear to work in them.

Water is generally available, though I know of one case in a deep mine not now milling, where, to save the cost of water purchased, the water was turned off when the inspector's back was turned. The men themselves are the great obstacle, as I know from experience, in further improving conditions. One great and real grievance, however, the men had, was that in several mines, though their legal working hours were eight hours in the face, they were kept below in the smoke and dust after blasting, while the mine captain used his skips to haul ore for the mill. The 8½-hr. bank-to-bank concession granted will remove this grievance. There are other minor grievances. It is notorious that the New Kleinfontein employees were willing to go on strike only because, owing to the reputation and conduct of the new management, everyone felt that his position was not worth a day's notice. Directorates have, however, learned a lesson over this incident. The bulk of the workers realize that the industry cannot bear further burdens and that the government will strictly preserve law and order in future. Renewed interest in electrical systems of blasting is evident in the hope that all blasting may be done when the mine is empty of men.

Mining developments are scarce. The Springs Mines No. 2 shaft intercepted the reef assaying 6 dwt. over 53 in.; another showing gave 10 dwt. over 36 in. in the vicinity, and prospects are good. The Rand requires, however, another £5,000,000 or more to press on the wide development of the Far East portion of the field and of the deep ground at Randfontein, which are almost the only promising areas remaining. The breakdowns in the share market and the labor supply have put off the hope of getting this sum, and made the position for keeping up the output some five years hence a doubtful one. The Cinderella Deep is suffering from shortage of labor and the new West shaft which should be rushed down, has been stopped; the Jupiter mine is stopping milling for the present, the natives being sent to the Knights Deep.

The two furnaces at work at the Star of the Congo mine, Katanga, last month produced 900 tons of copper. The Messina mine in the North Transvaal is smelting middlings from the mill, containing 10% copper, in two reverberatory furnaces 23x11½ ft. and is producing high-grade matte, so that the African copper output will show an increase for 1913.

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# Subliming Points of Metals

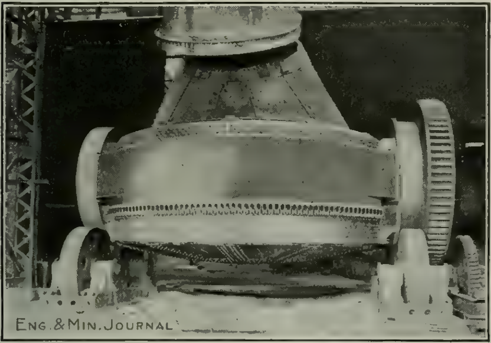
Experiments were made by G. W. C. Kaye and D. Ewen on the sublimation temperatures of the metals (Royal Soc. Proc., Vol. A89, p. 58). Experiments were made with iridium (in nitrogen at 20 mm. pressure), copper (in nitrogen at 1 mm.), iron and tungsten (in a high vacuum, about 0.004 mm. at the beginning), and sensible volatilization was observed in all cases at temperatures considerably below the melting points. In addition to volatilization as ordinarily understood, there was evidence of straight-line emission of particles of metal (see *Journ.* Soc. Chem. Ind., p. 751, 1913). The data for a number of metals, for which information is available, are collected in the following table; the volatilization was detected mostly at low pressures.

| Metal | Boiling point | | Volatilization detectable at | M pt at 1 atmos. |
|---|---|---|---|---|
| | At 1 atmos | In vacuo | | |
| | ° C. | ° C. | ° C. | ° C |
| Mercury | 357 | 160 | —39 | —39 |
| Potassium | 760 | 370 | 63 | 63 |
| Sodium | 880 | 420 | 97 | 97 |
| Cadmium | 778 | 450 | 160 | 321 |
| Zinc | 918 | 550 | 180 | 419 |
| Bismuth | 1420 | 1000 | 269 | 269 |
| Lead | 1525 | 1150 | 360 | 327 |
| Silver | 1955 | 1400? | 680 | 961 |
| Copper | 2310 | 1600? | 400 | 1084 |
| Tin | 2270 | 1700? | 360 | 232 |
| Gold | 2530? | 1800? | 1370 | 1064 |
| Iron | 2450 | .... | 950 | 1500 |
| Platinum | 2500? | .... | 1200 | 1750 |

# The Great Falls Reduction Works

This article is based on a descriptive pamphlet prepared by the Anaconda management for the Montana meeting of the American Institute of Mining Engineers, but we have made additions from our own observations, and consequently we, not the Great Falls engineers and metallurgists, are responsible for many of the statements.

The reduction works of the Boston & Montana Reduction department, near the north end of the Black Eagle dam across the Missouri River, is one of the reduction plants belonging to the Anaconda Copper Mining Co., the other being at Anaconda. The Great Falls works employs about 1100 men and has a capacity of about 3800 tons of crude ore per day. This plant is now being remodeled to embody results of experiments and investigations which have been made with a view to more economical treatment of ores. A brief description of the plant as it now and as it will be after the remodeling is as follows:



GREAT FALLS COPPER CONVERTER
(20 ft. in diameter.)

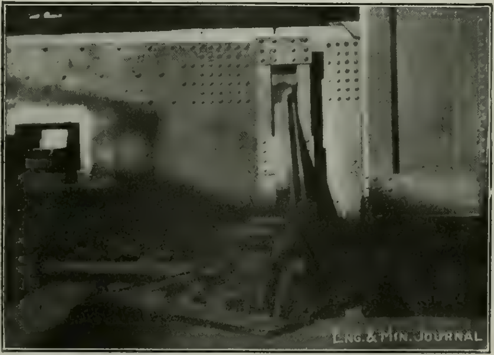
The concentrator department consists of six units or sections, each section treating from 550 to 600 tons of crude ore per day. This department is not being remodeled at the present time. A new concentrating process, however, has been developed and partially installed in the old mill, and an experimental section embodying this concentration process has also been installed at the concentrator at Anaconda. The improved method is a development of the roughing principle. As installed at Anaconda, it has resulted in an important saving in the one section there that so far has been rebuilt.

The blast-furnace department at Great Falls consists at the present time of four blast furnaces, each 56x180 in. at the tuyeres, and one 84x180 in. at the tuyeres, the smaller furnaces having a capacity of about 450 tons of charge per 24 hours, and the larger one a capacity of about 600 tons. These furnaces will not be changed at present, although they may be a little later. The new method of smelting that is being developed at Great Falls, especially the use of the mammoth converters, will probably leave less work for the blast furnaces to do than has heretofore been the case.

The calcining department consisted recently of 22 16-ft. McDougall roasting furnaces. McDougall furnaces 24 ft. in diameter will be substituted and possibly some driers for drying concentrate will be added.

The reverberatory department now consists of three gas-fired regenerative furnaces, each having a hearth 15 ft. 9 in. by 45 ft. These furnaces will be abandoned and a direct-fired type with hearths 22x102 ft. will be substituted, and the battery will be equipped with hot-blast stoves for heating the secondary air, that is, the air blown in over the bridge wall. The first of the new furnaces is now nearing completion. It embodies many novel features, both in construction and in principle. The furnace masonry is built up inside of a tank of heavy steel plate. Each end of the furnace is rounded. The products of combustion escape through flues in the roof at the chimney end and pass to the hot-blast stoves. The sides of the furnace are supported by buckstays, spaced rather far apart. Between the buckstays the casing plates will bend out a little to allow for expansion. Instead of being tied together by rods across the arch of the furnace, the buckstays are supported by props adjustable by means of jack screws. The accompanying engraving from a photograph, showing one of the propped buckstays, makes the scheme quite clear. It is estimated that the saving in ironing by this method will be from $5000 to $6000. The furnace arch is 20 in. thick and the side walls 30 in. thick.

The 43-ft. regenerative furnace now in use in the works costs about $50,000 to build. It is estimated that the new 102-ft. furnace will cost about $100,000.



GREAT FALLS REVERBERATORY
(Note the propped buckstay.)

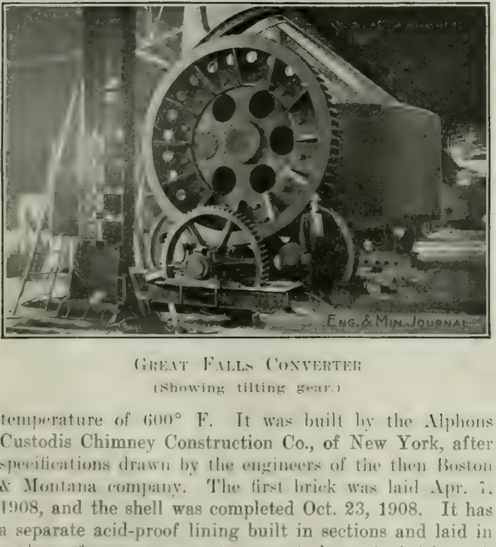
At the firebox end of the furnace, but separate from it, is a mammoth gas producer, having a shaking grate. The gas passes to the furnace by three brick-lined pipes and meets the secondary air preheated in the stoves by the waste gases. The new furnace is consequently a recuperative furnace, but of a different type from the old reversing regenerative furnaces. In principle the firing is similar to that of the long zinc-distillation furnaces at La Salle, Illinois.

The present gas-producer department comprises 26 small producers. This entire plant will be abandoned upon the adoption of the new type of reverberatory furnace.

The converter department, when rebuilt, will contain three converter stalls equipped with basic-lined upright converters 20 ft. in diameter, each converter having a capacity of about 120 tons of copper per day. The accompanying engraving shows a shell with sixty-two 1¾-in. tuyeres, which was the first tuyere equipment; the present converter has twenty-six 2½-in. tuyeres. The mammoth Great Falls converter is an efficient ore-smelting furnace. For each ton of blister copper produced about 0.7 ton of new concentrate is charged. A large proportion of the concentrates of the works will, therefore, be smelted directly in the converters, after a preliminary drying, when the new installation is completed. This is pretty much of a realization of the dream of pyrite smelting. The converter copper is cast either in anodes for the electrolytic refinery, or in slabs for shipment to the East, in two electric-driven casting machines, the copper being poured into the molds from a pot tilted hydraulically.

The electrolytic refinery at Great Falls has a capacity of about 65,000,000 lb. of refined copper per year. It is different from any other electrolytic refinery in the world in that it is a high-density plant, the ampere density being about twice that of other commercial plants. The furnace-refining department has a capacity of about 30,000,000 lb. per year.

The company built, during 1908 and 1909, an elaborate and complete flue system, a part of which system is the largest and the highest chimney in the world. It is 506 ft. high above the foundation and 50 ft. inside diameter at the top, the smallest point. It is of sufficient capacity to discharge 4,000,000 cu.ft. of gases per minute at a temperature of 600° F. It was built by the Alphons Custodis Chimney Construction Co., of New York, after specifications drawn by the engineers of the then Boston & Montana company. The first brick was laid Apr. 7, 1908, and the shell was completed Oct. 23, 1908. It has a separate acid-proof lining built in sections and laid in acid-proof cement, so as to protect the main brick work from the action of acid gases. The completed chimney contains 301,000 cu.ft. of material and weighs 18,000 tons. The concrete foundation is octagonal in shape, 23 ft. deep and 103 ft. wide across the flat, and 78 ft. in diameter inside at the base of the chimney. This chimney is of such a size that the Washington monument could be set inside it and only about 49 ft. would project above the top of the chimney.



GREAT FALLS CONVERTER
(Showing tilting gear.)

The chimney serves a flue system consisting of a dust chamber 175 ft. wide and 21 ft. high, and 180 ft. long. This dust chamber is connected to the chimney by a flue 1200 ft. long, 21 ft. high and 48 ft. wide.

It is estimated that this elaborate and costly system of chimney and flues will have paid for itself in about six years. The original cost was about $1,100,000.

Among the recent installations at Great Falls is an arsenic plant.

Regarded as a whole, the Great Falls reduction works, which dates back about 20 years, constitutes an example of the old ideas of metallurgical construction prevailing before the modern notions of plenty of elbow room and magnificent distances were conceived. Like Topsy, the plant has "just growed," and consequently, it is more cramped than Washoe and its successors. The concentrator is ramshackle in appearance, but it does excellent work in the matter of mineral extraction, so what more can be asked?

Just now the Great Falls engineers are wrestling with the problem of building a new furnace house over and around the old one, installing new roasting furnaces, new reverberatories, and new converters, and keeping the old ones all going. This job naturally presents some hard nuts to crack, but the engineers seem to be proceeding with reasonable equanimity.

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## Position of the Titaniferous Magnetites

Joseph T. Singewald, Jr., in his rather complete study of the titaniferous iron ores in the United States, published in Bull. 64 of the U. S. Bureau of Mines, sums up the situation in regard to these ores as follows:

The evolution of the modern blast furnace has taken place in such a direction as to make the utilization of titaniferous iron ores impracticable. Notwithstanding numerous experiments that have been conducted with a view to discovering a furnace charge that will make the use of these ores practicable from the standpoint of furnace operation and economy, there is today no hopeful feeling in regard to the possibilities of smelting these ores in the blast furnace. On the other hand, the introduction of the electric furnace holds out a new hope for the direct reduction of the titaniferous ores.

The results of magnetic-separation experiments conducted with these ores are promising in some cases and disappointing in others. No rule of general application can be formulated as to the behavior of the ores. Some deposits are amenable to magnetic separation, and yield concentrates that require the admixture of only a small proportion of nontitaniferous ores to make a satisfactory ore mixture. Other deposits are less amenable and yield concentrates that would have to be mixed with three or four parts of nontitaniferous ores for furnace use. There are many other deposits in which the percentage of titanium separable in this way is extremely small, so that the utilization of such ores seems to depend on the discovery of a process that will make their use feasible.

The cause of the difference in behavior of the ores toward magnetic separation is revealed in their microstructure, which is readily studied by the metallographic method. This method of investigation shows that the titanium occurs in these ores in the form of ilmenite grains of about the same order of magnitude as the magnetite grains, as ilmenite inclusions and intergrowths of microscopic size in the magnetite, and as an integral part of the magnetite molecule itself. The titanium occurring in the first form, as ilmenite grains, is readily separable by means of magnetic concentration, except in the finest-grained ores with which the degrees of crushing required would make such concentration impracticable. The titanium occurring in the two latter forms is inseparable by mechanical means. The percentages of titanium occurring in these different forms varies greatly in the different ores, and, consequently, every case must be tested for itself. A metallographic study of the ores of any deposit will at once decide the question of the amenability of the deposit to magnetic separation.

As regards chemical composition, except for their titanium content, the ores are desirable. The coarser-grained ores are usually of high grade in their natural condition, whereas a magnetic separation of the leaner ores yields a high-grade concentrate, with the deleterious constituents at a minimum.

As the iron industry at present demands large deposits of definite extent, the outlook for most of the deposits of titaniferous iron ore in the United States is not promising. As a rule the deposits are relatively small and of irregular extent and distribution. Further, they are of lean to medium grade, and inaccessibly situated as regards transportation facilities. In other words, to put the deposits on a producing basis would require a heavy initial outlay of capital, which the size and irregularity of occurrence do not warrant. There are, however, the two large, high-grade deposits of Sanford Hill, N. Y., and Iron Mountain, Wyo., which are so readily workable that, despite their titaniferous character, their utilization within a few years seems certain.

[The deposit at Sanford Hill, N. Y., will soon be the subject of an extensive experiment conducted by the McIntyre Iron Co., as described in the JOURNAL, Sept. 27.—EDITOR.]

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## The Coeur d'Alene Power-Rates Case

The question of the new power charges imposed by the Washington Water Power Co., is to be brought before the Idaho public-utilities commission through the instrumentality of the Federal Mining & Smelting Co., states the *Boise Statesman*. Soon after the complaint of the Federal company was filed with the commission an order was issued suspending the new rates against which the complaint was largely aimed.

The Federal Mining & Smelting Co. is not alone in its complaint. A similar complaint is filed by the Tamarack & Custer Consolidated Mining Co., and it is announced that practically every mining corporation in the Cœur d'Alene district is awaiting with deep anxiety the outcome. The commissioners of Shoshone County join in the complaint for the reason that the public-utilities law makes it necessary for the officials of a municipality or county to take this step.

Chief among the complaints is this: Five years ago the power company and the Federal company entered into a contract under which power was to be furnished at a certain price for a term of five years. It is now alleged by the mining company that this price was outrageous, that under it the mining company paid the power company $900,000, and that enough was paid in Shoshone County to pay all the cost of the power plant and transmission lines furnishing power for that county. But under the new schedule of rates, a still higher price is to be charged. The increase is estimated between 10 and 11%, and in addition to this the new schedule of rates makes it impossible for the consumer to know how much he is to pay because of the confusion in terms.

In addition to this it is said that the proposed contract with the Tamarack and other smaller companies would make it impossible for the consumers to dispose of their own property during the life of the contract, without the consent of the power company. Nor is this all. There are other serious grounds of complaint. In the proposed contract with the Federal company is found this objectionable provision: "It is mutually understood and agreed that the power company does not guarantee the continuous and uninterrupted delivery of electrical energy upon the premises of the consumer and shall not, under any circumstances, be held liable by the consumer for any damage or injury on account of the non-continuance or interrupted deliveries of such electrical energy."

Another provision makes it mandatory on the part of the consumer, before installing any new apparatus, to get the permission of the power company and furnish it plans and specifications. Under this provision it would be impossible to install an electric iron without the consent of the power company. It is so strict that it would prohibit the consumer from putting in an electric-light globe.

Still another provision against which there is vigorous protest is one making it compulsory on the part of the consumer to furnish the power company free title to all necessary rights-of-way over its land. It must furnish title also to a piece of ground 200 ft. long by 100 ft. wide to be chosen by the power company for substation purposes. Sufficient supply of clean water for cooling the transformer must also be furnished by the consumer without expense to the power company.

It is made mandatory in another provision in the contract for the consumer to repay to the power company the cost of the power line to the consumer's premises, and then this becomes the sole property of the power company.

On the expiration of the contract, each party to it is given 10 days to annul the agreement. If no such notice is given, the contract is renewed for a term of five years. It is insisted that the contract, if enforced to the letter, would close practically every mine in north Idaho, dependent on the Washington Water Power Co. for its electrical energy.

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## Goldfield Consolidated

Report of Goldfield Consolidated for August, 1913, shows a total production of 32,096 tons. From this material $198,784 was realized, of which $64,342 came from mining and $134,442 from milling.

Development cost $5.40 per ft. and 3094 ft. were accomplished. Combined operating costs are shown in the accompanying table.

| | Mining<br>Per Ton of Ore Handled | Milling and Transportation | Total |
|---|---|---|---|
| Mining: | | | |
| Stoping.. | $2.78 | | $2.78 |
| Development. | 0.52 | | 0.52 |
| Shipping expense... | 0.34 | | 0.34 |
| Dump moving... | 0.05 | | 0.05 |
| Transportation... | | $0.07 | 0.07 |
| Milling ...... | | 1.85 | 1.85 |
| Marketing......... | | 0.05 | 0.05 |
| General expense.... | 0.24 | 0.03 | 0.27 |
| Bullion tax . | 0.09 | | 0.09 |
| Construction....... | | 0.01 | 0.01 |
| Total costs. | $4.02 | $2.01 | $6.03 |
| Miscellaneous earnings.. | 0.04 | | 0.04 |
| Net costs . ... | $3.98 | $2.01 | $5.99 |

# Relining No. 2 Hamilton Shaft

*SYNOPSIS—The shaft timbering is being replaced by concrete. End plates, dividers and partition slabs are cast on the surface and cured. Walls are poured in place. A mixing plant installed on the surface. Rate of progress.*

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The No. 2 Hamilton shaft of the Chapin mine at Iron Mountain, Mich., was sunk in 1891, and consisted originally of six compartments as shown in Fig. 1: Two for skips or bailers, 4 ft. 8 in. x 7 ft.; two for cages 4 ft. 8 in. x 4 ft. 6 in.; and two for pipes, etc., 4 ft. 8 in. x 2 ft. 0 in., taken off the ends of the cage compartments.

This shaft was timbered with 16x16-in. material in the main members, the sets spaced 6 ft. 2½ in. center to center, the outside lagged with 2-in. planks, making a minimum rock section of 10 ft. by 24 ft. 4 in. The timbers, due to long service, became badly decayed, so that it was necessary to reline the shaft or abandon it. Early in 1911, it was decided to make it a permanent outlet for the Chapin mine, and install in it the permanent electrical centrifugal-pumping equipment. It was, therefore, necessary to reline it from collar to bottom, a distance of 1434 ft., and since there was a possibility of striking a vug of water in the underground workings at any time, provision had to be made so that bailers could be put in service on short notice. Since it was to be the permanent outlet, further provision had to be made for column pipes and electric cables. To provide for these pipes and cables, it was necessary to increase the inside dimensions of the shaft from 7x21 ft. 4 in. to 9x21 ft. 4 in., making a poured concrete wall 6 in. thick. The outside dimensions of the shaft were not changed. In the new design, the shaft consists of eight compartments: Two for skips or bailers and two for cages, each 4 ft. 8 in.x6 ft. 4 in.; three for pipes and cable and one for ladder, each 2 ft. 4 in.x4 ft. 8 in., the skip compartments set off with concrete-slab partitions. The arrangement is shown in Fig. 2.

### Relining Methods Considered

Various methods of relining were considered as follows: (1) Replacement of the old timbering; (2) steel sets and wood lagging; (3) steel sets and reinforced-concrete lagging; (4) steel sets, angle studdles and concrete-poured walls; (5) reinforced-concrete dividers, end plates, partition slabs, and poured-concrete side walls. The first and second schemes were neither fireproof nor permanent; the third and fourth schemes were not considered practicable; the fifth scheme was adopted on account of its permanent qualities, it being strictly fireproof and waterproof.

### Concrete Mixing Plant

To make the concrete economically, a mixing plant was built near the shaft, as shown in Fig. 5. The material is brought from a near-by gravel pit in dump wagons and contains a large percentage of sand. It is dumped directly into a crusher which discharges to a bucket conveyor; this elevates it to a cylindrical revolving screen, which is divided into two sections. The first section is perforated with ⅜-in. diameter and the second section with 1⅛-in. holes. All aggregate passing through the ⅜-in. holes is termed sand and all passing through the 1⅛-in. diameter holes is termed gravel. The oversize is used either for backfilling the concrete walls in the shaft or for recrushing. There are two Smith No. 1 concrete mixers, of 9 cu.ft. capacity. The ingredients are brought to the mixers in tram cars. The body of the car is divided into three sections designed to hold the required amount of cement, sand and gravel for the mixture of 1 : 2 : 4, which is used. By moving it under the spouts from the sand and gravel bins, the car is loaded with sand and gravel; the required amount of cement is poured in from sacks. A water-measuring box placed above each mixer discharges the proper amount of water into the batch to be mixed.

The dividers, end plates and slabs are made in steel forms, which are placed beneath the mixers so that the concrete can be poured directly into them. After the concrete has had sufficient time to harden, the forms are removed and the molds are picked up by a hand-traveling crane and carried into a drying room, where they are cured. The design of these members is shown in Fig. 3.

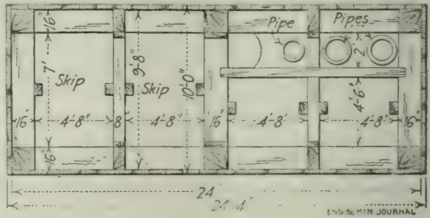

Fig. 1. Plan of Old Shaft Lining

### The Routine of Relining

The actual work of relining is done in sections, each section being carried upward from permanent bearers which were set to support the old timber sets. A set or two of old timber, usually 12 ft., is removed, loaded on to the cages and hoisted to the surface, where it is unloaded on cars and dumped into the near-by cave. The timber sets above the removed portions are supported by vertical columns with jack screws on the bottom, which rests on 12x12-in. timber placed on the bearers. After the first 6-ft. section of concrete is poured, the 12x12-in. timbers are placed on the reinforced-concrete dividers and end plates, which are themselves supported on the steel wall-forms, as shown in Fig. 4. The steel forms are made in sections, with recesses to support end plates and dividers and are spaced with either 4-ft. or 6-ft. centers. The original forms are designed for 4-ft. centers; when the 6-ft. spacing is used, a section is bolted to the top of the form. Since there are seven sets of steel forms, the footings to carry the weight of old timber sets will bear either on the permanent bearers or on at least five sets, 30 ft., of concrete, i.e., the support of the old timbers above does not depend upon green concrete.

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Note—An abstract from a paper by S. W. Tarr, construction engineer, Oliver Iron Mining Co., presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913.

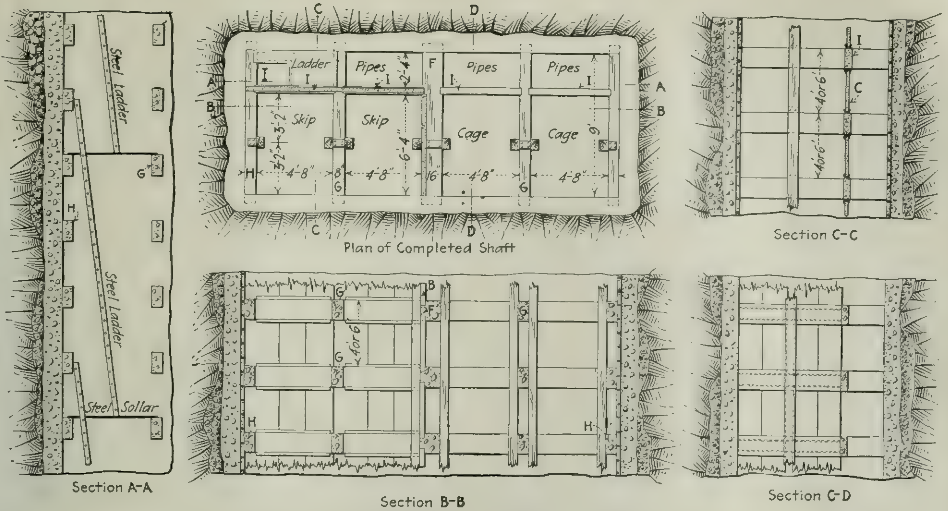


FIG. 2—ARRANGEMENT OF CONCRETE LINING

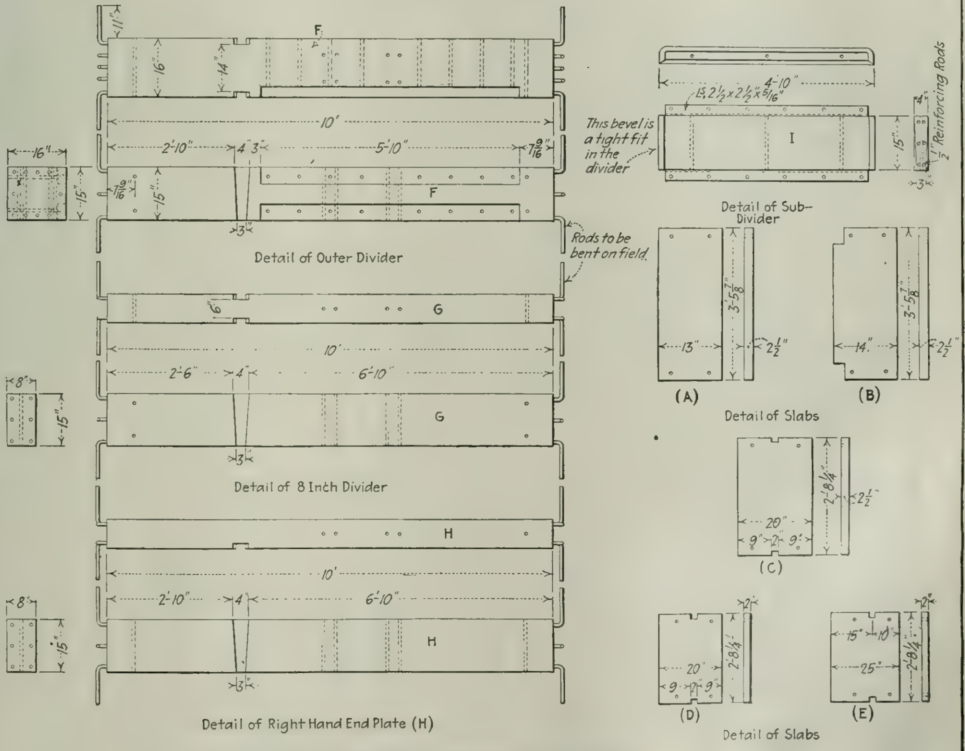


FIG. 3—DETAIL OF CONCRETE DIVIDERS AND SLABS

ENG. & MIN. JOURNAL

The New Concrete Lining in Detail and Assembled

After a new set of steel forms is lowered in the cages and installed, the dividers and end plates are lowered and placed in the recesses provided in the steel forms with their ends bolted to the forms. These end plates and dividers serve as horizontal struts to hold the forms in position. When a section is placed, the vertical reinforcing rods are put in position and the wall is now ready to be poured. The dividers and end plates have projecting reinforcement rods for anchoring the wall.

The concrete for the wall is mixed in the surface mixing plant and discharged into side-dump steel cars, seen in Fig. 4, which are hand trammed to the shaft. A turntable is installed so as to serve both skip compartments. The concrete car is run on a cage and lowered into the shaft. A revolving chute is attached to the spout of the car and the contents are discharged, as shown in Fig. 4, behind the forms and properly tamped in place. In places there are large crevices in the shaft. Where these crevices occur, they are filled to within 10 in. of the steel forms with large stones or rock from the over-size bin before the concrete is poured. The average amount of material for relining one 6-ft. vertical section of shaft is one cord of stone for backfilling, 10 cu.yd. of concrete, and 550 lb. of steel for reinforcing. The slabs for the skipway partitions are bolted to the dividers.

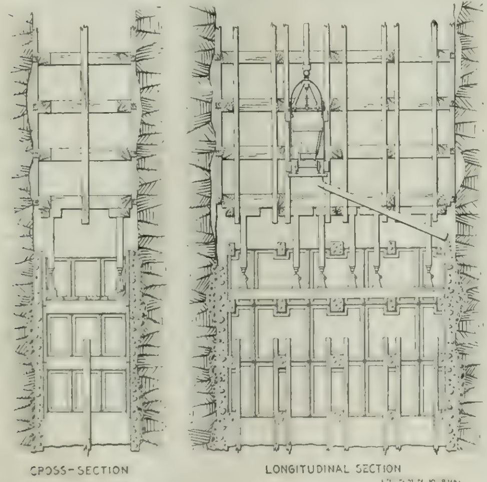


Fig. 4. Method of Installing Lining

### Number of Men Employed

In removing old timber, five men are required below and one man at the collar. The time required to remove one 6-ft. section varies according to the condition of the material. In placing steel forms or pouring concrete, four men are required below and two at the collar. This does not include the shaft foreman or the concrete foreman, as these two men do not spend all their time on this particular job. The work is carried on with three 8-hr. shifts and the average time required to concrete 6 ft. of shaft is 24 hr., including placing the forms, pouring concrete and removing an equal number of forms from below. When the forms are removed, they are taken to the surface, thoroughly cleaned and given a coat of crude oil before they are used again.

### New Equipment

When it was decided to make this shaft a permanent outlet, a new steel headframe, stockpile trestle and idler stand were erected. On account of the heavy flow of water in the underground workings at this shaft, it was necessary to dismantle the old wooden shaft house and erect the new one in the shortest possible time, as bailers might have had to be put in operation on short notice. This work was done in 10 days. The provisions made for installing bailers on 24 hr. notice during relining, proved to be a wise precaution, as a vug of water was encountered Oct. 22, 1912, and the bailers, put in operation within 24 hr., prevented the flooding of the lower mine workings.

### Progress of Work

The first section of relining was started 83 ft. 3 in. below the collar May 3, 1912, and the lining between this point and the collar was completed June 29. The second section was started 302 ft. 7 in. below the collar July 1, and was connected to the first section Oct. 5, 1912. The third section was started at the 551-ft. point Oct. 12, and connected Mar. 15, 1913. In this section work was discontinued from Oct. 22 to Nov. 18 on account of striking the vug of water on the 16 level. One week was also lost between Jan. 11 and 18, 1913, on account of a slip of old timbers. The fourth section was started at 696 ft. Mar. 22, and was connected on May 10. The fifth section was started at 917 ft. May 17, 1913, and on July 5, 813 ft. of the entire shaft was completed.

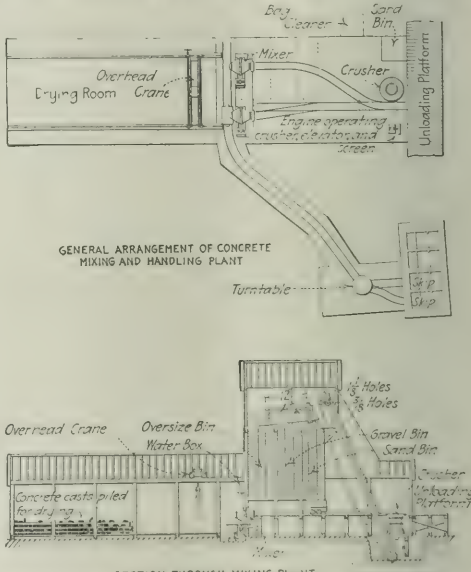


FIG. 5

The Surface Plant for Concrete Mixing

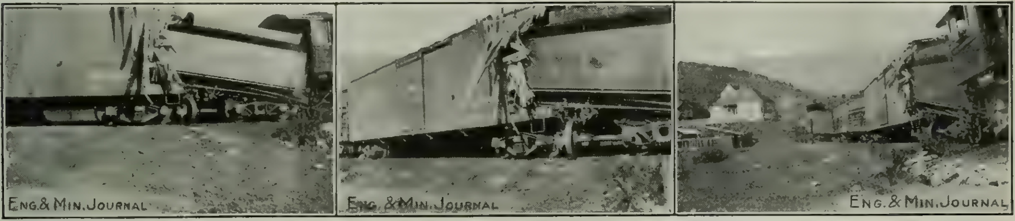
The average rate of progress since the beginning, without deducting the time due to delays, is 56.7 ft. per month and 63 ft. per month for actual working time. The progress for the last month was 72 ft. The preliminary estimate was based on relining 100 ft. per month. The old shaft timbers, however, were in far worse condition than could possibly be anticipated, and the slower progress has been due entirely to the difficulty in removing them and the precautions required to protect the lives of men who are employed on this work.

In the portion of shaft completed to date, all the work has proven perfectly satisfactory and entirely up to expectations. The walls are smooth and waterproof. The reinforced-concrete dividers and end plates come from the steel forms perfectly true, straight and smooth, and fit perfectly in the recesses provided in the steel forms.

## An Interesting Park City Accident

By George W. Short*

The accompanying illustrations show a wreck that occurred in Park City, Utah, on Aug. 30, which might have been disastrous to the city. Three 40-ton cars of lead ore were attached to the forward end of a locomotive and in switching, the engine and ore cars got away from the train crew and crashed into a car containing 30,000 lb. of Hercules powder. After striking the car of powder the force of the collision was such as to cause the cars to travel about 200 ft., striking another string of cars, as shown in the picture. Powder was scattered along the right-of-way under the engine and ore cars for the full 200 ft. The remarkable feature of the accident is that not one stick of powder exploded, if an explosion had occurred probably the whole of Park City would have been wrecked. The tender of the engine is resting on "pulped" powder in the end of the powder car.



Powder Car Rammed by an Engine at Park City, Utah

## Motion Pictures on the Iron Ranges

In the Iron River district of the Menominee range, Pickands, Mather & Co. are giving free motion-picture shows for the benefit of the employees at the Caspian and Baltic mines. The entertainments are conducted at the clubhouses, the company has provided at both properties and they are attended by assemblages that pack the auditoriums to the doors.

One series of pictures displayed recently showed how the house-fly spreads disease. The reel was furnished by the Michigan state board of health. The movements of the germ-carrying insects, enlarged to great magnitude, were watched with interest. The officials were highly pleased over the result of this particular entertainment and considered the illustration of what a house-fly can do to spread disease as profitable to the employees and of material assistance in the sanitary campaign the company is conducting at its various mines.

## Developments in the Joplin District

Special Correspondence

Interest has been aroused in the outskirts of the Joplin district by the results of new prospecting which may yield additions to the present producing area. At Springfield, Mo., the easternmost camp of the district, discoveries of rich lead and zinc deposits have been made southeast of that city in the old "gumbo" camps which were important 30 years ago, but which have been lying dormant save for the operations of a single company. The Daisy mine which has been in almost constant operation, and which has been among the most profitable zinc mines in the entire field, has attracted the attention of Springfield men and a coöperative citizens' company has again entered the field for prospecting operations. Meyer, Eslinger & Clas have taken up a number of leases in the old camp and will do considerable drilling this autumn. The new developments are upon the Arch Webb land where at a depth of 40 ft. some good ore is being taken out, and upon the Kershner farm where C. D. Meyer is sinking a shaft and is finding indications of ore at 30 ft. The companies that are now working in the field are the Daisy Mining Co., the Clark Mining Co., Cock Mining Co., Badger Lead & Zinc Co. and Meyer, Eslinger & Clas. The district has always produced a choice grade of ore, the blende running from 60 to 65% zinc, and the lead going to 80 to 84% in the concentrates.

### Ore Found as a Result of a Drought

Another development of interest is the discovery of lead and zinc ore 4½ miles southwest of the old Aurora camp in the eastern end of the district. The discovery was entirely accidental and came about through the drilling of a well on the Ernest Pharris farm. The severe drought compelled the sinking of a well and Pharris sought a drill rig from the Aurora field realizing that he could get immediate service by securing a machine from a mining camp. The drill man, accustomed to examine all cuttings naturally examined those taken from this well and found that the drill had struck ore at 110 ft. and continued in good ore to 158 ft. The strike has created considerable interest and this accidental discovery will be the means of starting considerable prospecting in that vicinity.

For several years desultory prospecting has been going on in McDonald County, which is south of the main part of the Joplin district, but little has ever come of the efforts made. Recent work on the George Tatum land at Anderson, Mo., has, however, resulted in the opening of a fairly good, soft ground, zinc mine. The operators are going ahead slowly and are cleaning the ores upon hand jigs. The good fortune attending these operations has started others into prospecting and a number of drill rigs will be sent to that part of the country.

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*Park City, Utah.

### GRASSELLI AND VINEGAR HILL COMPANIES

The Grasselli Chemical Co. recently became an active zinc producer in the Joplin district through the acquirement of the Boyd mine and mill at Sarcoxie. This property had been operated by three different companies previously. The property was first opened up by the Cameron Mining Co., was later operated by Dr. H. B. Boyd and then taken under option and lease by the American Zinc, Lead & Smelting Co., but later was released to the Boyd interests again. The mine is well equipped with a modern mill of 350 tons capacity. Mike Lawrence, of Joplin, will be the local manager, but the general manager will be W. A. Underhill, who has had charge of the company's operations in Tennessee. The Vinegar Hill Mining Co. acquired a half interest in the Church-Mabon lease at Miami, Okla., for $25,000. The property has been well drilled and is in the northern part of the Hattonville camp. Shafts are down and production by the new owners will begin soon.

One unit of the electrical plant of the Ozark Power & Water Co. at the new dam on the White River in Taney County was completed late in August. This means additional power for the mining districts of Missouri, Kansas, Oklahoma and Arkansas. The new plant will be able to deliver 30,000 hp., which will be distributed for power and lighting purposes from Springfield, Mo., on the east to Joplin, on the west. This additional source of power will allow of a greater distribution of the power of the Empire District Co. to the southwest and west, and thus more completely electrify the mining districts of Oklahoma and Kansas.

### NEW SOURCES OF ELECTRIC POWER

To southwest Missouri, Kansas and Oklahoma there can be distributed approximately 40,000 hp. of electrical energy, which, coming at a time when natural gas is failing, means a great addition to the power resources. Natural gas for many years has yielded cheap and efficient power for a large part of the mining district, replacing steam and coal in most of the plants. The electrical plants have taken part of this trade since the Spring River Power Co. was organized and the Lowell dam built. The weakening gas wells of Kansas have so lowered the gas pressure that winter seasons see the shutting off of all gas to industrial concerns and in some instances motors have succeeded the gas engines or the boilers. During the last two years practically all the energy that the Empire District Co. could distribute was either taken or the limit was very nearly reached. The Ozark plant on White River, therefore, comes in at an opportune time and will find a growing market for its power, directly in the mining district supplied by the company's other plant on Spring River. The two big plants will supplement each other and should give a much better service than the single plant does.

While the new source of power will be beneficial to the Joplin mining district directly, it will be of more service in helping develop a portion of the north Arkansas field, which has hitherto been difficult for operators to open up on account of the difficulty of securing power. The distance from railroads precluded hauling coal, but with transmission lines, the only hauling charge will be upon the ore.

In the hills of Arkansas there are a large number of zinc prospects that are now being looked upon as likely investments on account of the power possibilities now available. A number of Joplin mine operators are looking over that field at the present time and a period of new development is planned for the coming year.

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## Meteorite Used as Anvil

BY C. L. EDHOLM

One of the most remarkable meteorites ever recovered was found in the days of the Spanish occupation of Arizona by a party of soldiers who carried it to their *presidio*, or military station. After the garrison was withdrawn, this mass of iron, weighing 1400 lb., shaped roughly like a signet ring, was set up in Tucson on the plaza as a public anvil. No records show when the meteorite fell, and it was not until 1851 that Dr. John L. Leconte called the attention of scientists to its existence. After that it began a course of wanderings, through Hermosillo and Guaymas, Mexico, thence to San Francisco; thence by the Isthmus of Panama to Santiago, Cuba, and finally to the Smithsonian Institution at Washington, D. C.

THE IRWIN OR AINSA METEORITE

It is known as the Irwin or Ainsa meteorite, after two men who made it known to the general public. It is 124x97 cm., with an opening of 68 cm. and a greatest thickness of 49 centimeters.

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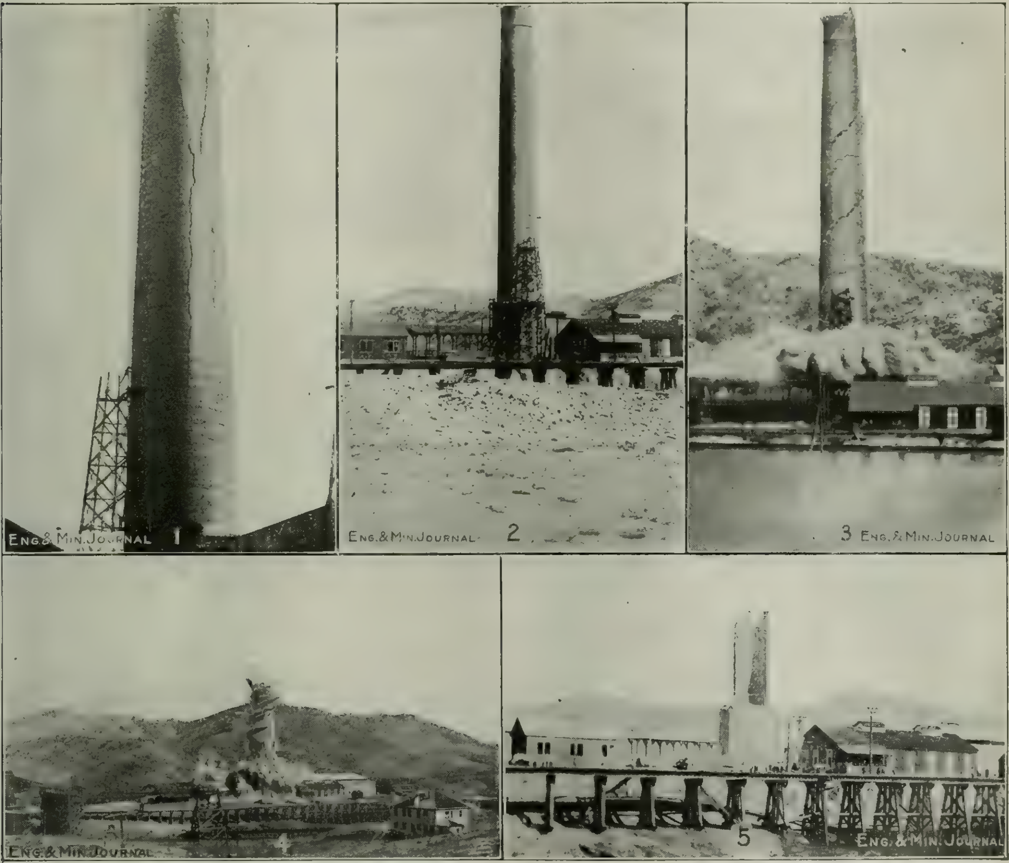
**The Best Route to Shushanna,** which is but 30 miles from the International boundary, has been announced by the Canadian Government. The route recommended is from White Horse through the Kluane district Canadian customs officials are arranging to facilitate the passage of prospectors with their equipment through Canadian territory. All those not taking in a sufficient supply of provisions will not be allowed to proceed. This measure is taken as otherwise many would starve

# Wrecking the Balaklala Stack at Coram, Calif.

Special Correspondence

The tall, hollow-tile stack at the works of the Balaklala Consolidated Copper Co., at Coram, Calif., was recently wrecked by blasting out the lower part of the round portion of the stack, just above the octagonal base. The stack was 275 ft. high; the octagonal base about 40 ft. high. After the stack had been used 18 months, it began to crack and flatten on one side. Some people said it had been struck by lightning, but it is not positively known that this is true. The condition of the stack on the south side is shown in Fig. 1. Where the cracks are, the stack had bulged out, and on the left, where the iron ladder-rungs can be distinguished, the stack had flattened so that when one went inside and looked up, there was probably 10 or 12 ft. of the inside which, instead of being a circle, was practically straight across.



Failure and Wrecking of the Hollow-Tile Stack of the Balaklala Consolidated Copper Co.

In June a 135-ft. brick stack in Cleveland, Ohio, was struck by lightning, causing almost the same condition shown in Fig. 1.

Many plans for saving the stack were discussed, such as banding, etc.; but as every few days a lot of brick would fall from the cornice, making it extremely dangerous, it was feared that, by working on the stack, some of the men might be injured. Fig. 2 is the photograph taken from the west side of the stack and shows how the top had crumbled away, several feet of it having fallen from time to time. In Fig. 3, the condition of the stack at the time of firing the blast, and just before it fell, is shown. In Fig. 4 the stack is shown a little later than in No. 3. Fig. 5 shows a piece remaining after the blast. This piece was taken down a few days later.

In wrecking the stack, 72 holes were drilled around half of the base, and in each hole three sticks of 40% powder were placed, and all the holes were fired simultaneously by an electric battery. It is understood that the hollow tile of which this stack was built were imported from Germany. The cost of the original stack was $35,000. It is probable that the stack will be rebuilt to a height of 40 or 50 ft. above the 40-ft. base, using the same old material; possibly it may be built higher. The staging, which is to be seen in various pictures, was built for the purpose of taking samples of smoke while the Cottrell process was being tried out.

## Calumet & Hecla Social Service Work

The late Alexander Agassiz, who was president of the Calumet & Hecla Mining Co., was a man of broad vision, who gave much attention to the men employed by the company. Under his direction the manual-training school in connection with the Calumet public-school system was established; he built the magnificent library at Calumet and stocked it; the company bathhouse was the outgrowth of his suggestion when the library was built; and through his efforts the employees aid fund was organized and operated successfully for many years. By this fund the workers not only received the best of medical and surgical service, but hospital and pharmacy service as wéll, and partial compensation when kept from work by illness. The story of the work of the fund is in itself a fine illustration of the employees' appreciation of properly directed efforts toward their welfare. The compensation act passed by the last legislature is but an enlargement of that principle, applied in a different way. That law, of course, takes the place of the aid fund and the company is now working out a system of industrial insurance with the balance of this fund as the nucleus.

Early this spring the Calumet & Hecla commenced the erection of a new hospital to do service for the various properties in the vicinity of Calumet. It will cost close to $200,000 when completed and equipped. There will be none better in the country. It will be fitted with every device of a serviceable, efficient hospital of the most modern type. This will replace the present hospital which is today the largest in the copper country.

In connection with the erection of the new hospital the company had planned the organization of a corps of trained nurses, some of them domestic-science experts. These nurses were to work among the families of the workingmen. To be sure the great majority of the families have no need for their services, but there are, nevertheless, among the thousands of families, always a good many where the domestic problems of the household are more than the wife and mother can work out unaided. These trained women were to teach the others efficiency methods in the homes. In connection with this same social-service work, a row of cottages will be built at Eagle River or Eagle Harbor, on the shores of Lake Superior. These are to be utilized in the summer time for the benefit of the wives of employees, and are planned to give such as are sick rest and recreation under conditions which are likely to insure more speedy recovery.

Plans had been laid before the strike was called, July 23, to elaborate the clubhouse idea. The directors of the Ahmeek had already authorized the expenditure of the money necessary for the erection of a clubhouse for the workingmen at Ahmeek. Five or six others were to follow, one at Isle Royale and Superior, another at Centennial and others in the vicinity of Calumet. These clubhouses were to be erected by the company, but managed by the men, a small fee being charged to convey the rights of proprietorship to the members. These clubhouses will yet be built and will be equipped with reading rooms, gymnasiums, with complete paraphernalia, running track, baths and whatever else experience may indicate as necessary.

It is planned to make these clubhouses the centers for social life among the workingmen. In many of the outlying districts the men have a limited choice of diversions when they are through with their work. Athletics of all sorts will receive every encouragement. Indicative of this feature it may be stated that an inter-mine baseball league had been organized and was operating successfully before the calling of the strike. Manager MacNaughton personally offered a suit of clothes to every man on the winning team, and the men in the mines were talking baseball in real earnest. It is believed that similar interest could be aroused among the men in basketball, handball, boxing and indoor-track team work.

To those who point out the difficulties that are certain to be encountered in the actual working out of these social-service endeavors, it may be stated that quite as many difficulties seemed to stand in the way of the success of the library, the company bathhouse, the aid fund and every other similar effort, when it was started, and while there have been a few abuses of the privileges granted, they are insignificant and the majority of the men have appreciated the opportunities and are anxious to take advantage of them.

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## Keeping Personal Accounts

### By A. H. Sawyer*

The average recent graduate from technical schools usually has no experience in book-keeping and usually has little theoretical knowledge of the subject. The object of the mining business, in common with all business, is to make money, and it is essential that those in charge should be well informed regarding accounting methods. Here, as in other lines of endeavor, proficiency can best be attained by practice.

Many engineers neglect the study of accounting until they are placed in charge of important work, and while they may learn it then, it is far better to have an understanding of it beforehand. This is shown by the fact that many managers of mines have been selected from the accounting rather than the engineering department.

The keeping of one's own personal accounts affords excellent practice in book-keeping, for while the items differ, the accounts are essentially similar. It has the additional value of showing one's financial condition and encouraging businesslike and economical habits. Too elaborate a system of book-keeping should not be attempted, at least at first, as it soon becomes burdensome and is likely to be discontinued.

A small note book may be ruled for the essential accounts, which are the Journal, Cash Account and Ledger. These accounts can best be explained by means of an illustration and for that purpose we will assume that John Doe, a recent technical graduate, has been engaged by the Sunset Mining Co., at a salary of $75 per month; that he has $110 in cash when he arrives and that he opens a checking account with the nearest bank and deposits $100. The following transactions are supposed to have taken place. Mr. Doe engages a room with board, buys clothes and boots amounting to $13.50, which is charged to him, and starts work on the first of July. On Aug. 1 his board and room rent, amounting to $25, are due and are paid by check. During July, Mr. Doe spends $5.75 cash for incidentals and also subscribes for a technical paper. His first payday comes on Aug. 15, when he receives a check for $74.50 from the company, the $0.50 having been deducted for hospital dues.

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*Redridge, Mich.

On Sept. 1 the books might appear as follows:

| 1913. | JOURNAL | Dr. | Cr. |
|---|---|---|---|
| July 1 | Miners Nat'l Bank.... | 100 00 | |
| | John Doe | | 100 00 |
| | Expense, Shirt, $1.50, Trousers, $5.00 Boots $7.00 | 13 50 | |
| | Mercantile Store Co. | | 13 50 |
| Aug. 1 | Sunset Mining Co. Labor in July. | 74 50 | |
| | Profit & Loss | | 74 50 |
| " 1 | Expense, Board & Room, July 1–Aug. 1. | 25 00 | |
| | Miners Nat'l Bank | | 25 00 |
| " 15 | Mercantile Store Co. | 13 50 | |
| | Miners Nat'l Bank. | | 13 50 |
| " 31 | Profit & Loss. | 74 50 | |
| | Expense | | 49 25 |
| | John Doe. | | 25 25 |

CASH BOOK

| 1913 | | Dr. | 1913 | | Cr. |
|---|---|---|---|---|---|
| July 1 | Cash on hand | 10 00 | July 31 | Incidentals | 5 75 |
| " 10 | Miners Nat'l Bank | 5 00 | " | Expense, Eng. & Min. Journ | 5 00 |
| | | | " | Balance (Red ink) | 4 25 |
| | | 15 00 | | | 15 00 |
| Aug. 1 | Bal. forward | 4 25 | Aug. 15 | Miners Nat'l Bank | 74 50 |
| " 15 | Sunset M'g. Co. | 74 50 | | Balance (Red ink) | 4 25 |
| | | 78 75 | | | 78 75 |
| Sept. 1 | Bal. forward | 4 25 | | | |

LEDGER

Miners National Bank

| 1913 | | Folio | Dr. | 1913 | | Folio | Cr. |
|---|---|---|---|---|---|---|---|
| July 1 | Dep. | J 1 | 100 00 | July 10 | Ck. No. 1 | CB 1 | 5 00 |
| | | | | " 31 | Bal. (Redink) | | 95 00 |
| | | | 100 00 | | | | 100 00 |
| Aug. 1 | Bal.fr'd. | | 95 00 | Aug. 1 | Ck. No. 2 | J 1 | 25 00 |
| " 15 | Dep. | CB 1 | 74 50 | " 15 | Ck. No. 3 | J 1 | 13 50 |
| | | | | | Bal. (Redink) | | 131 00 |
| | | | 169 50 | | | | 169 50 |
| Sept. 1. | Bal. fr'd. | | 131 00 | | | | |

Sunset Mining Co.

| 1913 | | Folio | Dr. | 1913 | | Folio | Cr. |
|---|---|---|---|---|---|---|---|
| Aug. 1 | Labor | J 1 | 74 50 | Aug. 15 | | CB 1 | 74 50 |

Expense

| 1913 | | Folio | Dr. | 1913 | | Folio | Cr. |
|---|---|---|---|---|---|---|---|
| July 1 | Dry goods, etc. | J 1 | 13 50 | Aug. 31 | | J 1 | 49 25 |
| " 31 | | CB 1 | 10 75 | | | | |
| Aug. 1 | Room & Board | J 1 | 25 00 | | | | |
| | | | 49 25 | | | | 49 25 |

Mercantile Store Co.

| 1913 | | Folio | Dr. | 1913 | | Folio | Cr. |
|---|---|---|---|---|---|---|---|
| Aug. 15 | July Acc. | J 1 | 13 50 | July 1 | | J 1 | 13 50 |

Profit & Loss

| 1913 | | Folio | Dr. | 1913 | | Folio | Cr. |
|---|---|---|---|---|---|---|---|
| Aug. 31 | | J 1 | 74 50 | Aug. 1 | | J 1 | 74 50 |

John Doe

| 1913 | | Folio | Dr. | 1913 | | Folio | Cr. |
|---|---|---|---|---|---|---|---|
| | | | | July 1 | | J 1 | 100 00 |
| | | | | | | CB 1 | 10 00 |
| | | | | Aug. 31 | | J 1 | 25 25 |

TRIAL BALANCE

| 1913 | | Dr. | Cr |
|---|---|---|---|
| Sept. 1 | Cash | 4 25 | |
| | Miners National Bank | 131 00 | |
| | John Doe | | 135 25 |
| | | 135 25 | 135 25 |

In practice a check register is used which, in many ways, takes the place of the journal or, in fact, is a journal of all transactions involving payment by check. In this case the journal proper is reserved for only those entries necessary for closing the books. This is an excellent method, but is not shown as beginners are likely to learn more rapidly by making regular journal entries of all transactions other than cash.

It must be remembered that items entered in the debit column of the journal should be debited to the proper account and similarly, items credited should be credited to the proper account.

In the cash book, however, items debited in the journal should be credited in the cash book, and those credited should be debited to the proper account. This is often confusing until it is remembered that the journal is simply a record of transactions, or day-book, the items being set down in the order of the transactions. The cash account is, however, a true account and formerly was a ledger account similar to others. It has been made an account of original entry simply to save time and labor.

In our illustration some of the entries might be made differently and perhaps more properly. For instance, the charge against the Sunset Mining Co., of $74.50 for labor, should really be $75, and the $0.50 entered as an expense. As the dues for medical attendance are monthly, however, it simplifies matters to consider the salary to be $74.50. Then, too, the entry of $5.75 for incidentals in the cash account might be itemized, but this is rarely done. It is preferable to keep a petty cash account and enter only the total in the cash book.

In the illustration, the expense account is not balanced in July. This is simply to show that it is not necessary to do so at the end of each month, but it is the usual custom and should certainly be done by beginners.

The trial balance, as its name implies, is for the purpose of testing the accuracy of the books; that is, to prove that for each debit there is an equal credit. In it are set down the balances of those accounts in which there is a balance after the books are closed.

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# Precipitants of Metallic Sulphides

As the result of a series of experiments conducted for the purpose of throwing light on the solution and precipitation of the metals, as influencing secondary enrichment, Frank F. Grout (*Econ. Geol.*, August, 1913), finds that it is rather difficult to reprecipitate silver and copper sulphides as against native metals. Attempts to form sulphides from dilute acid solutions, under conditions like those assumed to exist where the process is going on in nature, were singularly disappointing. Similar results followed the attempts to form the sulphides by evolving $H_2S$ from minerals, with the idea that it also would precipitate sulphides. But if these minerals, such as pyrite, chalcopyrite, sphalerite, pyrrhotite, stibnite, etc., are treated with a dilute alkaline solution and an acid solution of copper or silver added, the sulphides of these metals will be precipitated. These conditions seem to correspond with those in nature; there must be a zone in which the acid solutions resulting from surface leaching, meet alkaline solutions formed at depths where alkaline minerals occur and oxygen is not present, and in this zone, precipitation and secondary enrichment might readily occur.

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# The New Mill at the Globe Mine, Dedrick, Calif.

By A. A. Willoughby

The Globe Consolidated Mining Co., at Dedrick, Calif., had practically completed its new milling and cyanide plant in the middle of August and expected to be in operation by the first of September. The construction of the mill, cyanide plant, aërial tramway and new water flume has been in progress since last fall. The change in management recently brought about radical changes in the original plans. Wallace MacGregor, general manager of the company, is in active charge of construction and will direct the mining and milling operations. He has had much experience in Western mining, particularly at Goldfield. J. W. Rutherford is superintendent of construction. He has had similar experience in the construction of the Mexican mill at Virginia City, Nev., and at the Black Oak, at Soulsbyville, Calif., and other smaller plants.

The 20-stamp mill will embrace the newest ideas in mill practice. The cyanide plant is the second all-slimes plant installed in California, the Black Oak plant being the first. The ore will be thoroughly sampled after passing through the Gates breaker, before reaching the stamps, which is comparatively recent practice in California. From the stamps the crushed ore will pass to a Dorr classifier and thence to a 22x5-ft. tube mill of the closed circuit type. The remainder of the mill equipment includes three Dorr agitators, four thickeners, an Oliver 16-ft. filter and three sump tanks.

The ore will be delivered to the mill by a 6000-ft. aërial tramway, built on a steep incline describing a vertical drop of 2500 ft. This is said to be the second longest aërial tramway installed at a metal mine in California. The one at the Balaklala copper mine in Shasta County is five miles long, but it is not so steeply pitched. The recent installation at the salt mines of the Saline Valley Salt Co., in Inyo County, is 13 miles long and passes over a mountain at an elevation of 8700 ft., representing a drop of about 5000 ft. in a distance of six miles from the mountain to the railroad; but this drop is not so unusual as that at the Globe mine.

The plant will be driven by water power generated by eight water wheels. The water is furnished through a 6000-ft. flume newly built. The flume will carry 25 cu.ft. of water per second and the wheels will be driven under a 150-ft. head. The water is delivered on the opposite side of the cañon from the flume to an inverted siphon installed in the cañon, thus delivering the water to the wheels. The lumber used in the construction of the flume was transported from the sawmill by means of a cable carriage, a simply devised aërial tram, rigged for the purpose.

The entire plant is substantially constructed, and required careful planning, as the mill site is on a steep-pitched hillside. The whole surface equipment is under one roof, from the ore bins to the sump tanks. This covering is necessitated by the heavy snowfall and the long winter season. The mine is situated in Dedrick district, at about the center of the north half of Trinity County. Much of the district is practically inaccessible in the winter seasons. Dedrick is 80 miles northwest from Redding, the nearest available railroad shipping station. The wagon roads from Redding and other points are fair as far as Junction City, but from that point to Dedrick, a distance of 13 miles, the road is a typical cañon road, mostly rough and extremely narrow, so that travel is rather hazardous. A daily stage service is maintained; and during the past summer an auto-stage service to Weaverville, a distance of 25 miles. The mine owners contemplate the improvement of the road to Junction City.

During the period of construction of surface equipment the mine has been under systematic development. No. 6 tunnel in the Bailey ground adjoining has been advanced and a raise will be driven to connect with the Globe working situated at greater elevation. A temporary two-bucket tram is employed to carry the ore from the Globe through the Bailey crosscut for delivery to the mill. A large tonnage of ore is blocked out and ready for extraction and direct delivery to the mill.

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# Influence of Calcite in Manganiferous Gold Veins

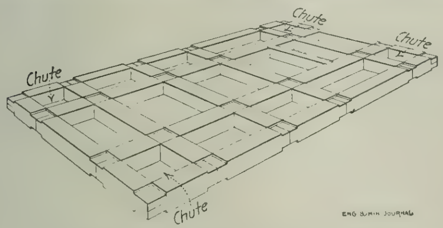
A few years ago, W. H. Emmons in discussing the influence of manganese in gold deposits developed the theory that in a manganiferous vein the tendency was for the gold to be dissolved by free chlorine liberated by the manganese salts formed during alteration, the gold being precipitated at the ground-water level, so as to give an enriched zone in the vein; in a nonmanganiferous vein, on the other hand, the tendency was for the gold to be eroded with the vein material and to form placer deposits. Discussing this theory in the *Philippine Journal of Science*, April, 1913, F. T. Eddingfield notes the point that Emmons' discussion applied to noncalcareous deposits and that certain discrepancies which occurred in the application of the theory were almost always cases of calcite-bearing veins. It happens that many gold-quartz veins in the Philippines contain considerable amounts of manganese and calcite. Examination and experiment indicate that Emmons' theory does not apply to these veins. On account of the presence of calcite, the mine waters are neutral or alkaline at practically all horizons above the ground-water level, which would prevent the formation of free chlorine. Furthermore, if nascent chlorine were generated, it would attack the calcite before the gold, while if gold chloride should be formed, at least some of the gold will be reprecipitated almost immediately by ferrous sulphate produced by the oxidation of the pyrite which is present. The theory was borne out by laboratory experiments and is also found to correspond with the facts as observed in the Islands. Thus in all the examples cited the richest ore occurs at or near the surface, the concentration being due simply to the removal of the other elements in the vein, and, so far as observed, the value of the vein decreases with depth, there being no enrichment at the ground-water level.

# DETAILS OF PRACTICAL MINING

## Shaft Jacketing in Heavy Ground

In order to relieve side pressure on the shaft when heavy ground is encountered, an arrangement like that shown in the accompanying illustration is employed in Butte. It is usual to raise around the shaft and place these jacket sets after the shaft is sunk; but in some cases they are carried down with the sinking (A. I. M. E. Bulletin, August, 1913). The purpose of the jacketing is to give room for men to work in removing ground to ease the timbers and to provide chutes through which the material removed can be shot down to the station below. The small corner compartments are usually used for chutes. The rock is usually extremely fine and can be picked out. If any of the outer jacket timbers break they can be easily replaced without disturbing the main sets of the shafts.

Sometimes the shaft sets are pushed out of line. In such case, vertical stringers are wedged to three sets all around. The jacket timber of the middle set, which it is desired to bring back to line, can be wedged against these stringers, while the blocks between them and the shaft timbers proper are removed. It is then possible to bring the shaft set to line by means of a bar and new, shorter blocks can be fitted between the shaft set and the jacket timbers. With one set lined up, the operation is repeated on the next one out of line.



Jacket Timbering in Butte Shafts

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## Qualities of Machine Drill Bits

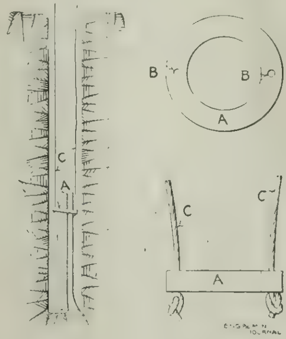
A good bit for use on machine steel should embody the following points, according to a booklet sent out by the Ingersoll-Rand Co.: (1) It should take full advantage of the chipping and fracturing quality of the rock; there is a certain depth to which the rock will be fractured when struck by a sharp tool, and if the edge is driven deeper or if it is dull, it will merely crush the material; (2) the wings should be as thin as is consistent with "mudding" and standing-up quality, since if the wings are heavy there is not sufficient space for the ejection of the cuttings; (3) the bit should be so designed that the cutting edge is its greatest diameter, since, in this manner, it will be always free in the rock at all times, the rock having a tendency to fracture a little bit larger than the length of the cutting edge; (4) the bit should be symmetrical, so as to allow equal wear on all corners, since otherwise the longest wing will cut a groove in the side of the hole and result in rifling and, furthermore, the wear will be unequal and extra strains set up in the steel will cause greater breakage; (5) the heat treatment should be suitable, precautions being taken not to overheat or to work while too hot; light, rapid blows should be used for forging, and tempering should be properly done, it being advisable to allow the bits to cool thoroughly after forging and to reheat for tempering.

⁂

## Removing Broken Drill from Hole

By George A. Addy*

An exceedingly ingenious and useful scheme for removing the bit end of a broken drill steel from a hole, is illustrated herewith. It consists simply of a ring of square iron *A* of a suitable diameter to slip over the broken steel. Two holes *B* are drilled on opposite sides of this ring and a stout cord passed through these holes and knotted on the lower sides. The ring is slipped over the steel in a down hole, and by loosening one cord and pulling on the other, the square corners of the ring grip the steel so that it may be removed. In case it is desired to use the device in a flat hole, one of the holes *B* is drilled large enough to take the pointed end of a scraper, and this tool is used in slipping the ring over the steel.



Ring and Cords for Extracting Broken Bits

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## Electric Signaling from Moving Cage

In the collieries of the Ostrau-Karwin district, various devices are installed for giving signals from a cage moving in the shaft, according to the *Colliery Guardian*, Aug. 22, 1913. Where the electrical method is in use, two systems are possible. In either case a bare wire runs through the hoisting compartment, mounted on insulators, forming one branch of an electrical circuit, the other branch of which is the hoisting rope. In one system current is furnished by a battery, and in the other by a magneto on the cage. Where the battery is used, the occupant of the cage gives the signal by touching the bare wire with a metallic conductor, so as to complete the circuit. In the other method, a trolley mounted on the cage is in continual contact with the bare wire, while signals are given by turning the handle of the magneto.

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*Park City, Utah.

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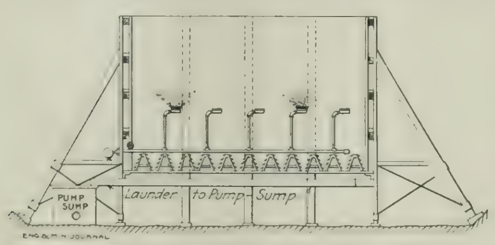
## Spray Cooling Tower

The accompanying drawing shows the cross-section of a cooling tower in use at the South Mine, Broken Hill, Australia. It is designed on rather novel lines, the water to be cooled being admitted in the form of a spray, as shown, so that most of the contact between water and cooling air occurs while the water is suspended in a finely divided state, instead of while it trickles over inclined surfaces and drops from their edges, as in the ordinary type of cooling tower (*Min and Eng. Review*, Nov., 1912). The tower has inclosed sides and admits the cooling air through the bottom. The bottom itself consists of a series of launders into which the water is conducted by louvered frames. By means of transverse launders, the cooled water is conducted to the boiler sump.

Excellent results have been obtained from this type of cooling tower, attributable to the following conditions: (1) The air has a large and unrestricted inlet to tower through the bottom only; (2) the sprayed water meets an equal supply of air in all parts of the tower; (3) the air and the vapor outlet is not contracted at the top and, therefore, there is a minimum restriction to the passage of the air; (4) the air is not retarded in its upward passage by the apparatus which is used to distribute the water, as is the case in most towers.



SECTION OF COOLING TOWER USING SPRAY SYSTEM

As illustrated, the tower draws in the air by natural draft, but if desired it may be built lower and the draft furnished by wind shields disposed about the lower portion below the launders and louvers.

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## Safety Rules—Ladderways*

(1) There should be provided in addition to mechanical means of ingress or egress at least one means of outlet for the miners, by means of ladders, from the lowest workings of the mine to the surface.

(2) All ladder compartments should be separated from hoisting compartments by a tight wall.

(3) The surface outlet of all ladder compartments should be properly protected with self-closing doors.

(4) All floors of sets in stopes and every shaft, winze, raise or incline steeper than 35° from the horizontal through which men are obliged to pass should be provided with ladders and ladderways.

(5) All ladders should extend at least four feet above the sollar or landing, and if this is not practicable iron staples or handholds should be provided.

(6) Substantial platforms should be provided at intervals of 20 ft. or less. Under no circumstances shall any ladder extending backward from the vertical be permitted.

(7) Defects in ladderways should be reported immediately.

(8) It is a serious offense to remove a ladder that is used as an exit.

(9) Use care in placing ladders before using them. If there is danger of a ladder's slipping, have someone hold it.

(10) Any ladderways, raises or manholes found unprotected or out of repair should be at once closed and kept closed until put in repair or temporary repairs made and danger signals provided until put in repair.

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## Types of Headframes

### By H. L. Botsford*

The structures erected over shaft collars to support and guide the hoisting rope and its conveyance, and to provide facilities for handling the hoisted material, may be classed as follows: (1) Tripod; (2) simple tower; (3) two-post; (4) four-post; (5) A-frame; and (6) special buildings for ore treatment, which also serve to support the sheaves.

The tripod can be considered a rudimentary headframe. It is well adapted to preliminary prospecting and exploration where hoisting is in buckets. It is cheap and easy to erect, being made usually from round poles obtained in the vicinity.

The simple four-post tower may be of two types, namely, symmetrical with regard to the hoisting engine, or unsymmetrical, having the two posts toward the engine more highly inclined. Fig. 1 illustrates an example of the first type. The four posts which comprise the main frame are battered equally. This particular frame is constructed of timbers built up out of 2-in. planks and is designed for a 3-ton hoisting load. In Fig. 2 the second type is illustrated. This is superior to the first in giving a larger base and thus being a more rigid structure.

The two-post type, which is extremely popular in Western mining districts, is illustrated in Fig. 3 with a rather elaborate example. The height of this particular headframe is noteworthy, as is also the size of the timbers. Considered merely as a support for the sheaves, it is the most economical type for work above the field of the tripod. It is evident that if the unsymmetrical four-post headframe, Fig. 2, had its two sets of posts brought together at the top and the front posts made vertical it would be a two-post headframe. The bracing in this two-post type is simpler than in any of the four-post designs and is easily computed by graphic methods.

The four-post type, Fig. 4, is really a tower with back braces, except that the original four posts are often

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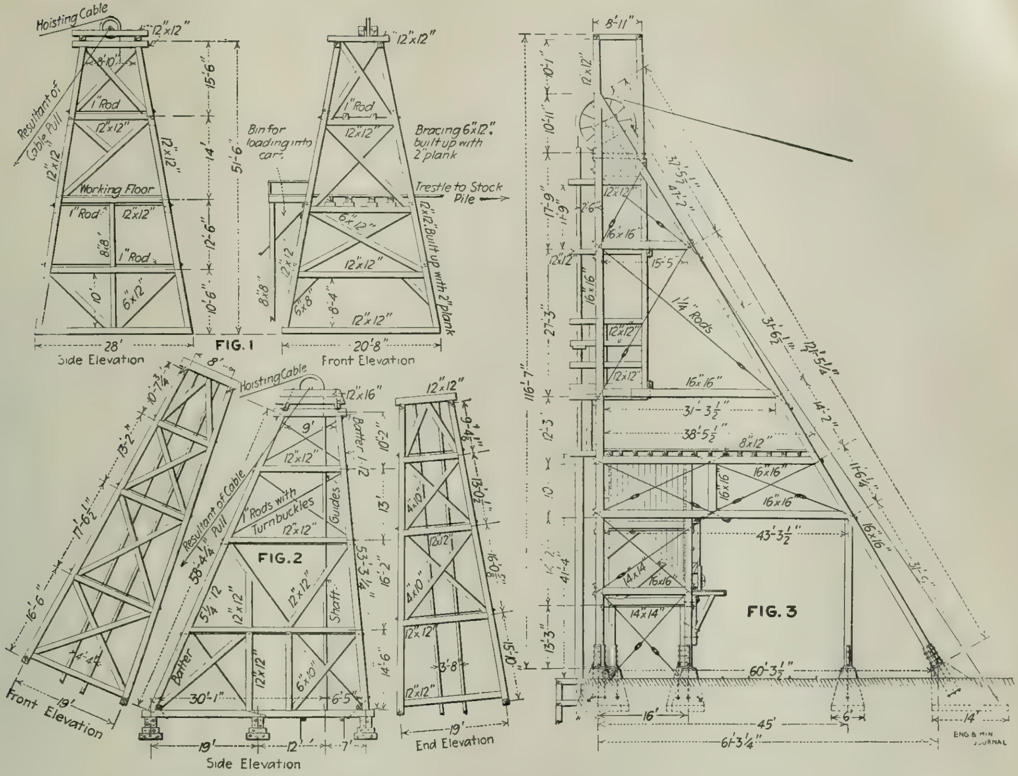
*From Inland Steel Co's book of rules.

*Mining engineer, Creighton Mine, Ont., Canada.



Symmetrical and Unsymmetrical Four-Post Towers and Two-Post Headframe

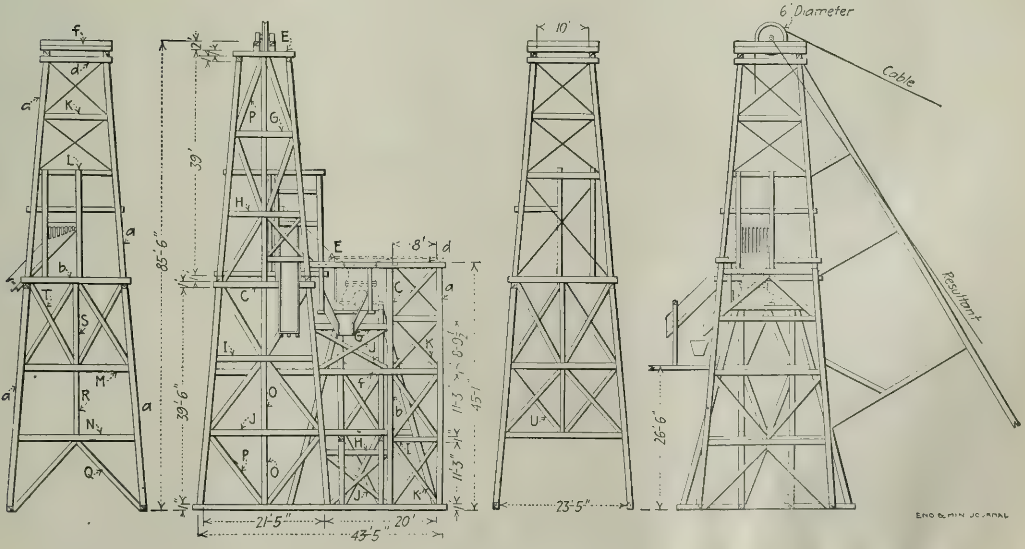


Fig. 4. Four-Post Headframe

made vertical. It is especially suited to shafts approximating a square, where all the hoisting compartments are not in the same line. It is also particularly available where heavy work and high headframes are required. It is less economical in the use of material than is the two-post type, but it is extremely convenient, especially for supporting the guides, the dump plates of the skip and the sheaves.

The A-frame type, unillustrated, is used in the case of an inclined shaft and gets its name from the fact that the front posts have a batter to correspond approximately with the inclination of the shaft. Special buildings for ore treatment are really combination headframes and crusher plants, such as are found in the rock houses of the Lake Superior copper country. The design of such buildings entails more attention to the crushing machinery than to the hoisting features, and requires special knowledge of the machinery to be installed.

In a headframe pure and simple, where no crushing machinery is included, the stress of greatest importance is that produced by the weight of the hoisted load and its rope, and the weight of the structure, including sheaves and loaded bins. The stress due to the weight of the rope and its load will be equal along the rope in the shaft and along the rope to the engine, and the resultsant of these two stresses will bisect the angle between the two-ropes. The position of this resultant with regard to the members of the headframe is a matter of great importance. If it falls inside the base of the structure, there will be no tendency toward overturning and the posts and back braces will all be in compression. If it falls in line with the back braces, these will be in compression and the posts will be neutral. If it falls between the engine and the back braces, there will be a greater or less tendency to overturn, and the front posts will be in tension. When this latter is the case, attention must be paid to the anchoring of the front post into the foundation and to the weight of the foundation itself, this being one of the principal forces opposed to overturning.

In the symmetrical four-post tower, the resultant will rarely fall within the base of the structure, unless, as in the Joplin district, the engine itself is carried in the headframe or close to the post. In the unsymmetrical four-post tower the resultant may be more easily brought within the limits of the base, if desired. In any event, it lies nearer to the back braces and the overturning moment is consequently decreased.

In the two-post type it is good practice to keep the resultants either in exact line with the back braces or between the back braces and the front posts. When the resultant is in line with the back braces, these carry the entire pressure and no stresses are transmitted through the bracing; the front posts merely support the weight of the structure and its attached load. The four-post type, being heavier, tends by its own weight to resist overturning, and the resultant may be safely placed between the back braces and the engine, thus taking advantage of the heavy construction.

[It is, of course, possible by placing the engine near the shaft to keep the resultant always within the base of any structure. Other considerations often prevent this; but one point which is sometimes dwelt upon should never be considered. It is assumed that the shorter the arc of contact between the sheave and the hoisting rope, the less the bending stresses in the rope. This is entirely a fallacy, since when the rope has once taken the curvature of the sheave, which it will do with an extremely small arc of contact, much smaller than is ever attainable in practice, any increase in the length of this arc does not increase the bending stress, since the relation between the wires is maintained until the rope leaves the sheave. For this reason there is no advantage in keeping the engine some distance from the headframe in order to reduce the arc of contact. To illustrate the fallacy of this argument, consider the sheave and the drum or reel. The rope is wound many times around the drum or reel and continues to revolve in this position, yet no one would maintain that the bending stress is increased by this operation.—EDITOR.]

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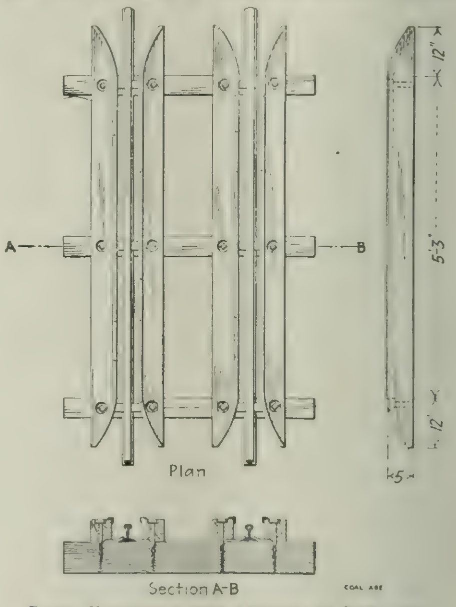
## Rerailing Device for Cars

The automatic rerailing device shown herewith is successfully used for mine cars in electric-haulage service at the Shamrock mine in the Herne district, Germany.



PLAN, ELEVATION AND SECTION OF RERAILER

It is described in the "Zeitschrift fur das Berg- Hütten- und Salinenwesen," Vol. 61, No. 1, according to *Coal Age*, Sept. 13, 1913. The guide blocks consist of oak posts about 5 in. square and 7 ft. 4 in. long, beveled at the ends to direct the car wheels. These rerailing blocks are usually placed behind the switch and fastened to the ties by wood screws. On the inside they are faced with angle irons, about 1½x1½x¼ in. in size.

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**Fir Timber Is Used for All Shaft Work in Butte, Mont.** This may be either Pacific Coast fir or what is called native fir, from Idaho or Montana (A. I. M. E. Bulletin, August, 1913). The latter seems to be the tougher wood, but it is hard to obtain clear lumber in the lengths and sizes necessary for shaft work. Some of the Anaconda shaft timber has been treated with creosote, but this practice has not become general since the ground of the camp is so heavy that the timbers usually crush before they rot. The sizes of timber most common for shaft work are 12x12, 10x12, 10x14 and 12x14. The new Leonard shaft, however, is timbered with 14x14-in. wall plates throughout.

# DETAILS OF METALLURGICAL PRACTICE

## Safety Rules—Construction Operations*

(1) In new construction or repairs, the surrounding premises should be kept as clean and orderly as possible. Boards should not be left with nails sticking up in them.

(2) Men working on high elevations from which they are liable to fall, should, where practicable, wear a safety line and belt.

(3) Men working overhead should not drop any material without giving warning to those below. When it is necessary to work above or below other men, those men should be notified. Men working overhead shall place a sign, "Danger, Falling Material," on ground below them. When the light is not sufficient to enable these signs to be readily seen, a red lantern must be placed thereon.

(4) Exercise great care in piling brick on scaffolds to prevent the former from falling. See that toe boards are in good condition.

(5) Do not overload scaffolds.

(6) Keep out from under material being hoisted.

(7) All shafts in which brick is being hoisted should be sheeted so that slings cannot catch.

(8) Be certain that signals used when hoisting material are thoroughly understood.

(9) Never place men at work under masons if it can be avoided; if necessary to do so, provide covering over men working below.

(10) Use care in placing a ladder; if there is danger of slipping, have someone hold it.

(11) Do not go up or down a ladder without the free use of both hands. If material has to be handled, use a rope.

(12) All scaffolds, whether swinging or otherwise, when higher than 10 ft. from the ground, shall be provided with a railing. On swinging scaffolds the railing may consist of a rope or cable attached to the supporting ropes of the scaffold. The planking of the scaffold shall be secure and cover the entire space between the supporting ropes. To prevent planks slipping from the stringers there shall be a hole in the planking on the outside of the stringers, through which a bolt shall be placed.

(13) Every employee before going upon any scaffold should see for himself that the scaffolds and its supports are properly built. Sufficient time at all times should be allowed to each employee to make this examination.

(14) Wire rope shall be used for lashing, except where liable to slip, or where raising light-weight material. In lifting heavy pieces, double lashing shall be provided, and, where practicable, double tackle shall be used. In all cases the man in charge of the work shall ascertain, if possible, the weight of the material to be hoisted, and, before raising, the man in charge shall carefully inspect the tackle and lashing.

(15) Chain or rope sling should not be used at any place where cable can be used.

(16) When necessary to use runway and horses, employees should see that they use sound lumber, that runways are at least 24 in. wide, cleated underneath and on top of the sides, to prevent slipping of the workmen, and well braced so as not to teeter.

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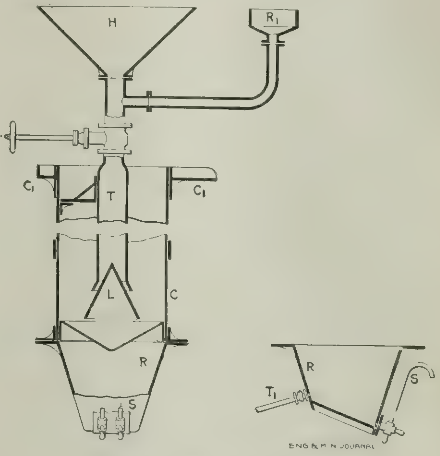
## A New Hydraulic Classifier

A new type of classifier has recently been introduced in Central America and Brazil, with, it is believed, satisfactory results. It is the invention of G. Michel, of Paris, and constitutes a distinct departure from classifiers involving the use of cones, spitzkasten, spitzlutten, etc. Before describing the apparatus, it may be interesting to refer briefly to the principle on which it is based. In the case of sand containing several constitutents of different densities, it is the custom in mechanical preparation, to class it according to size by the aid of screens. Examining the law of the free fall of bodies in water, it is found that all bodies falling freely in a medium of density $X$ acquire a velocity $v$, which at the beginning of the fall is represented by the formula



A NEW HYDRAULIC CLASSIFIER

$$\frac{dv}{dt} = g\left(1 - \frac{X}{D}\right)$$

$D$ being the density of the grain. When the speed becomes uniform if the height of the liquid column permits this, this uniform speed becomes in water

$$v = 2.44\,a\,(D - 1),$$

$a$ being the diameter of the hole through which the grains will pass. A short table is herewith given, showing the speeds in meters per second of certain grains at the beginning of the fall and after certain periods.

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*From Inland Steel Co.'s book of rules.

It will be seen that it is necessary, in order to obtain a constant speed of grains of the same size, to have a liquid column of constant section and of a sufficient height. If in carrying out the inverse operation one gives to the liquid column a uniform vertical movement directed from the bottom to the top, and a convenient height to enable the grains of largest size to obtain their constant speed, an apparatus is obtained by which it is possible to carry over those portions of light density and to collect at the bottom of the liquid column the grains of largest specific gravity.

In practice it is not sufficient, in order to separate the larger grains by difference in density, to utilize simply a liquid column in movement, because of the necessity of reducing to a minimum the eddies, and also the friction against the boundaries of the column. It is necessary to employ a cylindrical column of appropriate diameter to avoid sharp bends and present the least surface of resistance, and also to insure a sufficient section to minimize the friction of the grains against themselves. In liquid classifiers dealing with grains of comparatively large diameters it is hardly necessary to take much notice of the phenomenon of surface tension, but this point becomes important when dealing with fine sand. Its effect is due to the fact that the surface of a liquid in contact with air or any other gas presents a resistance to rupture and grains having a density higher than that of the liquid actually float on the surface without being able to break it. To avoid the inconvenience of the surface-tension effect it is necessary to introduce the grains which are to be classified into the interior of the liquid column so that they may break the pellicule forming its surface. Moreover, to maintain a constant speed of the liquid column and to avoid the production of eddies it is indispensable to accomplish the removal of the classified products in such a way that there are no eddies set up and no alteration in the speed of the column. It is also indispensable for the same reasons to maintain a constant feed of the material classified and of the liquid.

SPEED OF MINERAL GRAINS FALLING IN WATER

| Diameter in mm. | Nature of grains | ⅛ Sec. | ¼ Sec. | ½ Sec. | 1 Sec. | 2 Sec. |
|---|---|---|---|---|---|---|
| 15 | Galena | 0.903 | 1.441 | 1.630 | 1.650 | 1.650 |
| | Pyrites | 0.825 | 1.174 | 1.287 | 1.293 | 1.293 |
| | Quartz | 0.570 | 0.767 | 0.801 | 0.817 | 0.817 |
| 4 | Galena | 0.704 | 0.814 | 0.823 | 0.824 | 0.824 |
| | Pyrites | 0.586 | 0.643 | 0.646 | 0.646 | 0.646 |
| | Quartz | 0.383 | 0.409 | 0.409 | 0.409 | 0.409 |
| 1 | Galena | 0.409 | 0.413 | 0.414 | 0.414 | 0.414 |
| | Pyrites | 0.321 | 0.323 | 0.323 | 0.323 | 0.323 |
| | Quartz | 0.203 | 0.204 | 0.204 | 0.204 | 0.204 |

These considerations being noted, reference may be made to the accompanying drawing, showing the construction of the Michel hydraulic classifier. It will be seen that it consists of a vertical cylinder *C* of appropriate height and diameter, at the center of which is fixed a tube *T* in communication with a hopper *H* in which the mixture of water and mineral to be classified is placed. Between the tube and hopper is placed a regulating valve and the liquid containing the mineral grains in suspension passes first down the tube *T* onto a cone *L* and then upward again through the outer portion of the cylinder *C*. The grains are cleared of mud and fine sediment, and the latter particles are carried up with the constantly upward flowing water to an annular trough $C_1$ from which a regulated discharge is effected. The particles of heavier specific gravity separate and fall on an inverted cone at the base of the cylinder *C*. This cone has numerous holes in it whereby the classified particles fall through into a reservoir *R*. This reservoir is furnished with one or more siphons *S*, by means of which the classified matter is quietly and regularly withdrawn. In order to compensate for the water which is drawn away in this manner along with the classified particles, a pipe $T_1$ is attached to the receiver by means of which a stream of compensating clear water is introduced simultaneously with the withdrawal operations of the siphons. In this way disturbance of the main flow is avoided, and there are no eddy currents or speed alterations. The cylindrical form of the apparatus allows material in movement to obtain and preserve constant speed of rising for each grain during the whole of its upward course. The cone *L* has the function of uniformly spreading the flow throughout the whole circumference of the cylinder and in conjunction with the valve has also an effect in regulating the speed. In order to further insure a constant rate of feeding, an auxiliary reservoir fitted with a float valve $R_1$ is attached to the central tube. With this provision it is found that the Michel classifier is capable of doing good and uniform work, and is said to have been adopted with success by the Darien Gold Mining Co., of Central America, and by the Conquista Xicao Gold Mines in Brazil.

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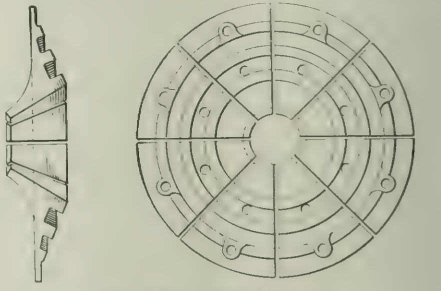
## Convex End Liner for Tube Mill

With the usual end liner used in tube mills, the function is simply to prevent wear to the greatest possible extent. A new device, however, has been produced by H. C. Holthoff, U. S. pat. No. 1,018,320, the object of which is to assist in the grinding operation. To accomplish this object, the liner casting is made convex, as shown in the accompanying drawing. Grooves or corrugations are placed in the casting, concentric with the entrance and discharge openings, for the purpose of catching and holding pebbles, thus forming a wear-reducing lining of itself, as is the case with the El Oro lining. End liners of this convex shape are said to prevent the exit of the larger ore particles and pebbles, throwing them back toward the center of the mill where they perform more grinding.



TUBE-MILL END LINING

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**The Substitution of Oil for Coal in British Warships** as was recently announced by the British Admiralty is of interest to Canadians because the possibility of furnishing a supply from the Canadian oilfields is being considered. For several years the output of the Ontario oil wells has been diminishing, and the expectation that Canada can supply any considerable portion of the British naval requirements is not warranted so far as the known oil resources of the older provinces are concerned. There are however, indications of oil in many parts of the West, especially British Columbia. These oil lands are on public domain and the prospect held out by the Admiralty's policy of a steady market for the output will be a stimulus to investigation both by the Government and private parties.

# THE ASSAYER AND CHEMIST

## Permanganate Titrations

By Donald M. Liddell*

A point which is ordinarily overlooked in certain determinations with permanganate, is the effect of the filter paper on it. This does not refer to the lime titration, where the filter paper and calcium-oxalate precipitate are usually dropped together into a weak sulphuric acid. Although it is probable that the fading out of the permanganate pink on long standing is due to the slow action of the filter paper, it is doubtful whether this source of error cuts any great figure in the short time necessary for this titration.

The effect I refer to is in those determinations in which sulphide or hydroxide precipitates are dissolved from filter papers by comparatively long acid treatment. In these cases it is certainly unsafe to proceed with permanganate titration on the solution, unless it be carried down to sulphuric-acid fumes, or unless a large excess of permanganate be added, and the solution boiled.

While the cause of this is obscure, it is probably due to acid converting some of the cellulose of the filter paper (or perhaps some of the starch which usually is found in paper) into soluble compounds, probably into one of the sugars. At any rate, the difference in two duplicate iron titrations in which ferric hydroxide has been dissolved and washed off filter paper by comparatively long acid treatment, may apparently amount to 3 to 5 mg. of iron, between the determination which has been thoroughly oxidized before reducing, and that which is put straight through the reductor. A titration made after oxidation before reduction will often hold its end color for hours, while one made without oxidation will often fade in a few minutes, in addition to giving high results.

This error seems to be entirely independent of the method of reduction used, whether zinc or stannous chloride. Where determinations are made by difference, subtracting iron, it is obvious the other determination is also affected by lack of this precaution.

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## Manufacture of Filter Paper

Chemical filter papers are generally made on hand molds, while those used for other purposes are manufactured on cylinder machines. The carefully sorted rags, freed from metallic impurities, are boiled with caustic soda and are preferably bleached in chambers with gaseous chlorine after washing and breaking (*Chem. News*, p. 269, 1913). The ash in the purified bleached half-stuff ranges from 0.177% for colored cotton rags down to 0.039% for new shirt cuttings. The water employed must be of the purest description, but even then it generally introduces 0.02 to 0.05% of mineral matter into the paper. The beating is regulated according to the rapidity of filtration and fineness of retention desired. For analytical work the paper is extracted with hydrofluoric and hydrochloric acids and washed until the washings give no opalescence with silver nitrate. It is then pressed and hung in open sheds, where it is frozen to increase its porosity. If dried before freezing, the desired effect cannot be obtained. Extracted filter paper contains about 0.015% of ash. Extreme precautions are taken for the determination of the ash in chemical filter papers; the chief constituents are silica and calcium, aluminum and magnesium oxides. The rate of filtration is determined on a paper 6 in. in diameter, through which 6 cu. in. of water at 90° should pass in 140 sec. as a maximum, to 90 sec. as a minimum.

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## Determination of Lead in Unchilled Slags

By Richardson T. Wilder*

The following method was devised for the determination of lead in unchilled slags, which are being shipped to the local smelter from old dumps in the vicinity of Chihuahua. I shall first give the method used by the smelter's chemist and formerly by myself, the hydrofluoric-acid method, after which the method I have devised will be described in detail.

Half a gram of the slag is weighed into a large platinum dish and 10 c.c. of nitric acid, together with 10 c.c. of hydrofluoric acid. The dish is then placed on the hot plate and heated just below the boiling point for 15 or 20 min., or until decomposition of the slag is complete. Remove, cool and add carefully 5 c.c. of sulphuric acid. Replace on the hot plate and take down to heavy fumes. Remove, cool and transfer to a beaker of convenient size with cold water, and, after boiling and filtering, proceed as in the usual Alexander method.

The newer or sodium-peroxide fusion method is carried out according to the following description. One gram or more, according to the lead contents of the slag, is weighed into a nickel crucible of 35 c.c. capacity, and mixed with about four times its volume of sodium peroxide. Heat gently over a Bunsen or other suitable burner, and as soon as the bottom has fused a whirling motion given the whole will prevent spitting. This fusion requires but little heat and may be accomplished in about two minutes. Take a No. 5 beaker and add about ½-in. of cold water and then place the crucible therein on its side and quickly cover the beaker with a watch glass as the action is quite violent. In less than a minute the crucible may be removed and washed with hot water and then with concentrated hydrochloric acid, which will remove the black oxide of nickel from the crucible and leave it bright and clean. Wash again with water and transfer all washings to the beaker, when the solution should be about 1 in. in depth.

Place the beaker on the plate and bring to boiling. If not enough hydrochloric acid resulted from the washing of the crucible to clear the solution, add enough to make the solution a clear amber, at which point everything should be in solution. While at boiling point add 15 grams of ammonium chloride, and when this is all dissolved, add enough ammonia not only to precipitate the gelatinous silica, which comes down of a yellowish tint, but also some of the iron, which will show red. Now add hydrochloric acid, drop by drop, with stirring between additions, until the solution just clears and is a [illegible]ed. At this point there should be no trace of precipitated gelatinous silica as this will delay the filtering of the sulphide. The solution must be at boiling point to perform this neutralization.

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*Associate editor, "Engineering and Mining Journal."

*Chemist, Buena Tierra Mining Co., Santa Eulalia, Chih., Mexico.

Water is now added to a volume of 450 c.c. and hydrogen sulphide passed for 20 min. Place on the hot plate and heat until the solution becomes clear between the suspended particles of precipitate. If the neutralization was properly performed, the lead sulphide will come down black and not greenish or reddish, which happens when the precipitation is incomplete. A drop or two of ammonia at this point will generally correct this without throwing down any silica.

As soon as the solution clears, as above described, filter through a No. 597 or other loose filter of 12½ cm. diameter, and without any washing of the paper and contents, remove it and place in a No. 2 beaker.

Add 10 c.c. of nitric acid and a gram of potassium chlorate and boil until the sulphide is decomposed and the filter paper disintegrated. Now add 6 c.c. of concentrated sulphuric acid to the hot solution, which will not foam or spit as with hydrochloric solutions. Continue boiling till the solution becomes black from separated carbon and then add, by means of a small glass tube, used as a pipette, 1 or 2 c.c. of nitric acid.

This may be done through the lip without removing the watch glass. Evaporate again to concentration, and if the solution again turns brown or black, repeat the addition of nitric acid and add another small amount of potassium chlorate immediately after the addition of nitric. It may be necessary to make another addition of nitric, but usually three additions will leave the solution white on again taking to fumes. As soon as this occurs take to heavy fumes and remove, cool, dilute and filter cold through an 11-cm. close filter and finish the determination as usual.

After the previous operation nothing remains but a small trace of iron, lime, etc., and the mineral ash of the filter paper, besides the lead sulphate. For this reason the solution does not need to be boiled after dilution, and may be filtered cold. This not only saves time, but decreases the amount of lead lost on account of the partial solubility of the sulphate. Cold water may be used for the washes also. This method may, of course, be used on chilled slags and on any ore using the filtrate from the silica or a separate weighing. The time required is one hour and three-quarters.

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## Determination of Fluorine in Zinc Ores

A method for the determination is given by L. [illegible]ler, in *Oesterr. Zeits. Berg. u. Huttenw.*, 1913 (see "Journ. Soc. Chem. Ind.," July 31, 1913). Ten grams of finely powdered blende or calamine intimately mixed with 5 grams of quartz, and 100 c.c. of concentrated sulphuric acid are heated to 160° to 170° C. in a 300 to 400 c.c. flask placed in an oil bath, dry air being passed through the apparatus. The gases pass a U-tube filled with small dry quartz fragments, then a flask containing not more than 100 c.c. of water. A fresh flask is substituted after one hour: the operation is interrupted when silicic acid no longer separates. The liquid is evaporated to dryness in a platinum dish after adding 2 grams of potassium nitrate to destroy sulphurous acid. The residue is treated with water, 25 c.c. of strong ammonia added, and the solution boiled with calcium chloride, the precipitate filtered off, ignited in a platinum dish, treated with acetic acid, evaporated to dryness and extracted with hot water. The residue of calcium fluoride and silica is ignited and weighed, the latter is volatilized with hydrofluoric acid, and after again igniting the calcium fluoride is weighed. The first weighing is useful as a check, as the ratio of $SiO_2$ (taken by difference) and $CaF_2$ is 1:3.4. This figure is empirical. The results are stated to be low: about 3.5% of the fluorine present appears to escape estimation.

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## Rapid Determination of Phosphorus in Steel

A modification of the usual method of estimating phosphorus in low-phosphorus steel is given in *Journ. Soc. Chem Ind.,* July 31, 1913. The yellow ammonium-phosphomolybdate precipitate, obtained from the steel in the usual manner, is washed with 1% nitric acid until free from iron, and the nitric acid is washed out by means of 1% potassium-nitrate solution until the washings are free from acid. The filter and precipitate are then transferred bodily to a 200 c.c. flask, 20 c.c. of $N/10$ sodium-hydroxide solution and 2 drops of phenolphthalein are added, and the excess of alkali is titrated with $N/10$ hydrochloric or nitric acid until the last drop completely removes the pink color.

The following reaction takes place:

$$(NH_4)_3PO_4.12MoO_3 + 24\ NaOH = \\ (H_4)_3PO_4 + 12\ Na\,MoO_4 + 12\ H_2O.$$

Hence, 1 gram of phosphorus is equivalent to 31 grams of sodium hydroxide, or each c.c. of $N/10$ sodium hydroxide is equivalent to 0.000129 gram of phosphorus. Thus, when working with 1 gram of steel, the percentage of phosphorus is obtained by multiplying by 0.0129 the difference between 20 and the number of c.c. of acid used in titrating the excess of alkali.

The method has been found to give accurate results, in excellent agreement with those obtained by the gravimetric method.

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## Tantalum-Platinum Ware

According to British pat. 23,050 of Oct. 9, 1912, granted to Siemens & Halske, tantalum, or a tantalum alloy is plated, coated or sheathed with platinum. The coated metal combines the advantages of platinum and tantalum, and is suitable for all the purposes which have up till now been closed to tantalum on account of its property of oxidizing when heated in the air. The improved metal welds well with platinum, copper and a number of other metals.

# Rand Mining Accidents and Deaths in 1912

*SYNOPSIS—Figures on the accident death rate for 1912. Analysis of causes. Recommendations for prevention. Tabulation of results for the various mine groups.*

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The death rate due to accidents in the Witwatersrand mines in 1912 is the lowest in 10 or 11 years. Thus the rate for surface white workers, based on the men actually at work, is 0.8 per 1000; for white workers underground, based on the men actually at work it is 3.73, and the rate for all the white employees, based on the total number in service is 2.14. The corresponding rates for the natives are 1.72, 4.80 and 3.72. Combination rates are 1.53, 4.73 and 3.56. As might be expected, the death rate for the natives is higher than for the white employees, inasmuch as they are less intelligent and less careful about taking care of themselves. The rates for all mining in the entire Union of South Africa corresponding to the figures given are: 1.27, 4.49 and 3.22. The general Transvaal figure, 3.56, which may be taken as a criterion, is, as stated, the best obtained in the district since the year of 1901-1902, when a large amount of surface work was being conducted immediately after the close of the war. This rate is decidedly lower than the corresponding rate in the United States and somewhat higher than that for the Australian Commonwealth. The government mining engineer considers this far too high and attributes it to the following reasons: Bad health conditions, speeding up to secure large output, and anxiety to reduce working cost. His comments are as follows:

### Bad Health Conditions

Throughout the whole Witwatersrand the bad effects of miners' phthisis has now reached its climax; many of the best miners are dead, others have left or are leaving before reaching the worst stages of the disease, and a general panic has set in, preventing fresh miners from coming to the Rand from oversea. The mines now employ largely second-rate types of miners of mixed nationality who are short of the standard of experience and efficiency necessary for dealing with huge outputs and for superintending the work of ignorant natives. A careless and inefficient miner discharged from one property easily obtains work at another mine, and wanders up and down the Reef putting in bad work on a number of mines and assisting to increase the accident rate by his carelessness in dealing with explosives, weakening the strata with injudicious use of heavy machine drills and heavy charges of explosives, and taking little heed of the dangers of badly supported hanging wall.

In some of the deep-level mines a want of systematic artificial ventilation must also affect considerably the health of both white and colored miners, causing them to be listless and nonobservant, and reducing their efficiency and usefulness to a considerable degree. It does not seem possible that men who at the end of a day's hard work have to sit for an hour at a waiting station thick with dust and nitrous fumes, can day after day put in a good day's work, nor can a native who walks a thousand feet up a stiff incline every day be really physically fit for his work on the following morning. If health conditions were improved, better men would compete for the comparatively high mining wages on the Rand; both white and colored would put in a better day's work, and it is reasonable to suppose that more intelligent white supervision would tend to reduce the accident rate.

If these arguments were considered insufficient from a humanitarian point of view, it might be further urged that improved health conditions, by bringing better and more efficient miners, might tend to actually reduce working costs and cause larger profits to be made. Working under unhealthy conditions the efficiency of the unskilled miner must remain low, and a larger number of persons must be employed to do a certain amount of work than would be under normal conditions. As regards white miners, the skilled miner with all his faculties clear and in working order breaks more ground and uses less explosives than a mere laborer, and the difference between placing machine holes rightly or wrongly is great, and has a far-reaching effect not only on the immediate output from the mine, but on the future cost of timbering and supporting weakened excavations.

### Speeding Up to Secure Large Outputs

With increased stamps and mills, and increased depths to hoist from, "speeding up" has to be resorted to to secure a large output. From the consulting engineer down to the last joined gang of boys, every one is rushed, and so safety measures are apt to get scamped, stopes are not properly inspected or trimmed down, packs are neglected, and the contractor, urged to his utmost by those over him, take risks which never were intended to be included among "dangers inherent to the industry of mining."

We have cases where the white man gets killed or injured with his boys, thus sharing with them the result of his careless work, or where he strenuously endeavors to protect the natives under his charge, but in many instances these consequences fall only on the natives, the white miner being away at the critical moment or working elsewhere out of the actual danger zone. If speeding up and rushing mining work to extremes is responsible for accidents, the responsibility rests principally with the controllers of the mine who determine the output on a scale which is frequently in excess of the labor complement available and of the capacity of the mine and its shafts, and who have now to live up to the promises made to shareholders. The manager only increases his anxiety and trouble by forcing work to extravagant limits, the mine officials are averse to driving men and boys, and are incessantly worried with accidents to men and plant.

### Reduction of Working Costs

At the present time attempts to reduce working costs are carried too far, and economies in timbering, waste packing, pillar cutting, and other safeguards to underground workers all tend to increase the possibility of accidents. This department has more than once had to insist on an increase in the safety measures mentioned above, which has certainly for the present added to the working costs of the mine. In capital expenditure also a large saving can be and has been effected by straining

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Note—An abstract from the annual report of the Mines Department of the Union of South Africa.

mining risks to the utmost, and working a large area with a single shaft. The decrease, however, in efficiency and safety resulting from this departure from one of the most important rules governing mining, makes it improbable that any further attempts will ever be made to save money by mining with single outlet.

### Falls of Ground

Of the deaths underground in 1912, 35% occurred through falls of ground, and against accidents due to this cause and to explosives, the technical staff of the department is paying special attention. The beautiful strong hanging wall of the Reef that we have heard so much about in the past, has had its day and has served its purpose, and where formerly stopes were cleaned out and left bare for hundreds of feet, proper mining has now got to be undertaken with necessary filling, packing and timbering. As the deep levels are opened up and the pressure increases, the strain on small pillars and open stopes reaches the breaking point; areas give way on weak fault planes or over improperly supported excavations, pillars burst and stopes and levels crush, all causing increased expense at lower levels, and killing, injuring and frightening the underground laborers. This crush in the mines with its attendant accidents can be met only by systematic filling, packing and timbering, methods that will no doubt involve increased expenditure at first, but which will pay for themselves in the future.

### Methods of Support

Sand filling is fortunately becoming more general, but in many instances has been delayed too long; tremendous areas of worked-out ground having to be caught up before a mine as a whole can feel relief from the general strain.

Packing is still unpopular, and is seldom done systematically. Packs are expensive, a trouble, and to be efficient must be packed tight with waste, at times difficult to get. Proper packs are absolutely necessary to reduce our accident rate from falls of ground in stopes, and the criticism that packs anywhere near the face of a stope are necessarily blasted to destruction means bad blasting, bad pack arrangements or both. There does not seem to be any advantage in the few large packs built in the stopes of some of our mines where the pack takes days to build, and for some time resembles only a large pile of loose rock. The efficient pack for safety purposes is one that can be erected quickly under weak hanging to take the place of temporary timber as the stope advances, and which will absorb rather than resist pressure.

To fill and pack and keep the filling and packing close to the face, is the only safe system of working ground under pressure, as with the extensive and continuous mining that has been going on all along the Witwatersrand for the last twenty-five years, it is reasonable to suppose that the pressure in the mines is now greater than ever before.

It is unnecessary to comment on timbering in drives and shafts. Levels have got to be kept open, and traveling ways cannot be allowed to cave; so every working mine has got to attend to shafts and levels or cease to exist. Timbering in stopes, however, leaves much to be desired. In steep stopes loaded stulls should be put in more frequently, as close to the working face as possible. Speaking generally, the use of timber, more or less temporary, should be far more extensive for the protection of all persons working in or under working places, and temporary propping should be insisted upon. Temporary props get blasted out, but they have served their purpose and can be put in again when the next shift goes to work. The system in which a contractor does his own timbering is not a good one, as he is more intent on making a big profit than on taking safety precautions, and a large gang of native laborers is dependent upon what safety measures he may choose to adopt. A timberman cannot, on the other hand, be in every stope at the beginning of the shift, but the contractor should be encouraged to put in such props as are temporarily necessary until the timberman arrives to make a more permanent job of it. The question of an easily accessible supply of timber for all stopes is, speaking generally, in an unsatisfactory condition, and will have considerable attention from inspectors in the coming year.

### Air Blasts and Periods of Rest

The rock burst appeared prominently on these fields only some six years ago, and, like artificial ventilation, was enshrouded in a good deal of mystery. It is generally recognized that these pressure bursts are the result of altered strains and stresses due to large excavations and deep mining and intimately connected with faults, fault planes and other lines of weakness. Extra pillars, unless large enough to prohibit economic mining, would not appear to stop the danger, and at times increase it to a marked degree. The remedy is to fill and pack stopes, and to keep this filling and packing as near the stope faces as possible, to avoid stripping ore along fault planes where air blasts are occurring, and to sheathe drift and stope pillars in areas already under pressure.

I am afraid that any suggestion for giving workings a rest will meet with little sympathy, but it is a recognized fact that ground under pressure becomes uneasy after blasting, and if left for a while settles down, the cracks and bursts dying away as the strains are rearranged. By increasing the number of working faces a deep-level mine would be able to allow a settlement after blasting in its worst workings and avoid some of the dangers attendant on trimming down a working near uneasy ground.

### Machine Drilling

A fruitful source of accidents from falls of ground is the indiscriminate use by incompetent persons of heavy machines for stoping. Many stopes are tender and uneasy, and only require the jar of one or more heavy drills to bring large portions of the hanging wall down during working hours. Many persons do not appear to realize the bad effect that drills, even working at a distance of hundreds of feet, have on surrounding strata. Here again the rush for rock compels the use of a dangerous, uneconomical machine, as many a stope that could be worked safely with hand stoping and small blasts, becomes dangerous when stoping with machines and heavy blastings are carried on. The skilled miner with his better knowledge and training will only utilize his rock drill for breaking ground along the natural lines of weakness, calculating his holes to break a maximum of ground with a minimum of explosives, but the ordinary ganger of today, knowing the power at his disposal, often breaks indiscriminately into the foot or hanging wall, and ruins the supporting power of the inclosing strata.

The danger in shaft sinking where from 30 to 60 persons may be crowded together in a shaft bottom has caused this department to make every effort to minimize the risk of misfires. In the new regulations a rule has been included making it compulsory to have special supervision in a sinking shaft with arrangements for blowing over the shaft bottom with air or water under pressure as an aid to detect misfires after blasting. In addition to these precautions, a sketch taken after blasting, showing the position of all misfires and sockets, is also compulsory.

These precautions in shaft sinking have been adopted on several of the diamond mines for some years past, but whether their low accident death rate is due to these special safeguards entirely, or is caused by the absence of rushing methods and more careful mining, cannot as yet be ascertained. Certainly these new shaft-sinking regulations have met with a good deal of disfavor among managers partially, in my opinion, on the ground of the expense of the extra supervision, and partially from the suspicion that the Rand record in smart shaft sinking might be lowered by delays caused by these restrictions. A few representative persons appeared to be genuinely afraid of directing air or water under pressure into cavities containing fragments of explosives.

To show that sinking accidents can be kept within a reasonable limit, we have 6300 ft. of sinking done at the South Rand and Turf Mine shafts with a death rate far below the average for the Witwatersrand shaft sinking, all of which work was done at a fair speed and reasonable cost. As a prevention of misfires in shaft sinking especially, it has been suggested to employ a better fuse and a different method of charging and priming. This matter is worth attention and is being investigated. For the time being, at any rate, inspectors have inaugurated a special examination and blowing over of all shaft bottoms, including a sketch and the necessary extra attention that this method involves. This regulation will be given a fair trial and will be rigidly enforced.

### General Misfire Accidents

Accidents from misfires in stopes, raises, winzes and development faces are far too numerous, and, where practicable, the regulation governing the extra precaution to be taken in sinking shafts has been extended to these workings. Numerous accidents are still caused by the carelessness of the ganger in not properly examining his bench before rigging his machine and laying out new holes, and the department is determined to adopt the most severe measures to prevent and punish carelessness of this description. At times the machine man is killed or injured at his machine, sharing the risks with his boys, but more often he is away from the danger point, and death and injuries fall on the native workers alone, who have been left to themselves during the dangerous period of starting to drill a new round.

### Responsibility of the Properties

If the comparatively recent large amalgamations of mining properties have brought about any of the anticipated advantages to the owners, their accident death rates leave a great deal of room for improvement, as shown by the following figures: East Rand Proprietary Mines, 5.46 per 1000; Crown Mines, 4.28; Geldenhuis Deep, 4.05.

If my remarks contain criticisms against the owners and administrators of the Witwatersrand mines, it is only fair to make any deductions possible in favor of their increased attempts to reduce the mining death rate. The past year shows an improvement of 0.2 per thousand over 1911, and we can analyze the possible cause. It is not contended that inspection has been any more rigorous or useful than it was in the previous year, nor have the attendant dangers in mining been any less. Miners have been no better than they were before, neither has the native laborer become more intelligent. This small death-rate reduction must, therefore, be attributed to the united efforts of controllers and managers, who, in more ways than one, have given proof that they realize what large room there is for improvement. If the frank criticisms contained in these remarks draw their further attention, and secure, as in the past, their coöperation in remedying the evils indicated, a useful purpose will have been served. The department received continued assistance from those interested in mining in its attempts to reduce accidents, and is quite willing to acknowledge that among both owners and administrators there are men who regard the protection of persons an essential in mining. But, unfortunately, there is the passive resister, the polite person who talks nicely, but will do nothing, and against this class of man, if he will not advance with the times, the department intends to bring the full force of the law to bear.

The average death rates for Witwatersrand gold mines, grouped according to controlling houses, give the following comparisons:

| Group | Accidents | Deaths | Injuries | Death-rate |
|---|---|---|---|---|
| Farrar-Anglo-French | 224 | 115 | 190 | 4.82 |
| Johannesburg Consolidated Investment | 174 | 85 | 149 | 4.81 |
| Consolidated Goldfields | 234 | 93 | 199 | 4.74 |
| General Mining and Finance | 171 | 73 | 138 | 3.93 |
| Rand Mines | 434 | 147 | 345 | 3.72 |
| Robinson | 292 | 107 | 248 | 3.50 |
| Central Mining | 324 | 93 | 301 | 3.38 |
| Neumann | 159 | 40 | 139 | 2.84 |
| Goerz | 91 | 22 | 72 | 2.69 |

Of the individual mines the Jupiter had the highest rate, 9.41, and the Wolhuter the lowest, 0.40, a remarkably low figure.

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## New York Section, American Electrochemical Society

The first meeting of the season will be held at the Chemists' Club, 52 East Forty-first St., New York, at 8:30 p.m., Friday, Oct. 17, 1913. The subject for the evening is, "Some Applications of the Microscope to Industrial Work" and the program is as follows:

"Metallography of Carbon," G. A. Roush, assistant professor of metallurgy, Lehigh University; "The Microstructure of Raw and Manufactured Copper," W. H. Bassett, technical superintendent and metallurgist, American Brass Co.; "The Microscope in Mineralogical Analysis," Gilbert Rigg, research engineer, New Jersey Zinc Co.; "Some Remarks on Micrometry as Applied to Alloys," Dr. C. H. Mathewson, assistant professor of chemistry and metallography, Yale University.

These talks will be well illustrated with lantern slides and photographs. Any member is welcome to bring guests who may be interested. All members of sister societies who are interested in the subject will be cordially welcome at the meeting and are invited to participate in the discussion.

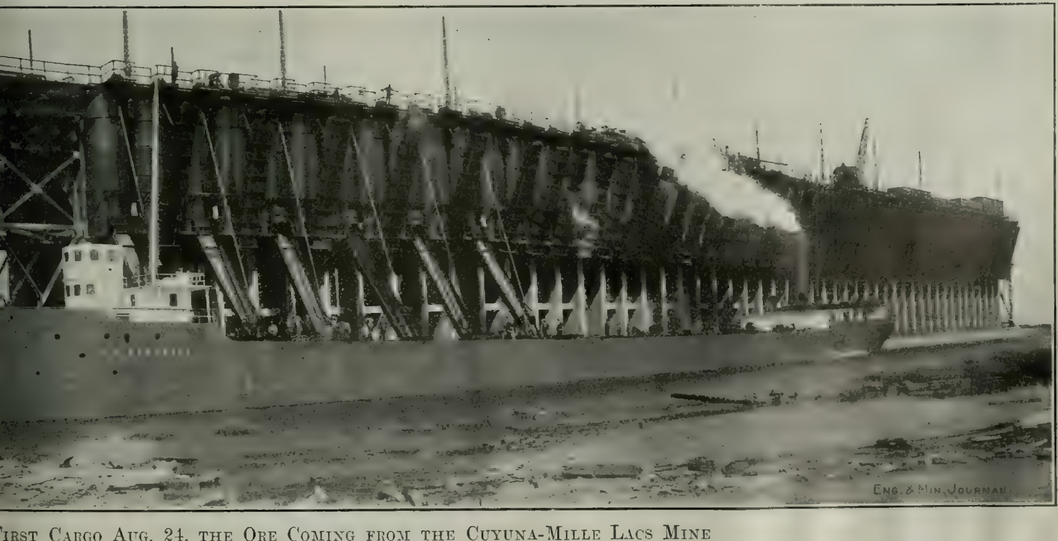
# PHOTOGRAPHS FROM THE FIELD

Substructure of New D. M. & N. Ry. Ore Dock, at Duluth, Will Be Largest in World and Cost $2,900,000

New Northern Pacific Ore Dock, at Superior, Wis. S. S. Saunders Taking the

Dock is of steel and concrete, 684 ft. long; steel approach, 300 ft. long; timber approach, 1200 ft. long; steel used in dock, 35 700 tons; bins have circular fronts, are equipped

Cottages at Sheep Creek Townsite of Alaska Gold Mines Co.



First Cargo Aug. 24, the Ore Coming from the Cuyuna-Mille Lacs Mine

440 tons, in approach 740 tons; concrete in substructure, 13,500 cu.yd., in bins 3400 cu.yd.; pockets, 102; total capacity. ith electrical hoists and Dickerson pocket doors.

## Across Alaska by Motor

United States army engineers have just completed a remarkable expedition in a motor truck, driving half way across Alaska to a point within two degrees of the Arctic Circle, the farthest northern point ever attained by a motor vehicle, and officially confirmed. The party drove from Valdez to Fairbanks and return, a distance of 826 miles, in 19 days.

The truck had been shipped to the Alaska road commissioners early in the summer. It was delivered in Valdez on July 26, and two days later it was started on the trail to Fairbanks, there to be joined by Lieut.-Col. Richardson, president of the Board of Road Commissioners, and other engineers. It left Valdez with a load of supplies and a quantity of mail for camps along the military telegraph line. Considerable mail was carried to points where none has been received in over a year. In order that the trip might reveal average conditions, the truck was not especially equipped, except in the matter of fuel and road tools. Food was carried for use only in the desolate regions, where there are no "road houses" or settlements.

Leaving Valdez in a drizzling rain, they crossed the delta of the Valdez glacier, and almost immediately entered Keystone Cañon, 14 miles long. After spending the night at a settlement known as Workman's, they resumed the journey through the cañon and began the real ascent on the trail over the Chugach Mountains, with a steady climb of 25½ miles to the summit at Thompson's Pass, an elevation of 3000 ft. While the temperature was decidedly lower at the summit, the danger of melting snow and ice was not entirely abated, and the truck ran into snow slides at four different places. Fortunately none was of great proportion, and the crew escaped with nothing worse than the extra work of digging themselves out. The descent from the summit was found to be much sharper than the ascent, and the truck rapidly descended into another delta region and forded half a dozen glacier streams before it reached a camp at Beaver Dam.

The next three days were spent on trails that have been opened in the last three years by the Alaska Road Commission in the deltas of the Copper and Gulkana Rivers. Corduroy trails, built of scrub timber, extremely rough and narrow at best, prevented the party from making rapid headway. For many miles the trail passed through dense scrub and beds of Alaska moss into which heavy objects would sink three feet or more.

Much time was lost on the banks of treacherous streams, fed by melting glaciers and churned by huge boulders whose exact location could be determined only by wading out into the stream before attempting to cross with the truck.

From Beaver Dam north the engineers experienced the greatest difficulties of their trip. Following the Copper River valley to the fork of the Gulkana, they traversed a vast area of delta land, where tractive conditions were worse than the region they had just left. The military trail, passing through a low and marshy country, was alternately covered with ice and glacier mud. In the worst places the wheels were wrapped with stout rope, and the truck had no difficulty in pulling through, but it was operated on low gear during the entire afternoon. To pass through several timber tracts it was necessary to cut down scores of trees and blast out stumps, rocks and ice.

Three days of constant trail-blazing and pathfinding brought the truck to Paxson, on the Gulkana River, in the foothills of the Alaska Range. Following the military trail straight north they began a gradual ascent into the ice-clad mountains of Alaska's principal range. According to the engineers, the grades averaged only 6%, but there were many places where it was necessary to climb a 16% grade on a rough surface of ice. At several points the grades were so steep and the turns so sharp that it was necessary to maneuver with the reverse gear to make the turns. No trouble was experienced in keeping the engine cool. In fact the cooling water did not boil at any time on the entire trip, despite long pulls on low gear.

The descent from the summit presented no difficulties other than the necessity for frequent inspection of the trail for considerable distances before driving ahead. After a long spell of cautious and skillful driving, they dropped down into the valley of the Delta River, and camped all night on the Guncreek flats, which were composed almost entirely of glacier mud and quicksand.

Leaving the flats there was a marked change in the character of the country. Flats and marshes were succeeded by giant boulders, subjecting the truck to fearful tests of distortion. Rain added to the discomfort. The military trail to the Tanana River passes a place known as Donnelly, and here the crew found evidence of real road work. A clay and gravel surface with a fairly good foundation began at Donnelly and lasted for 90 miles over a rugged country, with many stiff climbs and scarcely any snow or ice. While the surface was soft, it was easily negotiated by the truck.

The truck was carried across the Tanana River on a ferry to the town of McCarty, and then driven along the bank of the Tanana to Munson's. On the ninth day, after covering 379 miles from Valdez, it reached the northern end of the journey at the town of Fairbanks.

Three days were spent in Fairbanks preparatory to the return trip. The truck was again loaded with supplies and mail. Colonel Richardson took personal charge on the return trip and was accompanied by Superintendent Ingraham, Lieutenants Egerton and Steef, Thomas H. Parramore, Jr., and Homer Jones.

Leaving Fairbanks on Aug. 9, again in a downpour of rain, they retraced their route as closely as surface and weather conditions would permit. When they reached the Guncreek flats they found that the steady rain of three days had made the glacier mud very sloppy and wiped out the trail for considerable distances. Quicksand was also a constant menace. Despite the use of much brush and timber, the danger could not be entirely avoided, and the truck settled deep enough to lose traction. Similar conditions existed throughout the entire dash through the Gulkana and Copper River deltas.

Near Gulkana they met a military pack of six horses, an army field wagon, a buckboard, and a detachment of troops in command of a first lieutenant, sent out by the War Department to investigate an alleged gold strike on the Chisana River. Six horses were required to pull a two-ton load, and most of the load necessarily consisted of feed for the horses. Twenty-six miles south of Gulkana, at Willow Creek, they made a detour to Chitina, adding 68 miles to their journey and lengthening the return trip to ten days.

At Sheep Creek, just before reëntering the Keystone

Cañon, they were compelled to cut a swath in the woods for 500 yd. to avoid a bad washout caused by the torrent of a melting glacier. A bridge 12 ft. above the water when the truck crossed it on the outbound trip, had been completely carried away, and it was necessary to cut through the woods to a suitable fording place.

When they reached the Keystone Cañon the trail had been washed away in many places. Thousands of tons of rock and ice had been dislodged, and, in falling, had carried away bulkheads of solid stone supporting the trail. This forced the crew to fill in great gullies with stones before they could proceed. At the finish of the trip, on Aug. 19, the truck was again placed on the trail to carry supplies and mail to road camps and settlements in the vicinity of Valdez. Colonel Richardson said he believed that the road work contemplated by the Alaskan commissioners will make it possible to go from Valdez to to Fairbanks in four days next summer.

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## The Kennedy Extension-Argonaut Apex Suit

The most important mining trial ever occurring on the Mother Lode is the suit of the Kennedy Extension Mining Co. against the Argonaut Mining Co. for alleged trespass and extraction of gold ore from the plaintiff's property. The amended complaint brings the total amount sued for to more than $1,000,000, covering alleged accrued damages up to Jan. 1, 1913, according to the *Jackson Dispatch.*

The Kennedy Extension owns three claims east of the Argonaut claim, namely, the Muldoon quartz claim, adjoining the Argonaut claim, the Jackson quartz next and further east the Jackson placer. The Argonaut shaft has reached a depth of 4050 ft.; it is claimed that the south bottom levels from this shaft are under the placer claim owned by the Kennedy Extension, and that the ore in dispute has been taken from under the surface of this ground.

The suit hinges on a question of apex, it being claimed that the apex of the vein now being worked by the Argonaut company is in the Jackson quartz mine, 600 or 700 ft. easterly from where the Argonaut claims the apex in its Pioneer mine. The Kennedy Extension also contends that the ore fissure is east of a slate belt which runs through the westerly part of the Muldoon claim, and the easterly part of the Jackson quartz mine.

The complaint, until amended, set forth that the Argonaut company had for three years prior to Apr. 10, 1910, wilfully mined and extracted ore from plaintiff's ground to the extent of 50,000 tons, worth $500,000, and ore was then being extracted at the rate of 5000 tons per month. The levels were alleged to be closed by caves, dangerous and inaccessible, and for that reason, the exact tonnage could not be obtained.

The Argonaut company has admitted taking from under the surface of the Jackson placer something over 60,000 tons of ore, with a mill value of over $400,000, but it claims extralateral rights to this ore. In addition to this ore, the Kennedy Extension claims that the Argonaut took about as much more ore belonging to the Kennedy from outside the downward projection of the Jackson placer.

The Argonaut company says that no fact relative to the workings has never been concealed and that it has been willing to allow plaintiff the opportunity of ascertaining any facts connected with ore extraction. Admitting the caved nature of much of its worked-out levels, it states that such caves were from natural causes and not for the purpose of concealment. A denial is made that it is working more than one vein.

The Pioneer quartz claim, sold to the Argonaut Mining Co. in 1893, was located in 1859 and antedates by many years the locations of all other lands involved. From the date of location of the Pioneer to the commencement of this action, no doubt was raised as to the Argonaut company's right to lode patent to the Pioneer claim or its right to the ore mined or that it was not within its own territory.

The plaintiff company first received notice of the alleged tresspass through employees of the Argonaut mine, and formed a corporation with a capital stock of $700,000 for no other purpose, it is alleged, than to prosecute the case. The incorporators named were R. S. Penniman and James Hulme, of Berkeley, and H. G. Perry, of San Francisco. When this company commenced work to sustain its contention, the 800-ft. Muldoon shaft, long idle, was cleared out, retimbered and sunk 200 ft. Levels, crosscuts and general exploration work has been going on ever since in order to support the charge of trespass.

The Argonaut company, through its manager, R. S. Rainsford, has been diligent in protecting its interests since the filing of the complaint and has spent much money in underground work to make doubly certain that no mistake has been made in working the wrong vein. All dividends have been cancelled during the past three years and a large surplus accumulated.

Thus far the Argonaut's attorneys seem to be giving their opponents a free rein in the introduction of testimony. Many Kennedy Extension witnesses have already testified and over 50 exhibits have been introduced in its behalf, having largely to do with the title of the company and maps showing the underground workings of the two mines. A noteworthy feature of the trial is the lack of objections raised by the attorneys, the case being tried without much quibble or argument.

The trial is being reported by Willis & Stockton, of Oakland. They take down the evidence alternately and record it on a phonograph cylinder. This in turn is transcribed on a typewriter. Thus each side has the day's testimony written out for examination shortly after adjournment. Any oversight in the testimony can be corrected the following day.

Among the experts engaged are Messrs. George, Finch and Martin for the Kennedy Extension, and Messrs. Lawson, Wiley and Searles for the Argonaut. Perry & Dailey, Solinsky & Wehe, and Morrison, Cope & Brobeck are attorneys for the plaintiff, and C. H. Lindley, William J. McGee, W. E. Colby and Lillienthal, McKinstry & Raymond are attorneys for the defendant.

The Argonaut company, 15 years ago, in its action against the Kennedy Mining & Milling Co. for trespass, was compelled to prove that the apex of its vein was within the Pioneer lines. This was done at an expense of $30,000. The north end of the Argonaut was then involved. The present suit concerns the south end and the question of apex is to be fought over again.

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**The United States Quicksilver** output for 1912 is officially reported at 25,064 flasks of 75 lb. each. These are the U. S. Geological Survey's final figures.

# CORRESPONDENCE AND DISCUSSION

## Zinc Ore Prices

I have read with interest the editorial on the spelter situation in the JOURNAL of Oct. 4, in which it is remarked that the producers of ore now are having everything their own way. Let me correct the JOURNAL as to this. Many producers are, indeed, getting a large price for their ore, considering the price for spelter, but many of us who are selling on the basis of the average monthly price for spelter are not getting within $6 or $7 a ton of what the others are being paid and naturally we do not feel very good about this.

Joplin, Mo., Oct. 6, 1913. BLACK JACK.

[Our correspondent is correct in his statement, but he does not suggest the explanation, which is simple. In our remarks last week we referred especially to the status of the ore producers who are selling their output from day to day, or from week to week, upon competitive bidding. The shortage of ore and the sharp demand for it has for some time back reduced the difference between the prices of 2000 lb. of 60% ore and 1000 lb. of spelter to about $9. This is only a rough, convenient way of figuring the "margin." The actual margin is a little larger, inasmuch as out of 2000 lb. of such ore the smelter gets somewhat over 1000 lb. of spelter, but at the best he loses money on smelting alone at these prices. If all the ore supply were taken in at such prices, something would happen very soon.

Fortunately for the smelters, they have some sliding-scale contracts, entered into a long time ago, according to which the price for ore automatically falls with the price for spelter, leaving the smelter a reasonable margin always, although it may shrink along with prices. This is why some miners "are not getting within $6 or $7 a ton of what the others are being paid."

When these contracts, which are in all respects similar to the contracts for European and Australian ore, were made, neither party foresaw the situation that has lately developed in the ore market. On the contrary, it is scarcely more than a year ago that everybody was looking for a deluge of ore to come from Montana. The forecast respecting the quantity of the Montana ore was about correct, but nobody expected the checking of other supplies.

As it has turned out the producers who had sliding-scale contracts have failed to enjoy the high prices recently made in competition. However, those prices probably would not have been so high if all the ore had been free. In other times the shoe has been on the other foot, viz., the sliding-scale contracts have yielded the better results while the open ore has been a drug on the market. There is scarcely any kind of business in which anybody can reap all the profit all the time.

This thing is certain: The prices for ore must in the long run average so as to give the miner a fair profit and the smelter a fair profit. If they don't, something in the industrial chain will break. And when we talk about profit we do not mean simply the excess of income over immediate outgo, but we mean enough to pay back in a reasonable time the money invested in plant, whether it be mining plant or smelting plant.

Many operators in the Joplin district have neglected this principle, to their sorrow; but on the whole the district has been immensely profitable. Its mines have built a large, well equipped city, with many costly buildings and comfortable homes, many smaller towns, an excellent highway system, and many of the other things that go with civilization and betoken prosperity. All of this, together with substantial private fortunes, have come out of the mines. In late years, to be sure, the grade of the ore has declined uncomfortably, but by mining more of it the output of the concentrated product has been maintained. In this the producer of ore has been assisted by the improvements in the art of mining and also by about all of the improvement in the art of smelting. It is hardly more than 15 years ago that blende concentrate fetched only $20@25 per ton. The miner now thinks he is poorly treated if he does not get better than $40@50. How has this come about? How can the smelter pay $50 for the same ore that he obtained for $25 not many years ago? Simply that he has raised his percentage of extraction and reduced his cost of operation. Competition has compelled him to do that, but the same competition has compelled him to transfer about all the benefit to the miner about as rapidly as he has realized it. He has not done this philanthropically, but merely because he has had to get the ore.

Reverting to the present market situation, it is in no small degree attributable to the excesses of 1912. History has shown that whenever the price for spelter be boosted up into the realm of 7c. there is a penalty that has to be paid. Things are fine for everybody on the producing side while the going is good, but something ought to be laid by for the rainy day. It seldom is. After-complaints are likely to be those of the child who has eaten his cake. At present the sliding-scale miner is paying the penalty along with the smelter. The miner who is free to profit out of the necessities of the smelter is enjoying a sort of Indian summer.—EDITOR.]

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## Multiple-Spout Ladle Runner

In the JOURNAL of Sept. 6, p. 437, Ford's multiple-spout ladle runner is spoken of. This is apparently a double-spout affair, only. Mention is also made of multiple-sport runners in the copper business, as being old. Would it not be possible, by means of longer runners, to pour more than two streams of steel, as there is no need to pour equal amounts of steel in all the ladles, as it is with wire bars. Instead, conditions seem more analogous to those in ingot casting. Here, owing to the compactness with which the small molds can be placed, eight or 10 streams may be poured simultaneously.

COPPER REFINER.

Perth Amboy, N. J., Sept. 26, 1913.

# EDITORIALS

## Washoe and Great Falls

The Anaconda company is going to try one of the Great Falls converters at its Washoe works. It is rather curious that the metallurgists of the Washoe and Great Falls works, which have belonged to the same company for many years, and which treat the same kind of ore, have pursued such different lines. Washoe developed the long blast furnaces while Great Falls stuck to the old-fashioned proportions. Similarly, Washoe adopted the long, direct-fired reverberatories, which have been copied by many other smelters, while Great Falls adhered to its unique regenerative gas-fired furnaces. To be sure, the character of its coal supply had something to do with this. At last, however, Great Falls is going to try the long, big furnace but modified to the principles of recuperative gas firing. On the other hand, Great Falls has developed a peculiar type of converter, which Washoe has been slow to imitate.

It would not be right to imply backwardness on the part of either group of metallurgists, or the works under their direction. One excels in one thing, one in another. Environment, no doubt, has had a good deal to do with developments. Great Falls is a relic of old days, kept up to date but cramped and able to grow only with difficulty, while Washoe was the first in the new era of metallurgical construction, started when ideas first began to be big. Yet, recognizing all this, we cannot help being struck by the absence of uniformity in the technique of the two plants.

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## The Titaniferous Iron-Ore Myth

There has long been a semi-popular, semi-scientific belief that the titaniferous iron ores of the United States constituted a national resource of almost immeasurable extent, of no value for present use, but, in effect, a locked treasure house lacking only the key of metallurgical genius to render its stored wealth available for use, and to revolutionize the iron industry. Probably the rather vague ideas of most people on this subject took the form of the belief that by some metallurgical trick or new discovery the titaniferous ores could be utilized unmixed in the furnace in much the same way as other iron ores are at present handled. We publish elsewhere in this issue the conclusions arrived at by Mr. Singewald as a result of his study of this subject under the auspices of the Bureau of Mines. The Bureau has seldom done anything more useful than to authorize this investigation and issue Bulletin No. 64. We have previously printed the preliminary notice of the Bulletin[1] and also an account of an experiment undertaken on the treatment of titaniferous ores in the Adirondack region[2]. These three short articles taken together give a fair idea of the situation as it stands today.

Two prominent points are brought out by Mr. Singewald in his bulletin. First, that the deposits of this nature are much smaller and much less valuable than heretofore supposed; and, second, that their utilization will be a gradual process achieved slowly by various methods involving detailed modifications of existing practice, rather than by any stroke of original genius. Mr. Singewald states that the only two deposits of real consequence are those at Sanford Hill in the Adirondacks and at Iron Mountain in Wyoming. Subsequent to the preparation of the bulletin was the announcement of the McIntyre company to the effect that it intended to make an experiment on 30,000 tons of the Sanford Hill material. By the time this concentrating operation and furnace run is completed, it should be pretty well known what can be done with these ores, at least. It should be noted, however, that the Sanford Hill ore is more susceptible to magnetic concentration than most of the titaniferous ores. It is hoped, by the concentrating process, to take out at least half of the titanium and leave a product of good grade in iron.

We think perhaps Mr. Singewald is too pessimistic as to the possible use of other deposits. To a stranger surveying the field, the situation would seem to be not unlike that confronting the Mesabi operators when it was first attempted to utilize their finely divided ores. Their use, limited at first, became more and more extended, higher and higher proportions of the Mesabi ores being charged into the furnaces, until now that range dominates the American iron industry.

Similarly it is admitted that a certain amount of titaniferous magnetite can be smelted in a blast furnace without difficulty and without any particular changes in practice. It would seem to be extremely likely that this ratio can be increased as the handling of the ores becomes more understood. It would appear from Mr. Singewald's investigation, although of course no figures of actual tonnages even remotely correct can be given on deposits wholly undeveloped, that probably tonnage of titaniferous ores in the country is much less than the tonnage of the nontitaniferous oxides and carbonate.

It might not be far wrong to assume that the ratio in tonnages would be as one to seven, and if modern blast furnace can handle charges containing one-eighth of titaniferous ore, it would seem likely that the titaniferous deposits would become marketable and be consumed at about the same rate as the nontitaniferous ores, the high-grade ores, accessible, cheaply mined and subject to concentration being used first and the less desirable deposits coming into the market as the general grade of iron mined in the country decreased.

The deposits around Duluth and the Mesabi would seem to be particularly available after the Sanford Hill and Wyoming ore, inasmuch as the amount of titanium in these magnetites is exceedingly variable, some of the ores being practically nontitaniferous and others high in the objectionable element. The clean ores would naturally be mined first, and probably soon will be; it will then be a natural development to mine the neighboring ores with an increasing content of titanium. Titaniferous ores, of course, would probably always be penalized by the furnace men, similarly to the fine Mesabi ores and this should be considered a charge against operations, in estimating the value of the property.

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[1] Eng. & Min. Journ., Oct. 4, 1913.

[2] Eng. & Min. Journ., Sept. 27, 1913.

Another point brought out by Mr. Singewald is the fact that the grade of many of the titaniferous ores is lower than has been commonly supposed. Not only is the iron content lower, but of the total iron content only a certain part is available. The iron is present as magnetite, in the ilmenite and in the ferro-magnesian gangue minerals. If the ore is to be concentrated, most of the iron in the femic minerals goes into the tailings and also a part of the iron in the ilmenite, proportional to the amount of titanium rejected. Thus the iron content of the crude ore and the ratio of concentration are not sufficient data to estimate the iron recovery.

The question of the treatment of titaniferous iron in the electric furnace is one of great interest and importance. The McIntyre Company hopes to find an outlet for part or possibly all of its tailing, by selling it to ferro-titanium manufacturers. The demand for ferro-titanium is limited, however, and to absorb any great amount of high titanium tailing from magnetic concentrators would require a great expansion of the market. The electric smelting of the crude ore, either alone or mixed, so as to make a titanium steel, would seem to be a rather more promising line of attack.

We look to see the titaniferous ores come gradually into use and it is likely that the blast-furnace, the magnetic concentrator, and the electric furnace, will each play a part in their utilization. If not the source of inexhaustible wealth they were at one time supposed to be, they will nevertheless be a welcome addition to the mineral resources of the country, a small value, if real and immediate, being of more economic importance than a fabulous promise for the remote future.

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## The Use of Bucket Crossheads

Differences of mining practice in different regions, although conditions may seem identical, make up one of the many and interesting anomalies of the industry. A case in point is the choice between round and flat ropes, another is the use of crossheads with buckets. In many, if not most districts, it is considered advisable to apply a crosshead to the bucket rope in a vertical shaft where the hoisting is done by power. In some localities, however, notably in most parts of Colorado, it is deemed bad practice.

The crosshead is primarily a safety device. It is designed to prevent swinging of the bucket in the shaft and to damp the tendency to spin. In some cases it may carry safety dogs. Its desirability must therefore be considered from the safety viewpoint, and since the most important use of buckets is in sinking, the suitability of crossheads for this operation is a point of prime importance. In the ordinary wooden crosshead the rope passes free through a hole in the center. This is considered necessary in sinking, the crosshead being caught by stops at the bottom of the guides, while the bucket descends to the shaft bottom for loading. Evidently such a device not only can carry no safety catches, but may itself become a menace. For if it be accidentally caught somewhere on a guide and afterward loosened, as may easily happen, it will cause serious damage in the descent and a miner riding either the bucket or the crosshead will be in danger of his life. The danger can be reduced by making the crosshead of greater height, thus reducing the likelihood of its sticking on the guides. It can be obviated by making the rope fast to the crosshead and suspending the bucket therefrom. This allows the application of safety dogs and, if the bucket be suspended far enough below, is adaptable to sinking conditions. The distance from the crosshead to the bucket need not be enough to permit spinning or dangerous swinging. This long string, however, necessitates extra headroom for dumping.

The most elaboratly developed crosshead is fast to the rope under ordinary conditions, but includes a mechanism tripped by a stop at the bottom of the guide to permit the rope's passing through and the descent of the bucket to the shaft bottom, while the crosshead remains suspended. When the bucket is hoisted, it lifts the crosshead and the mechanism again locks in the rope. Such a device, of course, carries safety dogs.

We have then, the following possible methods of bucket hoisting: (1) Without any crosshead whatever; (2) with an ordinary crosshead loose on the rope; (3) with an ordinary crosshead attached to the rope and carrying the bucket; (4) with a safety crosshead attached to the rope and carrying the bucket; (5) with a safety crosshead ordinarily attached to the rope, but capable of release at any predeterminted point. As stated, practice in the matter shows great variation, partly because local conditions vary, but also largely because of traditions and prejudice. The Journal would be glad to publish intelligent discussion of this point.

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We wish that the Government bureaus and private companies who have lately become interested in the production of zinc ore in the country west of the Rocky Mountains, statistically and otherwise, would cease reporting output in terms of pounds of zinc. Such figures are next to meaningless, because there is no indication of how much zinc is really obtained. In fact, the percentage is rather widely variable. The unit of commercial interest is the ton of ore. If, in addition, the average grade of the ore may be stated, well and good. The talking about gross pounds of zinc has been very misleading to the inhabitants of the mining districts concerned in the matter. So long as it served merely to magnify in local minds the importance of the local output, making things look good, there was some amusement and no great harm. When, however, the same figures are used by the tax gatherer, the joke becomes less funny.

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Our financiers, who are upon occasions alarmed over the exportation of gold from the United States, are prone to forget the addition to our gold resources that our own mines are making all the time. The mines of the United States produce from $90,000,000 to $95,000,000 of gold annually. In addition thereto, our smelters and refiners produce about $20,000,000 annually from foreign ores and metallurgical products.

## BY THE WAY

The Geological Survey again reminds us that the price of gold is fixed by law at $20.671834625323 per oz. Will some sober and unprejudiced person look into the relationship of the error introduced by omitting the twelfth decimal and that corresponding to the probable error in weighing a single ounce of gold?

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To drop in one field the profits made in another is all too often the story of those who seek to exploit mines. Occasionally singular successes are chronicled, such as those that have attended the activities of P. H. Nelson, and G. Carlson, of Duluth. They have been successful in copper mining in Butte, in lead-silver mining in the Coeur d'Alene district in Idaho, and in iron-ore properties on both the Mesabi and the Cuyuna ranges. It was one of their Cuyuna range properties that was taken over by the Pittsburgh Steel Ore Co. last spring, and they have other proved properties in that new district.

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Karl Helfferich, director of the Deutsche Bank, has made a report to the Kaiser of the wealth of the German nation, showing an aggregate of $75,000,000,000 to $78,000,000,000. The wealth of France is placed at $60,000,000,000, of England at $57,000,000,000 to $65,000,000,000 and of the United States, at $124,000,000,000. The German per capita wealth is placed at $1100 to $1200, French, $1425, British, $1250 to $1385, and American, $1360. The annual income of the German people is reckoned at between $9,000,000,000 and $10,000,000,000, of which about one-sixth is used for public purposes.

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The following is an excerpt from an elaborate mining report: "GEOLOGY AND ORE ORIGIN: In order to open up a mine intelligently, to be competent to pass judgment on it as a prospect, and to be sure of discovering all the possible ore at contacts, in fissures, from parallel veins and shear planes, along feeders or robbers, spurs and angles, dikes and blind leads, then the geology, age and sequence in deposition of the various rocks in the vicinity as well as on the ground itself, all this is of paramount importance in determining the origin, occurrence and sources of the economic metals, how they came into their precent position and the further whereabouts of the channels filled by enriched thermal waters, welling up from plutonic sources." Oh, shades of Emmons and Clarence King!

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The versatility of one Western genius seems to leave small chance for anyone else in his town to make a living. A *verbatim* copy of his business card follows: "General contracting. Road building, cellars and cesspools, underground work, wells, tunnels and reservoirs. Team work, plowing, building and wrecking. Surveying, platting. Farm work and planting. Harvesting. Ditch and canal work, dredging and filling, town sights platted and sold. General mine development, old mines retimbered and unwatered. Mills, cyanide and general reduction plants erected and maintained. Oil and coal lands developed. We buy, sell, trade and lease. Mines and prospects. Mine and metallurgical reports, properties examined, mining corporation and maritime law. We buy, sell and exchange mines. We deal in oil and mining property. We deal in gypsum, potash, nitre and salt deposits. Mines handled under lease and bond. Copper mines, gold, silver, tin and lead mines. Large placer mines. Dry and hydraulic. Cement, placer and rich gravel channels. Oil lands for sale and lease. Have large lists of all classes of property. All kinds of mine and oil property wanted. Submit any proposition. We can handle it if anyone can. Stocks, bonds and securities."

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This touching tale, for the veracity of which we do not vouch, comes from a source that we do not know: "About 1660 a Spaniard, in Peru, named José Salcedo, fell in love with an Indian girl. He proceeded to do a thing almost unheard of in those times; he married her. Out of gratitude, her mother revealed to him a vein of silver of unexampled richness. He worked it, and drew from it considerable wealth—too much for his happiness, for his opulence excited the cupidity of the viceroy, Count Lemos, who had him charged with high treason, the penalty of which was death and the confiscation of all worldly goods. It was in vain that Salcedo demanded permission to appeal to Madrid, and offered to pay two ingots of silver daily during the 15 months that must elapse before a reply was returned. The Count refused, and hanged him in 1669. But the butcher got small good out of it. The Indians, intent on avenging their friend, destroyed the works at the mine, filled it with water, and concealed the entrance so cleverly that it could never be discovered. Neither promises nor threats could extract their secret, which remains so to this very day." This story is more romantic than those of the Gunsight, Pegleg, and several other "lost mines" of the American desert.

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A fatal shaft accident, so unusual in its nature as to deserve some special mention, occurred not long ago in the Speculator shaft in Butte. The account in the *Anaconda Standard* states that while lowering men on the four-deck cages, the men from the lower two decks of one cage were discharged at the 2400-ft. level and the cage then started for the 2200-ft. level. Soon after leaving the 2400-ft. level, the cage was felt to shake and a rumbling was heard in the shaft above; almost immediately a rock came into the top of the cage, striking and killing one John Maki and injuring John Yukovich. The rock, in some manner, bounded off more or less horizontally from the shaft timbers and so entered the cage under the bonnet. It would appear from this, that the use of bonnets on cages is not a complete protection against accidents from falling material. It is also a fact that rocks falling down a shaft will often bound out into a station, and accidents, as well as many narrow escapes have been known to occur from this cause. The remedy is plain, the sets in the shaft should be periodically and frequently cleaned of all material of a size sufficient to cause injury in falling. This is simple and inexpensive, as well as emphatically necessary, and should be as much a part of the mine routine as the inspection of cables and guides, legally enforced with a penalty for nonobservance.

# PERSONALS

Dr. [illegible] Heberlein will visit Mapimi, Mexico.

A. J. Eveland has taken offices at No. 42 Broadway, New York, for consulting practice.

H. J. Sayder, of Los Angeles, is examining mines in Butte and [illegible] counties, California.

F. Z. Burns of the firm of Simonds & Burns, New York, is in Colorado on professional business.

Allan J. Clark, metallurgist of the Homestake plants at Lead, S. D., was in New York last week.

S. B. Patterson, Jr., is mine superintendent for the Spanish American Iron Co. at Felton, Nipe Bay, Cuba.

F. F. Sharpless has gone to Nevada on professional business. He expects to be away about a month.

E. G. Spilsbury has gone to the Southwest on professional business, expecting to return about the end of the month.

Theodore Sternfeld is at Whitney, N. C., inspecting the works the Southern Aluminum Co. is building there.

H. V. Winchell returned to Minneapolis last week from Nevada and California. He intends to go to Colorado next week.

H. F. Wierum has returned from California, where he was engaged in the installation of the Hall process at the Balaklala smelting plant.

The services of Herman Garlicks, of New York, have been retained by the National Lead Co. to supervise the Collinsville smeltery and the Flat River mines.

Dr. Rudolf Diesel, inventor of the Diesel engine, disappeared while on his way from Antwerp to London. It is feared that he fell overboard during the night.

Robert Linton has left Los Angeles, Calif., to examine some mining properties in Gunnison County, Colo. After completing this work, he will go to New York.

Leon Perret, general manager of the Lenskoi Gold Mining Co., Bodaibo, Siberia, has engaged R. E. Smith as his chief technical assistant on the advice of C. W. Purington.

John Baker, formerly of the Cobalt-Lake Mining Co., Cobalt, Ont., has been appointed superintendent of the Peterson Lake mines in place of J. R. Graham, who recently resigned.

W. Gowland, emeritus professor of metallurgy at the Royal School of Mines, London, is about to publish, through Griffin & Co., a treatise on "The Metallurgy of the Nonferrous Metals."

C. H. Hitchcock, formerly with the Dominion Nickel Copper Co., and its successor, the Canadian Nickel Co. has resigned, and will take charge of the geological work of the Canadian Copper Co. in the Sudbury district.

Frederick G. Clapp, managing geologist of the Associated Geological Engineers, has returned to Pittsburgh where he will devote himself continuously for some months to the preparation of reports on foreign oil and gas operations.

Carl Zapffe, geologist in charge of Northern Pacific mining and exploration work in the Cuyuna District, Minnesota, testified in the dissolution suit against the Steel Corporation at New York. Hearings were resumed Oct. 1 and Mr. Zapffe was the first to testify.

William James, his wife, and Nels Nelson, the people who discovered gold in the Shushanna district, Alaska, have arrived at Dawson with $8000 in gold taken from the discovery claim, owned by James and Nelson, and William Johnson, of Dawson. Work at the diggings has ceased for the winter. James and his party are the first to come to the outside. They will winter in Seattle, Wash., and go back in the spring with a big outfit.

# OBITUARY

Andrew Jackson Maiden, better known as "Sourdough" Maiden, died at Fairbanks, Alaska, recently, aged 76 years. He was one of the oldest of Alaska prospectors, having gone to the territory 29 years ago in 1884, when there were only a few miners there, at Forty Mile and some other points along the Yukon. He was a prospector to the last year of his life. He leaves relatives in Roseburg, Oregon.

# SOCIETIES

**American Institute of Mining Engineers**—The October meeting, which is to be under the auspices of the Iron and Steel Committee, will be held on Oct. 16 and 17, in the United Engineering Societies Building, New York. Invitations have been sent out to the members of the following societies, through the respective secretaries, to attend this meeting and the dinner, which will be given on the evening of October 17: American Society for Testing Materials; American Iron and Steel Institute; American Society of Mechanical Engineers; American Society of Civil Engineers; American Society of Electrical Engineers; American Foundrymen's Association. Members of these societies have also been invited to contribute to the discussion of the various papers to be presented at the meeting.

1. W. A. Forbes, "Blast Furnace Gas Cleaning."
2. W. H. Blauvelt, "The Slagging Producer."
3. Prof. F. Peter (Leoben, Austria), "The Generation of Steam by Waste Heat from Furnaces."
4. G. C. Stone, "The Generation of Steam by Waste Heat from Regenerative Furnaces."
5. W. R. Shimer, "Over-Oxidation of Steel."
6. H. F. Miller, Jr., "New Design of Regenerators for Openhearth Furnaces."
7. Dr. Richard K. Meade, "The Use of Powdered Coal as Fuel."
8. H. R. Barnhurst, "The Use of Powdered Coal as Fuel for Metallurgical Furnaces."
9. W. S. Quigley, "The Use of Powdered Coal as Fuel."
10. E. Stuetz, "The Scoria Process for the Manufacture of Fine-Ore Briquettes."
11. Felix A. Vogel, "Briquetting."
12. Felix A. Vogel, "Use and Advantages of Briquettes in Blast-Furnace Practice."
13. R. H. Lee, "The Use of Nodulized Ore in the Blast Furnace."
14. H. M. Howe, "Discussion of the Existing Data as to the Position of Ae3."
15. H. M. Howe and A. G. Levy, "Determination of the Position of Ae3 in Carbon-Iron Alloys."
16. H. M. Howe, "Ae$_1$, the Equilibrium Temperature for A$_1$, in Carbon Steel."
17. G. K. Burgess, J. J. Crowe, and H. S. Dawdon, "Thermal and Microscopical Examination of Professor Howe's Standard Commercial Steels."
18. H. M. Howe, "The Divorcing of the Eutectoid in Meteorites."
19. R. R. Abbott, "The Influence of Various Elements on the Absorption of Carbon by Steel."
20. J. V. Emmons, "Some Phases of the Practical Treatment of Tool Steel."
21. W. E. Ruder, "Grain Growth in Silicon Steel."
22. J. H. Hall, "Shock Tests of Cast Steel."
23. G. H. Clevenger and B. Ray, "The Influence of Copper upon the Physical Properties of Steel."
24. J. H. Hall, "The Life of Crucible Steel Furnaces."

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## STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.

of The Engineering and Mining Journal, published weekly at New York, N. Y., required by the Act of August 24, 1912.

Editor, Walter R. Ingalls, New York, N. Y.
Managing Editor, Richard H. Vail, New York, N. Y.
Business Manager, Guy C. Townsend, New York, N. Y.
Publisher, Hill Publishing Company, New York, N. Y.
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Owners of 1% or more of Stock Issued

John A. Hill, 505 Pearl St., New York, N. Y.
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John McGhie, 505 Pearl St., New York, N. Y.
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G. Eugene Sly, 50 Union Sq., New York, N. Y.
Frederick W. Gross, 417 E. 11th St., Erie, Pa.
Alfred E. Kornfeld, 114 E. 71st St., New York, N. Y.
Emma B. Hill, 80 Munn Ave., E. Orange, N. J.

The balance of the stock issued (less than 1% each) is owned by 62 employees, one ex-employee, and 11 others who are wives, daughters or relatives of employees.

There are no bondholders, mortgagees, or other security holders.

C. W. Dibble, Vice-President,
HILL PUBLISHING COMPANY

Sworn to and subscribed before me this 29th day of September, 1913.

RICHARD L. MURPHY,
Notary Public
(My commission expires March 30, 1915)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Oct. 1

**California Has Had a Dry Season** this year in some districts, but in others there has been a sufficient supply of water for all purposes. Notwithstanding that it has been considered an unusually dry season the rainfall recorded is 24.70 in. compared with 21.63 in. in the previous season.

**The Option on the Hall Process** held by the Balaklala Consolidated Copper Co. has been extended for six months from the end of September. The actual tests that were delayed by the incompleteness of the gas plant at the Coram works and which were held up awaiting negotiations for the extension of the option will be resumed as soon as the new and larger gas holder is installed.

**At Stanford University** Dr. John Casper Branner was inaugurated as the second president, Oct. 1. Dr. Branner has for several months been acting president, having succeeded Dr. David Starr Jordan, who was made chancellor. Dr. Branner has been connected with the university and associated with Dr. Jordan for several years. Dr. Jordan was the first president that Stanford University has had. He was inaugurated 22 years ago on Oct. 1, 1891. Dr. Branner announced at the inauguration that he would retire at the end of two years when he will have reached the age of 65 years. He stated that he has no new policies to announce, no new theories to try out and no new reforms to use.

**California the Leading Gold Producer** in the United States in 1912, according to the Mint and records of the Western mining states, produced $20,008,000. Colorado produced $18,741,200, Alaska $17,198,600, Nevada $13,575,700, Utah $4,412,600, Arizona $3,785,400, Montana $3,707,900. While California has not produced as much gold in later years from deep quartz mines as in former years from the placers there has been a steady growth in quartz mining, and the state has had no great new camps developed since the discovery and development of the Randsburg district. Most of the increase in production in quartz gold has been from old mines either through progressive development and operation or the reopening of old mines which had been abandoned in the earlier years of quartz mining. It is an interesting fact that a large proportion of the gold from dredging operations is from the old placer and hydraulic mines that could not be worked to their full prospective capacity under the methods adopted before the introduction of gold dredges.

### DENVER—Oct. 4

**In the Mid-West Oil Case** Judge Hook of the U. S. Court of Appeals has certified the case to the Supreme Court without hearing arguments. The court will prepare in brief form the main questions involved, submit them to the highest tribunal in the land and then await the decision. The hearing will then be set again and after arguments a decision will be handed down by the Court of Appeals in accordance with the Supreme Court views on the vital issues. This action was taken to save possibly two years in court procedure.

**Regarding the Coal Strike** in a general way, the operators express themselves as satisfied and say that conditions are improving daily and that the production of coal is about 55% of normal. Most of the miners that went out were compelled to do so by threats of violence and death if they did not respond to the strike call and they would gladly return to work but for such threats. On this account strong pressure is being brought by the operators on Governor Ammons to send the militia into the southern field to protect the miners who go back to work. Equally strong pressure is being brought to bear by the heads of the mine workers, who tell the governor there is no reason for sending out troops. Thirty shots were fired into two camps this week, the bullets going through miners' dwellings, but nobody was injured. It is stated that this was done by the strikers, the operators having issued a statement to that effect, signed by five witnesses. "Mother" Jones is visiting all the southern camps and is making inflammatory speeches. On Oct. 3 one end of a shack in which Bulgarian strikebreakers employed at the Mitchell mine, at Lafayette, were boarded, was blown up by an explosion of a bomb hurled over the stockade that incloses this property of the Rocky Mountain Fuel Co. The bomb explosion was followed by 500 or 600 revolver and rifle shots. The attack was made when but few of the strikebreakers were on the surface at the mine and no one was injured. That same night an explosion destroyed the powder house and partly wrecked the company store of the Primrose Coal Co. at the Primrose mine, 35 miles miles north of Trinidad; 400 lb. of giant powder, stored in a small building adjoining the company store, was fired. The damage to company property is estimated at $3000. It is the theory of mine officials that a hole was drilled through the wall to drop the lighted fuse.

### BUTTE—Oct. 1

**Electrification of the Butte, Anaconda & Pacific R.R.** between the mines at Butte, and the Washoe smelting works at Anaconda, has been completed, and Sept. 30, two test runs were made over the line with an electric train.

**The Closing of the Washoe Works** at Anaconda was made necessary chiefly because of the condition of the flues. These have been cleaned out and the 10-year accumulation of material will be run though the furnaces. The work should be completed by another week and arrangements will be made so that more frequent cleanings can be made.

**Anaconda Agricultural Lands**, it has been announced, comprising about 500,000 acres situated in Lincoln and Flathead Counties, will be disposed of to prospective settlers. The principal part of this land was purchased by the Anaconda company from the Northern Pacific R.R. Co., which obtained it as a land grant from the Government. Although a large percentage of the land is covered with timber, yet much of it is valuable for agricultural purposes and will be sold to homesteaders on easy terms of payment.

### SALT LAKE CITY—Oct. 2

**The Output of Park City for September** totaled more than 6200 tons of ore and concentrates, which is slightly less than the average. The output for the first nine months of the year was about 70,000 tons, as compared to a production of 92,648 tons during all of 1912.

**The International Plant at Tooele**, since the blowing in of the fifth and last lead furnace a short time ago, has been running full blast. The copper furnaces have not been operated at full capacity on account of insufficient ores of this character. The Utah Consolidated has been sending approximately 500 tons of ore per day, as against previous shipments of 600 tons of copper ore.

**The Smoot Bill** was recently discussed by the committee on mines and mining of the Salt Lake Commercial Club which met Sept. 22 with Senator Smoot and others for the purpose of pointing out the objections which the metal miners of Utah have to the bill now pending before the Senate. The purpose of this bill is to perfect the title of states to school lands within their boundaries to which there may be objection preventing a valid transfer. The matter was discussed pro and con without arriving at an understanding. Another meeting is to be held, and an endeavor will be made to come to some agreement, if possible, as to the proposed law.

### CALUMET—Oct. 4

**Rioting and General Lawlessness** have prevailed throughout the north end of the Lake Superior strike district for the last week following the dissolution of the injunction against picketing and parading by Judge O'Brien. The injunction was granted by Judge O'Brien on complaint of the various mining companies, Sept. 20, and was dissolved Sept. 29. During the interval quietness prevailed throughout the district, but immediately upon the removal of the restraining order the trouble started with renewed vigor. Monday night, a party of about 50 men from the Ascher agency, employed as mine guards, arrived at Ahmeek, but did not disembark from the Pullman coach, owing to the mob that surrounded the train. The windows in the cars were demolished and the men returned to Calumet for the night. They were taken to Ahmeek early the next morning in automobiles, and in making the run, a fusillade of shots was fired from the surrounding hills and woods; some of the automobiles were hit by the bullets but none of the occupants was injured. Parties of hunters going into Keweenaw County were fired upon from ambush and one man received a gunshot wound in the shoulder while the chauffeur had the tip of one of his fingers grazed by a rifle bullet. As a result of this and the absolute disregard of law and order that has prevailed throughout Keweenaw County, the sheriff, prosecuting attorney and the supervisors have petitioned Governor Ferris for aid. General Abbey, in charge of the militia, which consists of a small force of mounted men, has taken charge of the situation and practically martial law prevails throughout the village of Ahmeek. Three more companies of militia have been ordered to prepare for a return to the Copper Country. A riot broke out the evening of Oct. 3 at the Wolverine location and about 50 arrests were made. A special trolley car was used in taking the prisoners to the County Jail at Houghton. Since the inception of the strike hundreds of arrests have been made, but few convictions, and the same people are arrestd time after time only to be released on small bond.

### DULUTH—Oct. 6

**Lake Superior Ore Movements** for September indicate that the shipments for the season of 1913 will show an increase over those of 1912. Some authorities have expressed the opinion that the shipments this year would not exceed those of 1912, but would doubtless be approximately the same as a year ago. The figures now at hand indicate that the shipments for this season to Oct. 1 were 32,401,249 gross tons as compared with 29,758,818 tons in 1912, indicating a net increase to the first of this month of 2,642,249 tons. September has shown a decrease of 353,671 tons from the gain which was shown to Sept. 1, when the increase was shown to have been 2,995,920 tons. This decrease is moderate, all things considered, and it will take a sharp falling off during the last two months of the shipping season to reduce the net gain for the season below a full 2,000,000. The present season will show a record of about 50,000,000 tons, possibly a little less, but yet a fair gain over 1912, when the record was 47,800,000 tons.

### MARQUETTE—Oct. 6

**The State Tax Commission** of Michigan has taken under advisement a protest by the Marquette iron range mining companies against the valuation placed on the ore in stock at the mines at the time R. C. Allen, state geologist, made his inspection to determine at what sums this class of property should be assessed. It is the contention that the method of valuation employed gives results that are not equitable. Professor Allen treats the stockpiles as if they were immediately salable. He estimates their value on the basis of the Lake Erie prices of the different grades of ore, less the transportation and other selling charges. By this method he has figured a value of approximately $5,600,000 on the more than 1,800,000 tons in storage when he made his inspection. As a result, though the realty of the companies is assessed at some $2,000,000 less than formerly, the aggregate of valuations shows, on the tentative figures, an increase of approximately $3,000,000. And, in addition, all of the buildings owned by the companies and not used for mining purposes, which had previously been covered by the general assessment, are assessed separately. The mining companies suggest that the value of the ore in the piles be appraised at a figure less than Professor Allen employed, or that account be taken of the equities involved in determining the realty values of the mines whence the ore comes. The reasons for the companies' contentions are outlined by George R. Jackson, superintendent of the properties of the Cleveland-Cliffs Iron Co. in the Gwinn district, where 560,000 tons of ore is stocked. "Much of this ore," he said, "has been mined not because at the time it is salable, but because conditions surrounding the operation of the mines are such that it is not practicable not to mine it. There is really nothing to do but go on mining, even if the market for the ore produced happens to be inactive. The closing of a mine is a serious piece of business." While the commission was busy in the iron-mining district of upper Michigan, George B. Horton, one of its members, took a side trip to Bessemer, Gogebic range, in company with Professor Allen, to hear a complaint of the Oliver Iron Mining Co. because the Bessemer board of review had assessed the Tilden mine at $200,000, whereas its value was placed by the commission at $150,000. The commissioner took the matter under advisement. The case is regarded as of considerable importance, for the reason that it bears on the right of a mining company to keep a valuable mine idle and escape paying the taxes that would have to be paid were the property worked. The Oliver company holds the Tilden under a sub-lease from the Tilden Mining Co. running for 36½ years. This lease provides for an annual payment to the Tilden company of $100,000 and an annual payment to the Keweenaw Association, of Boston, the fee owner, of [illegible],000 for the first six years and $50,000 annually thereafter. The Tilden is inactive at present. It was contended at the hearing that the fact that the Oliver company would pay $150,000 per year for the right to mine showed conclusively that the value of the property is many times the figure placed on it by the Bessemer assessor and which the Oliver company is now protesting is $50,000 too high.

The Steel Corporation has ceased its explorations on lands of the Michigan Land & Iron Co. in the Fence Lake country, midway between the Marquette and Menominee ranges, the last of the drills having been removed several weeks ago. While no announcement has been made, there is an impression abroad that the tests resulted unfavorably. However, if such be the case, it is still to be proved conclusively that the district does not contain ore of commercial quality. The field is extensive and the drills were operated into very little ground. Many mines might have been missed. The Fence Lake territory is considered well worth giving an extensive and systematic trial. It is believed that still further east, near Republic, ores of value will be found. Steps to drill a large territory are now being taken.

### FLAT RIVER—Oct. 4

**The Saint Joseph Company's Internal Troubles** have been adjusted and the suit for a receivership has been dismissed. The insurgent Holmes faction has been given representation on the board of directors and some of the economies Holmes suggested have been adopted.

**Operations at All the Lead Mines** are again at full scale and efforts are being made to make up for the time lost by the strike. As the result of the 11 days' strike, the miners secured an advance of 25c. per day, but the union was not recognized. As the operators only offered an advance of 15c. per day, the union is claiming the credit for obtaining the additional raise and has begun an active campaign to force all the men into the ranks of the Western Federation, threatening to beat up the nonunion men if they don't promptly join. That there will be another and worse strike next year seems to be generally conceded, as the Western Federation will again try to force the recognition that was refused this year. While none of the mines were completely flooded by the stoppage of the pumps, from one to three weeks was required to pump them out before work could again be started.

**The Consolidation** of the Saint Joseph and Doe Run lead companies has been practically effected. The committee appointed by the companies has made its report, which has been accepted by the directors of the two companies and the final approval of the stockholders will be obtained at stockholders' meetings to be called by each company within a few weeks. As a majority of the stockholders are known to be in favor of the proposition, the merger will soon be an accomplished fact. The merger will be accomplished by the absorption of the Doe Run by the Saint Joseph company, in exchange for which $5,000,000 in shares of the treasury stock of the Saint Joseph company will be given to Doe Run stockholders. As only $10,000,000 of the $20,000,000 authorized capital of the Saint Joseph company has been issued, this permits of the absorption of the Doe Run without any increase in stock. As $250,000 in dividends has been paid by the Saint Joseph company while the merger has been under consideration, the Saint Joseph will pay over to the Doe Run $125,000 in cash as its proportionate share of the profits that its stock would have earned if the merger had been promptly accomplished. The committee recommends a total of $55,000 for the salaries of the officers and that the New York expenses be limited to $15,000 per annum. The committee retained the services of J. R. Finlay to examine and report on the technical details. He finds that out of 9254 acres of land owned by the Saint Joseph company 6444 are ore bearing. He finds that the Doe Run company has 4445 acres, of which 3108 acres are ore bearing. He estimates that the Saint Joseph has 11,200,000 tons of ore in sight and that promising and partly developed land increase this to 22,275,000 tons. He estimates that the Doe Run has 8,250,000 tons of ore in sight, which partly developed lands increase to 12,700,000 tons. The actual operations of the two companies will mainly continue as before, as the ownership of the two properties has always been largely identical. There will be a marked saving in the administration expenses in thus having the two properties under one management, and it will make the new company one of the largest lead producers in the world.

### PARKER, ARIZ.—Oct. 1

**The Mining Outlook Around Parker,** in Yuma County, is brighter. C. L. Beckwith, examining engineer for Phelps, Dodge & Co., will visit some of the mines and prospects in the Seneca district as soon as cool weather sets in. The district is north of Parker and on the east side of the Colorado River. There are many good prospects and a few mines now idle for want of capital.

# THE MINING NEWS

## ALASKA

A SEVERE STORM AT NOME, one of the worst recorded in that region, is reported to have practically destroyed the city, Oct. 6; 500 houses have fallen and the damage is estimated at $1,500,000. The storm devastated two square miles of territory on the coast. Nearly every structure on the main street was wrecked including the pumping plant, so that little could be done to check the devastation caused by the fire that followed. Four are dead so far as known. Seattle is raising a relief fund. The steamships "Victoria" and "Corwin" made for the open sea and escaped damage. It is feared that there will be much suffering as winter is at hand and it will be almost impossible to get in supplies.

AN IMPORTANT DISCOVERY AT NOME is said to have been made. One group of lode claims has been bonded to Anheuser-Busch interests of St. Louis and options have been taken on others. The consideration was about $500,000. The Nome stamp mill will run all winter making tests. The gold occurs in what was long thought to be barren rock, but its structural similarity to impregnated rock found in Chihuahua, Mexico, led R. L. Kite, a mining engineer representing St. Louis men, to test the Nome rock for gold with the result that from 5 lb. he is said to have got a yield of $2.40; 500 lb. of the material has been sent to St. Louis for tests.

GOLD KING (Valdez)—The new stamp mill is now operating.

OLD GLORY (Smugglers' Cove)—A 4-drill compressor is to be installed at this mine, recently taken over by the Alaska Venture company.

RAMBLER (Shoup Bay)—A rich strike has been made on this property. The vein is 7 ft. wide, and can be traced for more than 1500 feet.

MILLIONAIRE (Valdez)—A shaft is being sunk on this claim, owned by the Mineral Creek Mining Co. Considerable tunnel work has been done.

ELDORADO—This group of claims in the Mount McKinley district has been leased to a company, and it is stated that new hydraulic machinery will be installed.

ALASKA-JUNEAU (Juneau)—The first unit of the mill will be in operation by Dec. 1, and 400 men will be employed. When completed the entire plant will consist of four units, each of a capacity of 3000 tons of ore per day.

## ARIZONA

### Maricopa County

RED ROVER (Phoenix)—The upper portion of the wagon road, which was washed out by a cloudburst some time ago, has been repaired and shipments of ore will be resumed.

### Mohave County

KINGMAN COPPER (Mineral Park)—The third drill hole has been begun.

### Navajo County

CHURN DRILLING IN THE COAL FIELDS, covering approximately 3000 acres, has been completed. An exhaustive report will be ready in October. Unofficial reports are to the effect that workable deposits of coal have been proved and that early in 1914 extensive developments will be started.

### Pinal County

A NEW STRIKE OF RICH SILVER ore is reported from the Roskruge Range south of Tucson.

THE SURVEY FOR THE RAILROAD FROM TUCSON TO AJO has been completed and the company is now running a line from Gila Bend on the main line of the Southern Pacific to Ajo to determine the best route. This work is being done by the Calumet & Arizona to get railroad connection between the mines at Ajo and the smelting plant at Douglas. Development work at the mine has been stopped until the road is finished. This road from Tucson to Ajo will open up some rich mineral country in the Baboquivari, Comobabai, and Quijotoa Mountains that heretofore has been impossible because of the long haul and lack of water.

OLIVE (Twin Buttes)—The concentrator will soon be working 16 hr. per day as development work increases. Arrangements have been made to mill the ore for some of the lessees in the district.

### Pima County

PAPAGO CHIEF (Baboquivaries)—Work has been resumed on this mine and shipments of high-grade ore are being made to Douglas.

RAY-ARIZONA (Kelvin)—The churn-drill hole is down nearly 400 ft. It is reported that for the last 60 ft. the drillings have shown good concentrating ore.

MAMMOTH (Mammoth)—Arrangements for development at this old mine are progressing rapidly. The company intends to make Tucson its headquarters for supplies. It is 55 miles from Tucson to Mammoth and only 26 miles from Winkelman to Mammoth, but the fact that the San Pedro River is impassable at times caused the company to decide on Tucson. From the road funds of Pima and Pinal Counties $15,000 is available to spend on the road. One large auto truck is used now and another has been ordered.

### Yavapai County

TEMPE-VERDE OIL (Camp Verde)—The second well being drilled in search of oil has reached the depth of 675 feet.

HAYNES COPPER CO. (Jerome)—The shaft is down to the 1000 level. Extensive crosscutting will be begun at the 1200-ft. level.

FORTUNE (Prescott)—A reduction plant is planned. There are about 8000 tons of milling ore on the dumps and a year's run blocked in the mine.

LITTLE DAISY (Jerome)—A new shaft is being opened from three points of attack. Work is proceeding from the surface and from the 800-ft. level where both raising and sinking are going on.

CALUMET & JEROME (Jerome)—A crosscut 500 ft. deep, and now in the mountain upward of 750 ft., is being driven to the vein. The formation is changing considerably, thought to be evidence of proximity of the ore.

ARKANSAS & ARIZONA (Jerome)—Extensive developments are being made. A large installation of hoisting machinery has been completed for the further sinking of the shaft which is down now to about 1400 ft. This is said to be the largest hoisting plant in the county. This shaft is to be sunk to a depth of 1800 or 2000 ft. A new store building has been completed near the mine which is well stocked.

## CALIFORNIA

### Butte County

FIRE AT FORBESTOWN, Sept 22, destroyed the Gold Bank Hotel, the postoffice and the store, the church, nine residences, three barns and a lumber yard. So far as learned none of the mine buildings was burned. The amount of property loss has not been ascertained.

### Placer County

YUKON GOLD DREDGING CO. (Auburn)—It was expected to have the dredge ready for operation on Mammoth bar on the middle fork of American River about Oct. 1.

POVERTY BAR DREDGE (Auburn)—Since the death of A. Tredidgo some changes in the ownership has occurred. The dredge operated lower down on American River by the Beaver Gold Dredging Co. will be dismantled and the machinery will be installed on the new hull built at Poverty Bar by the Eldorado & Placer Counties Co.

### Sierra County

TELEGRAPH (Downieville)—The power house was recently destroyed by fire, together with all machinery except a Pelton wheel, entailing a loss of nearly $10,000. The plant will be rebuilt.

EL DORADO (Alleghany)—A rich strike has been made at this mine on Kanaka Creek, in a raise 150 ft. above the main working tunnel. The vein is 3 ft. wide at that place, and full of free gold and arsenical sulphides. More than $1600 worth of coarse gold was picked up after the blast that uncovered the find. Fessler Bros. are developing, the property and the 10-stamp mill has been started since the strike was made.

RED LEDGE (Scott's Flat)—Three thousand feet of new road has been built to connect the millsite with the new Alleghany cut-off road, and stamp-mill machinery has been delivered and will be installed as soon as lumber can be gotten in to build a mill. A boarding house and other improvements will also be added. The ore carries nickel, as well as gold and silver, and an attempt will be made to save the nickel as well as the gold and silver.

MORSE BROS. GRAVEL MINE (Downieville)—A rich strike has just been made at this property, upon reaching bedrock by a 90-ft. incline. Pieces of gold worth $10 to $20 each were found at the bottom of the shaft, all of which is coarse. This ground is an ancient river channel, covered by a mountain slide and lying 30 ft. lower than the present river bed. Early-day miners started an incline for this channel, but abandoned it after reaching huge granite boulders half way down. The present owners have spent nearly a year in sinking the incline, and will now start drifting.

### Tuolumne County

A SKIPTENDER WAS KILLED in the Harvard mine in the Jamestown district, Sept. 17. He had been loading the skip at the 1100-ft. station when he must have been caught by it for later he was found dying. A coroner's jury could find no negligence on the part of the mine management.

### Yuba County

YUBA NO. 14 DREDGE (Hammonton)—The completed steel hull and the heavier parts of the superstructure of this new dredge was floated at noon Sept. 17. Initial construction work was begun with the laying of the center bottom plates Aug. 7. The first riveting was done Aug. 11. There was some delay in receiving material, so that the actual construction of the hull was begun with the arrival of the last of the bottom chords which were placed on Aug. 15. The hull was completed with the exception of finishing the riveting of the steel deck, Sept. 15, and the boat was then ready to float, awaiting the filling of the pond. The actual time required for construction of the hull ready for flotation was 80 days, or 45 days to the floating of the hull.

## COLORADO

### Clear Creek County

ALCO (Freeland)—The shaft is being sunk an additional 100 ft. The last 30 ft. of sinking has opened a 6-in. vein of $25 ore. Drifts will be advanced east and west from the shaft.

TOBIN (East Argentine)—Machine drills have been installed at this property. A shoot of smelting ore 18 in. wide is being opened on the Wheeling vein. Returns from recent shipments indicate a value of $90 per ton

BARD CREEK MINING CO. (Georgetown)—Small shipments of smelting ore are being maintained, while the milling ore is being blocked out and held in reserve, pending the construction of a 50-ton concentrator under consideration.

### San Juan Region

ALTA—The development and operation of this property in Gold King Basin continues under the management of Wagner Bros., with gratifying results. The operators are shipping about 20 cars of concentrates per month.

BALLARD (Telluride)—The construction of the tramway from the mine to the mill is under way. All of the equipment, excepting the cables, will be furnished by the Telluride Iron Works. The tramway will have a total length of 6200 ft. There will be seven towers on the line and the longest span will be 1700 ft. where the tramway passes over the cliffs below Mount Ballard. There will be two buckets, each having a capacity of one ton. The mill construction is being pushed and the company plans to have 10 stamps dropping within 60 days.

### Summit County

WELLINGTON MINES CO. (Breckenridge)—Five carloads per week is the present output of zinc and lead concentrates from the magnetic separator mill, which is treating about 55 tons of middlings per day.

FRENCH GULCH DREDGING CO. (Breckenridge)—The Reiling dredge has been dismantled and is now ready for its trip overland to some ground a mile up the gulch, which is said to be rich in coarse gold. It is said that this dredge has averaged $1000 per day for its actual running time this season.

COLORADO GOLD DREDGING CO. (Breckenridge)—The Bucyrus dredge of the company has taken out a large amount of placer gold this season, and a recent 15-days' operation is reported to have cleaned up $22,000. It is now digging in Swan Valley. The Ben Hall lease on the high bars of the Mekka placer, Nigger Hill, is said to be $6000 ahead for the season.

### Teller County

DUMP SHIPMENTS HAVE BEEN HEAVY LATELY. Ore has been moved from four shafts on the Isabella Bull Hill estate and lessees were also shipping from the dump at the Little Pearl, a fractional claim near the Trachyte mine of the United Gold Mines Co. Teams have also been moving dump ore from the Pharmacist mine, on Bull Hill, to the Rex plant, on Iron Clad Hill.

JERRY JOHNSON (Cripple Creek)—The tenth annual report for the fiscal year terminated Aug. 31, shows production for the year of 4380 tons of ore with a gross bullion value of $86,136. Deducting $27,533 for freight, hauling and treatment, the net value of the ore was $58,593, and the total amount in royalties paid into the treasury of the company was $14,444. The cash balance in the treasury was $21,059.

## IDAHO

### Cœur d'Alene District

CENTER STAR (Pine Creek)—The tunnel will be driven 250 ft. farther to cut the vein.

VIRGINIA (Sunset)—A new tunnel is being driven from Carbon Creek and will give 100 ft. additional depth.

COMET (Mullan)—A contract has been let to drive 50 ft. of tunnel The vein will be followed in the new work.

JACK WAITE (Union)—No mill is to be built at this mine and it is officially stated that it is not known when a mill will be needed.

AMY-MATCHLESS (Pine Creek)—Work has started after a shutdown of several months. A shaft will be sunk on the ore showing in the tunnel.

IDORA HILL (Wallace)—The mill is being operated 16 hr. per day, and records show that concentrates worth $83 per ton are being produced. The product is hauled eight miles to the railroad, by a six-horse team, and one car has already been shipped to the smelters

REINDEER-COPPER QUEEN (Mullan)—A consolidation has been effected between these two companies, the negotiations having been under way for several months The ore from the Reindeer property pitches into the Copper Queen The long tunnel of the Reindeer company can now be continued into the Copper Queen and the ore can be worked from the Copper Queen ground with little development Work will start immediately

H E M (Burke)—Plans for a 100-ton mill have been completed and work on its construction will begin soon The No 4 tunnel has been started It is 260 ft below the No 3 tunnel and 1000 ft from the outcrops This tunnel will crosscut the vein at 2100 ft In the No. 3 tunnel a body of concentrating ore from 11 to 15 ft wide and 150 ft long has been opened

HIGHLAND-SURPRISE (Kellogg)—Contract to drive 100 ft of tunnel has been let to Martin & Hanson It is the intention to drift on the vein opened last spring This vein was struck on the Highland side, and the work is being conducted from the Surprise tunnel, which has been extended into this ground The property is equipped with a mill and last year considerable milling was done chiefly of zinc ore The distance from the railroad and the almost impassable condition of the road along Pine Creek in the autumn and winter caused the shutdown of the mill at present, in order that efforts might be given to development work alone.

## MINNESOTA

### Cuyuna Range

CUYUNA-MILLE LACS (Crosby)—The new 2000-gal. cantrifugal pump has been put in operation.

THOMPSON (Crosby)—A night crew has been put on to hasten the stripping operations; property owned by Inland Steel Co. and formerly an underground operation but being turned into an openpit.

ROGERS-BROWN ORE CO. (Crosby)—The three shafts controlled by this company, the Armour No. 1, Armour No. 2 and Kennedy, have shipped over 600,000 tons so far this season. The Armour No. 2 has quit shipping and is stockpiling the ore.

BARROWS (Barrows)—The first shipment of ore from the South Cuyuna range was made Oct. 2, when a shipment of 14 cars was sent from this property owned by the Virginia Ore Co., a subsidiary of M. A. Hanna & Co. Other mines are being developed in the district and it will not be long before there will be several producers on the South Cuyuna.

ARMOUR (Ironton)—It is not at all unlikely that the Armour No. 1 and Armour No. 2 will be transformed from unuerground to openpit mines in the near future, as the management is now considering the change. J. S. Lutes has demonstrated at the Pennington what can be done in the stripping way on the Cuyuna, and others seem favorable to following the example set by him. It is far cheaper to mine with steam shovels than by underground methods, providing the overburden is not too deep, and it is not deep at the Armour

### Mesabi Range

A NEW SIGNAL CODE is advocated by the Practical Mining Mens' Institute, which includes the mine captains of the Mesabi range. At a recent meeting it was agreed to introduce a bill in the legislature making the use of a uniform signal code in the mines of the state compulsory.

MESABI CHIEF (Hibbing)—The initial shipment was recently made. This fee is owned by the state and the royalty goes to the permanent school fund. Property contains 5,000,000 tons, and is operated by Arthur Iron Mining Co., the operating name of the Hill interests.

GRANT (Hibbing)—This mine lately broke all records for shipments from a state lease, shipping 40,000 tons during one week, or 10,000 tons in excess of any previous record. The fee to this property is owned by the State of Minnesota and the royalty goes to the state permanent school fund.

WEED (Aurora)—The Oliver Iron Mining Co. has decided to call its new property, near Aurora, the Weed. A track was recently completed to the mine and material is now being received. The work of sinking will be started within a few days, and as large a force as can be worked advantageously will be employed in order that shipping may be started next summer. The Oliver company has done considerable diamond drilling and test-pitting in the Aurora field during the last few years, and it is not unlikely that other orebodies have been located.

INTER-STATE IRON CO. (Grand Rapids)—This company, a Jones & Laughlin subsidiary, is using a hydraulic dredge to remove the overburden from the orebody. The dredge draws but 28 in. of water, and was erected by the Marine Iron Works, Duluth, Minn.; total cost of dredge and machinery, $30,000, dimensions, 75x35 ft. It is planned to remove only such surface as lies adjacent to the Mississippi River. The dredge is fitted with a contrivance for breaking down the earth, which is then handled by the sandsucker and deposited at any desired distance. The scheme is patterned somewhat after the operation now being conducted by the Pittsburgh Steel Ore Co. at its Rowe mine, on the Cuyuna range.

## MISSOURI

### Joplin District

VINEGAR HILL (Thoms Station, Mo.)—This mine was sold to J. A. Hardy, Sr., of Webb City, for $15,000. It is situated on a lease of the Snapp land.

BONITA (Thoms Station, Mo.)—The shaft is 150 ft. deep and both lead and zinc are found. A lease on 40 acres has been obtained by John W. Griffin and others.

LAWTON MINING CO. (Lawton, Kan.)—Mineralized ground was recently encountered with the drill, one hole showing lead and the other zinc. The ore is found from 35 to 65 feet

NORTH JOPLIN MINING CO (Joplin, Mo.)—This company's mine is one of the good small producers of the district. Ore which yields a heavy mill recovery is being mined at the 95- and 150-ft levels

RICKMAN LAND (Joplin, Mo.)—A lease on 250 acres has been granted to local men and a drilling campaign is to be started. Previous operations have been confined to "gouging" but the lessees believe deeper ore exists.

LOST TRAIL (Hattenville, Okla.)—Two new shafts are being sunk for ventilation as well as to facilitate the hoisting of ore The mine is on the Frosty Morning land A 200-ton concentrator is kept in constant operation

CHAPMAN & CO. (Joplin, Mo.)—A lease of the Dixon land, will be operated on an extensive scale The Wyatt mine is situated on the lease, and good productions have been made The intention is to sink the south shaft deeper.

MEARES TRACT (Carthage, Mo)—A 37-ft. face of pay ore has been encountered by the drill Discovery was made by a farmer, while drilling for water The ore lies at a depth of 185 ft and continues to a depth of 222-ft. where drilling was stopped A lease on 12 acres of the farm has been granted to W C Thomas, of Carthage

DEXTER (Joplin, Mo)—The 200-ton mill is to be started up this week Development work on the lease was begun several months ago and an unusual orebody was discovered at a depth of 160 ft Drifts have been driven at that level from the shaft Sufficient ore has been blocked out to keep the concentrator in operation several months

## MONTANA

### Butte District

BUTTE & SUPERIOR (Butte)—The largest tonnage of ore to be mined and milled at this property in one day was recorded Sept. 25, when 1320 tons were hoisted and sent to the mill for treatment. An average of about 1100 tons of ore was hoisted during September, producing about 13,000,000 lb. of metallic zinc, as compared with 11,000,000 lb. in July. It is estimated that net earnings for September will approach $200,000.

ELM ORLU (Butte)—This property is expected to begin producing zinc next spring. Work has been commenced on the new concentrator and it is estimated that in four or five months it will be in operation. The mill will have a capacity of 250 tons to start with but before the summer is out it is expected that it will be enlarged to 500 tons per day. Many difficulties had to be overcome and problems considered before commencing construction. One of the important ones was the securing of sufficient water to operate the concentrator. A dozen wells were sunk and after connecting them a 12-in. pipe line was laid from the wells to the site of the mill, a distance of 1½ miles. It was discovered that a pumping station would have to be provided to force a sufficient flow of water through the pipe to the mill. The sinking of the wells and the laying of the pipe line cost $40,000. Another matter of serious consideration was the process to be adopted in treating the zinc ore. For upwards of a year several experts had been at work testing out various methods and an examination was made of a process in use in Germany. A short time ago the conclusion was reached that the flotation process was the best available and a contract was made with the Minerals Separation Co., for the use of its method of treatment. The machinery for the concentrator has been ordered and just as soon as the building is ready to receive it the work of installation will commence, as arrangements have been made whereby it will be shipped a month ahead of the time required.

### Chouteau County

BEAVER CREEK—A new mill was recently built at this gold mine in the Little Rockies. The company is preparing to use steam shovels to lift ore into the mine cars.

### Lewis & Clark County

FRANKLIN—Thomas Cruse, of Helena, who is operating this mine in the Scratch Gravel Hills under a lease and bond, has opened galena on the 200-ft. level. The property is being rapidly developed by a large crew of men.

ROCK ROSE—This property in the Grass Valley district, which has been idle for several years, is being unwatered preliminary to an examination by engineers representing Pittsburgh men. The shaft is 200 ft. deep, and considerable ore containing gold, silver and a little copper, was mined and shipped to Helena and Butte prior to the shutdown.

### Lincoln County

HAZEL T (Libby)—A sawmill will be sent to the company's mine eight miles, southwest of Libby, at once. The sawmill will be used in sawing lumber for a flume, concentrator and other buildings. Plans for the concentrator are being drawn now and additional mill tests are being made to determine the best methods of treating the ore.

CRIDERMAN PLACERS (Libby)—A survey has just been completed for the pipe line and ditch on these placers 16 miles south of Libby, and development work is in progress. C. E. Lukens, of Cut Bank, recently purchased an interest in these claims and it is the intention to at once install a hydraulic plant and work them. According to the agreement between Lukens and Criderman, this plant must be completed by Sept. 1, 1914.

### Missoula County

IRON MOUNTAIN TUNNEL CO. (Superior)—About 40 men are engaged in mining between the 1800- and 2000-ft. levels. A considerable tonnage of lead-silver ore is being hoisted. New electrical machinery and an air compressor have been installed recently.

## NEVADA

### Eureka County

BUCKHORN MINES CO. (Buckhorn)—Work is progressing rapidly and it is expected that the new mill will be treating ore before winter sets in.

EUREKA-WINDFALL (Eureka)—Following an examination by W. H. Leathers, of Chicago, said to represent several eastern stockholders, incorporation papers of the Alkali Mines Co., of Illinois were filed in the office of the county clerk. This company has been organized to take over and operate the Eureka-Windfall mine and mill sold at sheriff's sale last February.

### Humboldt County

THE OPAL DEPOSITS OF VIRGIN VALLEY, in the northern part of the county, are attracting attention.

CINNABAR DEPOSITS owned by W. G. Adamson and opened up 50 miles south of Winnemucca appear to be among the largest ever found. The Adamson group comprises 21 claims. A furnace is in operation and there is plenty of ore for a long run.

### Lyon County

BURLINGTON-NEVADA (Mason Pass)—Ore of shipping grade is now being mined. Development is progressing with satisfactory results.

WHEELER (Bald Mountain)—The cyanide plant which was erected to treat tailings from the Wheeler mill now has two 40-ton tanks in operation. A third tank is being installed.

YERINGTON-BULLION (Yerington)—It is reported that this company will replace its gasoline engine with electric power. This will require a two-mile line from the main power line of the Truckee River General Electric Co.

EMPIRE NEVADA (Yerington)—Notices to all lessees have been issued, stating that their leases will continue for only 60 days longer. This would appear to mean the abolishment of the leasing system, extensive work by the company and the probability of the erection of the proposed leaching plant to treat these and other ores of the district.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Sept. 25, 1913, were as follows: From Mason Valley mine, 2210 tons; from Nevada-Douglas, 873 tons; from other mines, 1045 tons; total 4128, or a daily average of 583 tons. During the same week four cars of matte were shipped.

### Mineral County

CALIFORNIA GOLD EXPLORATION CO. (Aurora)—Development on this company's group of 12 claims on Silver and Last Chance hills has been satisfactory. It is reported that a mill will be built next spring.

AURORA CONSOLIDATED MINES CO. (Aurora)—About two-thirds of the concrete work on the mill has been completed. Lessees on the 400-ft. level are mining ore assaying $50 per ton. The double-track haulage tunnel is now in 1700 ft. and will be driven 100 ft. farther to cut the vein. The intersection will be at a depth of 400 ft. The Last Chance Hill and Juanita claims will be prospected by a crosscut from the main tunnel.

### Nye County

FAHEY-NELSON (Ione)—This cinnabar property was sold recently; a compressor plant will be installed.

EARLE (Manhattan)—The mill formerly operated by the Brady lease has been purchased and is now in operation.

MERCURY MINES CO. (Ione)—A large tonnage of ore is being developed. Weekly shipments of 30 flasks of mercury are being made.

NEVADA CINNABAR CO. (Ione)—This company's property adjoins that of the Mercury Mines Co.; new furnaces are being installed. The first step, the burning of 450,000 brick of good quality, has been successfully accomplished on the property.

BIG FOUR (Manhattan)—A shortage in the water supply is responsible for milling below normal capacity. The sinking of the shaft on the Brady lease on the Union No. 9 to a depth of 600 ft. is nearly completed. A station will be cut at the 580-ft. level and a drift run to the vein. The drift on the 480-ft. level will be advanced.

MUSTANG (Manhattan)—It is stated that this property has been sold to San Francisco men, and that control of the Jumping Jack, Indian Camp, and Stray Dog, have also been secured and that these will be operated together with the Manhattan-Crescent and Riley Fraction. The ores will be treated in the War Eagle mill, and the addition of more stamps to the mill is contemplated.

TONOPAH LEASING & MINING CO. (Tonopah)—The shareholders at their special meeting in Salt Lake, recently ratified the proposition of the board of directors to dispose of their interests to the company owning the ground on which the lease was held. This is part of a deal whereby the Ross and Kirchen interests of Utah and Nevada take over territory in Tonopah. The proposition to dispose of the leasing stock was passed, and the leasing stock is to be exchanged for stock in a new company now under process of organization. The new company is to be known as the Tonopah Cash Boy Consolidated, its capitalization to be $2,000,000, divided into 2,000,000 shares of stock, par value $1. Of this capitalization, 500,000 shares are to be retained in the treasury; 935,000 shares go to the Tonopah Cash Boy company for its property; 265,000 shares go to the Tonopah Victor company for its property, and 300,000 shares go to the Tonopah Leasing & Mining Co. for its relinquishment of the two-year lease held by it on the Cash Boy territory. The leasing company will turn in its present stock, therefor receiving one share of the new for each four shares of the old.

## NORTH CAROLINA

### Union County

HOWIE (Waxhaw)—Work has been under way at this mine where a dry-crushing plant of 500 tons capacity has been remodeled. The result is a modern fine crushing, continuous treatment cyanide plant of 50 tons daily capacity, consisting of Gates rock breaker, two sets of Allis-Chalmers rolls crushing in solution, followed by a Dorr classifier. From the classifier the sand will go to a tube mill and be returned to the classifier. The slime passes to a thickener or dewatering tank, and the thickened pulp is diluted and agitated by air jets, after which it is alternately dewatered and thinned to wash out dissolved gold, and run to waste without filtering. The shaft is being retimbered and the mine is being unwatered. The intention is to work old dumps while developing. This is the mine where the first successful cyaniding was carried on in North Carolina, some $30,000, having been taken out of tailings eight years ago.

## OREGON

### Baker County

HOMESTAKE (Sumpter)—The owner of this group of claims is preparing for some improvements, and will continue operations throughout the winter.

FLAGSTAFF—Ore assaying $147 per ton has been encountered at this mine in the Baker district, and an increased force of men will be put to work at once.

### Malheur County

A NEW MINING DISTRICT, about 20 miles east of Jordan Valley post office, is being opened up to development. The orebodies consist of deposits of lead, copper and iron ores, and gold ore of good grade is found. At Flint, an English syndicate is now developing some properties, having built a large mill of 100 tons daily capacity and having put on a force of 50 men.

## PENNSYLVANIA

### Allegheny County

AMERICAN ZINC & CHEMICAL CO. (Pittsburgh)—Good progress is being made in the construction of the 400-ton zinc reduction plant; the foundations being about completed and by another month the buildings will be well up.

## UTAH

### Beaver County

MONTREAL (Milford)—Operations at this property have been suspended on account of the death of one of the chief owners.

BLACKBIRD (Newhouse)—This property is being developed through the South Utah workings, and milling ore carrying chalcopyrite has been opened.

### Juab County

TINTIC SHIPMENTS for the week ended Sept. 26 amounted to 133 cars.

EAGLE & BLUE BELL (Eureka)—Gross earnings in August amounted to $46,700. Operating expenses were $13,700, leaving $33,000 net earnings as compared with $15,900 in July.

BLACK JACK (Mammoth)—Ore for the trial run at the new Knight mill will probably be furnished by this property. This will come from old dumps at the Star Consolidated workings, a short distance from the Knight railroad.

GRAND CENTRAL (Robinson)—The shaft is to be retimbered from the 400-ft. level up, and this work will probably require a short shutdown. High-grade copper ore from the 2400 is being mixed with lower grade from the 2300 level.

EUREKA HILL COMPANY (Eureka)—This company, which supplies a large part of the water used in Eureka from its pumping plant at Homansville formerly run by steam, is now using electric power supplied by the Utah Power Co.

IRON BLOSSOM (Silver City)—The new vein east of the main ore channel has been opened at another place on the 500 level. This vein was first found from the No. 1 workings, and later from the No. 3 shaft. The work abovementioned cuts the vein between these points.

CENTENNIAL-EUREKA (Eureka)—A dividend of $1.50 per share has been declared. In April a dividend of like amount was paid, making a total of $300,000 thus far for 1913. There are 100,000 shares, practically all of which are owned by the United States Mining Co.

UTAH MINE (Fish Springs)—The September output amounted to two cars of high-grade silver-lead ore. This came largely from the upper levels, but as far down as the 800. Water has interfered somewhat with operations, on account of insufficient pumping equipment.

### Salt Lake County

MICHIGAN-UTAH (Bingham)—Repairs to the tramway have been completed, and operations resumed on a good-sized scale by the company.

OHIO COPPER (Bingham)—About 2500 tons of ore are being mined and milled daily. Little has been made public in regard to the recent directors' meeting, though it is understood that an effort will be made to reduce the charges of 15c. per ton on ore hauled through the Mascotte tunnel.

MONTANA-BINGHAM (Bingham)—This company has received 50,000 shares of the Bingham Amalgamated Copper Co. in accordance with the tunnel agreement between the two companies. The Montana-Bingham transportation tunnel had been driven 2020 ft., Sept. 15, which gave this company the right to the amount of Amalgamated stock above mentioned.

U. S. SMELTING, REFINING & MINING—The usual quarterly dividend of 87½c. per share on the preferred and 75c. per share on the common stock has been declared, payable Oct. 15. The total distribution amounts to $307,217 for the preferred, and to $364,740 on the common, which will bring an aggregate on both stocks to $18,520,506. Large coal properties have been acquired in this state.

### Summit County

DALY-JUDGE (Park City)—Work under contract by J. A. McIlwee is being done at this property, and during August, 1500 ft. of development was accomplished with a working force of 70 men.

DALY WEST (Park City)—A fissure carrying some ore in the quartzite is being followed on the 900-ft. level. The objective point is the limestone-quartzite contact. An increased tonnage of better grade ore is coming from the 1700. Development is being done by the McIlwee Company under contract.

### Utah County

YANKEE (American Fork)—Ore hauling will be started in the near future.

DUTCHMAN (American Fork)—Lead-silver ore of good grade has been mined from a new strike during the summer, and there is nearly a car of ore at present in the bins.

## WASHINGTON

### Pend Oreille County

PEND OREILLE COUNTY consists of the eastern portion of what was formerly Stevens County, the county having been recently divided.

METALINE ORIOLE MINING CO. (Metaline)—Plans for the 50-ton mill were to be ready by Oct. 1, and the work of erection will begin at once. It is the intention to install two tables at once so as to treat about 20 tons per day. There are about 300 tons of ore on the lower dump and 1200 tons blocked out above the lower tunnel level. Below the lower tunnel level there is an incline shaft 100 ft. deep on the vein which dips at this place about 60°. A drift has been driven to the west 70 ft., and is in ore all the way. The ore assays about 11% lead, 27% zinc, 20 to 60 oz. silver, about $5 in gold, and carries some copper and iron. From five to eight tons of ore yields one ton of concentrate.

### Spokane County

GERMANIA—Active operations are to be resumed at this mine in the near future.

[illegible]—This group of claims near the boundary has been taken over by the Grandby Consolidated company, which will do considerable development work.

## CANADA

### British Columbia

A NEW PLACER FIELD is reported to have been found on Sibola Creek, 50 miles east of the head of Gardner Canal. Stampeders are going in by way of Francis Lake. The entire creek has been staked and shafts are being sunk to bedrock.

PTARMIGAN—This group near the center of Vancouver Island, has been purchased by an English syndicate headed by the Earl of Denbigh. The group contains large bodies of low-grade copper ores.

UNION (Gloucester)—In a 75-ft. tunnel and at a depth of 100 ft. from the glory hole from which the recent shipment of ore was made, the vein has been reached. The 23-ton shipment made to the Granby smelting plant at Grand Forks netted about $50 per ton.

OWEN LAKE (Hazelton)—This group has been bonded to Frank A. Brown for $50,000. Five veins are exposed in the workings which show good zinc, silver, lead and copper ore. The veins range in width from 4½ to 10 ft. The group is 14 miles from the Grand Trunk Ry. and about 100 ft. higher.

### Ontario

STERLING (Arsenic Lake)—This mine was sold at public auction by order of the courts, Oct. 1, to the Montreal Trust Co., for $230,000.

THREE NATIONS (Porcupine)—Testing operations of the 10-stamp mill have proved satisfactory, and between 40 and 45 tons of ore per day are now being treated. A directors' meeting, shortly to be held in Montreal, will consider the matter of increasing the number of stamps to 20 and adding a cyaniding plant.

DOME (South Porcupine)—The concrete work for the new 40 stamps will be completed about the middle of the month, when work on the steel work will be commenced. It is not expected that the additional stamps will be ready for regular operation before Mar. 1, 1914. The main shaft has reached a depth of 425 ft., where a station for the fifth level is being cut.

## MEXICO

### Mexico

DOS ESTRELLAS (El Oro)—The employees have appealed to the director of the bureau of labor against the action of the new manager who proposes to do away with the practice that formerly prevailed of giving medicine free of charge to the families of the miners. The possibility of a strike by the miners is suggested in the petition.

### Sonora

THE SHIPMENTS FOR SEPTEMBER from Mexico through the port of Agua Prieta totaled 13,594 tons of ore, 72 bars of bullion and 40 cans of precipitates distributed as follows: Nacozari, 299 cars, 11,985 tons; El Tigre, five cars, 211 tons; Monte Cristo, one car, 16 tons; El Temblor, one car, 18 tons; San Nicholas, 1 car, 32 tons; El Vaquero, two cars, 66 tons; Crestoncito, 1 car, 33 tons; Ventana, 1 car, 37 tons; La Union, one car, 22 tons; Agua Buena, one car, 25 tons; Estrella, nine cars, 239 tons; Santa Marguerita, 11 cars, 310 tons; El Gallo, 17 cars, 546 tons; and El Tigre, 72 bars gold and silver bullion, 40 cans precipitates, estimated value, 200,000 pesos. The copper ore was worth 1,960,500 pesos; silver ore, 878,900 pesos, and the gold ore, 468,700 pesos, a total of 3,308,100 pesos.

MOCTEZUMA COPPER CO. (Nacozari)—The Pilares shaft which has now reached a depth of 1100 ft., will be continued on down to 2000 ft., which will make it the deepest shaft in Sonora.

LA UNION (Fronteras)—G. B. Bell is working about 30 men and making regular shipments to the Douglas smelters. An engineer is now on the ground making an examination for Eastern men.

EL TEMBLOR (Esqueda)—The new shoot of ore recently encountered has improved and a shipment is now at the smelters. One streak of ore contains some high-grade ore, which is sorted out and stored at the Tigre; the ore will average $1 per pound.

MINNEAPOLIS COPPER CO. (Cumpas)—When this company closed down about two months ago it was expected that work would be resumed in a short time. The property is now in charge of a watchman while creditors are trying to get some satisfactory settlement without taking over the property.

NACOZARI CONSOLIDATED COPPER CO. (Nacozari)—Work is being rushed on the foundations for the concentrator, which will be of 100 tons capacity. In the mine the whole breast is in ore containing silver, copper and lead. More ore is being developed all the time, and there is enough ore in sight now to keep the mill running for many months.

CHURUNIBABI (Nacozari)—The leases on the properties of the Moctezuma Copper Co. will run out next month and few of them will be renewed, as the Copper Queen smelting works will not accept any more ore from this district on the siliceous basis. It is claimed that more ore of this kind is being received now than is needed. The ore contains about $20 in gold and silver and about 80% silica.

## AFRICA

### West Africa

Gold production of the Gold Coast and Ashanti in August was 30,217 oz. For the eight months ended Aug. 31 the total was 225,903 oz. in 1912, and 268,587 oz.—or $5,551,693—in 1913, an increase of 42,684 oz. this year.

### Rhodesia

Gold production in Rhodesia in August is reported at 59,555 oz., or 287 oz. more than in July. For the eight months ended Aug. 31 the total was 426,985 oz. in 1912, and 454,410 oz.—or $9,392,655—in 1913; an increase of 27,425 oz. Other production for August included 90 carats diamonds, 11,777 oz. silver, 25 tons lead, 79 tons asbestos, 11,712 tons chrome ore and 20,494 tons coal.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Oct. 8

The metal markets have been inclined to quiet and prices have shown a slight declining tendency. Fluctuations have been small.

MONTHLY INDEX NUMBERS

| Month | 1912 | 1913 | Month | 1912 | 1913 | Month | 1912 | 1913 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 111 | 126 | May | 118 | 126 | Sept. | 127 | 118 |
| Feb. | 109 | 125 | June | 117 | 117 | Oct. | 133 | ... |
| March | 111 | 125 | July | 114 | 110 | Nov. | 129 | ... |
| April | 115 | 124 | Aug. | 120 | 116 | Dec. | 129 | ... |

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115 Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

## Copper, Tin, Lead and Zinc

**Copper**—A good deal of nervousness has been exhibited on the part of some producers and quotations have consequently extended through a wide range. Sporadic sales of near-by electrolytic have been made up to 16.65c. delivered in Europe, equivalent to about 16.40 here. On the other hand an offer by a dealer to sell a substantial tonnage for October-December at about 16c. cash, New York, failed to find acceptance. The efforts of some impatient dealers to force speculative lots for sale has been a feature of the market. There has been no demand from domestic consumers. The transactions of the week have been quite mixed and we can but generalize the quotations, representing neither the higher nor lower extremes. The situation in Lake copper remains unchanged. Casting copper has been rather pressed for sale.

The statistics which were published on Oct. 8 again emphasized the excellent statistical position of the metal, and it is hoped that in consequence of the further decrease in the available supply consumers will be more inclined to anticipate their requirements. At the close Lake copper is quoted at 16¾@17c., and electrolytic copper in cakes, wirebars and ingots at 16.20@16.30c., while casting copper is quoted at 16@16.05c. as an average for the week.

The London standard market has been depressed throughout the week and at the close is about £1 lower, the quotations being cabled at £73 2s. 6d. for spot, and £73 for three months. The position of the market is exceedingly sensitive, due to the small visible supply.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Exports of copper from New York for the week were 7635 long tons. Our special correspondent gives the exports from Baltimore at 2672 tons for the week.

Visible stocks of copper in Europe, Oct. 1, are reported as follows: Great Britain, 15,130; France, 2710; Rotterdam, 2700; Hamburg, 1120; Bremen, 1480; other European ports, 800; total, 23,940 long tons, or 53,625,600 lb. This is a decrease of 1200 tons from the Sept. 15 report. In addition to the stock, above 1320 tons are reported afloat from Chile and 3450 tons from Australia, making a total of 28,710 tons.

**Tin**—There was little activity in the market during the past week. The London bull party seems to be resting for the time being and to be leaving the market to its fate. It therefore displayed a sagging tendency and interest on part of consumers was entirely lacking. The close is somewhat firmer at £185 15s. for spot and £186 5s. for three months, and about 40¾c. for October tin in this market.

Visible stocks of tin on Oct. 1 are reported as follows, including tin afloat: London, 5648; Holland, 1938; United States, excluding Pacific ports, 5357; total, 12,943 long tons, an increase of 1682 tons during September.

**Lead**—The market is demoralized, due to the apprehension that a further cut in the official price of the leading sellers is imminent, and a great deal of metal has been pressed for sale in anticipation, as a result of which prices have experienced a sharp decline. The market is weak at 4.25@4.35c., St. Louis, and 4.40@4.50c., New York.

The London market for Spanish lead has also suffered a recession, the closing quotations being cabled at £20 for Spanish and £1 higher for English.

**Spelter**—With the passage of the Underwood bill, the position of the foreign market was brought to the attention of consumers, and in some cases orders were placed for foreign spelter, which, however, did not affect the price abroad. In consequence, consumers held aloof from the domestic market, while smelters, who did not wish the foreigners to take their business away from them, reduced their price below the import parity. All these developments have greatly unsettled business, and the market closes in this state at 5.20@5.25c., St. Louis, and 5.35@5.40c. New York. A considerable tonnage was placed at the sharp concession in price.

Good ordinary spelter in London is quoted at £20 15s., and specials 12s. 6d. higher.

Base price of zinc sheets was reduced ¼c. on Oct. 6, and is now $7.75 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Extras and discounts unchanged.

DAILY PRICES OF METALS

NEW YORK

| Oct. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb. | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 4.8600 | 61½ | *16¾<br>@17 | 16.25<br>@16.35 | 41¼ | 4.50<br>@4.60 | 4.35<br>@4.45 | 5.40<br>@5.45 | 5.25<br>@5.30 |
| 3 | 4.8595 | 61⅝ | *16¾<br>@17 | 16.25<br>@16.35 | 40¾ | 4.50<br>@4.55 | 4.35<br>@4.40 | 5.35<br>@5.45 | 5.20<br>@5.30 |
| 4 | 4.8580 | 61⅜ | *16¾<br>@17 | 16.25<br>@16.35 | 40¾ | 4.45<br>@4.50 | 4.30<br>@4.35 | 5.35<br>@5.45 | 5.20<br>@5.30 |
| 6 | 4.8570 | 61 | *16¾<br>@17 | 16.20<br>@16.30 | 40½ | 4.40<br>@4.50 | 4.25<br>@4.35 | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 7 | 4.8550 | 61¼ | *16¾<br>@17 | 16.20<br>@16.30 | 40½ | 4.40<br>@4.50 | 4.25<br>@4.35 | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 8 | 4.8550 | 60⅞ | *16¾<br>@17 | 16.20<br>@16.30 | 40¼ | 4.40<br>@4.50 | 4.25<br>@4.35 | 5.35<br>@5.40 | 5.20<br>@5.25 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Oct. | Silver | Copper: Spot, £ per Ton | Copper: Spot, Cts. per Lb. | Copper: 3 Mos. | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead: £ per Ton | Lead: Cts. per Lb. | Zinc: £ per Ton | Zinc: Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 28⅜ | 74⅛ | 16.10 | 74 | 79¼ | 187¼ | 188½ | 20⅝ | 4.48 | 20¾ | 4.51 |
| 3 | 28 7/16 | 73¾ | 16.02 | 73⅝ | 79½ | 186¼ | 186¼ | 20⅜ | 4.43 | 20⅞ | 4.54 |
| 4 | 28 5/16 | ... | .. |  | . |  |  |  |  | . | . |
| 6 | 28⅛ | 73⅛ | 15.89 | 73 | 79¼ | 184½ | 185¼ | 20¼ | 4.40 | 20⅞ | 4.54 |
| 7 | 28¼ | 73⅜ | 15.94 | 73¼ | 79½ | 184¾ | 185½ | 20 | 4.35 | 20¾ | 4.51 |
| 8 | 28⅛ | 73⅛ | 15.89 | 73 | 79 | 185¾ | 186¼ | 20 | 4.35 | 20¾ | 4.51 |

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately. Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

## Other Metals

**Aluminum**—The market has been quiet with only a moderate quantity of business. Quotations are rather nominal at 20@21c. per lb. for No. 1 ingots, New York. The foreign market is reported firm.

**Antimony**—Business has been more active and there is quite a demand for spot and early deliveries. The passing of the new tariff law has been followed by a general adjustment of prices, which are from 0.75 to 1c. lower. Cookson's is quoted at 7.60c.; Hallet's 7.12¾@7.37½c. per lb.; while 6.35 [illegible], is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—The market is rather quiet still. The New York quotation is $38.50@39 per flask of 75 lb. for large orders; while 55@56c. per lb. is asked for jobbing lots. San Francisco, $38.50 for domestic and $36 for export. London price is unchanged at £7 5s. per flask, with £7 named by second hands.

## Gold, Silver and Platinum

**Gold**—Prices of gold on the open market in London have been unchanged at the Bank level, 77s. 9d per oz. for bars and 76s. 4d. per oz. for American coin. Some £1,100,000 was reserved for Egypt and £120,000 for India, the balance of the supplies received being taken for Germany.

**Iridium**—This metal continues at a high level, dealers asking $83@85 per oz. New York.

**Platinum**—No change is reported and prices are a little irregular. Dealers hold for $45 per oz., but there are sales at $43@44 and the market can be quoted at those figures. For hard metal $49@52 per oz. is quoted.

**Silver** has barely maintained its high level; this owing to the fact that when the information became public that the India government had made large purchases of silver and a large shipment of about £1,000,000 had been consigned from London to the East, presumably for the government, the market reacted and silver has declined about ½d. to 28⅛d., and is today quiet at this figure.

Shipments of silver from London to the East, Jan. 1 to Sept. 25, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £7,551,200 | £5,163,500 | D. £2,387,700 |
| China | 933,500 | 652,000 | D. 281,500 |
| Total | £8,484,700 | £5,815,500 | D. £2,669,200 |

Imports of silver at New York week ended Oct. 4 were $214,246, chiefly from Mexico and South America. Exports were $842,720, to London and Paris.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Oct. 4

The base price paid this week for zinc ore was lower, $45 down to $43 per ton of 60% zinc. The base price paid for 80% lead ore was $55 per ton.

SHIPMENTS WEEK ENDED OCT. 4

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,481,040 | 64,450 | 1,090,760 |
| Year to date | 114,100,910 | 5,295,640 | 45,121,610 |

Shipped during week to separating plants, 3,299,620 lb. zinc ore.

### JOPLIN, MO.—Oct. 4

The high price of zinc blende is $48, the base per ton of 60% zinc $43@45 for choice grades. These prices ruled Friday for next week's delivery, and the market was decidedly weak, with no encouragement for a better condition soon. The shipment was practically the same. Calamine sold on a basis of $21@23 per ton of 40% zinc and the market continued strong to the week-end. The average of all grades is $42.02 per ton. Lead declined in some instances $2 per ton for week-end and early next week's delivery, but the bulk of the shipment was on last week's quotations. The high price is $59.50 and the base $54 per ton of 80% metal contents. The average of all grades is $55.66 per ton.

SHIPMENTS WEEK ENDED OCT. 4

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Total this week | 10,797,530 | 729,640 | 2,477,810 | $311,165 |
| Total 40 weeks | 429,288,340 | 32,150,750 | 72,035,560 | $11,989,664 |

Blende value, the week, $232,515; 40 weeks, $9,651,526.

Calamine value, the wek, $9690; 40 weeks, $414,749.

Lead value, the week, $68,960; 40 weeks, $1,923,389.

### MONTANA ZINC ORE

The Butte & Superior Co. reports total concentrates produced as follows: July, 8700 tons; August, 11,000; September, 11,500; total for the quarter, 31,200 tons.

## IRON TRADE REVIEW

### NEW YORK—Oct. 8

Reports published in the daily press early in the week that cuts of $1 to $3 a ton in steel prices had been "announced" following the enactment of the tariff bill, are entirely without foundation. There has been practically no noticeable decline in steel prices in the past week, though in some lines the market is a trifle softer. Sheets, which were specifically mentioned as having been reduced $2 a ton, are really the steadiest line in the whole list, with the possible exception of rails and merchant bars.

It is universally recognied that there will have to be declines in some steel products in order to start a fresh buying movement, but as buyers show not the slightest disposition to take hold for farward deliveries the mills in no hurry to offer concessions. Meanwhile they are still able to make fairly large shipments—against old orders, and are booking a moderate amount of new business—for quick shipment.

Price adjustments on account of the new tariff may prove to be less drastic than was expected. The main readjustments will be in finished products along the Atlantic and Gulf seaboards, and as the advantage of doing business with domestic mills is probably valued at $1 to $3 a ton the readjustments may prove to be slight. At present prices pig iron, unfinished steel or finished steel could not possibly penetrate inland as far as Pittsburgh.

### PITTSBURGH—Oct. 7

The steel mills in the Pittsburgh Valley district continue to run practically full. While they are being operated under slightly reduced pressure, there are no departments definitely closed, and the actual tonnage output is probably equal to fully 90% of the rated capacity. In bars and shapes the large mills are comfortably filled for three months' run in the majority of instances, while in plates they have nearly as much business. Eastern mills, it is reported, are not running nearly as well. Shading in plates has increased somewhat, so that an order does not need to be as desirable as formerly to bring a concession from 1.40c., which, however, remains the quoted market on small lots. On shapes 1.40c. is common although 1.45c. is sometimes quoted. It develops that wire prices were shaded considerably more in the buying movement of the past few weeks than was reported, and it seems all the important business was placed at concessions of from $1 to $2 from the nominal prices, based on $1.65 for nails. The market on fairly attractive lots is now quotable at $1.60 for nails and 1.40c. for plain wire, with concessions possible in the case of very desirable business.

Buyers are apathetic and are making purchases only for absolute wants in the immediate future. As a result prices are not under much pressure and whatever yielding there may be eventually will hardly occur until inquiry increases and there is more tonnage to figure upon.

**Pig Iron**—The market continues stagnant throughout, but without any weakening in producers' quotations, which are well held. Production is less than six months ago and the current output is well taken on old orders. Consumers are indifferently covered for the present quarter and have bought nothing for the new year so that an active market will necessarily be developed within 30 or 60 days. W. P. Snyder & Co. announce the average of bessemer iron in September at $15.75, and of basic iron at $14.1375, Valley, these averages each showing an advance of about 9c. from August, the first advances shown this year. The compilations are made from the actual sales of valley iron, in lots of 1000 tons or over. The September computations included 15,000 tons of bessemer and 1000 tons of basic, the smallest tonnages for several months. The market remains quotable as follows: Bessemer, $15.75; basic, $14; No. 2 foundry, $14; malleable, $14.25; forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—Through ferromanganese being placed in the free list in the tariff law which became effectiv Oct. 4 the pool price of $52.50, Baltimore, becomes $50 as the former price was subject to the old duty of $2.50. We quote the market for prompt and forward at this figure, with $2.16 freight to Pittsburgh and very little interest manifested by buyers.

**Steel**—Still lower prices are quotable on steel. Hardly any steel is passing in the open market, but mills having contracts have freely made adjustments at lower and lower figures on current shipments, to prevent their contract customers going elsewhere. We quote as the outside of the market on desirable orders $23 for billets and $24 for sheet bars, maker's mill, Pittsburgh or Youngstown, either bessemer or open hearth, a decline of $1 from last week's quotations.

Rods are quotable 50c. lower, at $26.50 on ordinary lots and $27 on small lots.

**British Exports and Imports** of iron and steel and manufactures thereof are valued by the Board of Trade returns as follows for the eight months ended Aug. 31:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel | £36,841,732 | £10,000,475 | Exp. £26,841,257 |
| Machinery, hardware, etc | 41,539,450 | 10,548,809 | Exp. 30,990,641 |
| Total | £78,381,182 | £20,549,284 | Exp. £57,831,898 |
| Total, 1912 | 62,702,948 | 17,799,474 | Exp. 44,903,474 |

Quantities of iron and steel exported were 3,091,429 tons in 1912, and 3,336,002 in 1913; quantities imported were 1,251,715 tons in 1912, and 1,436,794 in 1913. Exports above include value of new ships built for foreign countries.

### IRON ORE

Shipments of iron ore from the Lake Superior district in September were 6,166,687 long tons. This makes the shipments to Oct. 1 a total of 32,401,249 tons; an increase of 2,642,431 tons, or 8.9% this year.

The Canadian Venezuelan Ore Co. is pushing its work and expects to be able to ship 2500 tons of its Imataca iron ore daily. It is shipping now about 16,000 tons a month.

### COKE

**Connellsville Coke**—The demand for prompt and October furnace coke was all satisfied without absorbing anything like all the cut-price coke available, and the market is quotable at $2.15@2.25 for prompt, with contract coke available at $2.25. With the recent accretions to the ranks of operators who sell through the Producers Coke Company there are now about 5000 ovens thus represented, with an asking price of $2.50 on furnace coke, and about 5000 ovens are controlled by other companies which are also quoting $2.50. There remain in the Connellsville and lower Connellsville region about 5000 ovens the product of which is offered at various prices. The coke market is likely to be quite uneventful during the next two months while in December there should be considerable activity for 1914, as many contracts expire with the end of the year.

**Anthracite Shipments** in September were 5,572,279 tons. For the nine months ended Sept. 30 the totals were 44,835,219 long tons in 1912, and 51,281,885 in 1913; an increase of 6,396,666 tons.

**Coal Passing Sault Ste. Marie,** season to Sept 1, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 926,926 | 1,809,401 | I 882,475 |
| Bituminous | 8,063,094 | 10,553,201 | I. 2,490,107 |
| Total | 8,990,020 | 12,362,602 | I. 3,372,582 |

The increase this year was 37.5%. Gains were large, both in anthracite and bituminous.

**Coal and Coke Tonnage of Pennsylvania R.R.** east of Pittsburgh and Erie eight months ended Aug. 31, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 6,452,287 | 6,851,626 | I 399,339 |
| Bituminous | 30,207,895 | 33,396,286 | I.3,188,391 |
| Coke | 8,597,730 | 9,731,462 | I.1,133,732 |
| Total | 45,257,912 | 49,979,374 | I.4,721,462 |

The total increase was 10.4%. The largest proportional increase was in the coke tonnage.

## CHEMICALS

### NEW YORK—Oct. 8

The general market is still in good condition, with a fair amount of business forward.

**Arsenic**—The market remains dull. Quotations are $3@3.25 per 100 lb. and are rather nominal.

**Copper Sulphate**—Business is good. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market remains dull, but steady, and prices are unchanged. The quotations are 2.40c. per lb. for both spot and futures.

### PETROLEUM

Exports of mineral oils from the United States in August were 181,627,779 gal. For the eight months ended Aug. 31, the total exports were 1,197,999,755 gal. in 1912, and 1,314,452,536 gal. in 1913; an increase of 116,452,781 gal., or 9.7%, this year.

The monthly report of the "Oil City Derrick" gives the number of new wells completed in September as follows: Pennsylvania grade, 752; Lima-Indiana, 129; Kentucky, 26; Illinois, 163; Kansas-Oklahoma, 970; Texas-Louisiana, 153. A grand total of 2193 wells were completed, with an initial production of 54,330 bbl. There were 340 dry holes and 160 gas wells. Compared with the August report there was a decrease of 188 in completions. Illinois and Kentucky were the only divisions that gave an increase in completions and initial production. The largest decrease is in Texas and Louisiana. On Sept. 30, there were 686 rigs up and 2352 wells drilling.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | May | June | July | August | September |
|---|---|---|---|---|---|
| Alaska shipments | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 | .. |
| Anaconda | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 | . |
| Arizona, Ltd | 3,200,000 | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 |
| Copper Queen | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 | .. |
| Calumet & Ariz | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 | ... |
| Chino | 3,883,611 | 5,682,706 | 4,831,185 | 6,050,867 | 4,308,296 |
| Detroit | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 | ... |
| East Butte | 1,268,595 | 1,055,646 | 1,060,257 | ..... | .... |
| Mammoth | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 | .. |
| Giroux* | 625,000 | 610,000 | 610,000 | ...... | |
| Mason Valley | 1,186,560 | 1,097,014 | 908,892 | 867,060 | . |
| Miami | 1,943,900 | 2,612,000 | .... | .. | . |
| Mammoth | | | ...... | ... | 1,750,000 |
| Nevada Con | 5,933,275 | 6,344,863 | 5,403,919 | .... | ... |
| Ohio | 650,071 | 537,400 | 601,700 | ...... | ..... |
| Old Dominion | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 |
| Ray | 4,384,400 | 4,392,612 | 4,097,000 | 4,269,519 | .. |
| Shannon | 1,080,000 | 924,000 | 880,000 | 1,248,000 | 1,232,000 |
| South Utah | 200,000 | 185,000 | 140,000 | 223,498 | .... |
| Tennessee | §1,037,115 | 1,379,220 | 1,247,804 | ..... | |
| United Verde* | 3,000,000 | 2,900,000 | 3,000,000 | . | . |
| Utah Copper Co. | 10,003,227 | 11,637,949 | 9,849,043 | 10,302,251 | .. |
| Lake Superior* | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 | . |
| Non-rep. mines* | 6,300,000 | 6,000,000 | 6,200,000 | .. | . |
| Total prod. | 109,824,500 | 104,051,138 | 101,758,167 | | |
| Imports, bars, etc | 22,205,942 | 18,255,267 | 29,029,990 | | |
| Total blister. | 132,030,442 | 122,306,405 | 130,788,157 | | |
| Imp. ore & matte. | 10,528,562 | 7,497,002 | 8,527,046 | | |
| Total Amer. | 142,559,004 | 129,803,407 | 139,315,203 | | 2,688,000 |
| Miami† | | | 2,890,000 | 3,097,500 | |
| Shattuck-Arizona | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 | |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,076 | 634,238 | 618,379 | . | .. |
| Granby | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,424,800 | 1,984,640 | 2,240,720 | 2,264,640 | |
| Cananea | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 | 3,148,000 |
| Moctezuma | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 | |
| Other Foreign: | | | | | |
| Braden, Chile | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 |
| Cape Cop., S. Af. | 387,520 | 414,400 | | | |
| Kyshtim, Russia | 1,490,000 | 1,000,000 | 2,500,000 | . | |
| Spassky, Russia. | 721,280 | 835,520 | 660,800 | 1,048,320 | |
| Exports from | | | | | |
| Chile | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 | |
| Australia. | 7,840,000 | 7,616,000 | 10,304,000 | 7,720,000 | |
| Arrivals–Europe† | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 | ..... |

* Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| | United States | | | Visible Stocks | | |
|---|---|---|---|---|---|---|
| Month | U.S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| IX, '12 | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | . | ........ |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X | ........ | | ..... | 29,793,094 | 53,625,600 | 83,418,694 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt |
|---|---|---|---|
| Alpha Con., Nev | Sept. 22 | Oct. 15 | $0.02 |
| Ame[illegible], Utah | Sept. 18 | Oct. 18 | 0.001 |
| Blue Star, Ida | Sept. 20 | Oct. 16 | 0.03 |
| Challenge, Nev | Sept. 30 | Oct. 21 | 0.05 |
| Con[illegible], Nev | Sept. 23 | Oct. 14 | 0.10 |
| Con. Virginia, Nev | Oct. 3 | Oct. 24 | 0.10 |
| Copper King, Ida | Sept. 14 | Oct. 14 | 0.01 |
| [illegible], Utah | Sept. 19 | Oct. 18 | 0.005 |
| Her[illegible], Ida | Sept. 23 | Oct. 24 | 0.0011 |
| [illegible]spar, Ida (postpo'd) | Sept. 13 | Oct. 11 | 0.0025 |
| Lucky Swede, Ida | Sept. 20 | Oct. 16 | 0.003 |
| Michigan Copper & Gold, Utah | Oct. 8 | Oct. 25 | 0.0025 |
| New Hope, Ida (postpo'd) | Sept. 19 | Oct. 18 | 0.002 |
| North Bunker Hill, Ida (post'd) | Aug. 16 | Oct. 16 | 0.002 |
| Overman, Nev. | Oct. 2 | Oct. 23 | 0.05 |
| Raymond-Illinois, Utah | Oct. 11 | Oct. 27 | 0.005 |
| Royal Copper, Ida | Sept. 29 | Oct. 29 | 0.001 |
| Sandstorm-Kendall, Nev | Sept. 19 | Oct. 24 | 0.01 |
| Santaquin Chief, Utah | Oct. 13 | Oct. 31 | 0.0025 |
| Santaquin King, Utah | Oct. 9 | Oct. 27 | 0.0025 |
| Sierra Nevada, Nev | Sept. 25 | Oct. 25 | 0.10 |
| Silver Mountain, Ida. | Sept. 15 | Oct. 15 | 0.002 |
| St. Louis, Nev. | Sept. 22 | Oct. 14 | 0.01 |
| Sunset, Nev | Sept. 2 | Oct. 13 | 0.01 |
| Sunshine, Ida | July 1 | Oct. 15 | 0.001 |
| Teddy, Ida | Sept. 15 | Oct. 15 | 0.001 |
| Tuscumbia, Ida (postpo'd) | Aug. 23 | Oct. 23 | 0.003 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53.340 | 63.471 | .... | 24.594 | 29.299 | |
| November | 55.719 | 62.792 | .... | 25.649 | 29.012 | .. |
| December | 54.905 | 63.365 | ..... | 25.349 | 29.320 | |
| Year | 53.304 | 60.835 | .... | 24.592 | 28.042 | .... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | 16.328 | 17.698 | 16.799 | 78.762 | 73.125 |
| October | 17.314 | | 17.661 | | 76.389 | ... |
| November | 17.326 | | 17.617 | | 76.890 | |
| December | 17.376 | | 17.600 | | 75.516 | |
| Year | 16.341 | | 16.560 | | 72.942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.520 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.140 |
| March | 42.577 | 46.832 | 192.619 | 213.615 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.510 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | 42.110 | 223.762 | 193.074 |
| October | 50.077 | | 228.353 | |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | 4.698 | 4.924 | 4.579 | 22.292 | 20.648 |
| October | 5.071 | | 4.894 | | 20.630 | |
| November | 4.615 | | 4.463 | | 18.193 | .... |
| December | 4.303 | | 4.152 | | 18.069 | ... |
| Year | 4.471 | | 4.360 | | 17.929 | |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7.426 | | 7.276 | .... | 27.543 | ... |
| November | 7.371 | | 7.221 | ... | 26.804 | . |
| December | 7.162 | | 7.081 | | 26.494 | . |
| Year | 6.943 | | 6.799 | | 26.421 | |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.65 | 16.03 | 15.04 | 15.63 | 14.93 |
| October | 17.90 | | 17.18 | .. | 17.22 | ..... |
| November | 18.07 | | 17.09 | . | 18.00 | ...... |
| December | 18.15 | | 17.45 | | 18.73 | .. |
| Year | $16.01 | | $14.93 | . | $15.28 | .... |

# STOCK QUOTATIONS

| COLO SPRINGS Oct. 7 | |
|---|---|
| Name of Comp. | Bid |
| Acacia | ‡ 02½ |
| Cripple Cr'k Con | ‡ 01½ |
| C. K. & N | ‡ 07 |
| Doctor Jack Pot | 05¼ |
| Elkton Con | 51½ |
| El Paso | 3 00 |
| Findlay | 02¼ |
| Gold Dollar | 08 |
| Gold Sovereign | ‡ 02½ |
| Isabella | 09½ |
| Jack Pot | 04½ |
| Jennie Sample | ‡ 05 |
| Jerry Johnson | ‡ 03 |
| Lexington | ‡ 005 |
| Moon Anchor | ‡ 006 |
| Old Gold | 01¾ |
| Mary McKinney | 58½ |
| Pharmacist | ‡ 01½ |
| Portland | 98 |
| Vindicator | 88½ |

| SALT LAKE Oct. 7 | |
|---|---|
| Name of Comp. | Bid. |
| Beck Tunnel | .05 |
| Black Jack | ‡ 10½ |
| Cedar Talisman | 00½ |
| Colorado Mining | .10 |
| Columbus Con | ‡ 00½ |
| Crown Point | 00¼ |
| Daly-Judge | 6 00 |
| Grand Central | 17 |
| Iron Blossom | 1.22½ |
| Little Bell | ‡ 10 |
| Lower Mammoth | 00¾ |
| Mason Valley | 3 87½ |
| May Day | 06 |
| Nevada Hills | ‡ 90 |
| New York | ‡ 03 |
| Prince Con | 30 |
| Silver King Coal'n | ‡3 50 |
| Sioux Con | 01 |
| Uncle Sam | 03 |
| Yankee | ‡ 08 |

TORONTO Oct. 6

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | 05 | Foley O'Brien | 20 |
| Coniagas | 7 40 | Hollinger | 16 75 |
| T. & Hudson Bay | ‡70 00 | Imperial | ‡ 02 |
| Timiskaming | 20 | Jupiter | 14 |
| Wettlaufer-Lor. | ‡ 13 | Pearl Lake | 19 |
| Apex | ‡ 01 | Porcu. Gold | 08 |
| Big Dome | 10 00 | Preston E. D. | ‡ 01 |
| Crown Chartered | ‡ 00½ | Rea | 10 |
| Dobie | 10 | Swastika | 03 |
| Dome Exten | 07 | West Dome | 08 |

SAN FRANCISCO Oct. 7

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | 07 | Belmont | 7 00 |
| Belcher | ‡.21 | Jim Butler | 65 |
| Best & Belcher | ‡.05 | MacNamara | 10 |
| Caledonia | 1 90 | Midway | 41 |
| Challenge Con. | 12 | Mont.-Tonopah | 1 15 |
| Chollar | 02 | North Star | 38 |
| Confidence | 39 | West End Con. | 1 51 |
| Con. Virginia | 17 | Atlanta | 14 |
| Crown Point | ‡ 20 | Booth | 02 |
| Gould & Curry | 03 | C.O.D. Con | 03 |
| Hale & Norcross | 09 | Comb. Frac. | 04 |
| Mexican | 1 12½ | Jumbo Extension | 12 |
| Occidental | 70 | Pitts.-Silver Peak | ‡ 38 |
| Ophir | 22 | Round Mountain | 40 |
| Overman | 50 | Silver Pick | 04 |
| Potosi | .03 | Tramp Con. | ‡.01 |
| Savage | 18 | Argonaut | 2.50 |
| Sierra Nevada | 12 | Bunker Hill | 1.75 |
| Union Con | 10 | Central Eureka | 12 |
| Yellow Jacket | 46 | So. Eureka | ‡2 75 |

| N. Y. EXCH Oct. 7 | |
|---|---|
| Name of Comp. | Clg. |
| Amalgamated | 75½ |
| Am. Agri. Chem | 44 |
| Am.Sm.&Ref.,com | 65½ |
| Am. Sm. & Ref., pf | 100½ |
| Am. Sm. Sec., pf. B | 82½ |
| Anaconda | 35¼ |
| Batopilas Min | 1¼ |
| Bethlehem Steel,pf | 70 |
| Chino | 41 |
| Federal M. & S., pf | 38½ |
| Great Nor.,ore,ctf. | 32¾ |
| Guggen. Exp. | 44¼ |
| Homestake | 104 |
| Inspiration Con. | 15½ |
| Miami Copper | 23 |
| Nat'l Lead, com | 45½ |
| National Lead, pf. | 105 |
| Nev. Consol | 16¼ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 89¾ |
| Quicksilver, pf. | 3 |
| Ray Con. | 19 |
| Republic I&S,com | 19¼ |
| Republic I&S, pf | 80 |
| SlossSheffi'd,com | 29 |
| Sloss Sheffield, pf. | 89 |
| Tennessee Copper | 31¼ |
| Utah Copper | 53½ |
| U. S. Steel, com | 56¾ |
| U. S. Steel, pf | 106½ |
| Va.Car.Chem.,pf | 96 |

| N. Y. CURB Oct. 7 | |
|---|---|
| Name of Comp. | Clg |
| Ariz. Belmont | 19 |
| Barnes King | 1¾ |
| Beaver Con | .33 |
| Big Four | 20 |
| Braden Copper | 7¾ |
| B. C. Copper | 3¾ |
| Buffalo Mines | 2¼ |
| Can. G. & S. | 18 |
| Con. Ariz. Sm. | 25 |
| Davis-Daly | 1¾ |
| Diamfield-Daisy | 04 |
| Ely Con | 06 |
| Florence | 24 |
| Giroux | 1¼ |
| Gold Hill Con | $\frac{3}{16}$ |
| Goldfield Con | $1\frac{7}{16}$ |
| Greene Cananea | 35 |
| Greenwater | 05 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | $3\frac{13}{16}$ |
| Keystone | ‡1¼ |
| La Rose | $2\frac{1}{16}$ |
| McKinley-Dar-Sa | $1\frac{9}{16}$ |
| Min. Co. of A. new | 2¼ |
| Nipissing Mines | 8 |
| Ohio Copper | .50 |
| Pacific Sm. & M. | ‡¾ |
| Puebla S. & R. | 2½ |
| South Utah M.&S. | ¼ |
| Stand'd Oil of N. J. | 3[illegible]0 |
| Stewart | 1½ |
| Tonopah | 4½ |
| Tonopah Ex | $1\frac{15}{16}$ |
| Tonopah Merger | 69 |
| Tri-Bullion | ½ |
| Tularosa | $\frac{9}{16}$ |
| Union Mines | 08 |
| United Cop., pfd | 3 |
| West End Ex | 05 |
| Yukon Gold | 2¼ |

| LONDON Sept. 27 | | | |
|---|---|---|---|
| Name of Comp. | Clg | | |
| Camp Bird | £0 | 16s | 0d |
| El Oro | 0 | 15 | 0 |
| Esperanza | 0 | 18 | 9 |
| Mexico Mines | 5 | 17 | 6 |
| Oroville | 0 | 7 | 0 |
| Santa Gert'dis | 0 | 18 | 9 |
| Stratton's | 0 | 1 | 6 |
| Tomboy | 1 | 6 | 3 |

| BOSTON EXCH Oct. 7 | |
|---|---|
| Name of Comp. | Clg |
| Adventure | 1¼ |
| Ahmeek | 280 |
| Alaska Gold M. | 23¾ |
| Algomah | 1¼ |
| Allouez | 35½ |
| Am. Zinc | 18¾ |
| Ariz. Com., ctfs. | 4¾ |
| Bonanza | 32 |
| Boston & Corbin | 75 |
| Butte & Balak | 3 |
| Calumet & Ariz. | 65½ |
| Calumet & Hecla | 430 |
| Centennial | 14 |
| Cliff | 1¾ |
| Copper Range | 39½ |
| Daly West | 2 |
| East Butte | 12 |
| Franklin | 3¾ |
| Granby | 73 |
| Hancock | 16½ |
| Hedley Gold | 30 |
| Helvetia | 40 |
| Indiana | 4 |
| Island Cr'k, com | 51 |
| Island Cr'k, pfd | 84 |
| Isle Royale | 19 |
| Keweenaw | 1¼ |
| Lake | 8½ |
| La Salle | 3½ |
| Mass. | 2 |
| Michigan | 1¾ |
| Mohawk | 41½ |
| New Arcadian | 1¾ |
| New Idria Quick | 2¾ |
| North Butte | 27 |
| North Lake | 1½ |
| Ojibway | 75 |
| Old Dominion | 51½ |
| Osceola | 80 |
| Quincy | 58 |
| Shannon | 7 |
| Shattuck-Ariz | 29 |
| Superior | 24½ |
| Superior & Bost | 2¼ |
| Tamarack | 30 |
| Trinity | 4½ |
| Tuolumne | 60 |
| U. S. Smelting | 39¼ |
| U. S. Smelt'g, pf. | 48 |
| Utah Apex | 2¼ |
| Utah Con | 9 |
| Victoria | 1½ |
| Winona | 1¾ |
| Wolverine | 41 |
| Wyandot | 50 |

| BOSTON CURB Oct. 7 | |
|---|---|
| Name of Comp. | Bid |
| Bingham Mines | 5¾ |
| Boston Ely | 54 |
| Butte&Lon'nDev | 31 |
| Cactus | 01 |
| Calaveras | $1\frac{3}{16}$ |
| Chief Cons | 1¾ |
| Corbin | 90 |
| Cortez | 30 |
| Crown Reserve | $1\frac{9}{16}$ |
| Eagle & Blue Bell | 96 |
| First Nat. Cop. | $2\frac{1}{16}$ |
| Houghton Copper | 3½ |
| Majestic | 29 |
| Mexican Metals | 28 |
| Moneta Pore | ‡ 07 |
| Nevada-Douglas | 2¾ |
| New Baltic | 10 |
| Oneco | 80 |
| Raven Copper | 06 |
| Rhode Island Coal | 01 |
| Smokey Dev | 75 |
| So. Lake | 3 |
| S. W. Miami | ‡1½ |
| Tonopah Victor | 32 |
| Trethewey | 28 |
| United Verde Ext | 52 |

‡Last Quotation

The Engineering and Mining Journal

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# Southwestern Portland Cement Works

By Charles A. Smith*

*SYNOPSIS—Description of the plant and method of operation of a large cement works near El Paso, Tex. Lime rock is mined from a nearby open cut and trammed to the works where it is blended, ground, burned and reground into marketable product. The plant is modern and efficient.*

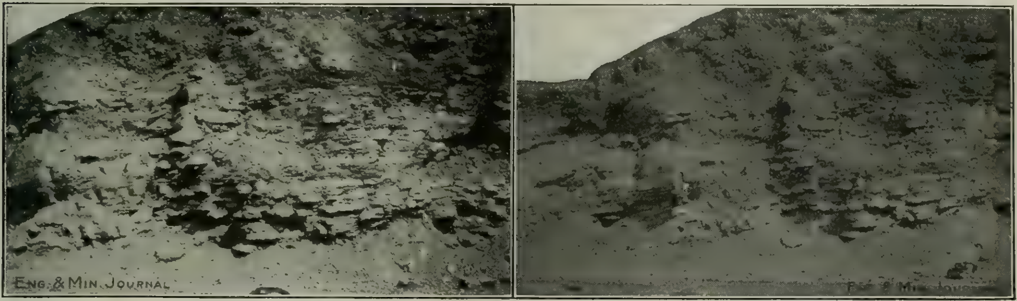
⁂

The quarry and factory of the El Paso Portland Cement Co. are situated just west of El Paso, Tex. The raw material secured from the quarry is an argillaceous lime shale of the Comanche series lying in well defined beds having a dip of about 15°, and carrying up to 90% $CaCO_3$. The rock is more or less irregular in composition. The mixture best suited for the cement contains 75% $CaCO_3$ and 25% argillaceous and other matter and a considerable proportion of the shipments from the quarry give approximately this analysis. The bulk of the raw material used, however, is made up of run-of-mine rock (which varies widely from the standard requirements) mixed with high- or low-lime material, as the case may require, to produce a mixture of the proper composition.

### Limestone Obtained from a Quarry

The quarry is a plain opencut driven into the hill, its main floor some 10 ft. above the railroad grade. Breaking is done from the bank onto this floor by means of holes from 25 to 100 ft. deep drilled by a Rockford well driller using a 5⅝-in. bit. A common charge for a deep hole consists of 100 kegs of black powder placed at the bottom and on top of this enough No. 6 Monobel to fill it to within 15 ft. of the collar. Three electric primers are used in each hole and up to three holes are shot at once. The breaking efficiency runs from 5 to 7 tons of rock per pound of explosive used.

The broken rock, drilled with plug drills and shot when necessary, is handled in 1-yd. capacity carts and dumped into the 2-yd. capacity larries, which take it to the factory. These cars move in a timbered tunnel or ditch run on the railroad grade 10 ft. below the main floor of the quarry, and partially covered on top so that the carts can be backed up and dumped into the middle of the larries. When the main floor becomes too extended, or, in other words, when the breaking face gets too far away from the edge of the main floor, the latter is quarried back and shoveled directly into the larries.



Limestone Deposit, Southwestern Portland Cement Co., El Paso, Texas

The mucking is done entirely by contract. The men work in pairs and are paid 8c. per cart. They fill from 30 to 55 carts per pair per shift. When the train runs steadily taking away the muck as fast as they handle it, they easily fill from 40 to 55 carts. Their wages vary from $1.25 to $2.25 each, and average about $1.80 each per day. The contract system seems to work most satisfactorily. The efficiency runs up to 35 tons per day per shoveler and up to 20 tons per day per man, including shovelers, bosses, mule drivers, tally men, train crew and all. The muckers are Mexicans, the rest are chiefly Americans.

At the factory the rock is dumped at the side of the track and shoveled directly into two No. 6 Gates gyratory breakers set with their tops level with the ties, which break it to pass a 2½-in. ring. From each crusher the rock goes to a steel-cased link-and-bucket elevator, is hoisted into a hopper and fed to a set of Crescent heavy-duty rolls, size 16x36 in., running at 78 r.p.m., which reduce it to ¾ in. From the rolls it is taken by a Webster bucket conveyor to the six first-blending bins, 750 tons capacity each.

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*553 Main St., Oconto, Wis.

### Rock Is Carefully Sampled and Measured

Before reaching the blending bins the rock is sampled. To make up this sample every thirtieth bucket on the conveyor is tripped into one of two receiving hoppers, one for each alternate hour.

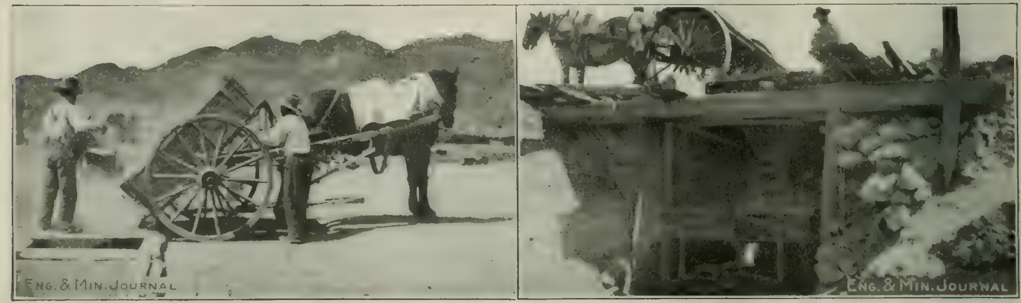
At the end of each hour the sample is drawn from the hopper and run through a fine-grinding Williams mill. From the mill it is sent to a Vezin sampler, which cuts out one-thirtieth as a sample, and the latter is run through a mixing drum and thence through a second Vezin sampler, which turns out a sample amounting to one-ten thousandth of the rock crushed during the shift. This sample is assayed each hour for lime and the rock dumped into the high-lime, low-lime or run-of-mine bedding bins, accordingly.

The first-blending bins are filled as indicated above, and on the flow sheet, with rock of a high lime content in one bin, rock of a low lime content in one bin and run-of-mine rock in the remaining four bins. Through a careful mixing of these three classes of material a regular product containing the proper proportions of lime and other matter is obtained for the final-blending bins.

The rock is drawn from the first-blending bins onto the bucket conveyor, as indicated on the flow sheet, dumped into an elevator, hoisted into a hopper and thence delivered by means of a swinging spout to any one of three hoppers which handle, respectively, the high-lime, low-lime and run-of-mine rock. These hoppers discharge through three Richardson automatic-measuring devices, respectively, having open indicators, showing at a glance what amount of material has passed through them and with their aid the mixture in the final-blending bins is regulated.

After passing the measuring devices the rock is taken on a short belt conveyor to an elevator, hoisted into a hopper, run through a sample mill and thence taken by a belt conveyor to the final-blending bins. The sample taken here is a good one. The entire stream of material is run through a Vezin, which cuts out one-tenth. This is then put through a mixing drum and then through a second Vezin, which cuts out another one-tenth, which last is collected in one of two hoppers, one for each ½-hr. period. At the end of each period the material in the corresponding hopper is run through a fine-grinding

Loading and Carting the Quarried Rock



Dumping from Cart into Larry

Burning Kilns, Southwestern Cement Co.

Williams mill, thence through a Vezin sampler, which cuts out one-tenth, and thence through a mixing drum and another Vezin sampler, which cuts out a final one-tenth, making a final sample of one-ten thousandth of the rock treated. This sample is assayed every ½ hr. for lime and the correct mix maintained by varying the proportions of material taken from the high-lime, low-lime and run-of-mine bins, respectively. The ½-hr. interval effects a correction on every 3 in. of material in the final-blending bins.

Regarding the sampling it is to be noted that at the first sample mill the entire reject, amounting to about 3% of the total run, and at the second mill the last two rejects, amounting to about 1% of the total run, go back into the conveyor or elevator and are returned through the sample mill. Apparently this does not affect the accuracy of the result to any appreciable extent.

From the final-blending bins, the rock is drawn onto a conveyor belt, carried to an elevator, hoisted and discharged into a 75-ton hopper, which feeds the drying kiln. The dryer is of the rotary type, 6 ft. inside diameter by 60 ft. long, set with an inclination of ¾-in. per ft. and revolving at the rate of three r.p.m. It handles about 30 tons of rock per hour, drives off from 2½ to 3¼% of moisture, consumes about 15 lb. of coal per ton of rock dried and delivers the dried product at a temperature varying from 260 to 320° F.

The product from the dryer is carried by a link and bucket conveyor to an elevator, hoisted to a small storage bin and taken from this by a mixing screw conveyor and discharged into four hoppers each feeding two Fuller raw-grinding mills. These machines run at about 140 r.p.m., and with a single grinding make a product running from 96% to 97% through 100-mesh, and from 86% to 89% through 200-mesh. The material is not reground. The product is assayed every hour for lime and fineness. The wear on the mills is small, the shoes and balls lasting about 2000 working hours and the die-rings lasting indefinitely. The mills are each driven by a single Westinghouse vertical-shaft motor of 90 hp., and running at 380 r.p.m.

The product from the mills runs into a collecting box, is taken from this by a screw conveyor to a link-and-bucket elevator, hoisted and discharged into a storage bin and fed from this by a variable-speed screw conveyor directly into the burning kilns. This screw conveyor is controlled by the attendant, who looks after the burning operation and regulates its speed and, consequently, the rate of feed, according to the condition of the charge in the kiln.

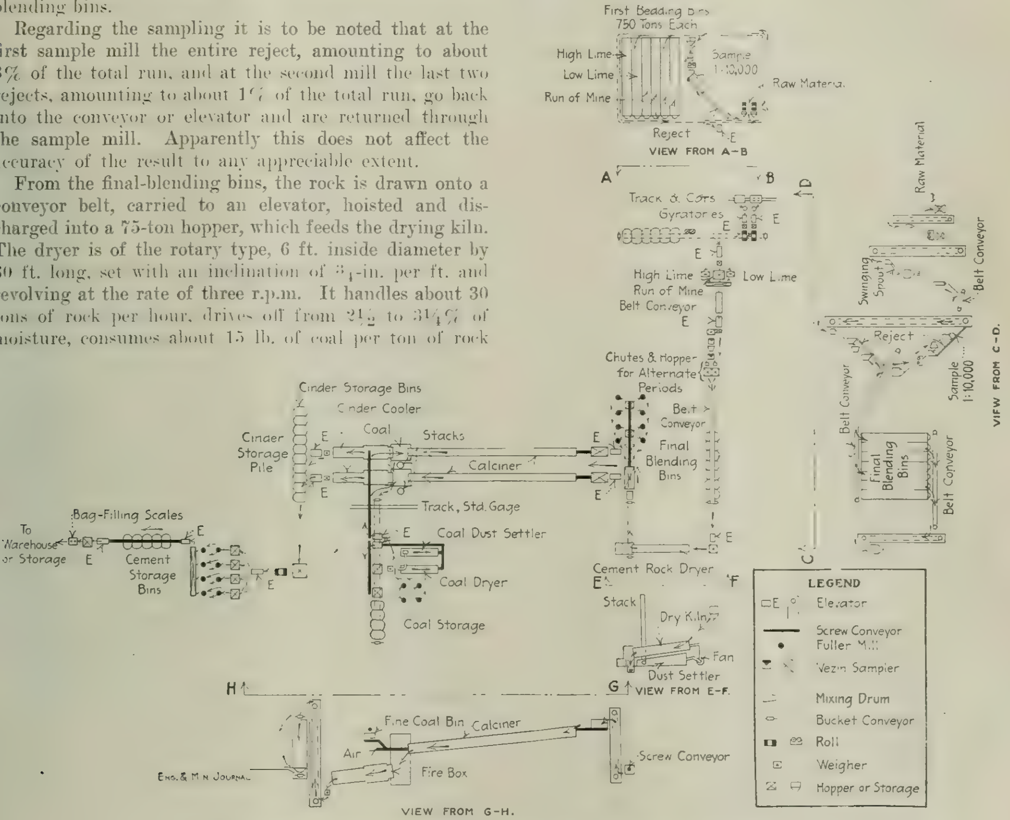


Diagram of Southwestern Portland Cement Co.'s Plant

Just before entering the kiln, the mix is sampled and assayed every hour for lime. The kiln is of the rotary type, three-tired, 8 ft. inside diameter by 150 ft. long, slopes ½ in. to the foot and is rotated at a speed varying from one revolution in 50 sec. to one revolution in 3½ min. The rotation is done by a variable-speed motor controlled by the burner attendant. The fuel used is powdered coal blown in by air delivered by a rotary fan. Figures on the consumption of coal could not be obtained. The lining of the kiln is comparatively durable. In the burning zone, the first 15 or 20 ft., it lasts from three months to one year, and the rest of the lining lasts indefinitely.

The capacity of each kiln was placed at approximately 800 bbl. of clinker, burned rock, per 24 hr. The burning is a somewhat delicate operation. The object of it is to drive off the $CO_2$, and at the same time effect only a slight fusion of the lime and clay forming the anhydrous tri-calcium silicate. Every hour a sample is taken of the calcined material as it leaves the kiln, and every 12 hr. these samples are combined and assayed for lime.

From the kilns the calcined rock, now called clinker or cinder, is discharged into two rotary coolers (similar to the kilns), cooled at their upper ends by outside water sprays, thence to two automatically registering rotary weighers, thence to two link-and-bucket elevators, which discharge it onto a single link-and-bucket conveyor serving the clinker-storage bins and the stock pile. The latter is built up in front of and against the bins by tripping the conveyor over suitable chutes, which throw the clinker outside of and in front of the bins instead of in them, and it is taken down, with more or less handling, through chutes cut to the conveyor under the bins. It is interesting to note that water does not affect the unground clinker, and it can be kept in the stock pile indefinitely.

### GRINDING AFTER BURNING

From the storage bins or the stock pile the clinker is conveyed and elevated to a hopper, passed through a set of rolls and thence to an elevator and screw conveyor, which latter distributes it to four bins, each feeding two Fuller mills, the general arrangement and drive of the elevators and mills being similar to that in the raw-grinding plant. Of the eight mills, six are 42-in., running 160 r.p.m., and two are 54-in., running 130 r.p.m. The wear on the mills is much greater than in raw-grinding, the shoes and balls having a life of only about 300 working hours and the die rings a life of only about a year. The clinker is ground only once, the single grinding producing 94% through 100-mesh and 79% through 200-mesh. The standard cement specifications call for 92% through 100-mesh and 75% through 200-mesh.

The product from the mills falls into a collecting box, is conveyed thence by a screw conveyor to an elevator, discharged onto another screw conveyor, which latter takes it to the final cement-storage bins. From the bottom of these bins it is drawn through chutes onto another screw conveyor, conveyed to an elevator and raised and dumped into a hopper which feeds the packing apparatus.

The packing apparatus consists essentially of a scale set to trip and dump at a certain weight, and a spout for feeding the cement. The pan of the scale is made of a shape suitable for holding a bag of cement, and the spout is placed conveniently for filling the bag as it rests in the pan. The empty bag comes to the scales with its neck wired up and, inverted on the scales, it is filled from the spout through a hole in one of the lower corners. No tying is necessary to close the filling hole. In effect, there is attached to the filling hole on the inside of the bag a 4- or 5-in. length of cloth tubing. The filling spout is run in beyond the end of this tube (and when withdrawn the weight of the cement is sufficient to close it), when the bag is filled with the set weight of cement the scales trip, the run of cement through the filling tube is cut off, the pan tips and the bag falls out away from the filling spout and down through a short chute to the handlers and is taken directly to the cars or to the warehouse. The output of the factory is 40,000 bbl. per month, the barrels weighing 380 lb. each. The output per man is about 11 bbl. per shift.

### GROUND COAL USED AS BURNING FUEL

The general arrangement of the coal-grinding plant is also shown on the flow sheet. The coal is dumped directly from standard-gage cars into a link-and-bucket elevator-conveyor and taken to four storage bins of 400 tons capacity each. From these bins it is drawn through chutes onto the same elevator-conveyor, carried to a hopper, run through an automatic weigher and fed to a Cummer rotary-kiln coal dryer, having a dust-settling chamber attached. The dryer removes from 4% to 12% of moisture.

From the dryer the coal is taken by a screw conveyor to an elevator, discharged onto another screw conveyor, conveyed to two feed hoppers and fed to four Fuller mills. The mills grind it in one stage, so that 97% to 98% will pass 100-mesh and 87% to 90% will pass 200-mesh. From the mills it falls into a collecting box, is taken by a screw conveyor to an elevator, elevated and discharged onto another screw conveyor, which takes it to the fine-coal feed hoppers, whence it is fed by means of a variable-speed screw conveyor, controlled by the burner man, to the air-stream, which blows it into the kiln.

WELL DRILLER FOR PUTTING IN BLASTING HOLES

The air used to feed the fine coal to the kilns was formerly taken from two stacks, which handled the hot waste air from the clinker coolers. This did not give satisfactory results, and the air is now taken by the blower directly from the atmosphere. Of the gases from the coolers, as much as can be utilized is turned through the burning kilns, and the balance is wasted through the stacks.

The power house is steamed by Stirling boilers stoked by Green Engineering Co.'s chain stokers. These latter seem to have given complete satisfaction. The power available for running the factory is 1200 kw.

The plant has been in operation $3\frac{1}{2}$ years.

For the above I beg to acknowledge my indebtedness to the courtesy of O. J. Binford, superintendent and secretary of the company, who gave me every opportunity to see the full working of the plant and process.

## Notes on Electric Pumps

By Sidney S. Walker*

Since their introduction some years ago, great improvement has taken place in both centrifugal and electrically driven plunger pumps. Theoretically, the high-speed centrifugal pump, with its motor direct-connected to the shaft, the whole forming a small and compact machine, would seem to be the superior type. It is now built in forms capable of high lift and its original efficiency running from 30 to 40% has been increased to 70%. These improvements are largely due to the competition of the triplex-plunger electrically driven pump, which in its turn has increased in efficiency from 66⅔% up to 80%, which is claimed with apparent justification. The improvement in both types is largely due to a better understanding of the principles involved and to improved design, together with improved methods of manufacture.

Mine pumping is usually arduous for the reason that the water is dirty and often carries corrosive salts and acids. The results of this are seen in the great wear on all water passages and in the tendency of the valves in particular to become defective and inoperative. For economical pumping, the movement of the water should be as smooth as possible in all portions of the pump, the supply and the delivery pipes, for the purpose of avoiding shock and eddy-currents, both of which consume power to no good purpose. Furthermore, when little shock has to be sustained, the whole system can be built lighter. Therefore, economy requires that the successive deliveries of water to the pipelines should be as frequent and as small as possible. The plunger pump is inherently defective in this respect, although, by the use of triplex plungers, the disadvantage is somewhat overcome. The reversal of direction of the water flow in the pump chambers is also an objectionable feature. Furthermore, defects in the gearings are likely to cause shock in the operation, which results in loss of power and a tendency to break both the pump and the delivery pipe. Modern tooth gearing, however, has been greatly improved so that the loss of power in this feature of the triplex pump is reduced almost to a minimum. Entrained air is sometimes a cause of difficulty and requires the addition of a special device to permit of its escape, so as not to interfere with the flow of water. On the other hand, an air chamber on the delivery side of the pipe is used to equalize the pressures between strokes of the pump, and is of advantage.

A point to be considered in pumps of both types is that of the "slip" or return of water through the valves. The efficiency of the pump depends largely on the efficiency of the valves as all slip is a direct loss of capacity and power. Spring control is usual, but direct positive action through mechanism is sometimes used and has proved of great advantage.

The original centrifugal pump contained impellers of crude design, being flat and rough, with large clearance and consequently high slip. In the modern centrifugal, the impeller is carefully designed to the proper curve, is made usually of some acid-resisting and hard metal, such as phosphor bronze, is machined so as to avoid loss of capacity through capillary action of the water, and works in conjunction with a chamber so that the direction of flow of the water is changed as gradually as possible, and the amount of eddy current set up is kept down to a minimum. Clearances have been reduced from one-sixteenth of an inch to one-thousandth. Air troubles do not arise with the centrifugal pump, but, on the other hand, it is not capable of picking up its own suction, and some means must be devised of charging it before beginning its operation. This is not difficult, but for cases where intermittent pumping is required, it may be a source of annoyance.

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*Consulting Engineer, Bloomfield Crescent, Bath, England.

## Coal-Mining Machines for Iron Ore

Improvements in mining methods on the Mesabi range have not heretofore extended to the actual extraction of the ore underground. The miners still drill by hand, muck their own dirt and otherwise mine as they have done since the beginning. The number of miners on the range has not grown in proportion to the amount of development, and in consequence the production from underground mines has not been so large as it should be. How to increase the production, using the limited number of miners available, is therefore a question of vital interest. Could power machines be successfully used, it would necessarily mean a division of labor into two classes, miners and muckers, and the output per miner would be largely increased. The common laborers, becoming more proficient, would eventually graduate into the miners' class, thus increasing their number. With these ideas in view, it was decided to experiment with machines on the soft ores of this range.

An ordinary Sullivan air pick or coal puncher, and a Jeffries air auger were installed at the Harold mine, in the Hibbing district. The pick machine is the largest type manufactured by the Sullivan company, having a depth of undercut of 5½ ft. The bore of cylinder is 5⅛ in., the air pressure required 80 lb. and total weight 825 lb. To understand thoroughly the application of these machines to our mining methods, it may be well to mention first the several operations incident to taking out a set of ground by the ordinary top-slicing method. The miners first drill a round of holes in the breast, each hole approximately 5 ft. in depth and varying in number from three to five, depending upon the height of post, character of ground and whether drifting into the solid or with caved ground on one side. The upper holes are usually fired first and the bottom holes after the top dirt is mucked out. The amount of dynamite used depends upon the conditions mentioned above and varies from 15 to 30 ½-lb. sticks. After the upper holes are fired the miners secure the back by poling from the last set of timber into the breast. The ore broken in this blast is then loaded and trammed, and the bottom holes are fired. After all the ore is mucked out, the miners trim the breast, back and sides and the set is ready for timber. Under ordinary conditions the amount of time spent in these several operations is approximately as follows: Drilling, 17%; blasting, 4%; blowing smoke,

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Note—Reprinted from a paper by H. E. Martin and W. J. Kaiser presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913.

3%; tramming, 7%; trimming, 9%; timbering, 20%, and mucking, 40%.

The number of men required for one machine crew, is two machinemen, three miners and six muckers. This ratio was experimentally determined and is of the most importance to the efficient working of the machines, since there should be no delay from miners, muckers or machinemen waiting upon each other. The minimum number of working places or rooms required to take care of one machine has been found to be five, though a larger number will insure no delays and will make for higher efficiency.

The actual taking out of a set of ground with the aid of the machines is as follows: The set is first undercut with the puncher to a depth of 5 ft., the cut extending from the solid rib to within 6 in. or so of the open side, thus leaving a small pillar 6 in. wide for the full length of the set, its purpose being to support the ground against premature caving. Two holes are then drilled with the air auger, about 1 ft. from the solid rib and spaced about 2 and 6 ft. respectively from the back. In case the slice was driven into the solid, four holes would be necessary, two on each side. Two short holes are drilled by the miners in the small pillar. Boards are placed in the cut under the block to be broken out, a small amount of ore picked down upon them to hold them in place, and the holes loaded and fired. The advantage of placing boards beneath the ore before it is broken, while hard to estimate, is of considerable importance, as it gives a smooth surface from which to shovel. The miners now secure the back by poling and the room is ready for the muckers. After the ore is mucked out, the miners square up the set, place the timber and start another cycle of operations.

The average time for undercutting one set of ground, excluding delays, has been 59 min.; for moving from place to place and setting machine, 26 min. Drilling with the air auger has averaged 2.8 min. per ft.; time setting up, 1.4 min. per ft. These figures can and no doubt will be considerably improved as the machinemen become more proficient.

The advantages which can be claimed for the machine, aside from any direct reduction in the cost of producing the ore, are the employment of one-half common labor, the use of approximately one-half the amount of dynamite, the decreased liability of posts being blasted out and consequent caving of rooms, and the possession of a smooth shoveling surface. To the successful working of the machines, several conditions are essential. The rooms served by the machine must be easy of access from one to another, their height should not be less than 7 or 8 ft. and no bottom stoping should be necessary. In other words, the system can be applied to ordinary slicing and square-setting.

The results obtained so far have not been so satisfactory as could be wished, primarily because muckers were not obtainable in sufficient number to keep the machine and miners busy at all times. At the start many delays were occasioned by not having a sufficient number of places opened up for the machine. However, during the first five weeks of work, the average number of tons per man per day was 12, an amount considerably above the average for most places in our underground mines. Taking these points into consideration, it can be conservatively said, that it is not a question of what the machines can or will do, but merely one of organization, and their future on the Mesabi range seems assured.

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# Mineral Output of New York in 1912

The figures of mineral production by New York mines and quarries in 1912 as reported by D. H. Newland, Assistant State Geologist, are shown in the accompanying table, together with the corresponding information for 1911. The items are arranged in order of descending values in 1912. The mineral resources of the state were actively exploited, and the total value of the production amounted to $36,552,784, as compared with $31,730,747 in 1911, an increase of nearly 17 per cent.

Iron ore is the most valuable metallic mineral from an industrial standpoint. The gross output of this ore last year was 1,277,677 long tons; after allowance for concentration, this amounted to 1,057,702 tons of shipping ore, having a value of $3,349,895. There was a good advance among mines in the Clinton belt, though the magnetite ores as usual constituted the greater part of production. New developments have been in progress which may lead to a material advance in the industry in the near future.

The improved conditions in the building trades also brought about an increased output of quarry materials, inclusive of granite, limestone, marble, sandstone and trap, which had an aggregate value of $5,718,994, as compared with $5,560,335 for the previous year.

The production of carbon dioxide from natural sources was discontinued as the result of the recent action taken for the conservation of Saratoga mineral waters.

NEW YORK MINERAL OUTPUT, 1911 AND 1912

| Product | 1911 | 1912 |
|---|---|---|
| Building brick, M | 1,078,019 | 1,205,704 |
| Pottery and clay products, including crude clay, value | $4,291,441 | $5,076,537 |
| Cement, bbl | 3,691,373 | 4,783,535 |
| Limestone, value | $3,174,161 | $3,510,445 |
| Iron ore, long tons | 952,364 | 1,057,702 |
| Sand and gravel, including sand-lime brick, value | $1,819,431 | $2,683,465 |
| Salt, bbl | 10,082,656 | 10,502,214 |
| Natural gas, M cu ft | 5,127,571 | 6,564,659 |
| Petroleum, bbl | 955,314 | 782,661 |
| Sandstone, value | $1,060,106 | $1,280,743 |
| Gypsum, tons | 446,794 | 506,274 |
| Mineral waters, gal. | 8,923,628 | 9,682,447 |
| Talc, tons | 65,000 | 61,619 |
| Trap, value | $899,414 | $483,863 |
| Pyrite, long tons | 53,453 | 58,137 |
| Marble, value | $278,041 | $241,847 |
| Granite, value | $148,633 | $202,096 |
| Graphite, lb | 2,510,000 | 2,628,000 |
| Garnet, tons | 4,285 | 4,112 |
| Feldspar and quartz, tons | 21,802 | 28,584 |
| Emery, tons | 769 | 589 |
| Other materials[1], value | $380,054 | $253,650 |

[1] Includes apatite, diatomaceous earth, marl, millstones, pigments, slate, and zinc ore.

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**A 13-Mile Bucket Tramway** for the Saline Valley Salt Co. was completed late in June, and was built for the transportation of salt from the beds in Saline Valley to the railroad at Swansea in Inyo County, California. It was built by the Trenton Iron Works and it is said cost $500,000. The total length of the bucket line is 26 miles, and is made up of five sections, each working independently. It is electrically driven. An interesting feature of the construction is the use of the down pull on the west side of the mountain for the generation of 75 hp., which is used in aiding the pull of the load up the east side of the mountain. The bucket line in its travel reaches an elevation of 8700 ft. The rated capacity of the plant is 20 tons per hour, which can be increased by increasing the size of the cables. The Saline Valley company owns 1100 acres of land in Saline Valley in the northern part of Inyo County, east of the Inyo mountains. Salt has been mined here for the last 10 years, but transportation by mule team was too costly to permit the creation of a market for the product beyond the local demand. The tramway will deliver the salt at the railroad station, and should place the company in the position of a large competitor in the salt industry of California.

# Wet Bucket Elevator Design

By Arthur O. Gates*

*SYNOPSIS—An investigation of the mechanics of the wet-bucket elevator, a comparison of results with present practice, and suggestions for improvements. A close relation between belt speeds and pulley diameters is shown, and "critical speeds" at which best results are obtained has been determined. Effects of shape of bucket and of overspeeds are studied, several striking results are noted, and one or two radical suggestions are made as to shape of bucket and means of obtaining increased capacities.*

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The speed at which a wet-bucket elevator should be run, the proper slope for the ascending belt, the question of feeding into the boot or into the bucket, whether the dividing point in the receiver should be high or low, the right and wrong side for the extra rubber cover of the belt, and many other such problems enter into the design of wet-bucket elevators; problems which are all too often left to rule-of-thumb solutions. In studying the underlying theory of the wet-bucket elevator I have come to the conclusions that are here outlined.

### Importance of Action of Head Pulley

What takes place at the head pulley where capacity is limited by several conditions is not well understood. It is known that centrifugal force helps the elevator to discharge, and that the force of gravity holds the pulp or liquid level in the bucket when going up and helps it out coming down; it is thought that friction perhaps slows up the discharge. Of the magnitude and relations of these forces our information is rather limited.

After the elevator bucket reaches the head pulley both the force of gravity and centrifugal force are acting on the pulp in the bucket, the former tending to hold it down in the bucket with its surface horizontal, the latter tending to pile it up against the discharge side of the bucket. As for friction, it will be found upon investigation that the velocity of the pulp with relation to the bucket, as well as the pressure between the pulp and the bucket, is low when they part company, and the distance passed over in contact is so short, that friction can be dismissed as having practically no effect on capacity or discharge.

The ordinary elevator bucket of malleable iron or pressed steel has a section about as shown in Fig. 1, the angle of inclination $Z$ of the outer face being about 30°. The force of gravity acting on any particle in the bucket is the weight $W$ of that particle, always constant and always acting downward. Centrifugal force $C$ is always a radial from the center of the pulley, and its magnitude is determined by the formula,

$$C = \frac{Wv^2}{gr}$$

where $C$ equals centrifugal force in lb.; $W$ equals weight, or force of gravity in lb.; $v$ equals velocity in feet per second; $g$ equals 32.2, the acceleration of gravity; and $r$ equals radius in feet, of path of particle.

The resultant $R$ of these two forces $C$ and $W$ is constantly changing in magnitude and direction as the bucket carries the particle around the pulley. The level of the liquid is always at right angles to the resultant force acting upon it, and with a varying resultant, the surface will change with reference to the tangent of the pulley. The volume carried in the bucket will be limited by the sides of the bucket and, as shown in Fig. 1, a plane perpendicular to $R$. As the centrifugal forces on the particle at all points pass through a common center and are equal in magnitude, the two forces $C$ and $W$ are combined in the accompanying diagrams, about this center, the resultant $R$ extending from the upper end of the vertical line representing the weight $W$, and ending at the circumference at a point corresponding to the angular position of the particle, the radial distance being equal to the centrifugal force $C$. The angle $y$, Fig. 1, between the surface of the pulp and the tangent to the circle of motion of the particle $X$ is always equal to the angle $y$ between the lines of the forces $R$ and $C$ (Fig. 2), each of the former being, respectively, perpendicular to each of the latter. From Fig. 1 it will be noted that as the angle $y$ decreases, the volume of pulp possible in the bucket decreases, allowing the surplus to slip over the lip of the bucket and to be discharged; when $y$ becomes equal to $Z$ the bucket has no capacity whatever.

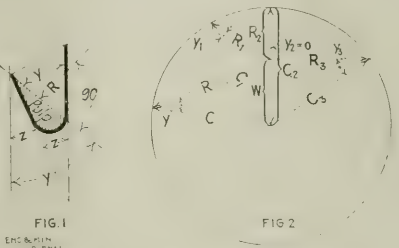

FIG. 1 FIG 2

Forces Acting on Pulp in Elevator Buckets

From Fig. 2 it will be noted that $R$ is least at the top position and greater at lower positions no matter what the relative magnitudes of $C$ and $W$, that $R$ tends to hold the pulp in the ascending bucket and discharge it from the descending. When $C$ is less than $W$, $R$ is downward at the top tending to empty the bucket onto the belt and to let it slop over the sides of the pulley. When $C$ is greater than $W$, $R$ is directly upward at the top position tending to push the pulp out of the bucket in that direction. When $C$ is equal to $W$, $R$ is equal to zero at the top position and the pulp is released from pressure against the bucket, and travels under the influence of the velocity it has, that of the bucket, and of the force of gravity. It is apparent that operation under this last condition will be near to that required for best results, the pulp will not fall onto the belt, the discharge will be free, and the buckets will have good capacity.

For this last condition, namely that centrifugal force be equal to the force of gravity, that is, $W = C = \frac{Wv^2}{gr}$ the velocities $V$ in feet per minute, equal to 241 times the square root of diameter in feet) of the bucket tip have been called "critical speeds," and the values have been plotted in Fig. 3 for different pulley diameters, speed and diameter being given in the form most advantageous in practice. It is here assumed that the pulp particles take the velocity of the bucket tip, which is substantially correct for the conditions which are being considered.

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*Purdue University, La Fayette, Ind.

As the velocity of the belt and pulley is less than that of the bucket tip, additional curves have been drawn for the pulley diameters when belt thickness and bucket projection are allowed for. The curves give both the belt velocities and the revolutions per minute of the pulley for the different values of $T$ (belt thickness plus bucket projection, in inches) of 3, 4½, 6, 7½, 9 and 12 in., when the bucket tip is traveling at the critical speed.

Many belt elevators in practice, operating at belt speeds from 300 to 400 ft. per min. will check fairly well with these curves; those at speeds above 400 ft. per min. are either running too fast or have pulleys too small for the belt speed. Present-day practice has been slowly and cautiously increasing velocities and pulley diameters, the curves show what changes can be made to increase capacity along rational lines.

In some plants elevators are reported running at 25 to 40% overspeed; critical speed equals 100%, and high hoods are required. This suggested a study of discharge points and of bucket capacities as affected by overspeeds, and the results as shown in Fig. 4 clearly indicate that these particular elevators were letting go of much if not all of their pulp just after the bucket reached the head pulley, probably recovering some of it to discharge nearer the receiver.

### EFFECTS OF OVERSPEEDS

In explanation of Fig. 4, it will be recalled that the resultant $R$ of the two forces $C$ and $W$ is changing in magnitude and direction as the pulley revolves, and it is the direction of $R$ that is of interest. At the critical speed a bucket traveling vertically, around the pulley, has its resultant $R$ at 45° from the horizontal, which means that the pulp in the bucket assumes this angle on its surface. At overspeeds $R$ is flatter, the pulp lies in the bucket at a steeper angle and capacity is less. As the bucket travels upward around the pulley the angle of $R$ does not increase as rapidly as the pulley turns, so that up to a certain point its capacity increases, then it gradually decreases until discharged.

As before stated, the angle $y$ is that between the surface of the pulp and the instantaneous direction in which it is moving. It varies, of course, with $R$, and its values are shown in Fig. 4 for the different angular positions as the bucket travels up to the top of the pulley, at the critical speed and at overspeeds. These $y$ curves are found to be true circles passing through the center and top points of the critical-speed circle, and with centers at the intersections of lines drawn from these two points at angles $y$ from the horizontal. The overspeed curves are lines of equal centrifugal force measured from the center of the circle. It will be noticed that the distance between them increases as overspeed increases, because centrifugal force increases as the square of the velocity.

### EXAMPLES OF OVERSPEED EFFECTS

Using Fig. 4, what happens, say with 20% overspeed will now be explained. When the bucket reaches the head pulley the surface suddenly changes from a horizontal position to one inclined about 36° from the vertical, and likely the shock will throw some of the pulp up on a still steeper angle. As the pulley turns and the bucket reaches a point 20° from the horizontal the surface of the pulp has subsided to an angle inclined 40° from its direction of travel, half way up the surface angle is 43° and then it decreases to 40° at two-thirds up and then to 35° at 70° up the arc, then 29° at 75° up, and 22° at 80° up. Discharge has taken place when the surface of the pulp is parallel to the face of the bucket, that is, when $y$ equals $Z$ in Figs. 1 and 4. If $Z$ is 30°, then discharge has taken place before the bucket is 75° up the arc. By the discharge taking place, is meant the point where pressure ceases between the pulp and the bucket and the pulp is free to leave, although it will be some little distance and time before they will actually have separated.

If a bucket with an angle $Z$ equal to 25° have an overspeed of 40%, it will discharge all of its pulp at contact with the pulley, the belt rising vertically to the pulley, it will perhaps recover some of it at 15° up and discharge again 40° up the arc, and it holds nothing on an angle $y$ greater than 31°. The surface of the pulp may be slightly curved and very likely as discharged will be elongated over the length of the face of the bucket. It does not seem that this would affect materially the point of division between the down-going buckets and the discharged pulp going into the receiver. I have been told that this point of division should be but little lower than the center line of the shaft, that it should be on a 45° angle from this, that it should be on a level with the bottom of the pulley, and again that it should be on a 45° angle tangent to the pulley. Two or three wet elevators that I have designed on the last basis discharged beautifully, but I am satisfied that the troubles of sampling-mill practice were responsible for this low discharge and

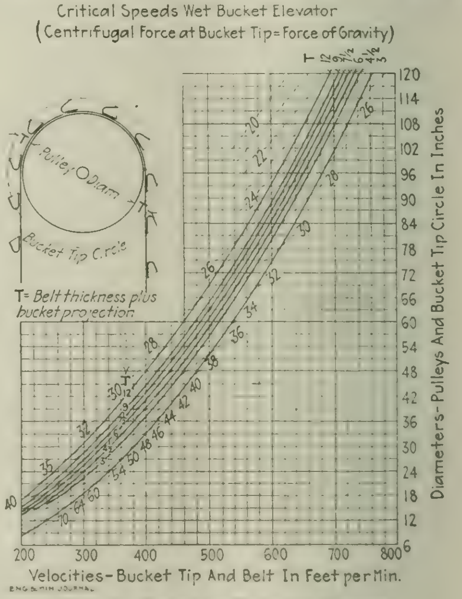

FIG. 3. CHART OF CRITICAL SPEEDS

that in wet mills such extreme precautions are not needed.

In Fig. 5 are drawn various pulleys, with the paths followed by the pulp particles leaving the bucket tip at critical speeds plotted to the same scale; three curves are also drawn in dash lines showing paths followed when discharged 60° up the arc by overspeeds. Critical speeds of 7, 8, 9, 10 and 12 ft. per sec. have been taken, corresponding to pulleys 24, 33, 45, 57, 69 and 84 in. diameter, with belt and bucket projections 6, 7, 8, 9, 10½ and 12 in., respectively. The location of the discharging masses and also of the bucket tips are shown ¼, ⅜ and ½ sec. after leaving top position. The discharging mass is shown elongated partly to call attention to it, the shape of the mass is open to question. One who has listened to the discharge of an elevator knows that discharge takes place in masses rather than in a thin stream.

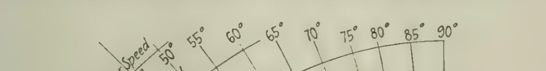

FIG. 4. FORCES ACTING ON CONTENTS OF BUCKETS ASCENDING HEAD PULLEY

From these curves in Fig. 5, it can be seen that the divider placed on a horizontal line with the center of the pulley will make a good separation, provided the elevator be running up to critical speed. If below critical speed, the pulp which has fallen on the belt is discharged at the velocity of the belt and not of the bucket tip, and in consequence it does not start as high up nor go nearly so far out in discharging. As the coarser sand which may have settled in the bucket would naturally discharge last, the error is made on the safe side when the divider is placed lower. These observations on the position of the divider do not apply to so called dry ores, where a little moisture often requires a low divider.

The following conclusions can be drawn from what has been stated. The velocity of the bucket tip should not be less than the critical speeds given in Fig. 3, and not more than 5 to 10% greater. Overspeeds reduce bucket capacity and help discharge but little. In elevating water and nonsettling pulps, the outer face of the bucket should be nearly parallel with the belt face, as the capacity is in the lower front corner, and the slope of the outer face does not assist discharge. For pulp in which the sand may settle out it may be necessary to stick to the present type of bucket. With the change in bucket shapes suggested, about double carrying capacity per bucket could be obtained. Bucket capacities should be stated on the basis of a line drawn from the tip at an angle of 45° with the belt face, this being the maximum possible capacity for wet elevators running vertically. The diameter of the head pulley must be taken into account in every calculation, it is fully as important as belt speed. By increasing the diameter, the belt speed can be increased, giving greater capacity. Increased diameters will be easier on the belts. Unless the buckets finish loading after leaving the contact with the boot pulley, the latter should have the same diameter as the head pulley. The inclination of the ascending belts will allow the buckets to retain a greater portion of their load as they reach the head pulley. Discharge is not affected by inclination on the descending side. Capacity is proportional to belt speed, which can be greatly increased only by increasing the diameter of the head pulley. Bucket capacity can be greatly increased by making the section nearly rectangular. With decreased weight of bucket for equal capacity and with higher speeds, belt wear will be reduced, and narrower belts can be used.

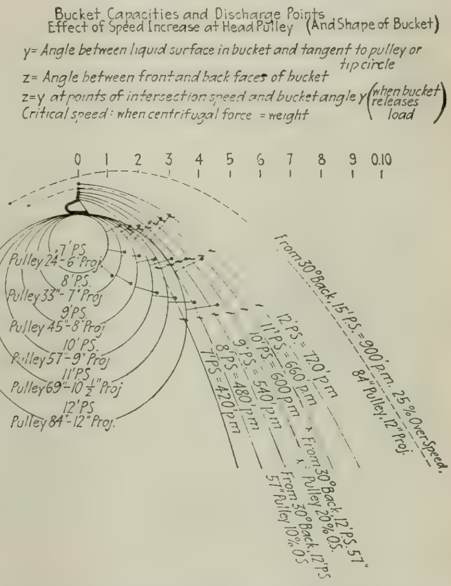
Bucket Capacities and Discharge Points
Effect of Speed Increase at Head Pulley (And Shape of Bucket)
y= Angle between liquid surface in bucket and tangent to pulley or tip circle
z= Angle between front and back faces of bucket
z=y at points of intersection speed and bucket angle y (when bucket releases load)
Critical speed: when centrifugal force = weight
0 1 2 3 4 5 6 7 8 9 0.10
7'PS
Pulley 24-6" Proj
8'PS
Pulley 33"-7" Proj
9'PS
Pulley 45"-8" Proj
10'PS
Pulley 57"-9" Proj
11'PS
Pulley 69"-10 1/2" Proj
12'PS
Pulley 84"-12" Proj.
12'PS = 720'p.m
11'PS = 660'p.m
10'PS = 600 p.m
9'PS = 540'p.m
8'PS = 480'p.m
7'PS = 420'p.m
From 30° Back, 15'PS = 900'p.m. 25% Over Speed.
84" Pulley, 12" Proj.
From 30° Back, 12'PS, 57" Pulley 20% O.S.
From 30° Back, 12'PS 57" Pulley 10% O.S

FIG. 5. ILLUSTRATION OF EFFECTS OF CHANGING DISCHARGE CONDITIONS

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**Plugging the Engine** is resorted to by Butte hoist men at the end of a trip. It consists of reversing the valve motion at the commencement of the retardation period, and keeping the throttles partly open, as well as the bypass. The effect is to retard the motion of the pistons with live steam which escapes to the other side of the piston and thence to the atmosphere through the exhaust valve. The quantity and pressure is regulated with the bypass valve. Such steam is wasted. But in the new installation of compressed-air hoists (A. I. M. E. Bulletin, September, 1913) a similar operation is performed with compressed air, which is restored to the compressed-air system, thus using the hoist temporarily as an air compressor.

# The Nosciniscato Placers, Peru

The placers of the Nosciniscato River and tributaries are in the province of Quispicanchi, Department of Cuzco, Peru, and on the eastern slope of the Eastern Cordilleras, of which the principal snow-covered peaks rise to altitudes of over 20,000 feet. This country is reached from Mollendo on the Pacific Coast by journeying to Urcos on the Southern Ry., 502 miles from the port, thence half the remaining journey is made on mule back and half on foot.

Cuzco, the nearest important city, is 32 miles from Urcos and is the distributing point for the surrounding country, including the mines. From Urcos, the distance of 120 miles can be covered in a minimum of seven days' continuoas travel. A fairly good mountain trail, 60 miles long, separates Urcos from Marcapata. 30 miles of very bad trail follows it to Cadena, and for the last 30 miles to the mine there is practically no sign of a trail. It is said, states Pierre Bouery in the *West Coast Leader,* that the placers were discovered by A. Hilfiker and sold to L. Gotuzzo, of Lima, who, without any knowledge of mining, spent $60,000 in expeditions, prospecting and taxes. Several expeditions were organized by him and his associates in the States, but only one reached the mines. This it did in 1909 and returned disgusted. The only work has been by natives, who during the dry season, pick out the best spots and, after weeks of work, come back with a few ounces of gold.

The bedrock is argillaceous schist. The Bonanza placer is 1½ miles from the mouth of the Huallumbe; it is over three miles long with a width ranging from 500 to 2500 ft. The depth of the gravel ranges from less than 1 ft. to a maximum of not over 7 or 8 feet.

The Huallumbe divides the gravel into two parts and exposes the bedrock or the thin layer of gravel above it. The grade of the river is about 1% toward the Nosciniscato, while nearer the source of the Huallumbe it reaches 5%. There the river has cut through the bedrock, making a deep cañon full of potholes. The bank cannot be worked by hydraulicking, because there is no grade for the sluice and there is practically no bank. From 2 to 7 ft. of bank means a continuous change of giants, elevators, or dredges, causing delays and expense which can only be compensated by a very high yield of gold. The costs of digging new sumps for elevators is prohibitive, as is also the moving of giants and the building of a retaining dam for raising the waterlevel to float a dredge.

The Quitari and the Yanaorco Rivers carry plenty of water all the year round, and with a ditch from 5 to 7 miles long will give a head of several hundred feet. Heavy floods during the rainy season would compel the use of expensive pipe lines, buried in the ground, to avoid breaks and delays. The size of the ditch should be sufficient to carry 2000 miner's inches, in order to overcome the lack of grade for carrying away the boulders and tailing. This amount of water will wash enough gravel to oblige frequent changes of the giants and elevators, and consequently the cleaning of all the uncovered bedrock, which would be a long and tedious operation. This could be partly overcome by washing at different places, but the equipment would then have to be more costly.

The first prospecting done by Bouery was near a small gulch. A dam was built between the banks and water was stored for rocking. Six pans were taken on each side of the bank and gave four fine colors. A second spot was selected along the river, and gave the same result in panning. A rich place was being sought as the natives customarily did but none was found. The crew of laborers was then divided into gangs, which for two days hunted for a place where the hose and water under pressure could be used to wash in the sluice-box a payable amount of gold. Finally at the end of the third day, in what is called the River of the Frenchman, the boxes were placed and the little stream dammed to get some pressure, because pan indications were very good, and it was thought that the right place had been found. The next morning work started and after 2½ cu.yd. had been washed, the boxes were cleaned. The contents were put in a bottle and panned until the last sign of black sand disappeared. On the scale the gold weighed 2.33 grams. Taking the gold at $20 per oz.; on account of its exceptional fineness of 997, the value of the gravel was 59c. per cu.yd. It was a good prospect, but it could not be taken as an average of the deposit, because it was a concentrate on the border of the river, the bedrock showing about 5 ft. further and rising abruptly with less than 1 ft. of gravel on it.

Another spot was picked out in the same gulch, 250 ft. farther up, and after setting the sluices, the bank was attacked with picks and shovels. The contents of the boxes showed 11 fine colors, which were picked out and separated from the barren material. They were not weighed, but their value was estimated by comparison to be from 15 to 20c. for half a cubic yard. Cemented gravel was found, 50 to 150 ft. thick. Careful panning taken from place to place, especially near Quince Mil Soles, proved it to be barren, but only systematic panning and washing would be conclusive. All the creeks emptying into the Huallumbe cut through the cemented gravel. Pannings were taken from the bottom of the creek up to the surface every 5 ft., but not a color was found. The party then returned, deciding to leave the country to the native miners, who have time to spare for finding the rich pockets.

There is gold in the Nosiniscato, but as long as the country is unsettled, the trails and the roads unfinished, and the population as it is, there is no hope of seeing it dug out.

# Chronology of Mining for September, 1913

*Sept.* 2—First of the new reverberatory furnaces of the Calumet & Arizona Mining Co.'s smelting plant at Douglas, Ariz., blown in.

*Sept.* 5—Smelting was discontinued at Teziutlan, Mexico, because of cutting off of fuel supply.

*Sept.* 13—The Strawberry tunnel, of the Strawberry irrigation project in Utah, was completed.

*Sept.* 15—Rio Tinto railway men went out on a strike.

*Sept.* 17—Miners employed in the coal mines near Bay City, Mich., went out on strike.—Coal miners in South Wales went out on strike because nonunionists were employed.

*Sept.* 20—Operators secure an injunction against picketing and parading by striking miners in the Michigan copper country.

*Sept.* 23—Coal miners in southern Colorado went out on strike.

*Sept.* 24—Robert Lee, camp marshall, was killed by striking coal miners near Segundo, Colo.

*Sept.* 25—Coal miners at Pontypridd, South Wales, returned to work.

*Sept.* 26—The Brown Mountain smelting plant, near Ouray, Colo., was blown in.

*Sept.* 29—Injunction prohibiting striking miners in the copper country of Michigan from picketing and parading dissolved.

*Sept.* 30—Disorder among the striking copper miners in Michigan again broke out.

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## The Anaconda Company in Agriculture

The difficulties between the Anaconda Copper Mining Co. and the farmers of Deer Lodge Valley, who allege destruction of their agriculture by smelting smoke, is a matter of history and of a voluminous literature, especially in the records of the courts.

Not long ago the Anaconda company discovered, through the services of an experienced and distinguished agriculturist that the real trouble of farming in the Deer Lodge Valley was that the soil had become waterlogged. In addition to the natural waterflow, the Anaconda company has been for many years turning a great volume of water into the valley from the Washoe concentrator, while the native farmers, ignorant of the real conditions, turned in irrigation water, which was like piling Pelion upon Ossa. What was really needed was subsurface drainage, not irrigation. Since this was discovered by the Anaconda company, it has been demonstrating the remedy on its own lands.

Field Drained by the Anaconda Company, and the Water From It

An accompanying photograph shows a field of about 160 acres that has been thus drained. The picture shows the line of a ditch, just filled in, for an 18-in. concrete pipe crossing the field. This photograph shows the thriving appearance of the grass land. A second photograph shows the stream of water, issued from the 18-in. pipe, running down a ditch by the roadside. This is a vigorous brook. Where the water issued from the 18-in. pipe, the latter was about half full. It is rather weird to observe such a stream of water coming out of the ground without any apparent reason.

This is indeed a curious outcome of the Anaconda's smelting-smoke troubles. Incidentally it is interesting to report that the Anaconda company intends to make a scientific agricultural development of its extensive land holdings. The main idea of the management is to improve the living conditions of the employees, to render it possible for them to get out into the country and have little farms within reasonable proximity of the works.

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## American Iron & Steel Institute

Final arrangements for the fall meeting of the American Iron and Steel Institute, to be held at Chicago, were made at the meeting of the board of directors at New York, Sept. 26. The dates of the Chicago meeting finally were determined as Oct. 24 and 25. The headquarters of the meeting will be announced shortly.

A list of the papers and discussions to be presented at the meeting is announced as follows: "Fuel Possibilities in Steel Melting," by William Whigham, assistant to president, Carnegie Steel Co., Pittsburgh; discussion, by W. G. Krantz, general manager, National Malleable Casting Co., Sharon, Penn.; "Developments in Treatment of Flue Dust," by Eugene B. Clark, vice-president and general manager, American Sintering Co., Chicago, Ill.; discussion, by John W. Dougherty, president, Pittsburgh Crucible Steel Co., Pittsburgh; "The Use of Refractories in the Iron and Steel Industry," by H. W. Croft, president, Harbison-Walker Refractories Co., Pittsburgh, discussion, by William C. Coffin, structural engineer, Jones & Laughlin Steel Co., Pittsburgh; "Extras—The Reason and Necessity Therefor," by J. L. Replogle, vice-president, Cambria Steel Co., Johnstown, Penn., discussion, by Henry P. Bope, first vice-president, Carnegie Steel Co., Pittsburgh; by John L. Haines, assistant to vice-president, Jones & Laughlin Steel Co., Pittsburgh; by Charles R. Robinson, general manager of sales, Lackawanna Steel Co., Buffalo, N. Y.; "Progress in Roll Design," by T. H. Mathias, assistant superintendent, Lackawanna Steel Co., Buffalo, N. Y., discussion, by Harry L. James, superintendent roll department, American Bridge Co., Pencoyd, Penn.; "Vocational Education," by Theodore W. Robinson, vice-president, Illinois Steel Co., Chicago, discussion, by Stephen W. Tener, manager accident and pension department, American Steel & Wire Co., Cleveland; "Steel Works Practice in the United States," by Thomas J. Bray, president, Republic Iron & Steel Co.; "The History and Problems of the Steel

Wheel," by John C. Neale, structural engineer, Carnegie Steel Co., Pittsburgh, discussion, by D. F. Crawford, general superintendent of motive power, Pennsylvania Lines West of Pittsburgh.

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## New Mine and Metallurgical Construction

*Alaska-Juneau,* Juneau, Alaska. The first unit of the mill is nearly completed.

*International Smelting & Refining Co.,* 42 Broadway, New York, plans building a smelting plant at Miami, Ariz.

*V. P. Mining Co.,* Prescott, Ariz., has reconstructed the old plant of 10 stamps at the Cash mine, and has added five Wilfley tables and a Monell slimer for treating 20,000 tons of ore now lying on a dump.

*Nacozari Consolidated Copper Co.,* Douglas, Ariz., is building a 100-ton concentrator.

*Skidoo Mines Co.,* Skidoo, Calif., has completed the new 10-stamp mill that is to replace the 15-stamp mill, which was destroyed by fire last June.

*Colburn Ajax Mill,* Cripple Creek, Colo., proposes building an aërial tram from the Strong mine to the mill some time next spring.

*North American Smelter & Mines Co.,* Denver, Colo. Pending an engineer's report, a mill will be built on the property of this company, probably near its smelting plant, at Golden, for treating ore from Clear Creek, Gilpin and Boulder County mines.

*United States Gold Corporation,* Boulder, Colo., is building 50-ton roasting furnaces, at its property.

*Mount Champion Mining Co.,* Leadville, Colo., has been considering the building of a cyanide plant, but as yet no definite plans have been approved. In no case will work be started before the summer of 1914.

*Red Bird Smelting Co.,* Clayton, Custer County, Idaho, has built a new smelting plant of 100 tons daily capacity; it was expected that the plant would be ready for blowing in about Oct. 1.

*National Copper Mining Co.,* Wallace, Idaho, will build a 500-ton mill in such a way that it may be enlarged to 1500 tons daily capacity. The erection work is being done by contract by the General Engineering Co., of Salt Lake City. A flotation process will be used in connection with the usual gravity method.

*White Fir Mine,* Elk City, Idaho, will be equipped with a mill.

*Flint Mines, Ltd.,* Flint, Idaho, is building a 100-ton stamp mill.

*Dell Development Co.,* Aitkin, Minn., is building a new Jones furnace plant, for the treatment of manganiferous iron ore.

*Dunglade & Co.,* Thoms Station, Mo., is building a concentrator.

*Nilson Land,* Carl Junction, Mo.—A. J. Shockley plans a mill for this property.

*Isherwood,* Carl Junction, Mo.—A concentrator is being planned for this property.

*Lulu V.,* Spring City, Mo., has just completed a concentrator.

*Cragg Mining Co.,* Joplin, Mo., is to build a 300-ton concentrator.

*Gerst & Raines,* Joplin, Mo., recently completed a 200-ton mill on the Red Lion lease.

*Whirlwind Mining Co.,* Joplin, Mo., has made plans for a concentrator.

*Athletic Mining Co.,* Webb City, Mo., will rebuild concentrator destroyed by fire Sept. 1.

*Dexter & Co.,* Joplin, Mo., is building a 200-ton concentrator.

*American Zinc, Lead & Smelting Co.,* Webb City, Mo., will build a new mill north of this city.

*Barnes-King Development Co.,* Kendall, Mont., has recently completed the installation of 19 new tanks, with a capacity of 2425 tons, nearly doubling the capacity of the plant; it is expected that from 200 to 250 tons of ore will be milled in the near future.

*Atlanta Consolidated Gold Mining Co.,* Atlanta, Nev., recently completed the installation of a new surface plant and headframe.

*Consolidated Copper Mines Co.,* Ely, Nev., is planning reduction works for the treatment of ores from its mines in the Ely district.

*Minnehaha Mining Co.,* East Rochester, Nev., is drawing up plans for a mill for the treatment of gold ore.

*Nevada-Douglas Copper Co.,* Ludwig, Nev., will build a leaching plant for the treatment of copper ore.

*Quartette Company,* Searchlight, Nev., will rebuild the 40-stamp mill, destroyed by fire several weeks ago.

*Coggins Mine,* Salisbury, N. C.—A mill of ten 1000-lb. stamps is being erected at this mine.

*Howie Mine,* Waxhaw, N. C. The mill has been rebuilt and equipped for cyaniding.

*Quapaw Mining Co.,* Miami, Okla., proposes building a mill.

*O. J. McConnell,* Miami, Okla., proposes building mills on the Never Sweat, Consolidated, Big Moose, Gish and two other properties.

*Arthur H. Gruber,* Milwaukee, Wis., will equip the Old Glory mines on Silver Creek, Ore., with complete, modern mining and milling equipment.

*American Zinc & Chemical Co.,* Pittsburgh, Penn. A 100-ton zinc reduction plant is being built.

*Oriole,* Metaline, Wash.—A 25-ton concentrator is to be built at this mine.

*Snowy Range Mining & Milling Co.,* Centennial, Wyo., plans building a mill for the treatment of gold ore next spring.

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## Mineral Production of India for 1912

The mineral production for British India is reported as follows by H. H. Hayden, director of the Geological Survey of India: Coal, 14,706,339 tons; gold, 590,555 oz.; petroleum, 249,083,518 gal.; manganese ore, 637,444 tons; salt, 1,454,602 tons; mica, 43,834 cwt.; saltpeter, 14,797 tons; lead ore and slag, 25,576 tons; tungsten ore, 1671 tons; ruby, sapphire and spinel, 323,245 carats; tin ore, 3493 tons, not including 4014 tons of block tin; iron ore, 580,029; monazite, 1135; copper ore, 9619; magnesite, 15,379; chromite, 2890 tons; alum, 5546 cwt.; steatite, 15,746; corundum, 8707 cwt. These items are arranged in order of descending values.

In addition to the above, other minerals and ores were produced, such as building materials, clay, garnet, gypsum, bauxite, diamonds, platinum, amber, etc., the value of which amounted to £363,738. The total value of the mineral output is estimated at £9,321,486, an increase of £1,340,318, or 16.8% over that of 1911.

# Availability of Motor Trucks for Mines

*SYNOPSIS—Compiled information on the performance of motor trucks in the mining industry. Results, as stated by various operators. The motor truck most available for incidental work close to the mine. Suitability for regular ore haulage not yet demonstrated. A résumé considers: Tires, repairs, fuel, roads, points in design, climate, altitude, first cost, interest and depreciation. Electric trucks possible under certain conditions. Trucks must be built better for hard mine service.*

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The invasion of the haulage field by the automobile and the threatened displacement of the draft horse, is an interesting recent phenomenon in our commercial development. As being of live interest and promising future development, the JOURNAL has collected data and information regarding the application of motor trucks to mining purposes. Most of this has been obtained by inquiry of the mining companies operating trucks. The motor truck in mining operations may serve two distinct purposes, namely, as a general convenience for handling supplies, etc., around the plant, running thus from mine to station, from mine to mill, from shaft to shaft, etc.; and as a regular means of ore or fuel transportation over greater or less distances, thus handling ore from mine to mill, or from mine to railroad, or concentrates from mill to railroad, or coal from railroad to mine, or some combination or variation of these duties. In the first case, the truck performs a great variety of functions, its work is irregular, and consequently no significant cost figures can be had. Its only competitor in this field is the horse-drawn wagon, and the truck may be said to have proved its superiority to the latter. In the second case, the work is systematic and capable of analysis on the cost sheets. The truck in such work competes not only with the animal-drawn freight wagon, but also with the surface tram, the aërial tram and the light railway. Its field is one which it was unsuccessfully attempted to cover some years ago with the gasoline or steam tractor of the type that hauls threshing outfits in the wheat-growing states. The success of the motor truck in this field is still undetermined.

### TRUCKS USED FOR INCIDENTAL HAULAGE

To take up first the case of the truck used for incidental work, reports from various companies have been received. The Portland Gold Mining Co., in Victor, Colo., has had a Pierce-Arrow, 5-ton truck in use for nearly three years doing general haulage about the mine. Its principal work is carrying freight from the station to the mine or mill, a distance of about one-half mile, or supplies between mine and mill, a distance of about one-fourth mile. The roads are the ordinary mountain roads, in places reaching a grade of 25%. The cost of operating the truck averages about $300 per month, including $125 paid to the driver, $75 for gasoline and lubricant, and the balance for tires and repairs; interest and depreciation are not included. The truck will make on an average about 400 miles per month, and perform the work that would otherwise require two four-horse teams. Repairs have not been heavy, except for the tires, which have been more expensive by far than would be indicated by any guarantees. The service of the truck is stated to have been satisfactory. Evidently in cases like this, figures of cost per ton or per ton-mile are of no value. The work in country like that of the Cripple Creek district is about as difficult as would be met with anywhere in this class of service.

The Hazel Mining & Milling Co., of Van Horn, Tex., in a communication states that while definite figures are not available, the upkeep expense is too great to make its truck an economical investment. The truck is used to haul freight from the railroad, a distance of about 15 miles.

Witherbee, Sherman & Co., Inc., of Mineville, N. Y., have in operation two Federal trucks of 1½-ton capacity each. They are used for hauling general mine supplies, such as lumber, coal, drills, etc. Gasoline consumption is between 6 and 10 gal. per day. For one truck, covering a period from June 1 to Jan. 1, repairs and replacements cost $288.95, and labor cost $105.47. The country is mountainous, steep grades are encountered, and the roads are rough.

### EXPERIENCE OF THE NORTH STAR MINE

The most detailed information covering truck service of this class comes from the North Star mine, of Grass Valley, Calif. A truck here has been in use for over five years. It is a Plymouth machine, purchased in May, 1908, for $2285, and has been in almost continuous operation since that time. The average annual mileage is probably 2500 and the loads vary between 1½ and 2 tons. Gasoline consumption will run one gallon per five miles; lubricant consumption, one quart per 200 miles. For 2½ years after November, 1910, in which time probably a mileage of 6300 was covered, the tire expense amounted to $750, equivalent to 12c. per mile. In June, 1912, 5-in. block tires were put on the rear wheels, and Diamond solid tires on the front; these tires are still in use. Previously, 3-in. block tires were used on the front wheels, and lasted only about 1000 miles. The tires in use at present seem to be doing better than 2000 miles. The principal repairs have been as follows: One year after purchase the body was rebuilt and the car changed from a friction to a gear drive; in 1912 the rear wheels collapsed and were patched in the mine shop; in the same year the cylinder cracked and was replaced for about $100; new gears, costing about $150, have also been installed. The cost of gasoline and lubricant is approximately 5c. per mile, with gasoline at its present price; tire expense is 12c. per mile, making a total of 17c.; repairs and depreciation probably increase this to a final total of 22 or 25c. per mile.

### USE OF THE TRUCK FOR ORE AND FUEL HAULAGE

In systematic haulage operations, conducted over a given route, the motor truck enters upon a much larger field, and yet here its disabilities become more marked. Accounts of the experiences of several operators have already appeared in the JOURNAL.[1] Our inquiry has also elicited considerable additional data.

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[1] "Motor Truck Ore Haulage in Arizona," by C. L. Edholm, "Eng. and Min. Journ.," June 14, 1913.
"Motor Trucks for Mines," David Ross, "Eng. and Min. Journ.," Aug. 23, 1913.
"Motor Trucks for Mines," O. H. Sonne, "Eng. and Min. Journ.," Sept. 6, 1913.

The Miller Lake-O'Brien mine, at Gowganda, Ont., purchased a 5-ton truck, principally for transporting an old dump to the mill, and also a 1-ton machine for road building and odd jobs. The smaller truck became bogged on its way to the mine and had to be hauled by teams. Following this experience, the company intends to build a good road with a hard surface on which the trucks will operate.

The Mason Valley Mines Co. writes that its ore from the Anderson mine, which is situated about 4½ miles from Luning, Nev., is being transported by a contractor using a motor truck. The grade from the flat country to the property is between 8 and 10%. Much difficulty is encountered from the fact that the truck has a wider gage than the ordinary wagon, and, as it operates over wagon roads, heavy wear occurs on the sides of the tires. It is stated that if the road were properly constructed and used exclusively for the motor truck the service would be satisfactory.

The Santa Fé Gold & Copper Mining Co., of San Pedro, N. M., describes the performance of its La France truck in a letter to the manufacturers as follows:

> We have our truck in service between our smelting plant and our coal mine, a distance of approximately 16 miles. We make the round trip going empty and returning with six tons of coal, in approximately five hours. On the loaded trip we encounter one grade of over 8%, which is fully ¾ miles long. The truck takes this grade easily, without steaming the water in the radiator. For the last five miles before reaching the smelting plant, we have a continuous upgrade which in two or three places is over 20% for short distances of possibly 50 ft. We have hauled as much as seven tons up this grade and have never yet been stuck. Our gasoline consumption varies from 12 to 13 gal. per round trip. Our tires have stood up extremely well, and we have not yet replaced the original set.

The only cost given is the gasoline consumption. The actual mileage obtained from the tires is not stated; nor are depreciation, interest, repairs, wages, etc., mentioned.

### Costs of the West End Consolidated

The following tabular presentation of the performance of the truck used for ore hauling by the West End Consolidated Mining Co., of Tonopah, is of considerable interest:

The cost data are rather more complete than usual, although a few points are not clear. The grade mentioned is against the load. Based on the figures furnished, the tonnage handled is 140 per day, or 1200 per month. Wages and repairs to trucks and roads amount to about 6.9c. per ton, the balance of the 13½c. being attributable apparently to fuel, lubricants and tires. The cost per ton-mile would be 27 cents.

**PERFORMANCE OF PIERCE-ARROW FIVE-TON MOTOR TRUCK**

| | |
|---|---|
| Length of trip | 1 mile round-trip |
| Nature of load | Ore one way |
| Weight of load | 10,000 lb |
| Weight of truck | 8750 lb |
| Maximum grade | 8½% |
| Average grade | 5% |
| Condition of road | Good macadam |
| Trips per day | 28 |
| Time of trip | 15 min. |
| Time of loading | 1 min. |
| Distillate consump. | 2½ gallons per mile |
| Altitude | 6200 ft |
| Oil consumption | 1 pint per day. |
| Wages paid | Driver, $5 per day; helper $4 per day |
| Hours of driver and helper | 8 hours |
| Monthly repair cost on truck | $80. |
| Monthly repair cost on road | $38.70. |
| Cost of hauling per month | $525 to $550 |
| Cost of hauling per ton | 13½c. |
| Cost of supplies | Distillate 22½c. per gal.<br>Lubricating oil 80c. per gal |
| Tire expense | 7c. per mile |

This figure does not, so far as can be seen, allow for interest or depreciation. A short road in a town, such as this truck operates over, can, of course, be kept in good condition for much less money than can a long road, extending some distance from the mine.

### Details from the Federal Lead Co.

A typical month's performance of an ore and coal-hauling truck of the Federal Lead Co., of Flat River, Mo., is given in the accompanying table. It goes into more detail than any other report received. The machine is a 1-ton Alco, and hauls coal to an outlying property of the company, making a return trip with concentrate. The property is about two miles from the railroad, and the intervening dirt road has been fixed up with rock and chats, until a fairly good surface and bed have been secured.

Conditions are favorable and the costs are probably as low as can be expected anywhere. It is to be noted that the coal handled is the determining load, but that the concentrate, by furnishing the partial return load, helps to reduce costs. No interest or depreciation are here included, and the expenditure on repairs for the month represented seems abnormally low.

### Résumé of Results Reported

Study of the results here presented, as well as those previously published, makes it clear that the great question in motor-truck transportation is that of the tires. Second in importance is the question of repairs, and third is that of fuel consumption. Bound up with these three points are questions of road surface, road grade, altitude, climate, gear ratios, first cost, wages and various points of design.

### Tires the Most Important Item

The tire question is the great stumbling block. A rubber tire on the average mining road simply will not stand up to its guarantee. The rubber block tire seems to be the worst of all. The attempt to substitute wood blocks for rubber blocks is rather an ingenious one, and seems to offer a partial solution. It is likely that in many cases, corrugated-steel tires, such as those used on traction engines, will prove most satisfactory. The cost of such tires per mile is, of course, low, and their tractive force in soft material is much greater than that of rubber. The power consumption and the jar on the machine are bound to increase, however, with their use. Such a tire has been applied to a truck used for logging (*Eng. News*, Vol. 69, p. 1065), apparently with success. In Grass Valley, the roads receive a good deal of care and have an excellent surface. Yet the reports of the North Star mine show that even with its light truck, the tire expense is enormous. Mr. Ross, describing his experience at the Pocahontas mine, states that tire expense, while high, is a fixed charge, so much per mile, since a set of tires, bought at a certain price, is guaranteed for a certain number of miles, 8000 to 10,000, usually. Probably Mr. Ross had an unusually good road surface over which to operate, for most of our correspondents report entirely different experiences. If, as Mr. Sonne, of the McConnell mines, says, a tire a week needs replacing, it is inconceivable that the tire manufacturer would sell more than one set covered by a 10,000-mile guarantee. In view of the rate at which some tires go, one truck might put out of business a tire company living up to and renewing its guarantee. In *Engineering*

*Record*, May 3, 1913, is noted a motor-truck haulage job across the California desert country, in which the statement is made that the tires in the soft desert sand lasted about three times as long as their guaranteed life; namely, 24,000 to 30,000 miles. It is small tribute to the intelligence of the manufacturers that they expect to address engineers and get away with such statements.

### REPAIRS AND FUEL ADD TO COSTS

Repairs are evidently a source of tribulation and expense. Neither chassis or engine is built to stand up under the use it is bound to get. Springs break and other parts wear, and the resulting expense is not only the cost of the new part but the labor of changing it and the loss of time for the truck. This loss of time is also serious when tires are to be changed. With a $6000 truck hung up for a day, interest charges mount, and if insufficient storage capacity exists, demurrage charges on cars and delay in mine and mill operation will help to swell the expense account.

MOTOR-TRUCK PERFORMANCE ON PHOENIX-FLEMING LEASE OF FEDERAL LEAD CO

MONTH OF APRIL 1913

| DATE | LABOR | | | | | | SUPPLIES CONSUMED | | | | COAL HAULED | | CONCENTRATES HAULED | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Motor | | | |
| | Driver, days | Helper, days | Loaders, etc., days | Repair | Road, days | Coal unload, days | Gasoline, gallons | Oil, gallons | Repair | Total miles | Loads | Tons | Loads | Pounds | Freight, tons hauled | Total tonnage hauled |
| 1 | $1\frac{1}{10}$ | $1\frac{1}{10}$ | 3 | | | | 17 | $1\frac{1}{4}$ | | 36 | 9 | 34 | 4 | 31,985 | | 50 |
| 2 | $1\frac{6}{10}$ | $1\frac{6}{10}$ | 4 | | 1 | | 18 | $1\frac{1}{4}$ | | 36 | 9 | 34 | 3 | 22,545 | | $45\frac{1}{4}$ |
| 3 | 1 | 1 | 3 | | 1 | | 19 | $1\frac{1}{4}$ | | 36 | 9 | 34 | 2 | 15,575 | | $41\frac{3}{4}$ |
| 4 | 1 | 1 | 3 | | 1 | | 18 | $1\frac{1}{4}$ | | 36 | 9 | 35 | 2 | 18,665 | | $44\frac{1}{4}$ |
| 5 | 1 | 1 | $2\frac{6}{10}$ | | | | 19 | $1\frac{1}{4}$ | | 36 | 9 | 35 | 3 | 24,185 | | 47 |
| 6 | 1 | 1 | 3 | | 1 | | 15 | $1\frac{1}{4}$ | | 32 | 8 | 31 | 2 | 16,260 | | 39 |
| 7 | 1 | 1 | 3 | | 1 | | 13 | 1 | | 28 | 7 | 30 | | | | 30 |
| 8 | 1 | 1 | $1\frac{6}{10}$ | | | | | | | | | | | | | |
| 9 | 1 | 1 | 3 | | $\frac{6}{10}$ | | 13 | 1 | | 20 | 5 | 18 | 2 | 16,080 | | 26 |
| 10 | 1 | 1 | 3 | | $1\frac{6}{10}$ | | 13 | $1\frac{1}{4}$ | | 32 | 8 | 30 | 3 | 25,570 | | $42\frac{3}{4}$ |
| 11 | 1 | 1 | 3 | | 1 | | 17 | $1\frac{1}{4}$ | | 32 | 8 | 30 | 5 | 40,270 | | $50\frac{1}{4}$ |
| 12 | 1 | 1 | 3 | | 1 | | 18 | $1\frac{1}{4}$ | | 40 | 10 | 39 | | | | 39 |
| 13 | 1 | 1 | 3 | | 1 | | 16 | $1\frac{1}{4}$ | | 32 | 8 | 29 | | | | 29 |
| 14 | 1 | 1 | 3 | | 1 | | 16 | $1\frac{1}{4}$ | | 28 | 7 | 24 | 5 | 40,800 | | $44\frac{1}{2}$ |
| 15 | 1 | 1 | 3 | | 1 | | 17 | 1 | | 28 | 7 | 27 | 1 | 6,915 | | $30\frac{1}{2}$ |
| 16 | 1 | 1 | 3 | | | | 17 | $1\frac{1}{4}$ | | 28 | 7 | 27 | 3 | 24,815 | | $39\frac{1}{2}$ |
| 17 | 1 | 1 | 3 | | | | 15 | $1\frac{1}{4}$ | | 32 | 8 | 30 | 2 | 15,455 | | $37\frac{3}{4}$ |
| 18 | 1 | 1 | 3 | | | | 17 | $1\frac{1}{4}$ | | 40 | 10 | 39 | | | | 39 |
| 19 | 1 | 1 | 3 | | 1 | | 15 | $1\frac{1}{4}$ | | 40 | 10 | 39 | | | | 39 |
| 20 | | | | | | | | | | | | | | | | |
| 21 | 1 | 1 | 3 | | 2 | | 14 | 1 | | 28 | 7 | 27 | | | | 27 |
| 22 | 1 | 1 | 3 | | 1 | | 13 | 1 | | 24 | 5 | 20 | | | | 20 |
| 23 | 1 | 1 | 3 | | | | 16 | $1\frac{1}{4}$ | | 32 | 8 | 31 | 3 | 21,650 | | $41\frac{3}{4}$ |
| 24 | 1 | 1 | 3 | | 1 | | 17 | $1\frac{1}{4}$ | | 28 | 7 | 27 | 2 | 16,760 | | $35\frac{1}{2}$ |
| 25 | 1 | 1 | $1\frac{6}{10}$ | | 1 | | 5 | $\frac{1}{4}$ | | 8 | 2 | 7 | 1 | 7,945 | | 11 |
| 26 | 1 | 1 | 3 | | 1 | | 16 | $1\frac{1}{4}$ | | 32 | 8 | 31 | 3 | 19,325 | | $40\frac{3}{4}$ |
| 27 | | | | | | | | | | | | | | | | |
| 28 | 1 | 1 | 3 | | 1 | | 16 | $1\frac{1}{4}$ | | 36 | 9 | 35 | | | | 35 |
| 29 | 1 | 1 | 3 | | 1 | | 15 | $1\frac{1}{4}$ | | 28 | 7 | 27 | 4 | 33,905 | | 44 |
| 30 | 1 | 1 | 3 | | $\frac{6}{10}$ | $\frac{6}{10}$ | 14 | $1\frac{1}{4}$ | | 32 | 8 | 31 | 5 | 39,850 | 15 | 66 |
| Total | $28\frac{6}{10}$ | $28\frac{6}{10}$ | $81\frac{6}{10}$ | $0.90 | $21\frac{6}{10}$ | $\frac{6}{10}$ | 419 | $31\frac{1}{2}$ | $105.44 | 840 | 299 | 801 | [illegible]5 | 43[illegible],555 | 15 | $1035\frac{1}{4}$ |
| Total Monthly Cost: Labor | | | | | | | | | | | | | | | | $270.50 |
| Supplies | | | | | | | | | | | | | | | | 197.12 |
| Cost per mile | | | | | | | | | | | | | | | | 0.5567 |
| Cost per ton hauled | | | | | | | | | | | | | | | | 0.4517 |
| Cost per ton milled | | | | | | | | | | | | | | | | 0.0510 |
| Cost per ton mile | | | | | | | | | | | | | | | | 0.2258 |

The cost of fuel in also a large item. Balanced, however, against the feed of animals used for hauling, it is surely cheaper per ton. It is noteworthy that in most cases fuel and feed prices go up and down together, geographically considered. Thus, in the remote mountain regions, gasoline and alfalfa are both high. This parallelism, however, does not always hold, and the differences in price might, in some cases, prove the determining factor in the choice of transportation methods. Distillate is used in many cases and probably will become increasingly popular. It is cheap and more compact, but is inconvenient. It costs on an average about half as much as gasoline and should give about 25% more power per gallon; but it is hard to explode and requires an auxiliary gasifier. The experience of the Calumet & Copper Creek Co., where gasoline proved cheaper per ton than distillate, may likely be due to a failure properly to use the distillate or to a difference in the efficiency of the engines of the two makes of automobiles.

### ROADS AND GENERAL CONDITIONS UNSATISFACTORY

Unquestionably, the manufacturers and salesmen have no conception of the country in which the trucks must operate for mining purposes. Grades and surfaces of roads are worse than are likely to be encountered under any other conditions. To some extent, the roads can be improved, especially for short hauls, but to put in a well surfaced road with easy grades for a long distance in rough country means a first cost, comparable with that involved in installing a tramway or even a light railway. Sharp stones will cut the tires and either deep sand or mud and bogs will stall the truck entirely. The substitution of a truck for wagon haulage almost always means a new or an improved road. In some cases, in desert sands, a board track has been laid and in other cases brush and straw have been used to obtain a surface which would give sufficient traction for the wheels. The gear ratios need always to be changed from standard practice, to give a speed sufficiently low to overcome the steep grades.

The wages of the drivers are a large item in the monthly running expense, but are usually less per ton than for animal haulage. In this respect the advantage is easily with the truck.

### DESIGN NEEDS MODIFICATION

Many small points of the design require to be changed. The practice of sending out a truck with double rear tires, giving a wider gage than the wagon gage, is peculiarly exasperating. The result is, of course, that the outside rear tires are scraped off by the sides of the rut. It is hard to understand why this custom persists. Mr. Ross advises an equal distribution of load over both axles. We know of one large truck user in New York, who, after tests, selected a Pierce-Arrow truck largely because the live load was all on the rear axle, and thus greatly increased the traction of the rear wheels. The result was that there was much less slippage and less spinning in tight places and consequently less wear on the rear tires. Radiator capacity is rarely sufficient and small consideration seems to be taken of the loss of power with altitude. All these points must be borne in mind and designs must be made to suit varying conditions. Altitudes will range from 0 to 10,000 ft., and temperatures from the extreme cold of Ontario to the great heat of the southwestern deserts.

### First Cost, Interest and Depreciation

When the question of first cost is considered, the motor truck lies between animal haulage and a tramway. The first-class truck is the only kind worth buying, costing $5000 or $6000 for a 5-ton machine. With spare parts perhaps even with a spare engine, extra tires, improvements to the road and probably some new machines for the shop, the first cost may easily approximate $10,000. The daily capacity of such an installation is naturally a question of the length of haul. The fact of the truck's being a single large unit is, of course, a disadvantage. Suppose the question lay between four freight teams and one truck as being of equivalent capacity. The addition of one team, equivalent to 25%, would afford sufficient standby capacity, while for the truck an equivalent standby would require a 100% addition, that is, a complete truck.

It should be noted that none of the costs presented take any note of interest and depreciation except those of the North Star mine. This is a large item. When the $5000 truck goes to the scrap heap, a large sum will remain to be charged up against operations at some point. It must be said, however, that similar conditions exist in wagon freighting. Interest and depreciation are seldom charged in estimating such costs. As a matter of fact, there is no money in freighting. Most mines contract their freighting and the contractor either goes broke or sells out to a sucker. The reason is plain. He makes his price to cover feed and something more than wages, already having his equipment. In a year or two his wagons are gone and a horse or two has died and he has provided no sinking fund to replace them. Some motor-truck operators are likely to find themselves in similar straits in a few years.

It is noteworthy that all the trucks on which reports have been received are gas machines. No electric vehicles seem to have been installed. It would seem likely that in certain cases where fuel is high and electric power is cheap, that the electric truck should find a field. It lacks punch to get itself out of a hole and is not efficient if speed is required, but it will take steep grades, if given sufficient time, and it attains the limit in simplicity of operation.

### Allowances Must Be Made for High Costs

The figures per ton, per mile and per ton-mile that we present look high, incomplete as they are, and auto-truck haulage would seem to be expensive. But all haulage is expensive; when ore is remote from the shipping or treating point, it will cost money to get it to that point. Furthermore, in considering the availability of the truck on the basis of these published costs, it must be remembered that it is a comparatively recent development. Higher efficiency will be obtained, as operators become better acquainted with the details of the work. It is necessary now to begin with a driver who is green in one respect or another. If he knows how to handle a truck, he will be ignorant of the country and the operating conditions. If he is acquainted with the roads and the regions, he will know nothing whatever about handling his truck. This is a condition which will remedy itself. These observations have been largely critical. Our desire is to present the facts just as they appear and point out the elements which could be changed. It is extremely likely that the motor truck will increase its field in mining. It is already accepted as a means of performing incidental work around the plant. Its success as an ore carrier is largely in the hands of the manufacturers.

We wish to express our thanks to the many mining companies who have put themselves to trouble to furnish us with the data we have published.

⁂

## Canada's Largest Power Station

Work has been started on the hydro-electric power station of the Cedar Rapids Manufacturing & Power Co., Montreal, Que., which, when completed, will be the largest in the Dominion of Canada, says *Power,* July 1, 1913. Its initial rating will be about 100,000 hp., and later on this will be increased to 160,000 hp. The site is at Cedar Rapids, in the St. Lawrence River, about 30 miles above Montreal.

The plant will be 663 ft. long and 130 ft. wide and will be built as a part of the dam. The intakes will be of the scroll or involute type. Generating equipment includes twelve 10,800-hp. waterwheels, which are to operate at 56 r.p.m. under a head of 30 ft., and will be the largest ever built. There will also be three 1500-hp. exciter units which will operate under the same head at 150 r.p.m. Twelve generators are to be connected to the waterwheels.

The turbines will be similar to those of the wheels for the plant of the Mississippi River Power Co., at Keokuk, Iowa. The chief difference is in arrangement for carrying the weight of the generator rotor and the moving parts of the turbine on a thrust bearing above the generator instead of below, as is done with the Keokuk turbines. The main units will be of the single-runner vertical-shaft type and will be installed in wheel chambers of spiral shape formed in the concrete foundations of the power house.

About 100,000 yd. of concrete work and 2,000,000 yd. of rock and earth excavating will be necessary. Contracts for 80,000 hp. of the output of this station have already been closed. Of this, the Aluminum Co. of America will take 60,000 hp. and the Montreal Light, Heat & Power Co. will take 20,000 hp. It is expected that the plant will be finished in October, 1914.

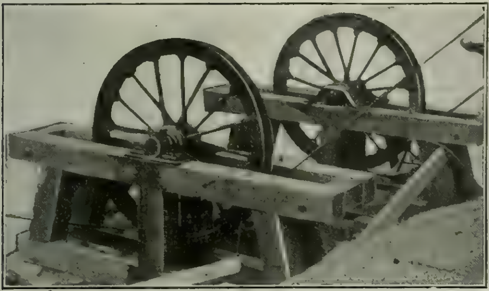
⁂

**Of the Iron Mined in the United States in 1912,** Minnesota produced 59.2%; Michigan, 19.3%; Alabama, 7.8%; New York, 2.1%. No other state mined over 1,000,000 tons. Four other states reported over 500,000 tons each—Wisconsin, Pennsylvania, Virginia and Tennessee, naming them in the order of their importance. Assuming all the iron mined to have been consumed the ore used to make one ton of pig iron in 1912 was 1.855 tons.

# DETAILS OF PRACTICAL MINING

## Holding-Down Sheaves

To control the direction of the hoisting cables from the Bonanza headframe to the hoist house, the Witherbee-Sherman company, at Mineville, employs the reverse sheaves shown in the accompanying illustration. They are similar in size and mounting to the ordinary sheaves on the headframe, but it is evident that the stresses on the bearings act in the opposite direction and that the supporting frame taken as a whole is under tension rather than compression, requiring special attention to its anchoring. Note that a strap has been applied over one of the bearings.



Reverse Sheaves between Headframe and Hoist

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## Efficiency of Butte Hoisting System

Soon after the installation of the new compressed-air hoisting system at the Anaconda mines, in Butte, a test was made to determine its efficiency ("Bull." A. I. M. E., September, 1913). The system includes a large storage capacity in receivers under a hydrostatic head. Practically all the air thus stored can be used without any important drop in pressure resulting. For the test the system was filled with air and the compressor stopped. The Mountain View hoist was then run for an hour with the stored energy from the receivers, and the drop of the water level in the tank which supplied the hydrostatic head was measured, thus giving the volume of the air consumed. The compressor was started and the air drawn during this time was restored. The electrical input for driving the compressors while restoring the air was measured. Indicator cards taken off the hoist during the run showed a low combined mechanical efficiency of the engine and the hoisting gear, due to the fact that the shaft was crooked, thus binding the skips. This mechanical efficiency was 69% from a depth of 1870 ft., and 67% from a depth of 1570 ft.

It was found that 327 hp. required on electrical input to the motor of 836 kw. Correcting this for the extra friction of the shaft as found by other tests at the High Ore and Speculator shafts, where the mechanical efficiency was about 80%, the input per shaft horsepower in a good shaft is about 2.04 kw., or 2.73 hp., giving a total efficiency of 36.37%.

While the air was reheated for this test and no note is taken of this in calculating efficiency, the heating was moderate, and, on the other hand, retardation on the end of the trips was effected by plugging the engine in the old way which wasted the compressed air employed, whereas in the system as operated, the hoists are used as compressors during the end of the trip to retard the skips and thus return a certain amount of energy to the system.

⁂

## Bulldozing Chute and Underswung Gate

By G. J. Jackson*

At the Perseverance mine of the Alaska Gastineau Mining Co., at Juneau, mining is conducted in large open stopes somewhat on the shrinkage system. Trouble was experienced from large rocks weighing several tons being drawn into the chutes; these rocks had to be blasted, with the result that chute timbers were often broken, and a continual expense in the upkeep of the chutes incurred. A chute with a special bulldozing chamber of my design, fitted with grizzly bars, was tried early in 1912. It proved a complete success, over 20,000 tons of rock being drawn through it without trouble. Fig. 2 is a section showing the general arrangement. The 80-lb. rails used for grizzly bars are spaced 2 ft. apart, one end resting in hitches cut in the foot wall and the other end on a 24x24-in. cap. Any rock passing through the grizzly can easily be handled in the cars; the larger rocks which remain on the bars are drilled with a small plugger machine and blasted. A ladderway, not shown, leads up to the bulldozing chamber from the level. When the ore is running freely, containing few large rocks, the grizzly

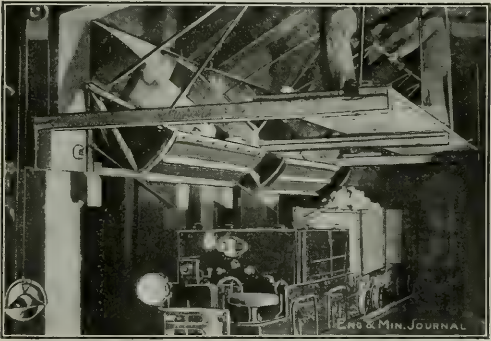

Fig. 1. Chutes, Gates, Platform and Train

bars, over the back pocket, will be partly covered. Should the front grizzly block up, the small rock is got rid of into the back pocket, and the large rocks thus made accessible are blasted. The two pockets together hold about 25 tons.

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*Superintendent, Perseverance Mine, Alaska Gastineau Mining Co., Juneau, Alaska.

The arc chute-gate shown in the photograph, Fig. 1, in side elevation in Fig. 2 and in front elevation in Fig. 3, is of the drop-down type. It is counterbalanced and is operated easily by one man by depressing the handle. It will handle any kind of rock and will shut off even with a 1-ton rock passing through. The operator stands on the platform above the cars, and is completely out of danger from rocks falling from the chute. In the old style of gate, men were constantly cut about the hands and head by falling material. A slide gate, not shown in the sketch, is used above the arc gate to check the rock.

The arc gate is made of ¼-in. iron plate, 18 in. wide and 6 ft. 6 in. long, bent with a 3-ft. radius. This is stiffened for its full length by three 2-in. angle irons riveted on. The two triangular end-pieces are made of ½x3-in. iron, reinforced by a piece of the same material fitted inside the arc. The two side levers are of ⅞-in. round iron, connected with a ⅞-in. iron handle, parallel with the gate. A $\frac{3}{16}$-in. wire rope attached to the end of each lever and passing over a small sheave wheel on the chute timbers, supports a weight sufficient to balance the gate. The gate is made in the mine shop and can be quickly set up on any chute, provided there is sufficient headroom to accommodate the operator.

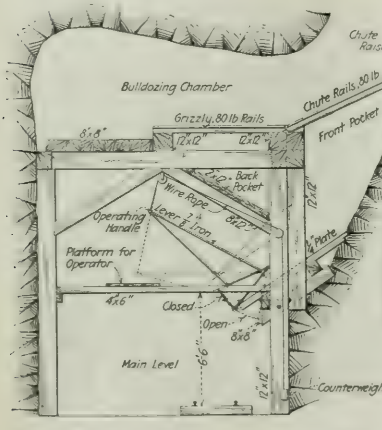


FIG. 2. POCKET, CHUTE AND GATE

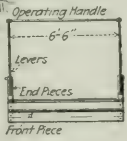


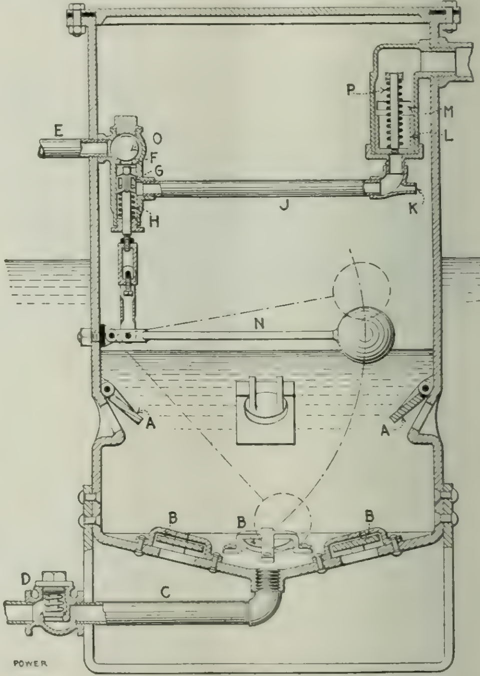
FIG. 3. FRONT ELEVATION OF GATE

⁂

**Accidents on the Mesabi Range** result in damage suits which furnish much of the litigation occupying the courts. As a sequel to losing his hat in the Adams mine at Eveleth, one miner asks $20,643 indemnity from the Steel Corporation. The defendant claims that while in the act of recovering his hat his arm was caught between the side of the shaft and a cage, and he sustained permanent injury. Because he was furnished with a dull pick at the Schley mine near Gilbert, another miner was blinded in one eye by a flying fragment of rock. He has filed a suit against the Republic Iron & Steel Co. for $3000. Still another miner is suing the Rogers company for $25,000. He claims that while walking alongside the pit of the Iroquois mine at Mountain Iron, the bank caved in and he was precipitated to the bottom, resulting in paralysis. Injured by a landslide at the Spruce mine at Eveleth so seriously that he never will be able to leave his bed, he alleges, another man is seeking damages of $25,000 from the Steel Corporation.

# Direct-Acting Compressed Air Pump

A mine pump using compressed air expansively, and with no piston, is shown in the accompanying illustration (*Power*, Aug. 19, 1913). The cycle of operations is as follows: Suppose the lower part of the chamber full of water, so that the float-and-lever device *N* is in the highest position. At this point the ball valve *O* is lifted off its seat *F* by the rod connection to the lever. This permits the compressed air to enter through the pipe *E*, passing through the valve *G* to the pipe *J* and thus through the outlet *K* to the upper part of the chamber. At the same time, it acts on the plunger *L*, which moves up in its casing and closes the ports *M* of the outlet valve. Air is admitted up to a point previously determined and adjustable. It is then shut off by the dropping of the float mechanism, which allows *O* to return to its seat. The expansion of the admitted air forces the contained water out through the pipe *C* until the pressure in the vessel is so reduced that the spring *P* can force down the plunger *L* and open the ports *M*. This permits the discharge of air and reduces the air pressure in the chamber to atmosphere. The pump being slightly submerged, the water then enters through the inlet valves *A* and *B*, fills the vessel to the previously determined point and the cycle is repeated. The connection between *N* and the inlet-valve mechanism is adjustable, thus making the cut-off point variable. The spring *H* keeps the plunger in contact with the ball valve *O* for a certain length of time. The check valve *D* prevents the return of the water from the column to the pump chamber.



SECTION THROUGH AUTOMATIC AIR PUMP

The pump is automatic, in that it will start as soon as compressed air is admitted to the pipe line. It must, of course, work submerged, having no suction power; the submerged parts are made of noncorrosive metal. The pump was invented by Edwin Chamberlin and A. M. Gardner, of Avella, Penn., and is in use in the mine of the Pittsburgh & Southwestern Coal Co.

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## Evolution of an Electric Signal System

By George A. Packard*

The Raven mine at Butte was opened originally by prospectors and leasers, who very properly followed the vein on its dip with their shaft. Later operators continued this shaft and made so many changes in the angle of inclination that it became difficult to maintain and operate the ordinary type of bell-rope signal. Accordingly it was decided to install electric lights at the stations, using an alternating current of 110 volts, and at the same time to add a third wire and use an electric bell in the hoist room, the bell to be rung by a simple push-button at each station. This worked satisfactorily until the shaft entered wet ground, water then trickled down the wires and got into the push buttons, resulting in stray bells in the engine room, and confusion to the men hoisting in the shaft. A new management soon replaced the push buttons on the wet levels with "pull-boxes." This was developed from one in use at the Original mine, and in its present form is shown in Figs. 1 and 2. Changes were made to eliminate machine-shop labor and to remove the opportunity for stray bells as the box wore.

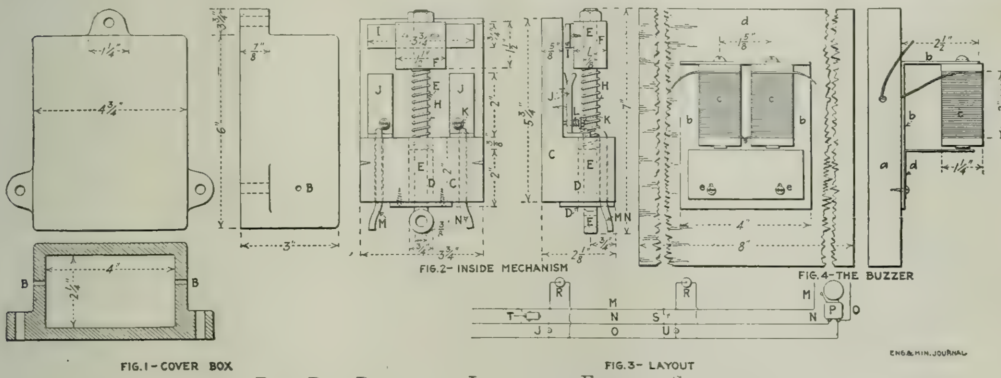

FIG. 1—COVER BOX FIG. 2—INSIDE MECHANISM FIG. 3—LAYOUT FIG. 4—THE BUZZER

Pull-Box, Buzzer and Layout for Electric Signaling

It consists of a plain cast-iron cover, Fig. 1, open only at the bottom to receive the fittings shown in Fig. 2. The cover weighs nine pounds, and is heavy enough to stand the blow of any small rock falling down the shaft. It is fastened to the shaft timbers by long screws or spikes through holes in the three lugs, and has two holes *B* for holding by screws the wooden block *C*, which plugs the bottom and acts as a base for the fittings. This block is made small enough to allow for swelling; it is bored vertically ¾ in. from the front to admit the cylindrical portion of a mushroom-shaped casting *D* fastened to the block bottom with screws. This cylinder serves as a guide for a ⅜-in. eye-bolt *E*. On the upper forced up by the spring *H*. The spring is made from No. 12 wire; its bottom rests against the top of the casting *D* in a socket in *C*. To the back of the block *F* is screwed a strip of $\frac{1}{16}$-in. brass *I*, and at each side of *C* are fastened four similar strips *J*, the back two beveled back at the top, and the front two bent forward. The back strips are bent out at right angles at the bottom and the line wires *M* and *N* are connected, one on each side, by screws. The front brasses are held in place by the screw *K*, provided with a washer and a small coiled spring *L*, ¼ in. long. When the bolt *E* is pulled down, the brass *I* is forced between the two portions of the brasses *J*, making contact and, by connecting *M* and *N*, ringing the bell. The wires enter the box through two holes *C*, bored of such size that the insulation fits tightly, and so placed that there can be no possible contact with the screws at *B* or the casting *D*. Where there is much "copper water" this casting is of brass. To prevent *I* from being pulled down so far as to stick, two stops were subsequently screwed into the bottom part of *C*, between *E* and *J*, projecting about an inch above the lower end of this bolt a small wooden block *F* is held by the nut *G* which presses against the top of the box *A*, being part of *C*. These are not shown in the sketch. A cord through the eye of the bolt, ending in a porcelain knob, completes the device.

Later, another manager, finding that occasionally a man, ringing for air, say, on the 1100, had no way of knowing that another man was ringing to be hoisted from the 500 at the same moment, while the engineer could not determine what either was after, introduced a flash light into the circuit at each station. Fig. 3 shows the arrangement at this stage. Wires *M* and *O* are those in use for the lighting circuit. The wire *N* is added for the electric signal system, connecting with *P* the bell in the engine room. This bell is of the solenoid type, only one blow being struck each time the button is pushed. The station light is represented by *R*, and the push-button used on the dry level, by *S*. When pressed, *S* closes the circuit between *N*, otherwise dead, and *M*, and rings the bell. A pull-box is shown at *T* similarly placed on the lower levels. The signal lights on each station are represented by *U* connected between *N* and *O*, so as to glow only when *N* is live. These lights were only 10-watt lamps and the labor of connecting was small. The scheme eliminated interfering signals and worked satisfactorily until an accident to a skip-tender showed that a simple flash light was not satisfactory, as it was a warning only when watched. Accordingly, a loud buzzer, obtained from the Anaconda company, was substituted, being connected into the water-proof lamp socket.

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*Mining engineer and metallurgist, Silver Bow Block, Butte, Mont.

This buzzer, shown in Fig. 4 consists of a piece of board *a,* 8 in. square, to which is screwed a piece of No. 10 sheet iron *b*, 4 in. wide, and 7 in. long, the top 2½ in. being bent out at right angles to form a shelf. Beneath this are fastened two magnets *c* about 2 in. long, wound for 110 volts. These take about 450 ft. of No. 28 wire each. The vibrating member is a piece of No. 20 galvanized iron *d,* 3½ in. wide by 4 in. long, the top 2½ in. being bent over at right angles. This is fastened to the board through slots *e* so that the position may be adjusted, the horizontal portion being about $\frac{1}{16}$ in. below the coils. It is planned to vibrate with from 1½ to 2 amp. The whole is covered with a sheet-iron cover to keep it dry. The sound can readily be heard in the shaft 100 ft. away.

The installation of the buzzers led to some trouble with the electric bell in the engine room, as the coils here were wound for 4 amp., but as soon as these were replaced by smaller coils, this trouble was overcome. At the same time the buzzers were installed, a push button was placed in the line near the engineer's stand so that he could signal to the levels if desired. The possibility of return signaling in this manner is a most useful and important feature in a signal system which is too often neglected. It offers a means of avoiding mistakes and even accidents.

The wire used in the shaft was formerly No. 10 triple-braid weather-proof, but this was not satisfactory. It seems to give satisfaction where it has a chance to dry out between rains, but where constantly wet underground very soon begins to allow current to leak. The insulation also begins to come off under a constant drip, after several months' service. It was replaced by double-braid solid-okonite wire, and when the shaft was sunk double-braid rubber-covered wire was used. Both have been perfectly satisfactory. The wires are fastened to ordinary porcelain knobs on the hanging side of the manway, and no ducts of any sort are used to protect them.

The only part of the pull-box which cannot easily be made at any mine are the two castings. The total cost of the pull-box at Butte is about $5. The buzzers cost $3.15 each. The No. 12 triple-braid weather-proof wire cost $1.17 per 100 ft. when copper was selling at 17c. per lb., while the price of the okonite covered is $3.16 and the rubber covered $2.10.

As electric power is supplied to the mines from a substation connected with several generating plants the signal system is rarely out of commission. In a district where the power is liable to be cut off, an auxiliary storage battery would be desirable.

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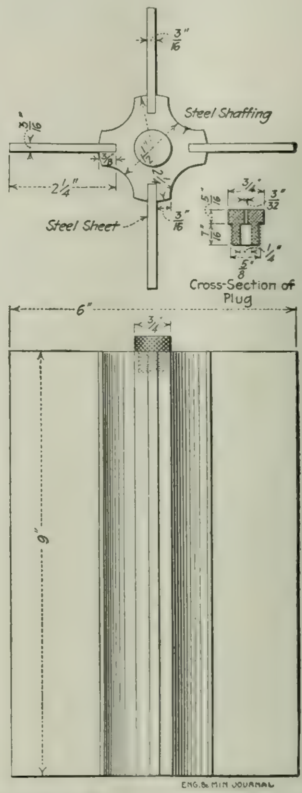
**Slabs Are Constantly Falling from the Roof** in drift mining the frozen gravels of the Fairbanks region, according to A. I. Katz, in Bulletin 525 of the U. S. Geological Survey. As the ceiling thaws in the stopes, sand and gravel fall in a continuous shower and pile up in mounds, partly filling the old workings. In some mines, where muck streaks are intercalated in the overhead gravels, large slabs spall off, gradually break away and fall. They come slowly so that they are not a source of grave danger to the men and therefore are not supported unless they threaten to bury the face. In this case pillars of unthawed material are left to hold the back until the face is brought well forward. When possible, these pillars are thawed and removed. Occasionally, the ceiling is supported with birch-pole cribs filled with waste gravel and boulders.

## Plumb Bob for Shaft Plumbing

The bob shown in the accompanying illustration was designed for plumbing shafts of moderate depth. The broad wings retard both the swinging and the rotary motions, causing the bob to come quickly to rest. It is inexpensive, being made of steel scrap, and can be easily fashioned by a machinist. A piece of 2¼-in. shafting, 9 in. long, was machined into the shape shown in the plan. This was done to make the wing shape more pronounced and to lessen the weight for a given size. Four longitudinal slots, equally spaced, were cut in the shaft ⅜ in. deep and $\frac{3}{16}$ in. wide. Into these slots were driven pieces of $\frac{3}{16}$-in. sheet steel, 9 in. long by 2¼ in. wide, these pieces being fastened securely in place by turning in the edges of the slots with a calking tool. A ⅝-in. hole was bored in one end of the shaft and tapped. A plug, turned from a solid piece of brass, was threaded to fit the hole. As shown in the cross-section, a ¼-in. hole was bored partly through the plug, and a $\frac{3}{32}$-in. hole the rest of the way. This latter hole is sufficiently large to admit any size wire desirable. The weight of the plumb bob is about 11 lb. Two such bobs were used in plumbing the shaft of the Blue Jay mine of the Mason Valley Mines Co. The design is that of Robert J. Nesbitt, Thompson, Nev., master mechanic of the Mason Valley Mines Company.



Bob with Wings to Damp Rotation

# THE COST OF DOING THINGS

## Hollinger Costs

The 1912 report of the Hollinger Gold Mines, Porcupine, Ont., states that the year's work having been so badly deranged, statistical data in regard to costs would be meaningless. This was due to a strike of about one-half of the employees. The costs for February, 1913, covering 9250 tons, are given, from which the following tables were made up:

HOLLINGER MINING COSTS

| Account | Cost per ton Ore Milled | Per Cent. Labor | Per Cent. Supplies |
|---|---|---|---|
| General mining charges | $0.053 | 75 | 25 |
| Superintendence | 0.126 | 100 | .. |
| Diamond drilling | 0.027 | 65 | 35 |
| Crosscutting | 0.043 | 36 | 64 |
| Drifting | 0.338 | 60 | 40 |
| Raising | 0.007 | 66 | 34 |
| Stoping | 1.581 | 54 | 46 |
| Timbering stopes | 0.219 | 90 | 10 |
| Track laying | 0.013 | 58 | 42 |
| Tramming and mucking | 0.438 | 99 | 1 |
| Pipe fitting underground | 0.042 | 34 | 66 |
| Mine drainage | 0.050 | 28 | 72 |
| Hoisting | 0.170 | 54 | 46 |
| Landing and dumping | 0.063 | 100 | .. |
| Drill repairs | 0.107 | 86 | 14 |
| Drill sharpening | 0.141 | 98 | 2 |
| Distributing steel | 0.050 | 100 | .. |
| Mine sampling | 0.041 | 95 | 5 |
| Assaying | 0.017 | 47 | 53 |
| Change house | 0.008 | 100 | .. |
| Mine lighting | 0.005 | 65 | 35 |
| Handling explosives | 0.025 | 98 | 2 |
| Handling waste | 0.016 | 100 | .. |
| Surveying | 0.008 | 100 | .. |
| Total | $3.588 | 65.5% | 34.5% |

HOLLINGER MILLING COSTS

| Account | Cost per ton Ore Milled | Per Cent. Labor | Per Cent. Supplies |
|---|---|---|---|
| General mill charges | $0.160 | 75 | 25 |
| Superintendence | 0.075 | 100 | .. |
| Heating | 0.076 | 55 | 45 |
| Lighting | 0.020 | 14 | 86 |
| Watchman | 0.009 | 100 | .. |
| Sampling | 0.006 | 100 | .. |
| Assaying | 0.033 | 48 | 52 |
| Coarse crushing | 0.073 | 61 | 39 |
| Conveying | 0.034 | 73 | 27 |
| Stamping | 0.181 | 47 | 53 |
| Classification and tube milling[1] | 0.277 | 19 | 81 |
| Concentration | 0.057 | 79 | 21 |
| Handling concentrates | 0.012 | 25 | 75 |
| Grinding concentrates | 0.036 | 48 | 52 |
| Handling pulp | 0.022 | 35 | 65 |
| Thickening | 0.012 | 82 | 18 |
| Agitation | 0.029 | 38 | 62 |
| Filtration | 0.147 | 67 | 33 |
| Acid washing | 0.013 | 77 | 23 |
| Neutralizing | 0.023 | 52 | 48 |
| Classification and precipitation | 0.074 | 15 | 85 |
| Smelting and retorting | 0.063 | 26 | 74 |
| Pumping solutions | 0.020 | 61 | 39 |
| Cyanide | 0.041 | .. | 100 |
| Alterations | 0.200 | 52 | 48 |
| Total | $1.693 | 49% | 51% |

[1] Includes cost of repairing and lining three tube mills.

TOTAL WORKING COSTS

| | Per Ton Milled |
|---|---|
| Administration, management, insurance, etc. | $0.407 |
| General charges | 0.209 |
| Clearing surface roads, etc. | 0.015 |
| Mining | 3.588 |
| Milling (not including alterations) | 1.493 |
| Operating camp | 0.261 |
| Loss on temporary boarding houses | 0.042 |
| Alterations to mill and plant | 0.221 |
| Strike expense | 0.508 |
| Total | $6.744 |

The costs are expected to be brought down to approximately $5.50 per ton under normal conditions. The wages paid range from $3.25 to $3.75 per day for skilled labor and from $2.50 to $3 for unskilled. Eight hours are worked in the mill and nine in the mine. Bed and board are furnished for 60c. per day.

## Shaft Sinking in Minnesota Iron Mining

The data given herewith were extracted from Bulletin No. 1 of the Minnesota School of Mines. At the Harold mine, three miles from Hibbing, Minn., the thickness of the ore varies from 16 to 60 ft., averaging about 40 ft. In the 40-acre tract the tonnage indicated by drilling is estimated to be from four to five million tons. Approximately, two million tons have been developed. At Jan. 1, 1912, the development consisted of 3490 ft. of main level and an aggregate of 31,797 ft. for five sublevels, all connected to one main shaft. This mine was developed to the slicing stage in 14 months with a total of 38,220 man-shifts. The average crew was 105 men, on two shifts. All construction work is included except steel headframe, which was built on contract. During the five-month development period to March, 1911, the following averages were obtained: 1.42 ft. advance and 5.83 tons per miner per shift, 1.05 ft. advance and 4.35 tons per man underground per shift, 0.72 ft. advance and 3 tons per man employed on the surface and underground per shift. During 10-month period of development and slicing ended Dec. 31, 1912, there was mined a total of 267,790 tons, 80% of which was slicing ore. The following averages were obtained: 2.07 ft. advance per miner on development work per shift, 10.03 tons of ore per miner slicing per shift, 6.58 tons of ore per shift per man employed underground, 4.99 tons of ore per shift per man employed on surface and underground.

It is stated that the cost of sinking a typical Mesabi shaft ranges from $50 to $100 per ft. This figure contemplates a shaft from 200 to 350 ft. deep with a certain amount of quicksand in thin layers, but no special difficulties. The water factor is variable and the maximum factor allows for a large volume. The following table may be considered as typical of the Hibbing and Chisholm districts.

| | | Cost per foot | | | Supplies analyzed per foot | | | |
|---|---|---|---|---|---|---|---|---|
| | Depth | Labor | Supplies | Total | Explosives | Timber | Steel-sets | Misc. |
| A | 213 | $29.99 | $24.61 | $54.60 | $0.49 | $10.00 | ...... | $14.12 |
| B | 253 | 46.03 | 56.74 | 82.60 | 3.32 | 14.00 | $15.44 | 19.15 |

"A" shaft was sunk in orebody under normal conditions; very little water; depth a little under average.

"B" shaft sunk entirely in rock, 60 ft. being very hard sinking through seamed taconite. For 45 ft. above station this shaft is supported by steel sets. The timber cost is per foot of timbered section and steel cost per foot supported by steel.

In a chapter on shaft sinking an interesting table of costs at the Webb No. 3 shaft is given, from which the following table has been arranged. The pumping cost includes all pumping expense outside of boiler house. Wage for common labor was $2.10; miners, $2.75 to $3.25 per shift; fuel cost was $3.95 per ton. Labor conditions were fair until water was encountered, then good men were scarce. On the whole progress was satisfactory, water never getting the best of the men for more than a few hours. The table is divided into monthly periods beginning with August, 1910, and ended July, 1911. To understand the working conditions thoroughly a history of operations is given.

August, 1910—Sinking began Aug. 14, 1910. 40 ft. surface, consisting of clay, sand, boulders and hardpan; 7 ft. heavy broken taconite—all machine drilling—two 10-hr. shifts.

September, 1910—43 ft. heavy broken taconite—all machine drilling—two 10-hr. shifts.

October, 1910—65 ft. progress—conditions unchanged until end of month, when water was encountered.

November, 1910—20 ft. of rock. Conditions unchanged. Water grew to 500 gal. per min., and much time was taken to prepare for larger volume soon to be encountered, consequently there were about 20 shifts in which no sinking was attempted.

December, 1910—37.5 ft. From 195 to 205 ft., a few thin seams of paint rock were encountered. These gave a good deal more water and at 200 ft. the water was 800 to 900 gal. per min., requiring two Prescott sinkers at all times. There were three sinkers in the shaft and a No. 10 Cameron.

January, 1911—15.5 ft. of progress. No sinking was attempted until Jan. 9, on account of more preparations for handling water, because a 20-ft. layer of ore and broken taconite was reached. It was known that water would increase in this layer, which it did up to 1500 gal. per min. Three Prescott sinkers, 14x8x12, were in continuous operation during January and afterward.

February, 1911—Solid taconite was encountered at 233 ft., on Feb. 3, and three 8-hr. shifts were started on the 16th. A depth of 248 ft. was reached by Mar. 1, and sinking was stopped to cut station and do considerable drifting. Prescott compound pumps, 9x16x10x18, were then put in place on the bottom level, and from June to July 5, inclusive, solid-rock sinking went on to completion.

Webb No. 3 shaft (Cost per foot)

| Month | No. ft | Boiler house expense | Pumping cost labor-supplies | Shaft labor | Shaft supplies | Steel sets | Total cost |
|---|---|---|---|---|---|---|---|
| Aug | 47 | $2 767 | $4 639 | $10 98 | $12 13 | $14 73 | $45 25 |
| Sept | 43 | 3 077 | 3 332 | 30 60 | 20 11 | 14 73 | 71 86 |
| Oct | 65 | 3 305 | 3 845 | 25 16 | 11 87 | 14 73 | 58 90 |
| Nov | 20 | 17 082 | 16 384 | 90 19 | 41 83 | 14 73 | 180 22 |
| Dec | 37 5 | 13 320 | 10 816 | 47 67 | 22 65 | 14 73 | 109 19 |
| Jan | 15 5 | 95 064 | 41 987 | 91 00 | 41 14 | 14 73 | 284 02 |
| Feb | 20 | 134 053 | 37 005 | 126 42 | 26 68 | 14 73 | 338 90 |
| June | 19 | 98 834 | 30 930 | 194 13 | 46 35 | 14 73 | 385 30 |
| July | 4 | 72 572 | 27 510 | 147 72 | 38 35 | 14 73 | 300 88 |
| Total | 271 | $28 197 | $12 668 | $56 39 | $22 50 | $14 73 | $131 49 |

The boiler house expense was made up of 85% fuel and 15% labor. Shaft supplies consisted of $1 17 per ft. for explosives, 37c. for candles and $17 96 for miscellaneous supplies.

The steel sets used in the Webb No. 3 shaft measured 6x18.75 ft. on the inside. The wall plates and end pieces are 5-in. H's, weighing 18.7 lb. per ft. The dividers are 10-in. I-beams. The sets are spaced 4 ft. center to center and held together with eight ¾-in. angle studdles; all angles are shop-riveted to the end pieces and dividers so that in a wet shaft less than two hours' time is required to put set in place. The shaft is lagged with Norway pine; the lagging is held in place by small 2½x2-in. angles, shop-riveted to the back of all wall plates and end pieces.

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## Recent Transvaal Costs

At the May Consolidated Gold Mining Co., Transvaal, South Africa, in the quarter ended Mar. 31, 1913, 43,590 tons of ore were milled at a cost of $3.69 per ton. The items were: Mining, hauling and pumping, $2.30; transporting ore, 9c.; sorting and crushing, 10c.; milling, 43c.; cyaniding sands, 25c.; cyaniding concentrates, 6c.; cyaniding slimes, 12c.; and general charges, 34c. The average yield of the ore was about $5.04 per ton. Of the ore mined 14.135% was discarded by hand sorting. The table given herewith is from the report of the General Mining & Finance Corporation for the quarter ended Mar. 31, 1913. The costs are based upon the tonnage milled. No allowance has been made for the government tax on profits.

RECENT WORKING COSTS— TRANSVAAL

| Company | Aurora West United Gold Mining Co. | Cinderella Consolidated Gold Mines | Meyer & Charlton Gold Mining Company | New Goch Gold Mines | Roodepoort United Main Reef | Van Ryn Gold Mines Estate | West Rand Consolidated Mines |
|---|---|---|---|---|---|---|---|
| Mining | $2.75 | $3.87 | $2.09 | $2.24 | $2.75 | $1.88 | $3.61 |
| Sorting, crushing and transporting | 0.14 | 0.09 | 0.09 | 0.19 | 0.23 | 0.15 | 0.17 |
| Milling | 0.42 | 0.46 | 0.44 | 0.43 | 0.37 | 0.47 | 0.41 |
| Cyaniding | 0.45 | 0.41 | 0.54 | 0.34 | 0.35 | 0.37 | 0.42 |
| General charges | 0.42 | 0.67 | 0.60 | 0.31 | 0.41 | 0.31 | 0.52 |
| Office expenses | 0.09 | 0.18 | 0.45 | 0.10 | 0.11 | 0.14 | 0.19 |
| Mine development and redemption | 0.73 | 0.73 | 0.23 | 0.20 | 0.49 | 0.45 | 0.55 |
| Permanent works | .... | ... | .... | 0.07 | ... | .... | .... |
| Total working cost | $5.00 | $6.41 | $4.44 | $3.88 | $4.71 | $3.77 | $5.87 |
| Working profit | 1.60 | Loss | 2.07 | 1.13 | Loss | 3.06 | 1.40 |
| Revenue per ton of ore milled | $6.60 | $6.40 | $6.51 | $5.01 | $4.60 | $6.83 | $7.27 |
| Tons of ore mined | 52,079 | 64,458 | 44,214 | 97,489 | 96,575 | 123,962 | 109,610 |
| Tons sorted out | 9,980 | 9,328 | 2,480 | 16,579 | 17,656 | 8,922 | 23,410 |
| Per cent. discarded by sorting | 19.1% | 14.3% | 5.4% | 17% | 18.3% | 7.2% | 21.5% |
| Tons ore crushed at mill | 41,699 | 55,170 | 42,014 | 81,160 | 78,891 | 116,000 | 86,300 |
| Days running time | 84.70 | 84.28 | 84.20 | 81.79 | 80.31 | 84.10 | 73.53 |
| Tons per stamp per day | 6.154 | 8.01 | 6.65 | 8.27 | 19.65 | 10.22 | 11.74 |
| Stamps in operation | 80 | 80–85 | 75 | 120 | 50 | 135 | 100 |
| Tube mills operated | ... | 3 | 2 | 4 | 3 | 6 | 4 |

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## Stewart Mining Co.

The Stewart Mining Co. in the Cœur d'Alenes, Idaho, from June 30, 1912, to Dec. 31, 1912, mined 100,043 tons of ore, 2753 of which were shipped direct to smelters and the remainder treated at the mill. The total cost of production as reported was $3.68 per ton mined, made up as follows: Mining and development, $2.12; transportation of ore, 15c.; milling, 35c.; administration and general expenses, 31c.; taxes, 11c.; depreciation, 4c., and litigation and miscellaneous items, 57c. In addition to these charges about 11c. per ton was charged to capital accounts for improvements. The average yield of the ore was $5.91 per ton. Mining expense was made up of 60% labor and 40% supplies as shown: superintendence, etc., 4c. per ton mined; other labor, $1.25; candles, 1c.; explosives, 6c.; timber, 20c.; machinery and drill parts, 6c.; sundry supplies, including freight, 5c.; development, 36c.; total, $2.15 per ton. The milling expense was made up of 47% labor and 53% supplies, and consisted of the following items: Labor, 16.4c. per ton milled; machinery and parts, 3.2c.; lumber and timber, 0.4c.; sundries, 1.8c.; rent, 7.1c.; electric power, 2.3c.; heating expense, 0.6c.; sorting ore, 3.8c.; and care of flume, 0.1c.; total, 35.7c. per ton milled.

# Historical Note on Zinc Smelting

The history of zinc metallurgy falls into two distinct lines—first, that of the metal, and second, that of zinc ore, for the latter was known and used to make brass by cementation with copper and to yield oxides by sublimation for medicinal purposes, nearly 2000 years before the metal became generally known and used in Europe.

There is some reason to believe that metallic zinc was known to the ancients, for bracelets made of it, found in the ruins of Cameros (prior to 500 B.C.), may have been of that age (Raoul Jagnaux, "Traité de Chimie Générale," 1887, II, 385); and, further, a passage in Strabo (63 B.C.—24 A.D.) is of much interest. He states: (XIII, I, 56) "There is found at Andeira a stone which, when burnt, becomes iron. It is then put into a furnace, together with some kind of earth, when it distills a mock silver (*pseudargyrum*), or with the addition of copper it becomes the compound called *orichalcum*. There is found a mock silver near Tismolu also." (Hamilton's Trans., II, p. 381). About the Christian era the terms *orichalcum* or *aurichalcum* undoubtedly refer to brass, but whether these terms as used by earlier Greek writers do not refer to bronze only, is a matter of considerable doubt. Beyond these slight references we are without information until the 16th century. If the metal was known to the ancients, it must have been locally, for by its greater adaptability to brass-making it would probably have supplanted the crude melting of copper with zinc minerals.

It appears that the metal may have beeen known in the Far East prior to such knowledge in Europe; metallic zinc was imported in considerable quantities from the East as early as the 16th and 17th centuries under such terms as *tutemque tuttanego calaëm* and *spianter*—the latter, of course, being the progenitor of our term spelter. The localities of Eastern production have never been adequately investigated. W. Hommel (ENG. AND MIN. JOURN., June 15, 1912) gives a very satisfactory review of the Eastern literature upon the subject, and considers that the origin of manufacture was in India, although the most of the 16th and 17th century product came from China. The earliest certain description seems to be some recipes for manufacture quoted by Praphulla Chandra Ray ("A History of Hindu Chemistry," London, 1902, p. 39), dating from the 11th to the 14th centuries. There does not appear to be any satisfactory description of the Chinese method until that of Sir George Staunton (*Journal Asiatique,* Paris, 1835, p. 141). We may add that spelter was produced in India by crude distillation of calamine in clay pots in the early part of the 19th century (Brooke, "Journ. Asiatic Soc. of Bengal," Vol. XIX, 1850, p. 212), and the remains of such smelting in Rajputana are supposed to be very ancient.

The discovery of zinc in Europe seems to have been quite independent of the East, but precisely where and when is clouded with much uncertainty. The *marchasita aurea* of Albertus Magnus has been called upon to serve as metallic zinc, but such belief requires a hypothesis based upon a great deal of assumption. Further, the statement is frequently made that zinc is mentioned in Basil Valentine's "Triumphant Chariot of Antimony" (the only one of the works attributed to this author which may date prior to the 17th century), but we have been unable to find any such reference. The first certain mention of metallic zinc is generally accredited to Paracelsus (1493-1541), who states ("Liber Mineralium" II): "Moreover there is another metal generally unknown called *zinken.* It is of peculiar nature and origin; many other metals adulterate it. It can be melted, for it is generated from three fluid principles; it is not malleable. Its color is different from other metals and does not resemble others in its growth. Its ultimate matter (*ultima materia*) is not to me yet fully known. It admits of no mixture and does not permit of the *fabricationes* of other metals. It stands alone entirely to itself." We do not believe that this book was published until after Agricola's works. Agricola introduced the following statements into his revised edition of "Bermannus" (p. 431), published in 1558: "It (a variety of pyrites) is almost the color of galena, but of entirely different components. From it there is made gold and silver, and a great quantity is dug in Reichenstein, which is in Silesia, as was recently reported to me. Much more is found at Raurici, which they call *zincum,* which species differs from pyrites, for the latter contains more silver than gold, the former only gold or hardly any silver." In "De Natura Fossilium" (p. 368): "For this *cadmia* is put, in the same way as quicksilver, in a suitable vessel so that the heat of the fire will cause it to sublime, and from it is made a black or brown or gray body which the alchemists call *cadmia sublimata.* This possesses corrosive properties to the highest degree. Cognate with this *cadmia* and pyrites is a compound which the Noricans and Rhetians call *zincum.*" We leave it to the readers to decide how near this comes to metallic zinc; in any event, he apparently did not recognize his *conterfei* from the furnaces as the same substance as the *zincum* from Silesia. The first correlation of these substances was apparently by Lohneys, in 1617, who says ("Vom Bergwerk," p. 83-84): "When the people in the smelting works are smelting, there is made under the furnace and in the cracks in the walls among the badly plastered stones, a metal which is called *zinc* or *counterfeht,* and when the wall is scraped it falls into a vessel placed to receive it. This metal greatly resembles tin, but it is harder and less malleable. . . . . . . The Alchemists have a great desire for this *zinc* or bismuth." That this metal originated from blende or calamine was not recognized until long after, and Libavis ("Alchymia," Frankfort, 1606), in describing specimens which came from the East, did not so identify it, this office being performed by Glauber, who says ("De Prosperitate Germanias," Amsterdam, 1656): "Zinc is a volatile mineral or half-ripe metal when it is extracted from its ore. It is more brilliant than tin and not so fusible or malleable . . . . . . it turns (copper) into brass, as does *lapis calaminaris,* for indeed this stone is nothing but infusible zinc, and this zinc might be called a fusible *lapis calaminaris,* inasmuch as both of them partake of the same nature. . . . . . It sublimates itself up into the cracks of the furnace, whereupon the smelters frequently break it out." The systematic distillation of zinc from calamine was not discovered in Europe until the 18th century. Henkel is generally accredited with the first statement to that effect. In a contribution published

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Note—One of the footnotes from Hoover's translation of Agricola, Book IX.

as an Appendix to his other works, of which we have had access only to a French translation (*Pyritologie*, Paris, 1760, p. 194), he concludes that zinc is a half-metal of which the best ore is calamine, but believes it is always associated with lead, and mentions that an Englishman lately arrived from Bristol had seen it being obtained from calamine in his own country. He further mentions that it can be obtained by heating calamine and lead ore mixed with coal in a thick earthern vessel. The Bristol works were apparently those of John Champion, established about 1740. The art of distillation was probably learned in the East.

Definite information as to the zinc minerals goes back to but a little before the Christian Era, unless we accept nebular references to *aurichalcum* by the poets, or what is possibly zinc ore in the "earth" mentioned by Aristotle ("De Mirabilibus," 62): "Men say that the copper of the Mossynoeci is very brilliant and white, no tin being mixed with it; but there is a kind of earth there which is melted with it." This might quite well be an arsenical mineral. But whether we can accept the poets or Aristotle or the remark of Strabo given above, as sufficient evidence or not, there is no difficulty with the description of *cadmia* and *pompholyx* and *spodos* of Dioscorides (1st century). His *cadmia* is described as rising from the copper furnaces and clinging to the iron bars, but he continues: "*Cadmia* is also prepared by burning the stone called pyrites, which is found near Mt. Soloi in Cyprus...... Some say that *cadmia* may also be found in stone quarries, but they are deceived by stones having a resemblance to *cadmia*." *Pompholyx* and *spodos* are evidently furnace calamine. There can be no doubt that these materials, natural or artificial, were used to make brass, for he states (V. 46): "White *pompholyx* is made every time that the artificer in the working and perfecting of the copper sprinkles powdered *cadmia* upon it to make it more perfect, the soot arising from this . . . . . is *pomphalyx*." Pliny is confused between the mineral *cadmia* and furnace *calamine*, and none of his statements are very direct on the subject of brass making. His most pointed statement is (XXXIV, 2): ". . . . . Next to Livian (copper) this kind best absorbs *cadmia*, and is almost as good as *aurichalcum* for making sesterces and double asses." As stated above, there can be little doubt that the *aurichalcum* of the Christian Era was brass, and further, we do know of brass sesterces of this period. Other Roman writers of this and later periods refer to earth used with copper for making brass. Apart from these evidences, however, there is the evidence of analyses of coins and objects, the earliest of which appears to be a large brass of the Cassia family of 20 B.C., analyzed by Phillips, who found 17.3% zinc ("Records of Mining and Metallurgy," London, 1857, p. 13). Numerous analyses of coins and other objects dating during the following century corroborate the general use of brass. Professor Gowland (Presidential Address, Inst. of Metals, 1912) rightly considers the Romans were the first to make brass, and at about the above period, for there appears to be no certainty of any earlier production. The first adequate technical description of brass making is in about 1200 A.D., being that of Theophilus, who describes ("Hendrie's Trans.," p. 307) calcining *calamina* and mixing it with finely divided copper in glowing crucibles. The process was repeated by adding more calamine and copper until the pots were full of molten metal. This method is repeatedly described with minor variations by Biringuccio, Agricola ("De Nat. Fos."), and others, down to the 18th century.

## Mr. Shaw's Statements

President Quincy A. Shaw, of the Calumet & Hecla Mining Co., has made positive denial of the various statements made Oct. 5, by J. A. Walker, president of the mining department of the American Federation of Labor, before the Boston Central Labor Union, descriptive of what Mr. Walker said were the "real conditions" in the Lake Superior copper region.

"I have no desire in any way," said Mr. Shaw, "to influence or attempt to influence public opinion on the labor controversy now existing. A full 80% of our men are at work and we have every hope of being able shortly to clear up the situation.

"When Mr. Walker states to a public assembly that my annual salary as president of the Calumet & Hecla Co. is in the neighborhood of $300,000 and that the salary of a vice-president is $85,000, it must be plain what impression he is endeavoring to create.

"In answer to that statement I say that my salary as president of the Calumet & Hecla is $15,000 a year, and that the salary of Mr. Agassiz, the first-vice president, is $12,000.

"Mr. Walker charges that the men have been working 11 hours a day under a contract system. The hours of work for the great majority I say are approximately nine, and for some time we have been trying to plan operations so an eight-hour day would be possible.

"The payrolls of the last full month of the Calumet & Hecla show that the miners were receiving an average wage of $3.66, and the trammers $2.89, after deductions for their medical assessment which entitled themselves and their families to medical treatment and medicines, and for the aid fund which pays benefits in cases of sickness and minor injuries. Both of these funds I might say are also supported in part by contributions from the company.

"In answer to his statement that 'trammers are a physical wreck after three years,' because, as he explained it, they have to push heavy ore cars along the rails, I can state without fear of contradiction that this is untrue. We have many trammers who have worked for us for years, and he also neglected to say that the ore cars which they push are on a down-grade to the shafts.

"One-man drill machines are not operated in isolated places. Such operations are only carried on where inspectors and workmen are at hand or frequently passing.

"In answer to his charge of stifling copper-dust-laden air, I would say the natural ventilation in the mines is so great that it is necessary to put in doors in the various levels to prevent too sweeping a draft. In answer to the charge that deaths and injuries are not reported because of their great number, I would say that under the law we make four reports of all such to different authorities. Inasmuch as a workmen's compensation act is now in effect in Michigan, the ridiculousness of this latter statement must be plain to all.

"The total number of men at work for the Calumet & Hecla company alone, exclusive of its smelters, is something over 3000. I think it approximately true to say that 1500 or more men are at work underground. These figures do not include men at work in the Osceola, Isle Royale, Superior, Quincy and Copper Range mines.

"The miners are law-abiding and peaceful men, and we have long been proud of their long service records with us, and the general spirit of friendliness which has existed. In Laurium and Calumet villages, with a population of close to 50,000 people, two marshals and two night watchmen have constituted the entire police force.

"This trouble has not come from our men, but from an element from outside which has attempted for its own purposes to take control of the labor field. We have with us hundreds of men who own their own houses, who are bringing up their families in a way creditable to the district and the country, and our relations with them even during this trouble have never changed. It is a business as well as a sentimental proposition that a contented working staff is the first requisite for real efficiency in any undertaking, and that is what we have always kept in mind in our relations with our employees."

The JOURNAL's readers will appreciate the humorous character of Mr. Walker's remarks about the trials of trammers and the suffering of the one-man drill runners who have to work in "stifling copper-dust-laden air."

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**Discontinuance of Iron Bounties and Keen Foreign Competition** has caused losses which have resulted in the Canada Iron Corporation deciding upon reorganizing its finances in order to reduce fixed charges. The corporation did a large business last year, but was unable to realize upon many of its accounts, mainly those due from municipalities. As a preliminary step the court at Montreal was asked to appoint a receiver to conduct affairs pending the reconstruction and F. F. Whyte, of New York, was appointed. The corporation has outstanding bonds to the amount of $4,637,933, and $7,741,300 stock, of which $2,909,000 is preferred. The properties of the corporation include iron mines at Eganville and Bessemer, Ont., Bathurst, N. B., and Torbrook, N. S., furnaces at Midland, Ont., and Radnor and Drummondville, Que., and foundries at Fort William, Hamilton, St. Thomas and Midland, Ont., Montreal and Three Rivers, Que., and Londonderry, N. S.

# Landing Cableway at Nome, Alaska

The accompanying two views show in operation a cableway which is used to transport both passengers and freight from steamships to the shore at Nome, Alaska (*Eng. News,* Sept. 4, 1913). Fig. 2 shows a section of pipe being landed from a lighter, which in turn has been brought in from the steamer visible behind the pipe. The view was taken on June 22.

The cableway was built some years ago for the John J. Sesnon Co., of Nome, Alaska, by the Lidgerwood Manufacturing Co. The company at the time operated steamers from Seattle and San Francisco to Alaskan ports and owned warehouses and a wharf on the beach at Nome. The beach slopes gradually so the vessels have to lie several miles off at sea and land their passengers by small boats or lighters. In onshore winds the sea is rough and in the winter the waters freeze to the bottom for a long distance out. In order to provide a safe and continuously available method of landing, the company erected the cableway, part of which is shown in the views.

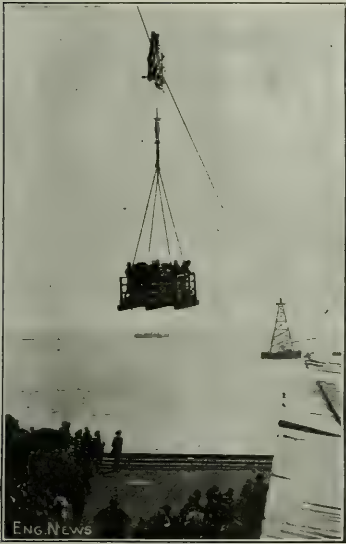


FIG. 1. LANDING PASSENGERS

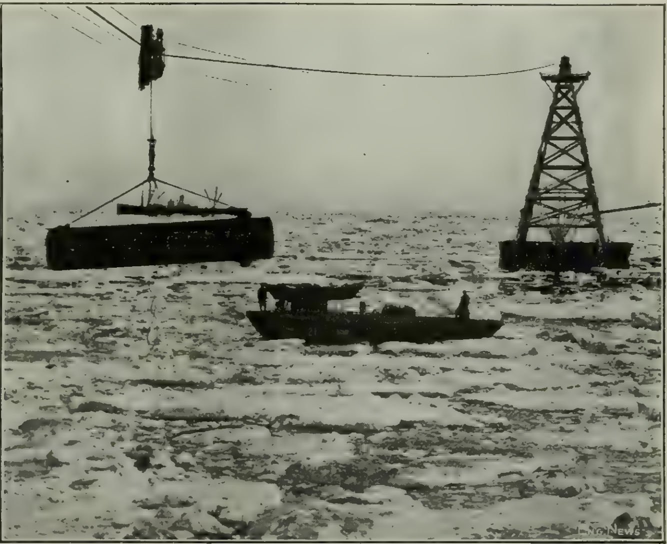


FIG. 2. LANDING PIPE AT NOME, ALASKA

This cableway spans between the sea tower illustrated and a shore tower not shown. The shore or head tower is 125 ft. high and the sea tower is 85 ft. high, the span between them being 1400 ft. A 2½-in. cable is used and the capacity of the cableway as designed is 10 tons.

The sea tower is built on a concrete base, which, in turn, is footed on timber piles driven in about 10 ft. of water. The concrete section is in plan a hollow square with the side toward the shore omitted. The off-shore face of the square is 48 ft. long and 10 ft. thick, with corners thickened up to 12 ft. The side faces are 46 ft. in length, 3 ft. thick and have corners 8 ft. square. The tower is of timber. The sills and posts are 12x12 in. in section, while the bracing is made of 3x12- and 4x12-in. timbers. The shore tower is of similar construction.

# NEW PUBLICATIONS

THE GEOLOGY OF GOWGANDA MINING DIVISION. By W. H. Collins. 9¾x6½, pp. 131, illus., paper. Memoir No. 33, Canada Dept. of Mines, Geological Survey, Ottawa.

ECONOMIC MINERALS AND MINING INDUSTRIES OF CANADA. By the Staff of the Mines Branch. 6½x10, pp. 77, illus., paper. Canada Dept. of Mines, Mines Branch, Ottawa.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF METALS. Vol. VI, 1912. Edited by W. M. Corse, Secretary. 6x9, pp. 250, illus. Published by the Institute, Buffalo, N. Y.

THE PRODUCTION OF PETROLEUM IN 1912. By David T. Day. Advance Chapter from Mineral Resources of the United States, 1912. Pp. 141. U. S. Geological Survey, Washington, D. C.

BRITISH COLUMBIA MINISTER OF MINES, ANNUAL REPORT FOR THE YEAR ENDING 31ST DECEMBER, 1912. 7¼x10, pp. 349, illus., paper. Richard McBride, Minister of Mines, Victoria, B. C.

THE TITANIFEROUS IRON ORES IN THE UNITED STATES: THEIR COMPOSITION AND ECONOMIC VALUE. By Joseph T. Singewald, Jr. Pp. 145, illus. Bull. 64, U. S. Bureau of Mines, Washington, D. C.

MAP OF THE STATE OF SONORA, MEXICO. 49¾x36¾ in., drawn to a scale of one inch to 11.8 miles. Price $2 in folder for pocket use, or on rollers for hanging. Published by S. M. Greenidge, Mining Engineer, Douglas, Ariz.

L'EXECUTION ET LES EFFETS PENDANT L'ANNEE 1911 DE LA LOI DU 31 DECEMBRE 1909 FIXANT LA DUREE DE LA JOURNEE DE TRAVAIL DANS LES MINES. Rapport Présenté aux Chambres Législatives par M. Le Ministre de l'Industrie et du Travail. 8½x11, pp. 245, paper. Ministère de l'Industrie et du Travail, Administration des Mines, Brussels, Belgium.

SAFETY. By William H. Tolman, Ph.D., and Leonard B. Kendall. Pp. 422, illus.; $3. Harper & Brothers, New York and London, 1913.

This book is the only comprehensive work on safety that has yet appeared in the English language. Its sub-title "Methods for Preventing Occupational and Other Accidents and Disease" is adequately descriptive. Doctor Tolman, one of its authors, is well known as the director of the American Museum of Safety. He has been devoting his undivided attention to this subject for a great many years and consequently writes respecting it as an expert.

In their preface the authors say that their book proves that 50% of industrial accidents are preventable and cite the experience of the Pennsylvania R.R. Co., the Midvale Steel Works, and the United States Steel Corporation, which last year reduced their serious shop accidents by 63%, 61% and 45%, respectively. In their book they discuss the nature and causes of occupational accidents and show how they may be prevented.

The book is not only eminently practical, but also it is good reading. We have no hesitation in saying that every works manager ought to buy a copy and ought to read it. It would not be a bad idea for every mine manager to do likewise, although the book does not treat extensively of mining accidents pure and simple.

ELECTRICITY IN MINING. By Siemens Bros. Dynamo Works, Ltd. 7x11, pp. 196, illus. Charles Griffin & Co., London.

This is an excellent summary of all the common applications of electricity in mining practice. Some attention is given to electrical generation, distribution, transmission, switch gear, etc., and more detail is presented on the use of electricity for hoists, pumps, fans, compressors, haulage, drills, signaling, blasting, etc. The entire book is written in clear and intelligible technical language, if such an anomaly be possible. Published by a firm of electrical manufacturers, as the book is, the arguments are all, naturally, in favor of electrical installations, and some allowance must be made for exaggeration in favor of the application of energy in that form. The comparisons usually drawn are between electrical motors and steam engines, and no attention is paid to air engines, which are of considerable importance in this country, at least. In view of the increasing use of motors in mining practice, it may be that the statements made, while not strictly exact today, are truly prophetic. The best chapter in the book is that covering the various systems of electric hoisting, giving the advantages and fields of application of the various systems possible. The book cannot be taken as altogether authoritative, since in discussing the question of electric pumping on page 101 the statement is made that transmission by belt or gearing hardly comes into consideration. This is absurd in view of the fact that electrically driven geared plunger pumps are probably now the accepted type in the United States.

WINDING ENGINES AND WINDING APPLIANCES. By George McCulloch and T. C. Futers. 5½x9, pp. 452, illus.; $6. Longmans, Green & Co., New York.

This is the most satisfactory treatise on the subject of mine hoisting that has yet appeared in the English language. It is equally excellent from the viewpoints of mechanics, mechanical engineering and mining, all three phases being kept constantly under consideration.

The introductory chapter sets forth the mechanics of the whole subject of hoisting, and by means of moment diagrams makes clear the influence of acceleration, inertia, speed and retardation, on the work to be performed by the engine. Chapters II to XII take up in order a number of typical designs, starting with a non-condensing, duplex-cylinder engine, with cylindrical drums and without tail-rope, and concluding with the most elaborate electrical systems for hoisting from great depths. In most cases, a certain definite problem is presented, with numerical assumptions of weights, resistances, speeds, safety factors, etc., from which the data affecting the design of the engine for the particular requirements are deduced. This makes the subject much more clear for most readers than the derivation of general formulas. By comparing one case with another, the effects of varying the assumptions of the general problem are clearly brought out. Conical drums, tapered ropes, flat ropes, and other means of equalizing engine work are discussed in detail. Results of actual tests are given.

Part IV, beginning with Chapter III, takes up the mechanical details of construction of hoisting engines, treating of cylinders and valve gears, of governors, pistons and rods, of drums, brakes, and clutches, of indicators and safety devices. The section on devices to prevent overwinding is especially valuable.

Chapter XVI covers the subject of hoisting ropes in a thoroughly practical manner, pointing out the advantages of certain ropes as compared with others for mine hoisting. Under the subject of safety catches for cages, only three types, all unknown in America, are illustrated. The application of one of these to cages running on steel guides is interesting. The subjects of skips and headframes are not covered very thoroughly. The methods described for decking cages at coal mines, and for transferring the cars to and from them, reflect the best European experience, and contain many novel ideas for American engineers, as does also the matter of rope guides.

GENERAL METALLURGY. By H. O. Hofman. 6x9, pp. 909, illus.; $6. McGraw-Hill Book Co., New York.

This is announced as the first volume of a series of five, the four others of which are to treat respectively of the metallurgy of copper, iron and steel, lead and the minor metals. Prof. Hofman has long been known as a teacher, original investigator and technical author. His early contributions to the "Transactions of the American Institute of Mining Engineers" showed him to be unusually gifted as a keen observer and clear expositor, characterized also by patience and industry in technical investigations. These qualifications were illustrated in his book on the "Metallurgy of Lead," which has run through five editions, and has recently received a ninth impression of the fifth. No doubt it will be enlarged and again revised to form one of the five volumes of the new magnum opus. An inspection of the general introductory volume now before me has given me an overwhelming sense of the labor and critical intelligence involved in its preparation. The author frankly acknowledges his obligations, and dedicates his book to Prof. Robert H. Richards, S.B., LL.D., "Teacher, Investigator, Friend"; and names also Prof. Joseph W. Richards of Lehigh University and several of his own colleagues in the faculty of the "Tech" as having given him important aid. But all that these eminent gentlemen have contributed amounts to little in comparison with the vast scope of this work, and the patient accumulation, careful sifting and logical arrangement of the voluminous material scattered through modern technical literature. Prof. Hofman naively confesses in his preface that "it has taken a great deal more time to write this book than was anticipated." The wonder is, that he has been able to write it at all, and that, having finished it, he has enough strength and courage left to promise that its successors will appear "at brief intervals."

As he justly observes, there is no other treatise on general metallurgy which meets present requirements. It is seven years since Babu's "Traité Théoretique et Practique" was left unfinished, 10 years since Schnabel's "Lehrbuch" brought the subject down to that date and 34 years since Bruno Kerl furnished a classic model in his introductory volume. Even the smallest of these periods covers a surprising variety of new discoveries and improvements. That Prof. Hofman has taken full account of these, not only his text, but his abundant foot-notes and bibliographical lists bear testimony. In more than 900 closely printed pages, with almost an equal number of engravings, and 250 tables, he covers the physical and chemical properties of metals, alloys and metallic compounds, the various types of metallurgical processes, their ores, fluxes, apparatus and products, and, in greatest detail, the various fuels and refractory materials.

A glance at this list of subjects reveals at once how many of them have been so affected by modern progress as to require new treatment and arrangement. The chemical and physical properties of metals and alloys have been studied so fruitfully as to bring into existence a new science, with the microscope and the electric current as its tools. New processes in metallurgy have created new ores—that is, have enabled us to treat as ores low-grade materials not formerly entitled to that name. The mere increase in size of furnaces, their speed of running and degree of pressure and temperature, has revolutionized the rules of many metallurgical constructions and processes. Innumerable methods and devices have been introduced to meet the ever-growing demand for technical efficiency, the saving of labor and of other costs, and the abatement of injury to health or property. A new fuel—petroleum—has won a wide use, and the employment of gaseous fuel has been greatly extended and improved—latest of all is the employment of gas engines, and the manufacture and testing of refractory materials have been perfected to meet the severe requirements of higher temperatures and fiercer attacks involved in the new metallurgy.

It is a matter of no little difficulty to decide just what properly belongs to a treatise on general metallurgy, and what should be relegated to special treatises on the several metals. Professor Hofman has not only courageously met this difficulty; he has increased it by including hydrometallurgical and electrometallurgical processes and apparatus, and even the department of mechanical metallurgy covering crushing, ore-dressing, etc. No doubt, all these things may be regarded as logically embraced in general metallurgy; but Professor Hofman has been obliged to discuss some of them with unsatisfactory brevity. The only omission I have noted, however, in his outline is that of "flotation" under the head of ore-dressing. It is in dealing with refractories, furnaces and pyrometallurgical processes that he is naturally strongest, since it is in that department that he has most distinguished himself as investigator and instructor. On many other subjects, for instance, crushers and mills, he gives to his readers the advantage, which he has himself enjoyed, of the admirable testing-laboratory of the Massachusetts Institute of Technology, and, as I have already observed, he supplies to the student, with every chapter, through abundant bibliographical notes, the means of further research.

The list of creditable American technical books has grown with surprising rapidity during the last few years. It constitutes already a comprehensive library of applied science, and considering the contributions made to technical progress by American authors and practitioners, we may fairly say that this library is both a cause and a result of that progress. Certainly, no one of its constituent volumes better deserves a prominent and permanent place on its shelves than this great work, the students of which will ardently hope that its author may be enabled to carry out the greater work he has so brilliantly begun.

INTRODUCTION TO THE STUDY OF IGNEOUS ROCKS. By George Irving Finlay. 5x7½, pp. 228, illus., leather; $2. McGraw-Hill Book Co., New York.

It was perhaps a mistake to call this book an "Introduction," firstly because it presupposes a fairly complete knowledge of crystallography and of the use of the petrographic microscope, and secondly because one who has mastered the contents of the book can claim a rather intimate acquaintance with the igneous rocks. The author's experience of 15 years as a teacher of petrography is clearly reflected in the book; it deals with exactly those puzzling questions which are always coming up in the minds of students, and it clears them away in a most satisfying manner. The optical study of rocks is accentuated, the determination of hand specimens being reviewed in a single short chapter. This being the case, a chapter on the preparation of rock sections, and one on the manipulation of the petrographic microscope would have been in order, though the latter subject is referred to incidentally in the chapter on the "Movement of Light in Crystals."

The opening chapters are particularly clear in stating the relationship and points of contrast between the several great families of igneous rocks. Similarly, the distinguishing features of the relatively few essential minerals are presented with exceeding clearness; while the finer distinctions are treated in less detail; the discussion of the difficult recognition of the several types of feldspars is particularly valuable. Other minerals are treated in the same clear manner; in our judgment the book is characterized by its forcible presentation of broad distinctions.

The type rocks, 12 in number, are described in a chapter by themselves, followed by one covering the variations from the type rocks, in larger numbers. Excellent tables are presented at this point, serving to identify a rock by the preponderance or absence of stated minerals. Chapter VIII, on the method of describing rocks, introduces a profusion of elaborate technical terms, useful, of course, for abbreviating descriptions, but requiring that the reader of the description shall hold the cipher. The final chapter is an exposition of the quantitative classification, outlining the purpose and plan of the originators of the scheme, and indicating, by means of a few selected examples, the method of computing and assigning a given rock to its rightful niche in the edifice. Tables of molecular weights of the common rock constituents are grouped at the back, to expedite the calculations. Finally come two tables presenting the distinguishing optical features of the essential and of the accessory rock minerals.

The book is copiously illustrated with diagrams and micro-photographs, and is conveniently bound for pocket carrying. It is a practical handbook for petrographic students rather than a treatise on petrology.

ZINK UND CADMIUM. By R. G. Max Liebig. Pp. 598, illus.; 30 marks. Otto Spamer, Leipzig.

This new work rounds out a series of treatises on the metallurgy of zinc, of which the first was Ingalls' in English, and the next Lodin's in French. Nor should we forget the leading section of Prost's general metallurgy, which is a rich treatment of this subject. Thus we have had since the beginning of this century an exposition of the art of zinc smelting from the American, French, Belgian and finally the German standpoints. This is doing well for a branch of metallurgy, which only a few years ago was criticized for the deficiency of its literature.

The new book comes from highly competent hands. Herr Liebig, who is a retired works manager, was for many years the director of the famous Grillo smeltery at Hamborn (Rheinland). Through the relations of the management of that plant with certain American zinc-smelting interests Herr Liebig enjoyed unusual facilities of acquainting himself with foreign practice and of obtaining experience in the smelting of a wide variety of ore. Throughout his works career he must always have been a deep student as appears from the evidence of the present book.

Comparisons are always odious. We shall not pronounce it either the superior or inferior of Lodin's great work. They are both comprehensive treatments of their subject, although neither is exhaustive. Herr Liebig's is of course the most up-to-date of anything.

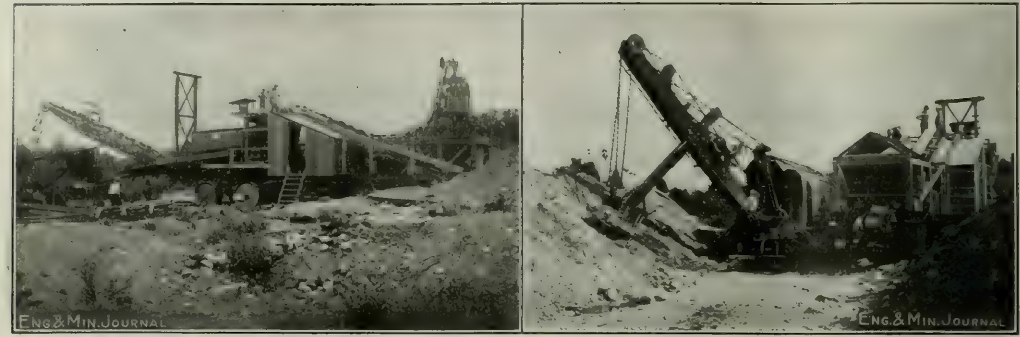
Herr Liebig has gone extensively into the history of the art. He says in his preface that he has done this because a full understanding of the development of a technical art cannot be possessed without a knowledge of the steps that contributed to progress. In this we agree with him. Possibly he has overdone the historical features in his book, but anyway he is ever interesting in them and we marvel at the minuteness of his knowledge.

In his technical pages he gives us descriptions and discussions of all the important methods, machinery and furnaces of European practice, richly illustrated with drawings and freely disclosing figures of costs, results, etc. This is, of course, the most valuable part of the book, and with respect to it we cannot exaggerate our appreciation of it.

Having thus expressed the high measure of our approval, we may be more critical with respect to the last section of the book, which relates to the methods and proposals for the extraction of zinc by methods other than distillation in retorts. Such a section of such a treatise is necessarily a compilation of reports recorded in the literature. The author may, however, be expected to exercise discrimination with regard to them and no doubt usually tried to. Herr Liebig has given us a wealth of valuable information in these pages and clearly has aimed to be discriminating. However, he has not always succeeded. This is, of course, largely the fault of the editors of technical journals and of technical societies, who allow things to be enrolled in literature that ought not to be. We will go further and say that it is also the fault of the profession who allow erroneous or misleading statements to go without correction and live to be embodied finally in permanent literature. Herr Liebig has suffered in this way along with other authors. His treatment of the matter of electric smelting, for example, is wholly inadequate and imperfect in conception.

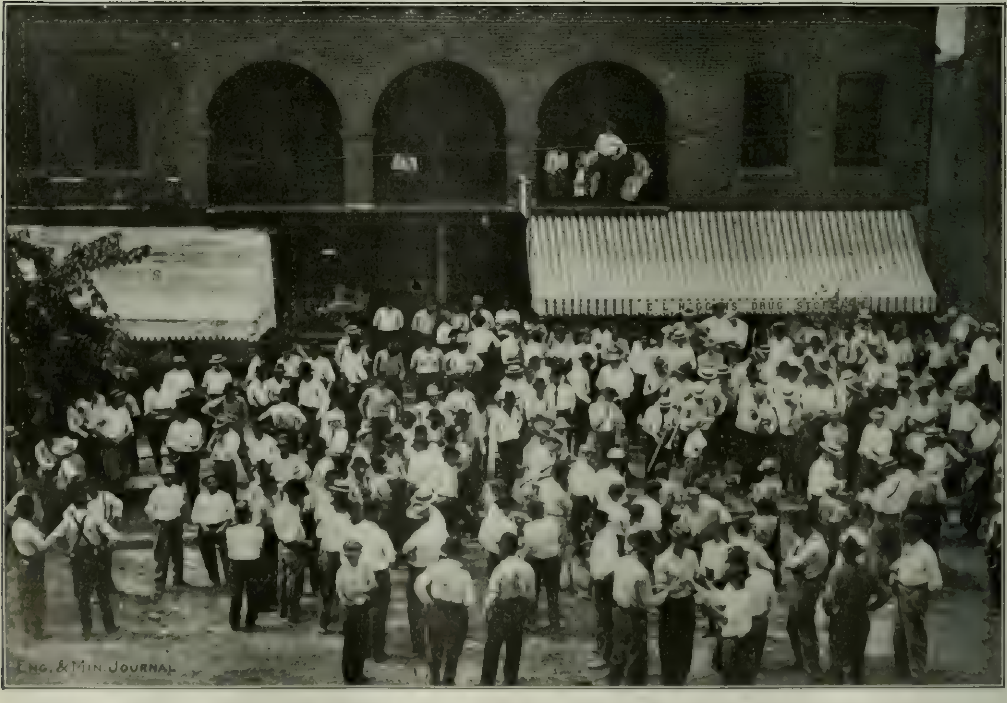
This is, however, a minor criticism and is in no wise detractive of the value of his work as an exposition of the art of zinc smelting as developed in standard practice. We are enthusiastic in pronouncing this book as one of the metallurgical classics.

# PHOTOGRAPHS FROM THE FIELD



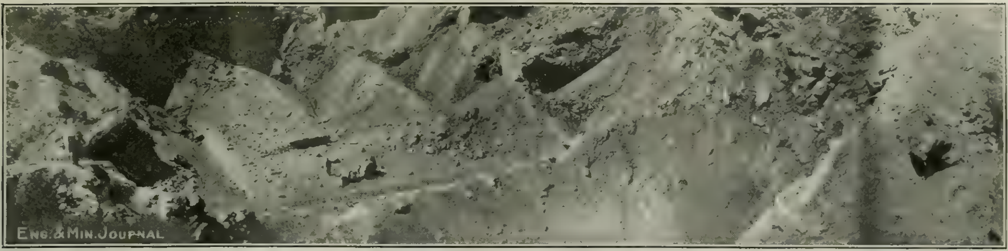
THOMPSON & PORTER ELECTRIC-SHOVEL GRAVEL-MINING PLANT, AT IGO, CALIF.

This unique Shasta County plant has a capacity for 200 cu.yd. daily, the only water used is that required for sluicing Plant includes shovel, elevator, revolving screen, sluice boxes and stacker. It moves on rollers.



STRIKING LEAD MINERS AT FLAT RIVER, MO.

The strike began Aug. 16 and ended Aug. 26, the men gaining their point for increased pay, but losing on recognition of the union.



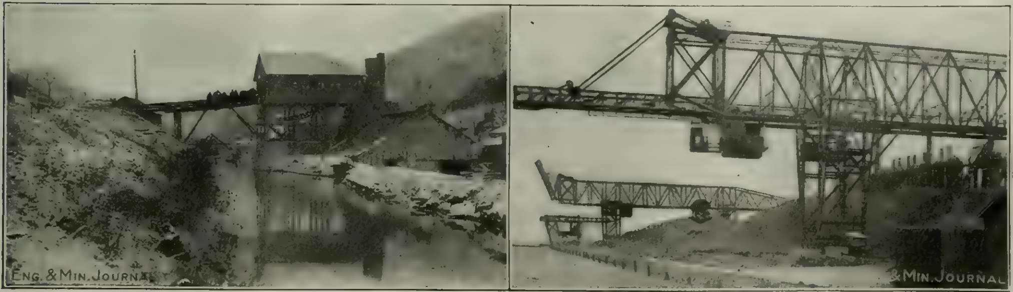
Chicago Iron Mine of Colorado Fuel & Iron Co., Hartville, Wyo.

General View of Sunrise Property, Another Wyoming Iron Mine

A Cloudburst Resulted in a Flood at Rawhide, Nev., Late This Summer

Flooded Main Street of Rawhide

Water at office of Nevada New Mines Co.



Old Iron Furnace Still in Commission Compared with a Modern Blast-Furnace Plant

Cold-blast charcoal furnace with "mulely" skip hoist, water-wheel blower. Daily output 5 tons of pig.

This 500-ton plant includes hot-blast stoves, electric skip hoist, and ore unloading bridges with 5-ton grabs.

## Chilean Iron Ore

In the hearing of the Government vs. the Steel Corporation, on Oct. 8, two vice-presidents of the Bethlehem Steel Corporation told of iron-ore reserves sufficient for 60 years supply that the company recently acquired near the coast of Chile. This, they said, can be mined and shipped to South Bethlehem furnaces cheaper than ore can be obtained from Lake Superior district.

Charles Austin Buck, one of the Bethlehem company's vice-presidents, said that his company uses between 1,250,000 and 1,500,000 tons of iron ore a year. Part of this supply comes from Cuba, where the company gets 400,000 tons a year, part from the Kirunavaara mine in northern Sweden, where it gets 400,000 tons a year, and the rest being obtained in this country from the Lake Superior district and from the Adirondacks.

As to the Bethlehem Corporation's future supply, Mr. Buck said it would come from the Tofo mine in Chile near Coquimbo, about four miles from the coast. This mine was acquired by the Bethlehem company within the last six months. It has 60,000,000 tons in sight with no development work.

> This rich ore is sticking out of the ground on a conical hill unconcealed by earth. We believe there is 150,000,000 tons on the property. We intend to bring it through the Panama Canal to Philadelphia and will operate our own boat line for this purpose.

He said that preparations were being made to ship 1,500,000 tons of ore a year through the canal.

> We estimate that we can deliver this exceptionally high-grade ore very much cheaper into Bethlehem from these foreign ore beds than we can any of the Lake Superior ore.

Henry S. Snyder, another vice-president of the Bethlehem company and president of several of its subsidiaries, was called to substantiate Mr. Buck's testimony. He estimated that there is 3,230,000,000 tons of iron-ore reserves on the north coast of Cuba, that the Bethlehem company owns 770,000,000 tons of it and that the Steel Corporation owns only 200,000,000 tons. He said that the Bethlehem company would be bringing its ore from the new mine in Chile within two years, and thought there was enough there to last the company about 60 years.

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## Smelting in Bond Provisions

The bonded-smelting warehouse provision contained in "N. Subsection 1" of the customs administrative section was retained by the conference committee in nearly the Senate form, the final draft accepted by the conference being as follows:

> N. Subsection 1. That the works of manufacturers engaged in smelting or refining, or both, of ores and crude metals may, upon the giving of satisfactory bonds, be designated as bonded smelting warehouses. Ores or crude metals may be removed from the vessel or other vehicle in which imported, or from a bonded warehouse, into a bonded-smelting warehouse without the payment of duties thereon and there smelted or refined, or both, together with ores or crude metals of home or foreign production: Provided, That the bonds shall be charged with the amount of duties payable upon such ores and crude metals at the time of their importation, and the several charges against such bonds may be canceled upon the exportation or delivery to a bonded-manufacturing warehouse established under paragraph M of this section, of an amount of the same kind of metal equal to the actual amount of dutiable metal producible from the smelting or refining, or both, of such ores or crude metals as determined from time to time by the Secretary of the Treasury: And provided further, That the said metals so producible, or any portion thereof, may be withdrawn for domestic consumption, or transferred to a bonded-customs warehouse, and withdrawn therefrom, and the several charges against the bonds canceled upon the payment of the duties chargeable against an equivalent amount of ores or crude metals from which said metal would be producible in their condition as imported: And provided further, That on the arrival of the ores and crude metals at such establishments they shall be sampled and assayed according to commercial methods under the supervision of Government officers, to be appointed by the Secretary of the Treasury and at the expense of the manufacturer: Provided further, That antimonial lead produced in said establishments may be withdrawn for consumption upon the payment of the duties chargeable against it as type metal under existing law and the charges against the bonds canceled in a similar sum: Provided further, That all labor performed and services rendered pursuant to this section shall be under the supervision of an officer of the customs, to be appointed by the Secretary of the Treasury, and at the expense of the manufacturer: Provided further, That all regulations for the carrying out of this section shall be prescribed by the Secretary of the Treasury.

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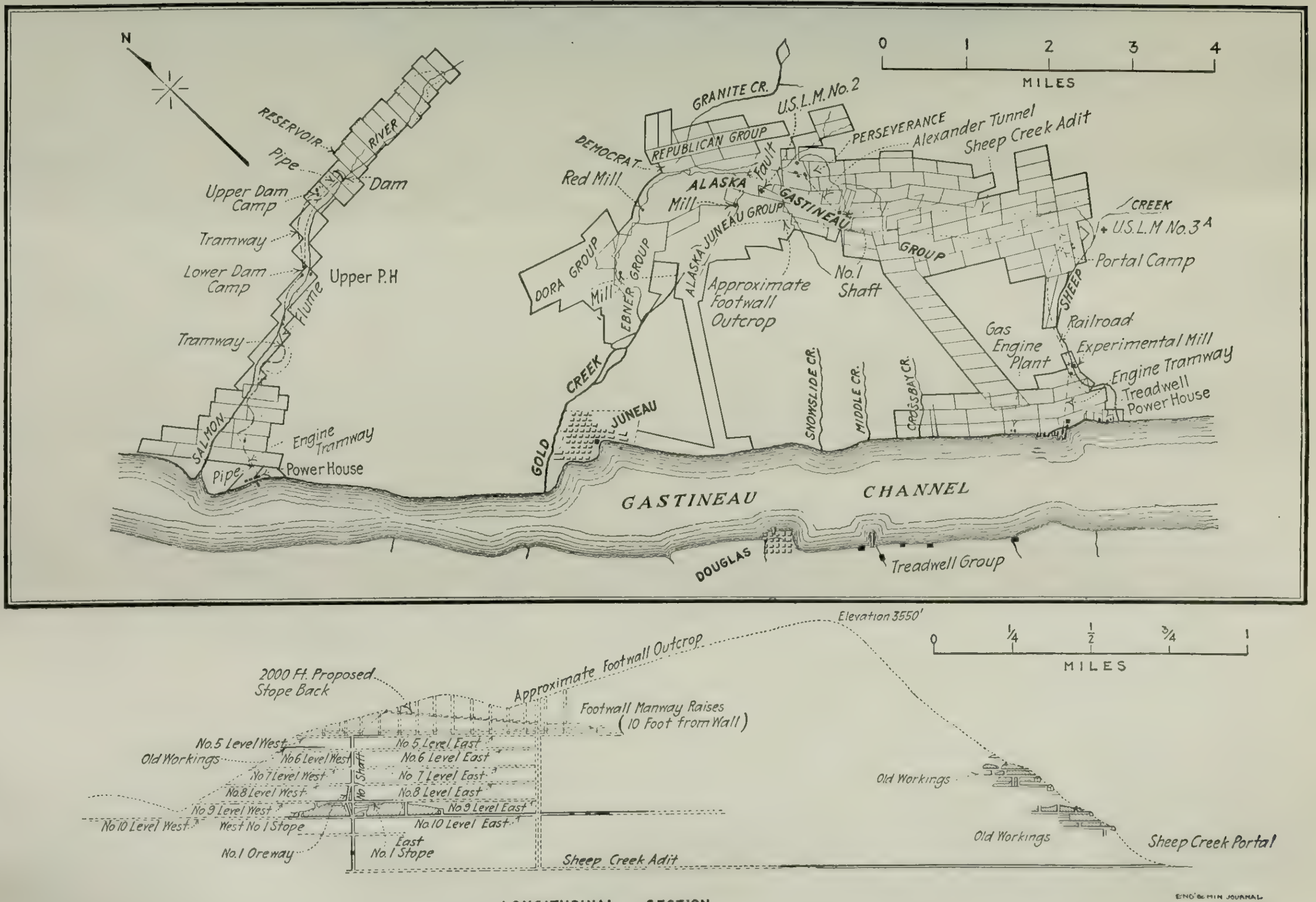
## Work at the Alaska Gastineau

Hayden, Stone & Co. have issued a circular dated October, 1913, which gives the latest developments and sums up the situation at the Alaska Gastineau property of the Alaska Gold Mines Co., near Juneau, Alaska. It will be remembered that the original estimate of the engineers gave 50,000,000 tons capable of yielding $1.50 per ton. Development operations have led the sponsors to state that the reserves will probably run into the hundreds of millions of tons, although no measurements and assays are presented. These developments consist of drifting and crosscutting on the Alexander level of the Perseverance lode, development of another vein parallel to the Perseverance on the north and the encountering of the Perseverance lode on the Sheep Creek adit level. The Perseverance developments to the east extend the Alexander level to over 3000 ft., and the last four crosscuts to the ore from this level encountered ore averaging over $3 per ton, decidedly higher than what has been regarded as the average of the deposit. It is not stated whether all of the new ore encountered was of this grade. To the west of the shaft on this level, also the latest crosscut at a distance of 600 ft. from the shaft, is said to penetrate ore for over 150 ft., of good average value not quantitatively expressed. This width is greater than usual.

The new deposit on this level has been opened up for something over 300 ft., and is showing up consistently, with a content approximately that of the Perseverance—whether higher or lower is not stated. Developments in the Sheep Creek adit are considered the most important. This, it will be remembered, is the new working entrance, driven from the opposite side of the ridge from the old Alexander adit of the Perseverance mine and 700 ft. lower. It has been reported that the adit has encountered material of the same character and value as the Perseverance ore, and it is a fair conclusion that it is the same deposit. Probably it has not yet been possible to crosscut so as to determine the width of the lode at this level, and no sampling results are included in the report. The point of intersection is 1000 ft. east of the most easterly working on the Alexander level, probably indicating at the new horizon an important extension of the deposit on the strike in this direction. A total length on the strike of over a mile is indicated by existing exploration. The statement is made that at an adjoining property the same deposit



LONGITUDINAL SECTION

MAP AND SECTION OF THE ALASKA GASTINEAU WORKINGS has been encountered 1000 ft. below the Alexander level showing an excellent value at that depth.

Progress on the Sheep Creek adit has been at the rate of over 500 ft. per month, said to be probably a record in the driving of large tunnels. In fact, it is nothing of the sort, and large tunnels can be more rapidly driven, speaking generally, than small ones. A sustained rate of progress of 500 ft. per month, however, indicates good work, well above the average. It is expected that the adit will be under Perseverance workings this month, and that a raise will be holed through before December. By the end of January, the adit should be advanced to the shaft being sunk from the Alexander level, which will have arrived at the level of the new adit by that time. The continuation of this shaft has already been raised through to the surface.

At the new mill site, tributary to the Sheep Creek adit, the timber has been cleared for an area of 1500 ft. square, the coarse- and fine-crushing plants have been located and in a general way the main concentrating and amalgamating building, so that grading on all of them is progressing. Contracts for the steel will be placed in October, and there is no doubt but that the mill can be completed as soon as the mine is ready to furnish the ore.

The big 165-ft. concrete dam at Salmon Creek is being built and will be finished before the end of the year, ahead of schedule time. The section of the power plant in commission at present can furnish 2000 hp., and the complete installation will have a minimum capacity of 6000 and a maximum of 8000 horsepower.

It is stated that within the last few weeks the company has decided possibly to make a radical departure in the treatment of low-grade gold-bearing ores. By a process whose efficiency has been thoroughly proved, it will be possible to slough off the greater part of the gangue at the first operation. The exact nature of this new method is not disclosed.

Some anxiety seems to be caused the company by slurs cast on the weather of Juneau. Thus it is stated that contrary to a rather widespread impression climatic conditions are such as easily to permit of work at the property the year around. There have been other statements published to the effect that the climate is much like that of Boston. This is hard on Boston. As a matter of fact, work near the sea can be carried on all the year around, but not easily. There are few places wetter than Juneau. Surface work a few thousand feet back from the water is seriously interfered with. At the Perseverance surface plant, low temperatures, heavy snows and the constant menace of snowslides, make winter construction difficult or impossible. It is true, however, that with the property in operation, climatic conditions will not appreciably interfere with work.

The circular concludes with the statement that when it comes time to increase the original 6000-ton milling unit to the ultimate contemplated capacity of 20,000 tons, new funds will be necessary. This, it is said, may involve the sale of additional securities, but not in anything like the same proportion, so that the probabilities of earnings-per share greatly in excess of those previously indicated are said to be thought excellent.

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**Diamond Mine Taxation in German South-West Africa** is now computed on the following basis. If T be the tax; V the value of the output, and C the working costs, then

$$T = 0.66V - 0.70C,$$

according to a British consular report.

## Stripping Iron Ore with a Dredge

The steam shovel has generally been used on the Lake Superior iron ranges for stripping the overburden from shallow deposits, ever since John T. Jones, the inventor of the step-process furnace, first demonstrated in the Mesabi district the feasibility of stripping by machinery. That was a quarter of a century ago, and since then the steam shovel has been used almost to the exclusion of other devices for this work.

A few years ago the grab system of stripping was tried at the Grant mine, only to be succeeded by the steam shovels. The Interstate Iron Co., a subsidiary of the Jones & Laughlin company, is now about to try an entirely new plan. An attempt will be made to use suction dredges to move the surface material overlying ore deposits on the Mesabi range. The plan will be tried in the Grand Rapids district, near the Mississippi River, where the company several months ago obtained control of large mineralized areas.

The Pittsburgh Steel Ore Co. is already trying the hydraulic method of stripping on the Cuyuna range. For that reason there is keen interest in the result of the Interstate company's new experiment. The Jones & Laughlin engineers believe the scheme feasible, with conditions such as exist. They hesitate to say in advance that the innovation will prove practicable, but they have carefully worked-out figures indicating that in the particular field concerned, stripping can be cheaper by dredge than by steam shovel and exploratory work can be conducted more satisfactorily. The hydraulic method, while a success in the Cuyuna district, manifestly has its limitations. Dredging, it is contended, can be employed in ground wherever it is practicable to utilize the steam shovel and where ample water is available.

The dredging system will be tried at Lot 7, Section 13, 55-26. A large barge will be launched on the Mississippi River, whence it will be floated into a canal to be excavated by the dredging machinery carried upon the craft. The barge is of Washington fir, 77 ft. long, 36 ft. wide and 6 ft. high. Two 350-hp. boilers will be installed. Should the experiment work out as is hoped, the equipment will be supplanted with boilers and dredges of greater capacity and operations will be expanded. Meanwhile, two exploration shafts are being sunk at the Fargo and Buckeye properties and mine buildings, including engine and boiler houses and shops, are being built.

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## Calcite Solution in Philippine Veins

Many gold-quartz veins of the Philippines contain considerable amounts of calcite. The surface waters, furthermore, carry remarkably high amounts of carbonic acid, according to F. T. Eddingfield, in the *Philippine Journal of Science*, April, 1913, the amount present in the water varying from 0.22 to 0.45% by volume. Since the dissolving power of water on calcite is increased from 18 mg. per liter to 700 or 900 mg. by saturation with carbonic acid, the vein calcite is readily dissolved and removed by these surface waters. The result is a honeycomb quartz stained with iron and manganese, and free of calcite. The removal of calcite in this manner results in enriching the vein at the surface, since the ratio by weight of gold to gangue material is thus increased.

## Utah Copper

General Manager Gemmel, of the Utah Copper, says that they have recently had another record day when 30,000 tons of ore were shipped from the mine to the mills, says the *Boston News Bureau*. The company has 425 ore cars in service, with a capacity of 56 tons each. A single train hauls 2600 tons. In addition to this the Rio Grande R.R. hauls 7500 tons daily. Four Mallet compound engines are in service on the Bingham & Garfield line and 25 new steel ore cars have been ordered.

To produce this tonnage the company has 22 steam shovels operating in various parts of the property. Fifteen shovels are used on the original Utah Copper estate, two of which are regularly in one and 10 that alternate between the porphyry and stripping. Four of the company shovels are used in stripping on Boston Consolidated territory, and three additional shovels are used in stripping under a contract with the Utah Construction Co. During September, 55,000 tons of stripping and ore were broken down daily. About 1½ times as much waste is removed as ore. The ore production during September was slightly in excess of 21,000 tons daily, about the normal capacity of all the sections of both mills. A larger tonnage could be milled by crowding the plants, but the percentage of recovery would be lower.

Utah Copper as at present developed will require the moving of twice as much ore and material as that handled in the excavation of the Panama Canl. There are now approximately 80 miles of underground workings.

## Electric Zinc Smelting

The Société pour l'Electrometallurgie du Zinc is being formed at Lyon, France (address, 6 Rue Grolée), with a capital of 1,000,000 francs. This company intends to exploit the process of Cote & Pierron.

According to the *Journal du Four Electrique* the production of spelter by electric furnaces in Sweden in 1912 was 3228 metric tons.

The Canadian Department of Mines is erecting a furnace of about one ton daily capacity in the old works of the Canada Zinc Co., at Nelson, B. C.

It is reported that the Sulphide Corporation is going to erect an electric furnace in its smelting works at Cockle Creek, N. S. W. This furnace will be of 500 hp., and in design will follow lines determined in Sweden. The source of the energy will be a Mond gas plant, arranged for ammonia recovery, in connection with which sulphuric acid made from the roasting furnace gases will be used.

## The Lake Superior Strike

The Lake Superior copper-mining companies will inaugurate the eight-hour day before Jan. 1 next, and will appoint a day or half-day each week as "grievance day," when the general manager or a representative will hear any complaint of employees, and subsequently investigate and adjust every legitimate grievance. The mines will not recognize the Western Federation of Miners nor employ its members. No minimum wage scale for all mines will be adopted. The one-man drill has come to stay.

These statements, says the *Boston News Bureau*, were made by a committee of the mine managers to the committee of the Copper Country Commercial Club, which has just completed an investigation of the strike called by the Western Federation of Miners. They are contained in the committee's report to Governor Ferris, officials of the Western Federation and other interested parties. Copies of the report will be distributed among the strikers and present employees. From data collected for its report the committee will draft a proposal for the settlement of the strike and probably will endeavor to get a vote of the actual employees of mines, ignoring the Western Federation and its officials.

The report shows that 14,300 men were employed at the various mines on surface and underground previous to the strike. The number at work on Oct. 8 was 5445, of whom 2079 were underground.

The report reviews the financial history of the 70 mines that have operated in the Lake Superior district from 1848 to 1910, showing that with the Calumet & Hecla eliminated, the copper industry here has just about paid back to shareholders the money expended. The report shows the average wage of miners to be $3.20, and of trammers, $2.63. The Western Federation demand is a $3 minimum.

## A Substitute for Gasoline

According to newspaper reports, there will be something of a revolution in the refining of oil if the new method of making gasoline proves to be the success claimed for it by the Standard. Under a new process which the Standard Oil Co. of Indiana is installing, at Whiting, it is believed that it will be possible to convert 75% of the crude petroleum into gasoline. The process opens the way for breaking up the hydrocarbons of petroleum into the combinations needed and condensing them under compression. It is understood motor spirits will appear in the markets soon at about 4c. less per gallon than the present price of gasoline.

## Kimberlite Company's Charter Revoked

It is reported that the Kimberlite Diamond Mining & Washing Co. has been barred from further operations in Arkansas. The company is one recently organized to operate near Murfreesboro in Pike County. Suit for ejectment and damages was brought by M. M. Mauney, a neighboring operator. The Kimberlite company, a foreign corporation, had the case transferred to a Federal court. It appears that this is expressly forbidden by an act of the 1907 Arkansas legislature. The violation of the act by the Kimberlite company resulted in its charter being revoked by the secretary of state.

## Itinerary of Mine Rescue Cars

### Billings Car No. 5

| Arrive | Leave | Address |
|---|---|---|
| Oct. 17 | Oct. 24 | Burke, Idaho |
| Oct. 24 | Oct. 31 | Mace, Idaho |
| Nov. 1 | Nov. 8 | Mullan, Idaho (Morning Mine) |
| Nov. 9 | Nov. 18 | Mullan (Hunter Mine) |
| Nov. 20 | Nov. 28 | Phillipsburg, Mont. |
| Nov. 30 | Dec. 16 | Butte, Mont. |
| Dec. 17 | Dec. 23 | Elkhorn, Mont. |

# CORRESPONDENCE AND DISCUSSION

## Milling in Southeastern Missouri

In regard to Mr. Thacher's criticism of the historical part of my article, I wish to thank him for calling attention to a mistake which I appear to have made. He, if he is the man whom I take him to be, is probably best able of anyone to decide questions in regard to the early history of the Missouri lead district. The facts are undoubtedly as he states them. My informant, no doubt, did not know of these earlier attempts, although he is well informed in regard to the district.

I thought at first I would let the matter of the automatic samplers go. But now I think that Mr. Thacher will see that my statement concerning automatic weighers of the belt type in dusty places has been confirmed by the total silence of the manufacturers of such devices in spite of the suggestion that no matter how dusty the place is, belt-weighers can be made to work efficiently by playing an air-hose on them from time to time. Mr. Thacher, no doubt, realizes that manufacturers are always only too ready to resent criticism of their wares, especially when it affords them an opportunity for free advertising.

My statement was made simply as a fact long known to me through discussion with millmen who have used such devices. Personally, I think that weighing devices should be used wherever they are practicable. Indeed, I think that automatic weighers should be used much more than they are at present; still their use cannot be promoted by trying to get them installed in places where they are not able to work satisfactorily. As many millmen did not and do not realize the shortcomings of these devices, I made the statement in question in the Missouri article, since it was only fair to the designers of this excellent mill to show just why they had not installed an automatic weigher at so well designed a plant.

From June 21 to Aug. 30, this statement concerning automatic weighers has gone uncontradicted by any manufacturer of such apparatus, and no one of the many users has taken exception to it except the gentleman from Bertha.

Finally, such a well informed engineer as Mr. Messiter, who, as I remember it, is somewhat of an authority on such matters, confirms this statement as to its accuracy in regard to all devices in common use heretofore, but notes a device that he thinks will overcome this difficulty.

As to automatic weighers of the dumping-pan type, I will remark that I know of a millman who, with automatic sampling of heads and tails and careful sampling and weighing of concentrates by outsiders, gets indisputable extractions of over 100% for periods of as long as a year, when he uses one of the dumping-pan weighing machines. The scales are as much to blame as his sampling. This fool's paradise of a milling plant, which never gets below 95% extraction, and which has got, according to annual reports of the company, as high as 110% extraction, as I remember the figures, averages about 99%. The judgment of an experienced millman as to his work, especially when he makes no extraordinary claims in regard to extractions, is often far more accurate and much more worthy of credence than the so called facts that are obtained from crude sampling and weighing of the ore into which these automatic weighings and not especially refined sampling procedures often degenerate.

CLAUDE T. RICE.

Chicago, Ill., Sept. 10, 1913.

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## Questions and Answers

### LOCOMOTIVE HAULAGE IN METAL MINES

To what extent is locomotive haulage employed in metal mines? Is it of such general use as in coal mines?

B. L. W.

There is nothing of a statistical nature on this subject that we know of. We cannot do anything more than give some general ideas.

Locomotive haulage is general in all large metal mines. As compared with coal mines, we think the relative tonnages of production may reasonably be accepted as an index. In 1912 the coal mines of the United States produced about 512,000,000 tons of coal; the metal mines produced about 131,000,000 tons of ore. We imagine that the mines of nonmetallic substances other than coal, such as the phosphate mines, salt mines, etc., may have produced 10,000,000 tons of material in the aggregate.

It is necessary, however, to make a further allowance in the case of the metal mines, which usually have to handle a great deal more waste rock than in the case of the coal mines. Some of the large copper mines and iron mines have to handle as much as one ton of waste rock per ton of ore. We will venture to guess that our metal mines have to handle about 200,000,000 tons of ore and rock annually in the aggregate.

The ore of the metal mines goes to a large extent to smelting works, all of which are equipped with elaborate railway and tramway systems. They deal in the main with concentrated products, the aggregate weight of which is less than the weight of the crude ore produced by the mines, but in metallurgical works the products have to be handled several times. The product of the smelting works is again rehandled in the refineries. There are in the United States 110 copper-, lead- and zinc-smelting and refining works and 314 iron-smelting works.

We can give a fragmentary idea of things in a little different way. The copper mines of Butte, Mont., produce about 5,000,000 tons of ore per annum. The number of electric locomotives now in use in Butte mines is 67.

These data pertain only to the mines of the United States and do not in any way include the mines of Canada, Mexico and other foreign countries, the ores and products of which, to a very large extent, come to this country for smelting and refining.

# EDITORIALS

## The Stock of Copper

At the end of September the combined European-American stock of copper was only 83,418,694 lb. All of this was not immediately available, inasmuch as the European figures include Chile bars and other material requiring refining before use. The stock at American refineries was only 29,793,094 lb., or less than a week's output. Up to a year ago no one supposed that business could go on smoothly with a stock of much less than 40,000,000 lb. There is a great variety among the forms of wirebars, cakes and ingots wanted by the manufacturers of wire, sheet, brass, etc., and the refiner reckons that he ought normally to have about 10 days to comply with specifications.

The fact that business has proceeded without any friction in the face of the dwindling stock is evidence of the overwhelming extent to which the copper business is done on contracts and the insignificance of over-the-counter transactions. The manufacturers in their last purchases covered their requirements for October, partially for November and to some extent for December; and copper is constantly going from the refineries to fill those contracts. The stock on hand at any moment is of interest only to those belated or underestimating buyers who need immediate shipment. The absence of any flurry among them indicates their ease in the matter of supplies.

A wire drawer said to us not long ago, "If the stocks keep on diminishing the refiners' statistics may some day show a minus quantity." That would, of course, be impossible. However, in the light of recent experience it seems likely that stocks might be reduced nearly to zero without creating any serious disturbance.

The disturbance would arise if the manufacturers should come into the market to complete their November-December requirements and be told by the selling agencies that their order books for those months were filled, or nearly filled. Then there would be a scramble. It is the delay of the buyers in thus coming into the market and the fact that the sellers' order books are not yet satisfactorily filled that has caused the late nervousness, which has been heightened by the suspicion that the ultimate consumer may not be using so much copper as he was. Of course, the manufacturer—be he wire drawer, brass maker, or something else—is in just about the same position as the refiner. He is waiting for his customers' orders and does not want to buy copper until he gets them.

However, there is one thing that the reduction in the copper stock certainly does, viz., it relieves the producers and selling agencies of lugging any load to speak of and removes all necessity on the part of anybody to press copper for sale in order to lighten his load. There is a big difference between the cost of financing 30,000,000 lb. of copper and 230,000,000, especially when money is as dear as it is now.

Recent events have also taught us another thing, viz., that a good many manufacturers who have thought that they had to have Lake copper can in fact do with electrolytic. Their supply of Lake copper having been cut off, they have had to use electrolytic or nothing at all. Of course, this is no surprise to metallurgists, who have long been aware that save for a few special purposes the electrolytic copper is the better copper, anyway. Present experiences in this matter may result in some market changes when the supply of Lake copper is restored to the normal. For the moment there is an unpremeditated, entirely innocent, corner in Lake copper, which enables the single holder to obtain its own price, as to which it has been eminently reasonable, it is only fair to say.

## U. S. Ore Production

The U. S. Geological Survey has published a table, which we conceive to be the best possible index of the magnitude of our mining industry—far superior to summations of value in which the coal that goes into the manufacture of coke and the coke that goes into the manufacture of pig iron are counted thrice, and in which some substances are entered as of their value at the mouth of the mine and other substances as of their value at New York, including smelting cost, freight, refining charges, etc., and in which all such heterogeneous, duplicating and even quadrupling figures are indiscriminately added together to produce a grand total, which, after all, is without any particular meaning. The improved table to which we now refer is entitled the "Production of crude metallic ores from domestic mines in 1911 and 1912, in short tons." After all, the ton of ore hoisted from the mine is the real index of mining activity. The more metal we may produce the better off we may be commercially and economically, especially if it reflect the mining of a high grade of ore, but the more tons of ore we produce the more men do we employ, the more plant, and in general the more activity do we display. The table is as follows:

| Substance | 1911 | 1912 |
|---|---|---|
| Iron ores | 46,023,540 | 63,859,728 |
| Manganese ores | 2,752 | 1,864 |
| Manganiferous iron ores | 3,006 | 3,247 |
| Chromium ores | 134 | 225 |
| Tungsten ores | 16,500 | 34,000 |
| Titanium ores | .......... | 6,900 |
| Aluminum ores | 174,292 | 179,040 |
| Gold ores | 9,884,684 | 9,736,203 |
| Silver ores | 739,200 | 848,574 |
| Quicksilver ores | 138,525 | 155,693 |
| Tin ores | 42,200 | 3,000 |
| Vanadium and uranium ores | 8,468 | 18,000 |
| Copper ores: | | |
| Western States | 18,207,566 | 23,431,301 |
| Central States | 10,978,827 | 11,411,941 |
| Eastern States | 801,842 | 830,089 |
| Total | 29,988,235 | 35,673,331 |
| Copper-lead ores | 6,923 | 14,614 |
| Lead ores: | | |
| Western States | 2,157,817 | 2,388,598 |
| Central States | 3,794,712 | 4,064,366 |
| Total | 5,952,529 | 6,452,964 |
| Zinc and zinc-lead ores: | | |
| Western States | 1,356,781 | 1,344,222 |
| Central States | 10,629,269 | 11,899,185 |
| Eastern States | 413,332 | 497,832 |
| Total | 12,399,382 | 13,741,239 |
| Grand total | 105,380,370 | 130,728,622 |

The classification of this table is not in all cases perfectly clear. "The figures for gold ore include siliceous, pyritic and other ores in which the predominant value is gold. The production of silver ore is mainly that of silver-gold ores in which the value of silver exceeds that of gold." We understand this to include all of the gold and silver ore that is treated by the amalgamation and cyanide mills, and all of such ore going to the smelters as is noncupriferous, nonplumbiferous and nonzinkiferous. Ores containing copper, lead and zinc going to the smelters who win such metals are apparently classed according to their predominant base metal in spite of the fact that they carry gold and silver and indeed yield a very large part, probably the larger part, of our precious-metal output. Assuming our interpretation to be correct, let us say that we consider such a classification to be wholly rational and to convey a proper idea of the respective branches of the mining industry.

Now, regarding the figures, the most striking feature we think is the relative unimportance (in point of tonnage) of the gold and silver mining industry and the superlative importance of iron mining, the latter contributing nearly 50% of the total tonnage, the larger part coming from Michigan, Wisconsin and Minnesota. Next in order is copper mining, then zinc mining and finally lead mining, dismissing all ores whereof the output is less than a million tons annually.

What does the grand total of 130,000,000 tons mean? Unfortunately, we have no reliable data indicating the approximate cost of mining. The census figures ought to give us a clue and perhaps they would if they could be unraveled, but how to do it we don't know. If we guess the whole output to average a cost of $2 per ton, or a total of $260,000,000, we don't think we shall be far out of the way. Nor if we venture the guess that about 60%, or $156,000,000 goes for labor, and about 10%, or $26,000,000, for power; the remaining $78,000,000 is spent for timber, explosives, illuminants, lubricants, track, tools, machinery and perhaps a thousand varieties of supplies.

All of the figures and references in this article are exclusive of the gold placer mining and dredging enterprises. These are of a good deal of importance in several districts, but in comparison with the metal-mining industry as a whole they do not bulk very large.

The figures that we have been considering in this article relate only to the metal-mining industry, pure and simple. They take no account of the coal-mining business, which in point of tonnage is upward of three times greater, nor of what are commonly called the other nonmetallic minerals. The latter include phosphate rock, pyrites, talc, salt, cement rock, fluorspar, gypsum, borax, barytes, graphite and a multitude of less important minerals, which in the aggregate amount to some millions of tons.

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## An Excellent Chute Gate

Among the details of practical mining described this week in the JOURNAL, readers will find the bulldozing chamber and the chute gate installed by Mr. Jackson to be devices of unusual merit. The idea of disposing of large boulders by blasting them in a special chamber and thus preventing the chute from choking, is so simple and easy that one wonders at its never having been practiced or described before.

The chute gate, however, is a device of perhaps more general application. It is about the best of which we know, taking everything into consideration. The most highly developed gates in general use are either of the air or hydraulically operated type, or are similar to the finger chutes originating at the Treadwell. This counterbalanced, underswung gate would seem to be superior to either. It is remarkable that the underswung principle is so rarely applied. In most gates it is attempted to chop off the ore stream by swinging down from above and there is always the risk of sticking on a big rock. With a gate cutting off the stream from below, no possibility of such sticking exists, and the danger of a runaway chute and a buried car is done away with. Compared with the mechanically operated types, this gate is possibly a little slower and it requires a certain amount of strength for operation. It is so much cheaper, however, more rugged, and simpler, that in most cases it is to be preferred. The fact that the operator stands on a platform, out of danger from flying rocks or a rush of material, is not the least point in its favor.

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## The Future of the Motor Truck

To a stranger reading the technical press and the Sunday editions of the daily press, it would seem that the horse in this country must be about to vanish as a source of haulage power. The increase in the use of motor trucks has been really astonishing, and it must be admitted that their advantages, especially in congested city streets, are manifold. A skeptical and shrewd observer, however, might wonder whether the elimination of the horse is to be complete in quite so short a time, and even whether the inroads of the motor truck are altogether the results of its merits and are not based largely on a powerful and a clever press campaign. Manufacturers, dealers, designers, garage owners, oil companies, electric companies, are all enthusiastic boosters for the mechanically propelled vehicle, while the horse is dumb and its advocates that are bound by financial retainers are few and generally inarticulate. One with his ear to the ground might even occasionally catch the echoing knocks of hard-headed operators who, after a trial of motor trucks, have reverted to the primitive horse, justifying their reactionary attitude with the ignoble plea that the horse is cheaper.

It was inevitable that the motor truck should claim attention for mine-haulage purposes, and many have been bought and installed for that purpose. Since this is a new and interesting development of the ever-present and ever-expensive problem of transporting ore and material, the JOURNAL has attempted to collect all the data on this subject that was obtainable. Several of the more interesting communications resulting from this inquiry have already appeared, and in this issue we present the rest of the data received, together with a summary and conclusion.

Our opinion is this: That for miscellaneous work, as a heavyweight errand boy, so to speak, around a large or medium-sized mine, the motor truck is unexcelled; but as a regular means of transporting ore or fuel in a systematic manner, it is still on trial. Trucks must be better all through, and must be more specificially designed for the work they have to do. The truck manufacturers must go through the experience of the drill and pump manufacturers and produce a machine built to stand hard usage to a degree now quite beyond their comprehension.

We venture a prophecy: The truck manufacturers are now, as it were, accelerating their load. They are increasing the field of usefulness of their product, and are producing trucks at least as fast, and probably faster than they will be consumed when their legitimate field is full and new trucks are required only to replace those worn out. When this state of saturation is nearly reached and supply begins to exceed demand, more vigorous efforts will be made to find new territory, and more attention will be paid to special design. The mining field will then be emphatically in demand. The manufacturer who is first to realize this and to build a really successful truck for ore haulage should be able to capture the business.

## CIVIL SERVICE EXAMINATIONS

The Civil Service Commission announces an examination for aid, on Nov. 5 and 6, 1913, to fill vacancies in the Bureau of Standards, at salaries of $600 and $720 per year. Competitors will be examined in: (1) Elementary algebra, geometry and trigonometry, 30; (2) general physics, 30; (3) elementary mechanical drawing, 20; (4) education, training and experience, 20. Graduation from a mechanical-training, technical or scientific school or equivalent training in a scientific or technical laboratory is requisite. Applicants must have reached their nineteenth but not their twenty-fourth birthday. Persons who desire this examination should apply to the U. S. Civil Service Commission, Washington, D. C., for application Form 131-2, Aid (male), No. 1081.

⁂

The Civil Service Commission announces an examination for electrometallurgist, on Nov. 10, to fill a vacancy in the Bureau of Mines, at from $1800 to $3000 per year, to conduct investigations and inquiries into metallurgical problems, the investigation of ores with reference to their constitution and treatment, both mechanical and chemical, including smelting, and especially the investigation of ores with reference to the feasibility of their treatment by electrometallurgical processes. Competitors will be rated on: (1) General education and scientific training, 40; (2) practical experience and fitness, 40; (3) publication or thesis, 20. A training equivalent to graduation from a college or university of recognized standing, including courses in geology, chemistry, physics and metallurgy, and not less than three years' experience in electric-furnace work, are requisite. If a thesis is submitted under (3), it must present the results of original investigation in electric furnace work. Applicants possessing a thorough knowledge of metal mining and metallurgical work, including smelting operations, will receive additional credit under (2). Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons desiring this examination should apply for Form 304, Electrometallurgist (male), No. 1082.

⁂

The Civil Service Commission announces an examination on Nov. 10, for metallurgist, for work with smelting fumes, to fill a vacancy in the Bureau of Mines, at from $2700 to $3600 per year. The duties of the position will be the investigation of smelting fumes and possible methods of preventing or controlling the same. Competitors will be rated on: (1) General education and technical training, 40; (2) professional experience and fitness, 40; (3) publication or reports, 20. A training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics, metallurgy and mineralogy, and not less than three years' experience in the chemical and metallurgical phases of smelter operations in both copper and lead, and in the examination of smelter fumes, are requisite. Under (3) the applicant must have demonstrated ability as a writer of reports. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who desire this examination should apply for Form 304, Metallurgist (male), No. 1084.

⁂

The Civil Service Commission announces an examination on Nov. 10, for metallurgist, to fill a vacancy in this position in the Bureau of Mines, at Salt Lake City, Utah, at from $3000 to $4000 per year. The duties of the position will include especially investigations of low-grade ores and methods of testing the same, but will also include other mining and metallurgical problems. Competitors will be rated on: (1) General education and technical training, 35; (2) professional experience and fitness, 35; (3) publications or reports, 30. An educational training equivalent to that required for graduation from a college or university of recognized standing, such training to have included courses in chemistry, metallurgy and geology, and not less than five years' experience in metal mining or metallurgical operations, are requisite. Under (3) the applicant must have demonstrated ability as a writer. Applicants must have reached their thirtieth but not their forty-fifth birthday. Persons who desire this examination should apply for Form 304, Metallurgist (male), for work in low-grade ores, No. 1085.

⁂

The U. S. Civil Service Commission announces an examination on Nov. 10, for chief metallurgist, to fill a vacancy in the Bureau of Mines, at $4000 to $4800 per year, to supervise investigations and inquiries into metal and metallurgical problems; investigation of ores with reference to their constitution and treatment, including smelting; the saving and waste of material and the increase of safety and efficiency in the production of the more important metals. Competitors will be rated on: (1) General education and technical training, 30; (2) professional experience and fitness, 40; (3) publication or reports, 30. A training equivalent to that required for graduation from a school or college of mines, and at least five years' experience in mining, engineering and metallurgical practice, are requisite. Applicants who have had experience in teaching will receive additional credit under (2). Under (3) the applicant must have demonstrated a capacity for preparing reports. Applicants must have reached their thirty-fifth but not their fiftieth birthday. Persons who desire this examination should apply for Form 304, Chief Metallurgist (male), No. 1083.

# PERSONALS

Walter Belts, of Miami, is examining properties north of Phœnix, Arizona.

C. W. Purington has arrived in London from the Lena Gold district in Siberia.

John Hoy and J. A. Clifford, of Butte, Mont., are in Patagonia, Ariz., making an inspection of the Trench mine.

W. S. Ayres, of Hazleton, Penn., has just returned from an extended professional trip through British Columbia.

Julius Marcus, technical chemist, formerly with the Ray Consolidated Co. in Arizona, has gone to the Braden Copper mines in Chile.

A. Adiassewich, a Russian mining engineer, is visiting in the United States to observe American mining and metallurgical practice.

John T. Fuller, mining engineer, of Little Rock, Ark., has been appointed consulting engineer to the Arkansas State Department of Mines.

J. H. Plummer, president of the Dominion Steel Corporation, has sailed from Canada for England on business in connection with the financing of the company.

L. E. Stoddard and Henry Darlington, of New Haven, Conn., accompanied by B. D. Lawrence, of New York, are examining properties in Pinal County, Arizona.

Charles A. Banks, manager of the Jewel-Denoro Mines, Ltd., Greenwood, B. C., is in the East to examine and report on some properties in Quebec for a British company.

E. P. Ross, who has been manager of Cranberry Furnace at Johnson City, Tenn., for the past five years, has accepted a position with the Carnegie Steel Co., at the Edgar Thomson works.

T. E. Carter and J. C. Carter have associated themselves with Dr. T. Poole Maynard, with offices in the James Building, Chattanooga, Tenn., and will practice as civil, mining and geological engineers.

Charles E. Hulick, who has been superintendent of the Saucon furnaces of the Thomas Iron Co., at Hellertown, Penn., since 1903, has been promoted to superintendent of the company's Hokendauqua furnaces.

C. E. Sweet and E. L. Snider, of Kansas City, have been in Patagonia, Ariz., in connection with the settlement of the bondholders' claims on the old Mansfield property. Mr. Snider is trustee for the bondholders.

F. Close, lately manager of the Kinandam Sumatra Mining Co., has started a consulting practice in conjunction with G. T. Holloway & Co., Ltd. His address is now 13 Emmett St., Limehouse, London, E., England.

Dr. Jean Perrin, professor of physical chemistry in the University of Paris, visiting French professor, 1913-1914, delivered his first lecture at Columbia University, Oct. 13, on "Le Mouvement Brownien et la Realité Molèculaire."

Ex-Senator Simon Guggenheim has been chosen chairman of the boards of the American Smelting & Refining Co., the American Smelters Securities Co. and the Guggenheim Exploration Co. The office in each case is a new one. It is understood that he will take an active part in the management.

Richard B. Stanford, who has been consulting engineer and manager of the Bonanza and other mines in Nicaragua, has returned to his office in New Orleans. The mines have been sold to the Canadian Agency, Ltd., of New York, and Orvil R. Whitaker, of Denver, Colo., will be consulting engineer for the new company.

W. C. McKee has resigned his position as superintendent of blast furnaces of the Inland Steel Co., Indiana Harbor, Ind., and on Oct. 4 became general superintendent of the Thomas Iron Co. in charge of the company's blast-furnace plants at Hokendauqua, Hellertown, Alburtis and Island Park, Penn. He will make his headquarters at Hokendauqua.

Ernest Solvay, discoverer of the Semet-Solvay process for the manufacture of heavy chemicals, celebrated the 50th anniversary of that discovery on Sept. 2 at Brussels, Belgium by giving more than $1,000,000 to educational and charitable institutions and the employees of his firm. The Universities of Paris and Nancy received $100,000 each.

Woldemar Hommel, who for several years was metallurgical engineer for Huntington, Heberlein & Co., in London, and later was general manager of the Metals Extraction Co., in London, and who is well known as a contributor to the "Journal," has joined the instructing staff of the Clausthal Bergakademie as docent in metallography and metallurgical engineering.

Thomas J. Drummond retired both as president and director of the Lake Superior Corporation at the annual meeting of the company, which was held at Camden, N. J., Oct. 1. J. F. Taylor, of Sault Ste. Marie, who has been vice-president and practically general manager of the company there, has been made president. Mr. Drummond has not been in good health for some time.

W. K. Whigham, of London, has been made chairman of the board of the Lake Superior Corporation, and the other officers elected are: Henry Coppell and W. C. Franz, vice-presidents; Thomas Gibson, secretary; Alexander Taylor, assistant secretary, and A. H. Chitty, treasurer. The directors include, besides the officers, Frederick McOwen, of Philadelphia; John T. Terry and Joseph S. Dale, of New York; W. E. Stavert and D. C. Newton, Montreal, and James Hawson, of Sault Ste. Marie, Ontario.

# OBITUARY

Henry B. Lupton, vice-president of the Oliver Iron & Steel Co., Pittsburgh, died at his home in that city Oct. 9. He was born in Cincinnati Dec. 23, 1849. Mr. Lupton was one of the best known men in the iron and steel trade in the Pittsburgh district.

T. Frame Thomson died from an accidental injury at his home near London, England, Sept. 30. He was 46 years old and had been engaged in engineering work in England and South America as well as in this country. For seven years past he had been chairman of the board of the Otis Steel Co., of Cleveland, Ohio.

Nathaniel Baxter, Jr., died at Nashville, Tenn., Sept. 29, aged about 73 years. He was a lawyer and banker and took a prominent part in the early movement to build up the iron industry in the South. He was president of the Tennessee Coal, Iron & R.R. Co. from 1883 to about 1890. He retired from business several years ago.

William J. Isaacson, of Cincinnati, died at Los Angeles, Calif., Sept. 13, aged 65 years. He was born in Norway, but came to this country when a boy. He was engaged in the iron and tinplate business, and for 21 years was managing director of the Dayton Coal & Iron Co., at Dayton, Tenn. In 1906 he retired on account of ill health.

Dr. Rudolph Diesel, well known as a profound student of thermodynamics and the inventor of the Diesel engine, was lost overboard from a steamer on the night of Sept. 29, while on his way from Antwerp to London to attend a meeting of representatives of the various Diesel engine-manufacturing companies. He was last seen walking on the deck in the evening, and is supposed to have fallen overboard accidentally. A recent dispatch from London reports that he was heavily in debt, though it was believed that he had received large sums for his engine patents.

# SOCIETIES

**Mining and Metallurgical Society of America**—A meeting of the Philadelphia section will be held at the Engineers' Club, Philadelphia, on Monday, Oct. 20, at 8 p.m., the subject of discussion being the report of the Committee on Standardization recently published.

The New York section will hold a meeting on Oct. 23, at the Engineers' Club, New York, at 8 p.m. at which the subject of discussion will be the hydrometallurgy of copper.

**Pennsylvania Industrial Welfare and Efficiency Conference**—This meeting has been called by the Pennsylvania Department of Labor and Industry, and will be held, under the auspices of the Engineers' Society of Pennsylvania, at Harrisburg, Penn., Oct. 28-30. The Conference is of a strictly business character, to be attended by representatives of the industries and others interested. The work to be done is laid out about as follows: The first day, according to the provisional program, is given up to a general presentation of the subject, and to a study of what a number of the most interested state departments can do for the industries, including information as to how the service can be best obtained by those desiring it. The second day is devoted more specifically to labor conditions and their improvement, from the standpoint of both employer and employee. The third day is used in a study of accidents and fires, and their prevention. Preliminary correspondence indicates that the conference will be attended by many prominent representatives of the most important industries of the State, and already sufficient specific indications of a desire to coöperate have been given to insure large success. In addition to individual establishments, many strong associations, representing all phases of industry are lending a cordial helping hand toward promoting the results sought.

## INDUSTRIAL NEWS

The Mount Morgan Gold Mining Co., Queensland, Australia, is increasing the capacity of its timber-framing plant and has ordered another single-end timber-framing machine from the Denver Engineering Works Co., Denver, Colo.

The Compagnie d'Enterprises de Lavage des Minerais has transferred to F. & H. Dallemagne, of Chichy, France, all business connected with its patents for the mechanical preparation of minerals; also the operation of the plants at Clichy, France, and Pasajes, Spain.

The S. Flory Manufacturing Co., at Bangor, Penn., has completed temporary buildings in place of those recently destroyed by fire, and has them fully stocked with improved machinery for the manufacture of stationary and hoisting engines, boilers, slate saws, planers, etc. Permanent buildings are to be erected at once.

The Victor M. Braschi Machinery Co., Inc., has been organized, with Victor M. Braschi, president and treasurer; Alfonso Mendozo secretary. The new company has taken over the business formerly conducted in Mexico under the name of Victor M. Braschi. In addition to its offices in the City of Mexico the company has opened an office at 121 San Francisco St., El Paso, Texas, under charge of Carroll Helmick; also one at 80 Wall Street, New York, in charge of Gustavo Lobo. The company will continue to act as agent for a number of prominent manufacturers of mining machinery in the United States.

General Electric Co., Schenectady, N. Y., report the following orders recently received: The Matthiessen & Hegeler Zinc Co., La Salle, Ill., two 937 kv-a. Curtis turbo-generator Co., Calumet, Mich., of seven motors ranging from 15 hp. to 1250 hp., a 7-kw. turbo-generator set, an 8-kw. generator, one 7.5 kv-a. and three 15 kv-a. transformers, switchboard and accessories; the Montreal Mining Co., Garley, Wis., a 100-kw. two-unit three bearing motor-generator set and switchboard, and four 4-ton and two 6-ton electric mining locomotives; the Bethlehem Chile Iron Mines Co., South Bethlehem, Penn., a 215 kv-a. alternating current generator with 7-kw. exciter, nine transformers ranging from 10 hp. to 75 hp., switchboard panel and accessories; the Alaska Treadwell Gold Mining Co., Seattle, Wash., a 225-kv-a. alternating current generator and switchboard; the Arizona Copper Co., Clifton, Ariz., two 10-hp. two 50-hp., four 75-hp., and two 100-hp. motors with compensators and switches; the Carr Mines Co., Central City, Colo., two 50 kv-a. transformers, a 75-hp. motor and accessories; the Tierney Mining Co., Stone, Pike Co., Ky., a 300 kw. generator and switchboard.

## TRADE CATALOGS

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Hand drills and portable compressors. Illus., 16 pp., 6x9 in.

Sullivan Machinery Co., Peoples Gas Building, Chicago, Ill., Bulletin 66-H. Hyspeed and Liteweight Drill, Ill., 56 pp., 6x9 in.

Orenstein-Arthur Koppel Co., Koppel, Penn. Catalog No. 900. Portable and industrial railways, dump cars, buckets, locomotives, etc. Illus., 84 pp., 8½x11 in.

Ingersoll-Rand Co., 11 Broadway, New York. Bulletin, Form No. 8011. "Little David" riveting hammers. Illus., 8 pp., 6x9 in. Booklet, Form No. 632. Calyx core drills. Illustrated, 3½x5½ in.

The Laclede-Christy Clay Products Co. has issued a booklet, Laclede-Christy Fire Brick Uses and Practices for which Adapted. Illus.; 10 pp. 3½x6½ in. This booklet contains much valuable information and tables, and can be taken up by the practical everyday user of firebrick and followed with profit.

## NEW PATENTS

COPPER ALLOY. William F. Nolan, St. Paul, Minn. (U. S. No. 1,074,285; Sept. 30, 1913.)

TUNNELING MACHINE. Norman Ebbley, Wallace, Idaho. (U. S. No. 1,075,027; Oct. 7, 1913.)

AMALGAMATOR. Lloyd Oscar Crocker, Beatrice, Neb. (U. S. No. 1,074,410; Sept. 30, 1913.)

CRUCIBLE FURNACE. Hans Koch, Dietikon, Zurich, Switzerland. (U. S. No. 1,073,912; Sept. 23, 1913.)

INGOTS—Apparatus for Manufacturing Ingots. William H. Connell, Pittsburgh, Penn. (U. S. No. 1,074,251; Sept. 30, 1913.)

SEPARATOR—Electromagnetic Ore Separator. Georg Rietkötter, Hagen, Germany. (U. S. No. 1,074,068; Sept. 23, 1913.)

ORE REDUCTION—Improvements Relating to the Reduction of Ores. E. R. Sutcliffe, Leigh, Eng. (Brit. No. 17,935 of 1912.)

ROASTING—An Improved Furnace for Roasting Ores or Other Materials. J. Socignet, Paris, France. (Brit. No. 146 of 1913.)

INGOTS—Manufacture of Ingots. William H. Connell, Pittsburgh, Penn. (U. S. Nos. 1,074,248, and 1,074,249; Sept. 30, 1913.)

LEACHING—Method of Treating Ores and the Like. Niels C. Christensen, Jr., Salt Lake City, Utah. (U. S. 1,075,011; Oct. 7, 1913.)

MELTING FURNACES—Improvements in Crucible and Melting-Pot Furnaces. L. F. Tooth, London, Eng. (Brit. No. 8474 of 1913.)

FLUME. Robert J. Johnson, Sheridan, Wyo., assignor to Sheridan Iron Works Sheridan, Wyo. (U. S. No. 1,073,857; Sept. 23, 1913.)

SEPARATION—Method and Apparatus for Magnetic Separation. Oscar Alfred Zander, Stockholm, Sweden. (U. S. No. 1,074,999; Oct. 7, 1913.)

SEPARATOR—An Improved Magnetic Separator. Fried Krupp Akt. Grusonwerk, Magdeburg-Buckau, Germany. (Brit. No. 4595 of 1913.)

CASTINGS—Method of Making Sound Castings. Frank D. Carney and Lewis B. Lindemuth, Steelton, Penn. (U. S. No. 1,073,735; Sept. 23, 1913.)

MINE-CAR WHEEL. Hiram A. Holzer, Pittsburgh, Kan., assignor to United Iron Works Co., Springfield, Mo. (U. S. No. 1,074,363; Sept. 30, 1913.)

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ZINC—Process for the Recovery of Zinc Oxide from Zinkiferous Materials, Especially Slags. F. C. W. Timm, Hamburg, Germany. (Brit No. 10,376 of 1913.)

PULVERIZER—Apparatus for Pulverizing Coal and Other Materials. Claude Albemarle Bettington, London, England. (U. S. No. 1,074,040; Sept. 23, 1913.)

ZINC—Alloy of Zinc. Thomas Abraham Bayliss, Warwick, England, assignor of one-half to Byron George Clark, London, England. (U. S. No. 1,074,234; Sept. 30, 1913.)

DRILLS—Automatic Feed for Percussive Drills. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,074,320; Sept. 30, 1913.)

ELECTRIC FURNACE. Johannes Hess, Vienna, Austria, assignor to the Firm of Bosnische Electricitats-Actiengesellschaft, Vienna, Austria. (U. S. No. 1,073,684; Sept. 23, 1913.)

FURNACES—Improvements in and Relating to Furnaces Particularly Applicable for Metal-Heating and Metallurgical Purposes. J. A. Hill, Sheffield, Eng. (Brit. No. 2489 of 1913.)

CASTING INGOTS. James Rossiter Hoyle and Arthur William Brearley, Sheffield, England, assignors to Thomas Firth & Sons, Ltd., Sheffield, England. (U. S. No. 1,073,988; Sept. 23, 1913.)

LEACHING—Apparatus for Extracting Metals from Ores. Henry S. MacKay, Riverside, Calif., assignor to MacKay Copper Process Co., Riverside, Calif. (U. S. No. 1,074,274; Sept. 30, 1913.)

IRON AND STEEL MANUFACTURE—Art of Making Iron and Steel. James R. Billings, Birmingham, Ala., assignor to Billings Process Co., Birmingham, Ala. (U. S. No. 1,073,587; Sept. 23, 1913.)

SEPARATION—Process of and Apparatus for Progressive Electrostatic Separation of Comminuted Materials. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,073,645; Sept. 23, 1913.)

TIN AND GOLD RECOVERY—Improvements in or Relating to the Saving or Recovery of Tin, Gold and Other Ores, from Sand or Other Ore-Bearing Ground. T. H. Martyn, Quinta, Cornwall, Eng. (Brit. No. 19,346 of 1912.)

CRUSHING—Process for Crushing or Pulverizing Materials. Carl Dietz and Emil Gofferje, Leverkusen, near Cologne, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co., Elberfeld, Germany. (U. S. No. 1,074,847; Oct. 7, 1913.)

HARDENING—Case-Hardening Process for Articles of Iron, Steel and Steel Alloys. Frederico Giolitti, Turin, Italy, assignor to Societa Anomina Italiana Gio. Ansaldo Armstrong & Co., Genoa, Italy. (U. S. No. 1,074,114; Sept. 30, 1913.)

ZINC—Deposition of Metallic Salts from Solutions Containing Them. Harry Rees, Llansamlet, Glamorgan, Wales, and Henry Livingstone Sulman, London, England, assignors to the Metals Extraction Corporation, Ltd., London, England. (U. S. No. 1,074,203; Sept. 30, 1913.)

# EDITORIAL CORRESPONDENCE

## SAN FRANCISCO—Oct. 8

**Forest Fires** have destroyed a large amount of property in California in the last month, but the proportion of loss of mining property has been small. The only serious fire in the mining districts was at Forbestown, and that was exaggerated in the news item of last week. Later reports showed that the stores and post office were not burned, and besides the church the principal loss was confined to old unoccupied buildings. The Gold Bank hotel was an old building that had not been occupied for a long time. The hotel now being operated was not burned.

**The Kennedy Extension-Argonaut Suit** occupied the superior court, in the second week of the trial, with the testimony of R. S. Rainsford, manager, and W. J. Nettle, superintendent, of the Argonaut mine. Both in the direct- and cross-examination of these witnesses the attorneys have gone carefully and methodically into the many details of the physical conditions of the Argonaut and its relation to the Muldoon and the Jackson veins. The entire underground workings of the Argonaut were described by Mr. Rainsford, and with the aid of maps and the large model the several drifts, crosscuts and raises were exploited in practical minerlike language, shorn of unnecessary technical and scientific terms. The audience in the court room was composed of mine owners, managers, superintendents, foremen and miners. There has been no apparent contention between the parties to the action over the amount of ore mined by the Argonaut nor as to the demands of the Kennedy Extension. The whole case evidently rests on the question of apex. The Argonaut Mining Co. contends that the Jackson vein claimed by the Kennedy Extension does not exist, and that it has been working only on its own vein, the apex of which is claimed to be within the surface of the Argonaut ground. While the testimony of Mr. Rainsford is confined chiefly to the Argonaut the conclusions and deductions are in refutation of the findings of Dr. John W. Finch, witness for the plaintiff, but the evidence of Professor Lawson and Professor Wiley will be more in the nature of direct refutation of Doctor Finch and Professor George. There is practically no dispute over the physical condition of the several workings in both mines. The geological deductions will decide the case with but little, if any, differences on other matters to hamper findings of the court. The case will probably require two weeks more.

## DENVER—Oct. 13

**Pitchblende and Carnotite Deposits** in Gilpin County, including the German, Wood, Belcher and Mitchell mines, have been purchased by Alfred du Pont, of Wilmington, Del., a millionaire philanthropist, and brother of the head of the powder manufacturing company. The mines are being operated by the German Uranium Gold Mining Co., and the ore is being stored until a sufficient quantity has been produced, when it is du Pont's intention to erect a concentrating and refining plant to produce radium. The radium will be turned over to American physicians for research work. It is stated that H. O. C. Thofern, of Paris, who is in Denver, and said to represent Madame Curie and the Radium Bank of Paris, tried to buy the output of the du Pont mines, but the offer was declined.

**The Coal Miners' Strike** is dragging along, injuring the business of the state, raising the price of coal, and bringing misery on the families of the strikers, with no apparent disposition on either side to yield. Violence is increasing, strikers are armed and are supplying themselves with ammunition. Hundreds of shots have been fired, the bullets perforating miners' dwellings and tents, and on Oct. 10 one man was shot dead and three others wounded at Ludlow, the hotbed of the strike. Operators and railroad companies are trying to get the governor to send the militia into the field to protect the nonunion workers, and the strike leaders, of course, are persuading him it is not necessary. The business men of Denver who attended a meeting of the Chamber of Commerce Oct. 8 passed a resolution asking Governor Ammons to call a special meeting of operators and workers, in an endeavor to reach a satisfactory settlement. So far the governor has failed to make any decisive move. The manager of the Denver & Salt Lake R.R. has given notice that owing to the short supply of engine coal, he will only run three passenger trains per week between Denver and Steamboat Springs.

## BUTTE—Oct. 9

**The Recent Washoe Shutdown** for repairs did not throw the employees out of work, as the entire force was engaged in cleaning out the flues which had become badly choked by dust. The men received the same wages as were paid to them for their regular work.

**The Bradley Process** has not yet been abandoned by Thomas W. Lawson, although A. C. Burrage has withdrawn his financial backing. Lawson advanced the money necessary to pay off all debts and is now said to be putting up cash for the payment of the men left in charge of the plant. Bradley is in the East trying to raise money with which to continue his experiments.

**An Experimental Leaching Plant** of 80 tons capacity has been erected by the Anaconda company to test a new method for recovering copper and silver from the tailings of the concentrator at the Washoe smelting plant at Anaconda. Laboratory experiments have demonstrated that by treating 3000 tons of tailings per day an average of 10 lb. of copper and 5c. in silver can be recovered from one ton of the tailings at a cost of 70c. By crediting the silver, the cost of extracting the copper would be 6.5c. per lb. There are over 16,000,000 tons of tailings on the dump, and this amount is being increased by about 8000 tons daily. If the 80-ton plant confirms the results of the laboratory work, a 3000-ton plant will probably be erected.

**Pilot Butte has been Enjoined** by the Anaconda company after vainly trying to avoid bringing suit. The injunction is to prevent Pilot Butte from mining on a rich vein, which the Anaconda company opened in the Pilot, and from which it has been shipping ore for two weeks. The Anaconda company lays claim to the vein, saying it apexes in the Emily claim, south of and adjoining the Pilot. The Anaconda company had requested the Pilot Butte to cease mining and drive a crosscut between the 1300 and 1800 levels to determine whether or not the vein upon which mining is being done on the 2000 and opened on the 1800, is the same vein found by the Pilot on the 1300, but the Pilot Butte company declined to do that work, acting on the advice of its attorneys. Then the Anaconda brought the suit and stopped mining on the vein in question. The controversy involves several interesting questions, including the question of apex in which the side lines of the Pilot claim become the end lines; the question of a junction of veins and of prior location. Officers and attorneys for the Anaconda expressed regret over the necessity of bringing suit. The temporary injunction will simply preserve the orebodies in dispute until the controversy is finally settled, and will not prevent the Pilot-Butte company from working other veins.

## SALT LAKE CITY—Oct. 9

**Three Dividends Paid in September** by Utah mines aggregated $1,234,496. These were the Bingham-New Haven, with $22,869, the Grand Central, with $25,000; and the Utah Copper with $1,186,627

**Utah Copper** has made a new high record in handling and shipping 30,000 tons of ore from the mine to the concentrators at Garfield. This is 1000 tons more than the highest day's output in September. The average has been from 21,000 to 22,000 tons a day.

**Ore and Bullion Settlements** in Salt Lake during the last two weeks have been the heaviest in more than three years. For the week ended Oct. 4 the ore receipts at one bank amounted to $814,000 and the bullion shipments to $715,000, or a total of $1,529,000. These figures include returns from one only of the three smelters in the valley.

## CALUMET—Oct. 11

**The Injunction Dissolution Has Been Suspended** by the supreme court, and the injunction is now in effect as originally issued by Judge O'Brien Sept. 20, with the exception that peaceful parades and meetings are allowed the strikers, and Nov. 1 has been set by the supreme court as the date on which Circuit Judge O'Brien is to show cause why a writ of mandamus should not be issued to compel him to vacate his order of Sept. 29 dissolving the injunction. Lawlessness and rioting prevailed throughout the district this last week resulting in the killing of a deputy sheriff and a striker at the Isle Royale mine, south of Houghton, early Wednesday morning. James Pollock, the deputy, was attacked by a party of 10 or 12 strikers or strike sympathizers and was cruelly beaten and shot in the head; he died one hour after he was found. In the mêlée, a striker was shot in the stomach, which proved fatal. Several arrests have been made and the civil authorities have secured confessions from two of the men implicated in the fracas, and so have the case well in hand. Early in the week, Guy Wilkins, assistant supply clerk at the Ahmeek mine, was shot at from ambush and slightly wounded while on the way to the mine. Conditions throughout the district are decidedly strained and serious trouble is momentarily looked for. The strikers are holding parades at the various locations early in the mornings and the men assemble in groups, prior to the starting of these parades along the roads and streets that the men going to and coming from work traverse, and are only keeping within the restraining order, so that an outbreak may occur at any time.

### HOUGHTON—Oct. 9

**Additions to the Working Forces** at all of the mines have been made this week. The Calumet & Hecla now works all of its shafts one shift, and four of the shafts were started on the night shift this week. The rock tonnage is between 4000 and 5000 daily at present, about half of normal. However, it is practically certain that the output of copper for the month of October will be closer to two-thirds of normal than half, for the reason that the richer stopes in the conglomerate lode are being drawn on to offset, as much as possible, the smaller rock tonnage. This week the Calumet & Hecla commenced to import men, one party coming from Butte and another from Lead, S. D. These men came to Calumet understanding the conditions. Most of them are men who formerly worked in the Calumet & Hecla mine and who went to the Western camps some years ago. They are returning in the face of the strike conditions and express themselves as glad to get back to Calumet. Many of the miners regularly employed at outlying mines but afraid to go to work at these mines because of the danger entailed to their lives and to their families are now working as trammers in the Calumet & Hecla, pending a more settled condition. The Quincy mine now is sending down about one-third normal output of rock, and the same condition prevails at the various Copper Range Consolidated mines, namely, the Champion, Trimountain and Baltic. At the South Kearsarge, the Osceola and the North Kearsarge mines, at Allouez and at Centennial a partial resumption of operations has been brought about and the exploratory properties are continuing their work as if nothing had happened.

### MARQUETTE—Oct. 13

**The Arctic vs. Cleveland-Cliffs Case** will come before Judge Clarence Sessions sitting in the United States court at Grand Rapids, Nov. 17, and one of the most important litigations that have arisen in the Lake Superior region will be argued. The lease of the Regent group of mines at Negaunee, Marquette range, to the Oliver Iron Mining Co. by the Arctic company, the owner of the fee, is the matter in litigation. As an outcome of previous court proceedings, the master appointed for the purpose has found damages of $900,000 against the Cleveland-Cliffs company, a sum approximating the amount claimed by the plaintiff corporation. The defendant company will seek a reduction of these damages, and it is expected that, if the master's finding is upheld by Judge Sessions, the case will be appealed at Cincinnati. The $900,000 found for the Arctic company by the master is said to be the largest finding of damages ever returned in Michigan. But if this finding is finally sustained, the Cleveland-Cliffs company will be a loser by only one-half the amount, for it holds the stock of the Arctic company equally with the E. N. Breitung interests of Marquette. The inception of the case dates back to February, 1904. W. G. Mather, of Cleveland, president of the Cleveland-Cliffs company, was a trustee of the Arctic company at the time the lease of the Regent lands to the Oliver company was granted, and when the Breitung interests, in behalf of the Arctic company, instituted the litigation it was claimed that under the provisions of the lease there were reserved to the Clevland-Cliffs company certain advantages which should have been enjoyed exclusively by the Arctic company. The case was not finally disposed of in district court until 1909, when Federal Judge Knappen found unreservedly for the Arctic company. The $900,000 damages represents the Arctic company's share of profits from the operation of the Regent mines in the period subsequent to the closing of the lease with the Oliver company, and is exclusive of the return of valuable securities and rights to the Arctic company. The case has been stubbornly fought throughout, and it is likely to be a matter of a year of two more before the case is adjusted.

### JOPLIN—Oct. 11

**Lawton,** which has at last "arrived," belongs to that class of camp the development of which was due to the persistency of one man. In the case of Lawton the one man was Walter Ragland, former state mine inspector of Missouri and the manager for the Eastern Lead & Zinc Co., which has opened the camp and made it possible for other operators to enter it. On leaving the service of the state five years ago, Mr. Ragland took up the work of prospecting land at present embraced by the Lawton camp. The land had been mined in a desultory way many years before, but the heavy water conditions prevented extended development. Mr. Ragland drilled steadily for many months. The results of his drilling showed a mineral deposit covering an area at least one-quarter mile long and 200 ft. wide. In spite of the apparent richness of the deposit and its extent, many of the older operators scoffed at the idea of going "way over into Kansas to mine a water hole," but Mr. Ragland kept at it and finally with the assistance of his Eastern associates organized the Eastern Lead & Zinc Co. It was a mining venture that required more than the ordinary patience to achieve success, for it required many months of faithful pumping in the face of many discouragements to get the water under control so that the ground could even be entered much less mined. Even today the company maintains one of the largest pumping plants in the district and it is kept steadily at work night and day. Since the mine has been finally opened up it has been a consistent and heavy producer. Its long assured life and the richness of the ore have attracted other operators and today there are two other milling properties in the new camp with the certainty of others coming in before another half year. The Larkin Mining Co. has a mill about completed; the Lawton Mining Co. has just started the erection of a mill. The John Hall mill will be running soon, while Oakes & Church have a property which is nearing the stage for building a concentrator. A large number of prospect drills are busy in the camp, and some shaft sinking is planned for the autumn months. In character the new camp resembles both the old Badger and Oronogo camps. It resembles the Badger camp in its heavy water problems and in a certain way some of its ores. On the other hand, the Lawton camp bears a remarkable resemblance to Oronogo. In the first place it lies in a small side valley of Spring River just as Oronogo does with Center Creek. This side valley in both instances is of large dimensions widening out as it gets back from the main drainage lines and having in it large outliers of Pennsylvanian shales and sandstones. The ore appears to lie in close proximity to the line of contact between the shales and limestone and flint. The ores are also greatly disseminated and in this respect resemble the Oronogo ores.

### COBALT—Oct. 11

**The 7% Arsenic Limit** on Cobalt ores imposed by the American Smelting & Refining Co. will put a number of properties under a serious handicap. A large proportion of the ores from this camp carry in excess of 7% arsenic and the mines are now faced with the problem of marketing their ores. The majority of the ores shipped to the States were sent to the American Smelting & Refining Co. smelting works at Denver and Perth Amboy and to the Pennsylvania plant at Carnegie. The Canadian works are located at Thorold, Deloro, Copper Cliff and Orillia. During the last year, however, the Pennsylvania and Copper Cliff plants have been closed down and the Orillia plant was destroyed by fire. The other two Canadian plants have a limited capacity, and the Deloro plant which is controlled by M. J. O'Brien gives preference to the ores from the O'Brien mine in Cobalt and the Miller Lake-O'Brien mine in Gowganda, while the Thorold plant which is owned by the Coniagas company, has a capacity not much in excess of the requirements of the mine. It is understood that the Orillia plant will be rebuilt, and while this will somewhat relieve the situation, it will not be able to take care of all the excess ores. It is also believed that a market can be developed in Saxony, where there are plants for the treatment of ores similar to those of Cobalt and which have been running at reduced capacity on account of the failure of local ores. There is also some talk of erecting a customs plant at Cobalt, similar to those in operation at the Nipissing and Buffalo mines, where the high-grade ores are treated by combined amalgamation and cyanidation, with results more satisfactory than can be obtained at the smelters. The output is in the form of silver bullion and the cobalt residues find a ready market.

# THE MINING NEWS

## ALASKA

DIGGINGS ON SULLIVAN CREEK in the Hot Springs district are turning out rich, a recent cleanup after a short run netting $20,000. About 200 men are working on this creek.

SOLOMAN HAS BEEN DESTROYED. The storm that did much damage at Nome wrecked every building in the settlement, which had a population of 300.

IN THE KANTISHNA DISTRICT, via Fairbanks, Peter Lesh, who recently purchased claim No. 8 Above, found a 45-oz. nugget. There have been many forest fires in the country adjacent to the Kantishna River, but comparatively little damage has resulted.

IN THE CIRCLE DISTRICT, Deadwood P. O., rains in August permitted many of the small operators, who had closed down from lack of water, to resume operations. It is reported that Lamb & Co., on Mammoth, are to close down. The Elmer dredge has had many misfortunes during the summer, a breakdown in August necessitating a trip to Fairbanks for repairs.

TOLOVANA MINING CO. (Fairbanks)—Arrivals from Willow Creek state that a vein has recently been cut parallel to the old tunnel. A shaft is being sunk to determine the dip of the vein.

NEWSBOY (Cleary)—Sufficient water was available during most of August for the mill to be operated 24 hr. per day. Good ore has now been developed on three levels, the 100-, 150- and the 215-ft. and prospecting on the 315-ft. level is giving encouraging returns.

HADLEY (Ketchikan)—These properties have been taken over by the Granby Consolidated company, and development work will be started next spring. The ore will be shipped to Grand Forks. The Hadley mines have been involved in bankruptcy proceedings for several years.

VAN CURLER'S BAR (Fairbanks)—High water in the upper Chena River during the latter part of August destroyed a portion of the 400-ft. dam, flooding the workings and carrying away flume, sluice boxes and tools, with a total loss of $10,000. It is understood that the dam will not be rebuilt this season.

CRITES & FELDMAN (Meehan, via Fairbanks)—A shipment of 45 tons of ore was made from a fractional claim near the Helen S. Development work on the Helen S. has disclosed a comparatively large body of excellent ore, and tunnels are now being driven on some adjacent claims, which are owned by Crites and Feldman.

## ARIZONA

### Maricopa County

MESA GOLD MINING & MILLING CO. (Mesa)—A new hoist and other mining equipment has recently been installed.

VULTURE (Wickenburg)—The mill is running steadily, and regular shipments of concentrates are being sent to the smelter at El Paso. An abundant water supply has recently been obtained near the mine.

EUREKA (Walker)—The test run on Eureka ores recently made at the Poland mill proved highly satisfactory. The resulting car of concentrates was shipped to the Copper Queen works at Douglas Development has been resumed in the mine and the mill will be overhauled and put into shape for continuous work.

### Mohave County

WALKOVER (Kingman)—This property, near the Copper Giant, has recently been bonded. It is understood that development work will be commenced immediately.

KINGMAN COPPER CO. (Mineral Park)—The drilling operations of this company at Mineral Park have been discontinued and a drift is now being driven on one of the large veins.

TELLURIDE MINING CO. (Oatman)—Work has been resumed. The shaft is now 200 ft. in depth and is being sunk to the 300-ft. level. The property adjoins the Black Eagle claim of the Tom Reed mine

ARIZONA-SOUTHWESTERN COPPER CO. (Yucca)—This company has received two of the new Saurer 6½-ton trucks recently ordered. The new mill is completed and has been tried out successfully since the repairs to the foundations of the crusher and tables were made. The new hoist is in operation and the sinking of the shaft below the present level will soon be started.

COPPER GIANT (Kingman)—The station has been cut at the 300-ft. level of this mine, and drifts are being driven in each direction along the vein In places on this level, the orebody is 8 ft wide and assays 25% copper Ore is being piled on the dump preparatory to better shipping facilities being provided At present, the ore that is shipped is hauled to Hackberry and there loaded for shipment to Jerome A siding is being put in at Valentine on the Santa Fé R R., which is only about four miles from the mine The success attending the work of the Clark interests on this property is stimulating activity in mining in the whole Chloride district

### Pima County

CABABI MINING CO—Work has been resumed on the property formerly known as the Picacho group

SAN XAVIER (Tucson)—The Empire Zinc Co. is developing the copper portion of its holdings, opening up a good grade of copper ore.

### Pinal County

RAY-ARIZONA (Kelvin)—The churn drill hole is now down 580 ft. It is reported that the company will soon begin work on its main shaft.

KELVIN-SULTANA (Kelvin)—The winze from the 300-ft. level on the No. 2 vein is down 15 ft. and shows 3 ft. of 8% copper ore. In the east drift on the same level and vein a shoot of 4% ore 6 ft. wide has been opened for 30 ft. along the strike. Preparations are under way to resume sinking the shaft. The next station will be cut at the 500-ft. level.

### Santa Cruz County

ELEPHANTS HEAD—Development work has been reduced pending the purchase of new mining equipment.

ANNA BELL (Patagonia)—The first carload of ore from this mine in the Mowry district has been shipped by O. H. Weaver and H. B. Briggs who recently leased the property. The ore is valued at $54 per ton.

CONNECTICUT (Patagonia)—Hogan & McCutcheon, lessees, have shipped another car of ore. Tunneling is being continued, with about 100 ft. to be driven to connect with the old winze, which will open up 400-ft. backs for stoping.

### Yavapai County

HUMBOLDT CONSOLIDATED (Big Bug)—The shaft has reached a depth of 200-ft. and drifting has been begun on the 100-ft. level. As the shaft is deepened the force will be increased and shipments will be made.

OCTAVE (Congress)—The company has executed a trust deed to the International Trust Co. of Massachusetts to secure a bond issue up to the sum of $500,000. This is the initial step in the resumption of operations at the property.

WYMAZONA (Prescott)—A Humphreys mill has been installed, which is expected to treat from 8 to 12 tons per 24 hr. This is the first mill of its kind to be installed in the state; a second has been shipped to some property in the southern part of the state.

### Yuma County

SUNSET (Harrisburg)—The Sunset, Central and Copper Belt groups, owned by J. A. Reid and John Devine, were sold recently. The new owners plan to begin work in November.

LA FORTUNA (Yuma)—T. C. Woodward and B. Keever, who recently acquired this old mine, have 50 men at work cleaning out the old workings and retimbering. Some development work has been in progress and an important new strike is reported.

TREGO PLACER (Swansea)—Recently R. M. Stene, vice-president of the Centennial Mining Co., examined and negotiated for 640 acres of placer ground about 45 miles southeast of Bouse. This ground has been worked by dry-placer methods intermittently and on a small scale for several years. Stene expects to install a plant of 500 tons daily capacity the principal feature of which will be the Stebbens dry-concentrator.

## ARKANSAS

### Marion County

PHILADELPHIA (Yellville)—J. T. McCarty, a lessee on this property, expects to begin operations in the near future.

CANE SPRINGS (Yellville)—Henry Hurd started work at this property Sept. 25. A large quantity of carbonate ore is said to be in sight.

## CALIFORNIA

### Amador County

CENTRAL EUREKA (Sutter Creek)—Sinking is continuing to a depth of 2800-ft., where a new level will be opened, making two new levels below the lowest place at which ore was extracted up to the first part of this year.

BUNKER HILL (Amador City)—Sinking has been resumed and the shaft deepened to 2350 ft. A new level will be opened at this depth, making two levels below the 1950-ft. station which is the present lowest working level. The vein at the bottom is wide and the ore is of good milling grade.

### Calaveras County

ANGELS (Angels Camp)—It is reported that orders were received from J. V. Coleman, owner, to reduce the number of men employed. That this is an indication of a possible sale of the mine has not been confirmed.

### Kern County

WINDY (Randsburg)—The ground adjoining this mine has been leased by Watchman Bros and Robert Tait.

GOODHOPE (Randsburg)—A recent 14-day run of the mill produced 179 oz of bullion, from 68 tons of ore, that averaged $42 per ton. The tailing assayed $3 per ton.

### Modoc County

HESS (Alturus)—Bullion worth $900 was recently shipped. It is reported that the new mill will now be operated regularly.

### Nevada County

DAYING (Hills Flat)—Recent development of high-grade ore at a depth of 20 ft. in the shaft has encouraged the owners to install a steam hoist.

EAGLE BIRD (Maybert)—The mine has been bonded to the Eagle Bird Mining Co., E. C. Klinker manager. A ¾-mile flume is being built to furnish water for milling and power. Lumber is also being cut at the company's sawmill for housing the 10-stamp mill that is to be built. This mine is an old producer that has been idle for a long time. The 800-ft. shaft is filled with water to within 50 ft. of the collar. The water will be pumped by steam pumps refitted for air. The shaft will be deepened. The present equipment consists of a hoist and air compressor. The 30-stamp mill operated by the former operators was destroyed by fire.

### San Diego County

MONTEZUMA (Warner Springs)—The shaft house was burned and some of the machinery was damaged by fire and explosion resulting from lightning striking and exploding a box of dynamite, a barrel of gasoline and a barrel of kerosene. The loss, estimated at $15,000, included damage done to the compressor pumps and ore bins. The plant will be rebuilt.

### San Luis Obispo County

OCEANIC QUICKSILVER (Cambria)—Murray Innes has purchased this property at a price said to be $20,000. The mine was worked and produced 7400 flasks of quicksilver between 1876 and 1879, and was idle until 1903, when a Scott furnace was installed. It has been operated irregularly since then. It is reported that Mr. Innes will reopen and operate the mine.

### Sierra County

AT BRANDY CITY, after a long season during which a large amount of ground was worked, the hydraulic mines are operating with a smaller force until autumn rains shall replenish the supply of water.

YOUNG AMERICA (Downieville)—A plant for working the mill tailings has been installed by Charles Crooks and associates, who will operate throughout the coming winter.

SLEIGHVILLE HOUSE (Downieville) — This property owned by Thomas Rose and R. St. Clair has been bonded to a company that is at work opening up the gravel on a large scale; good prospects are being obtained.

ALHAMBRA—(Downieville)—A big vein, showing ore of good grade, has been disclosed at this Jim Crow Cañon property, and a 20-hp. Rix compressor, with machine drills and accessories, have been installed for development. An assay office and other buildings are also to be erected.

LEE BROS. (Sierra City)—Extensive improvements are being made. A hoist house, blacksmith shop and other buildings are being erected, a 4000-ft. pipe line is being put in, and a 40-hp. boiler, engine, hoist and pump will be installed. The hoisting and pumping machinery will be convertible, so that either steam or electricity may be used. A new shaft will be sunk this winter to a depth of 400 ft., to prospect the big vein.

### Siskiyou County

THE SALMON RIVER DISTRICT water season ended about Sept. 1. It is reported that the miners have had a successful year and that a large amount of gold has been taken out from both placer and quartz mines.

## COLORADO

### Clear Creek County

ONEIDA (Freeland)—A streak of smelting ore has been opened in the breast of the lower tunnel. This is probably the downward extension of the oreshoot opened in the upper levels.

TWO KINGS (Idaho Springs)—This company, operating in Hukill Gulch, recently installed a pipe line from its property to the compressor plant of the Stanley Mines Co. and will purchase compressed-air power for the operation of its machine drills and pump.

UNITED FREELAND DEVELOPMENT & TUNNEL CO. (Idaho Springs)—This is a new company formed to complete the McLelland tunnel on Lode Mountain near Dumont. This tunnel is already in over a mile, and will be continued to the intersection of the one time famous Freeland vein.

LUCANIA TUNNEL & MINES CO. (Idaho Springs)—The property of this company, on Bellevue Mountain, has been sold at public sale to satisfy a judgment amounting to $48,404. The property was bought in by Samuel Sternberger for $51,500, which includes the amount of the judgment and cost of suit. The crosscut tunnel is 6500 ft. long and has its portal on Fall River. Several promising veins have been intersected and will be further developed in the near future by the new owner of the property.

### Lake County

THE DEMAND FOR ZINC ORES is on the increase. The Empire Zinc Co. is buying heavily, and taking 22% ore; until quite lately 25% was the lowest grade it would accept.

### San Juan Region

BROWN MOUNTAIN (Ouray)—The furnace is now running smoothly. A mishap occurred after starting. The roof caught fire, making it necessary to shut off the blower.

MINNEQUA MINING & REDUCTION CO. (Denver)—This company has leased promising ground and is producing 300 to 400 tons of high-grade lead-zinc ore monthly. About seven tons of zinc concentrate is produced daily, assaying 50% zinc, 5 to 6% lead, 2½ oz. silver, less than 3% lime and 3% iron.

### Teller County

DANTE (Cripple Creek)—The Gaylord mill on this property treated in September 1300 tons of $4 ore at a profit.

VINDICATOR (Cripple Creek)—The regular quarterly dividend amounting to $45,000 has been declared, making a total of $2,767,500 received by the stockholders.

## IDAHO

### Cœur d'Alene District

BIG ELK (Taft)—Good copper ore was struck at this property, when the crosscut tunnel encountered the vein. More men have been put on and work will continue throughout the winter.

GREEN HILL-CLEVELAND (Mace)—The débris caused by the wrecking of the hoisting plant about two months ago has been cleared away and within a day or two it is expected that the work of replacing the hoist can begin.

NATIONAL (Mullan)—The new 500-ton mill will be under cover within 30 days. The concrete foundations for the structure have been completed and work has begun on the framing. The track for the electric-haulage system between the mine and mill is being laid and the transportation equipment will be installed by the time the concentrator is ready to operate, which will be about Jan. 1, provided there are no unforeseen delays.

## MICHIGAN

### Iron

JUDSON MINING CO. (Crystal Falls)—This new company is sinking an inclined shaft on its property in the Mastodon field. Foundations for an engine house and a boiler house have been completed. Two 150-hp. return-tubular boilers have been installed and space allowed for two more. A 2000-cu.ft. Ingersoll-Rand air compressor and a Lake Shore Engine Works hoist have been purchased. The Foster Construction Co., of Milwaukee, will build the engine house. Machine shop, change house, warehouse and office will be erected later.

IMPERIAL (Michigamme)—The Cleveland-Cliffs Iron Co. has succeeded in selling the ore that has been in stock at this mine for several years, and the steam shovel ceased work last week. The little ore remaining will be loaded by hand and sent out this year. The Imperial ore is limonite and does not sell readily in the market. A number of improvements have been made at the property during the last year and a half, and it will be well equipped for mining when orders are given to resume operations. It is believed that work will be started around the first of the year if there are any inquiries for the ore.

## MINNESOTA

### Cuyuna Range

BRAINERD-CUYUNA MINING CO. (Brainerd)—The shaft, within the city limits of Brainerd, is down 25 ft. Structural material is all assembled for the shaft.

ARMOUR NO. 1 (Crosby)—This shaft, which had ceased shipping and started to stock its output, has again resumed shipments at the rate of 1000 tons per day.

CUYUNA-MILLE LACS (Crosby)—The company has sold 10,000 tons of high-grade manganiferous iron ore to the Cleveland-Cliffs Iron Co. for delivery this season.

IRON MOUNTAIN (Iron Mountain)—First ore was raised from the new 3-compartment shaft the week ended Oct. 4. The Soo railroad is laying track to the property; product is manganiferous iron ore, but not high grade.

ROWE (Riverton)—Track gangs are now laying track into the property. Two standard Baldwin locomotives and 20 dump cars are at hand to serve the two steam shovels as soon as the tracks are in. Meantime, hydraulicking continues and will do so until freezing weather interferes.

CUYUNA-DULUTH IRON CO. (Ironton)—Underground connections have been made between the Ironton shaft of this company and the Armour No. 2 shaft. This will work to the advantage of both properties as it insures better ventilation and increased safey for the men. The company has put down 22 holes on lands which it owns near the Kennedy and it is reported that some manganese ore of good grade has been encountered.

### Mesabi Range

ORE SHIPMENTS FOR SEPTEMBER over the Duluth, Missabe & Northern Ry. amounted to 1,938,823 tons against 1,652,735 in September, 1912; over the Iron Range R.R., 1,518,030 against 1,130,482 last September. For the season to Sept. 30, the Duluth, Missabe & Northern Ry. moved 9,830,726 tons compared with 7,729,187 last year; the Iron Range R.R. moved 8,194,738, last year 7,310,194 tons.

HULL-RUST (Hibbing)—It is estimated that close to 4,000,000 tons will be shipped this season to lower lake ports. It would be possible to push the work and get out more than that but the Oliver Iron Mining Co. is content to let the property run as it is, producing twice as much iron ore as any other Lake Superior property. There are about 300,000,000 tons of ore in sight.

OLIVER IRON MINING CO. (Chisholm)—A new property is being opened up between the Monroe and Shenango mines. The company has secured possession of 80 acres, which has an extensive ore deposit, being a continuation of the body on the Shenango. The shaft work will be started with in a few days and it will not require a great deal of time to get the mine in shape for a large production.

JORDAN (Chisholm)—After being abandoned for several years, this property will again be operated by Joseph Wilson and J. J. Gleason, of Eveleth. The property was formerly a combination of openpit and shaft, the ore being "milled." The new operators have drilled the property and located additional tonnage, which will be removed through a new shaft now going down. When abandoned the ore had apparently pinched out.

### Vermilion Range

SECTION THIRTY (Ely)—Hoisting now is at the rate of 800 tons per day. A new shaft is contemplated, to increase the output to 1200 tons. Over 17,000 ft. of drifting has been done on the property to date.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

IN THE SHERWOOD CAMP operations are being resumed after an idleness of two years. Charles Moore has started work at the Texas, a new producer, and W. C. Eyster, of Joplin, is opening one of the old producers. Mining was first begun in this camp in 1887, but a few years ago operations were abandoned.

E. G. DOANE & SON (Joplin, Mo.)—Several new silicate strikes have been made on the lease near Spring City.

VAILE MINING CO. (Joplin, Mo.)—This company has struck a 6-ft. vein of lead ore at a depth of 141 ft. A 20-acre lease is held. With the shaft sunk through the ore, drifting will begin.

POCATELLO (Thoms Station, Mo.)—The concentrator building has been completed and machinery is being installed. Operations are expected to begin within two weeks. Ore has been blocked out at a depth of 182 feet.

EASTERN LEAD & ZINC CO. (Lawton, Kan.)—Mark Hall, operating on a lease of this land, has purchased the Becker mill, situated in the south Carterville camp, and will have it removed to his property. Good ore is being mined, the deposit justifying a concentrator.

SOUTHSIDE LAND (Galena, Kan.)—Isley & Co. are working a good run of lead ore and a pay vein of zinc at the 186-ft. level. A. G. Peck and associates are encountering unusual zinc ore at a depth of 45 ft. Larger producers are the Hartford, Black Hills, Diplomat, Lockport, Squires, James Murphy and Rohrbaugh Bros.

SHOEMAKER TRACT (Joplin, Mo.)—D. Molloy, A. Raymond and others are opening a good prospect, which promises to rival the old Bumble Bee, one of the big producers of the Joplin camp a few years ago. Ore was found by drilling and the company will sink two shafts to prove the find. One shaft already is operated on the lease.

TEMAGAMI (Joplin, Mo.)—An underground tramway is to be built in order to work the orebody, which has been dipping gradually, making it difficult to reach the shaft with loaded tubs. The tramway will be 560 ft. long and on an incline. Loaded "cans" will be hoisted a distance of 20 or 30 ft. from a point near the heading and then placed on a car and carried to the bottom of the shaft by their own weight; from there they will be hoisted to the surface.

## MONTANA

### Butte District

CORBIN (Butte)—According to a report from Boston the company has made arrangements for temporary financing. A Boston house agreed to take the 60,000 shares on which the assessment of $1 is due, at a price that would net the company $1 per share.

BUTTE-MILWAUKEE (Butte)—Stockholders have received another communication from President C. W. Peters urging them to exchange their stock for that of the Butte-New York Copper Co. at 2½ shares for one. He says 92% of the stock has been exchanged.

ANACONDA (Butte)—The Washoe smelting plant, closed since Oct. 1 to permit repairs being made to the flues, has resumed operations. The Anaconda and other Butte companies paid miners for September at the rate of $3.75 per day, the average price of copper during the month having been a little less than 17c. per pound.

BOSTON & MONTANA DEVELOPMENT (Butte)—Surveyors in the field for the Butte, Wisdom & Pacific Ry., to be built by the Boston & Montana Development Co., have reached the mouth of the Wise River, above Dewey, Mont., and there diverted the work up the Wise River to the Elkhorn mining district, where the company owns about 40 claims, including several producing properties.

BERKELEY (Butte)—This mine of the Anaconda company, which has been closed for some time for repairs and to make the change from steam to compressed-air power, will resume operations about Nov. 1. Up to date the Anaconda company has equipped 10 of the larger hoists at its mines with air power; eight auxiliary engines have been similarly changed.

ALEX-SCOTT (Butte)—The shaft has reached a depth of 145 ft. below the 1900-ft. level and will be continued to the 2200-ft. level. A station will be cut on the 2000-ft. level this month and a crosscut started south to intersect the vein. Daily shipments of 150 to 200 tons of ore are being made to the East Butte smelting plant, of which about 50 tons is first class, averaging between 9% and 13% copper, and the remainder second class, carrying about 4½% copper. The expense of hoisting ore has been materially lessened by the new hoisting equipment by which hoisting is done with a double-deck cage. Good ore was recently encountered on the 1900-ft. level

### Granite County

ROYAL BASIN (Philipsburg)—At this property of the Royal Basin Mining & Milling Co., good copper and silver ore has been opened. The vein was encountered Sept. 28 in a crosscut tunnel being driven to open the mine at a depth of 800 ft. After drifting a few feet in ore of concentrating grade a shoot of ore was encountered which assays 7½% copper and from 5 to 70 oz. silver.

EAST BROOKLYN—By a supreme court decision handed down at Helena Oct. 6, R. S. Leveredge and F. F. Schur, lost the suit which they instituted some time ago against Thomas [illegible] and Timothy Connors to quiet title to a portion of the East Brooklyn lode claim which conflicted with a prior location of the Speculator lode. In rendering the decision the court held that the law concerning the location of a claim requires that, taking the discovery shaft as the initial point, the boundaries must be so definitely located that they can be definitely traced, and that the declaratory statement must contain directions which will enable a person of reasonable intelligence to find the claim and run the lines. It was ascertained that the law was not fully followed in the location of the Speculator lode, and the defendants were allowed to remain in possession of the disputed territory.

## NEVADA

### Douglas County

LONGFELLOW (Gardnerville)—An oreshoot showing free gold was struck on the 100-ft. level recently.

### Eureka County

NEVADA CENTRAL COPPER CO. (Palisade)—Active exploration work has been resumed after a shut-down of two months due to loss of the engine house by fire during last July.

### Humboldt County

THE PRESENT PRODUCTION OF ROCHESTER is about 100 tons daily, assaying from $30 to $250. The population of the camp is about 700.

A NEW PLANT FOR THE CINNABAR DEPOSIT near Gold Banks, it is stated, will be built in the near future. The deposit is large and the ore is of good grade and can be mined from opencuts.

ROCHESTER WEAVER VS. ROCHESTER NUGGET—The trouble between these two companies, arising from the nonpayment of royalties by the defendant company, a lessee on the ground of the plaintiff, has been settled by compromise out of court.

SEVEN TROUGHS COALITION (Seven Troughs)—A Sullivan, type E, diamond drill has been installed, and the first work was done on the 800-ft. level. The drill will be used in prospecting for parallel veins, and for portions of the main vein which have been faulted.

### Lyon County

McDONALD-BOULTER (Mason Pass)—The West End company, of Tonopah, has secured an extension of time on its lease on this property and development will be continued

NEW YERINGTON (Yerington)—The 400-ft. level is being advanced as rapidly as possible, another shift having been put on for this purpose. A winze is being sunk in ore from the tunnel level.

NEVADA COPPER BELT R.R. (Mason)—Two new Packard auto trucks have been put on between Hudson and Aurora. A passenger auto and an auto truck will be put on the road from Yerington station to Yerington.

YERINGTON-BULLION (Yerington)—Leaching tests on ores from this property by the Foss International Ore Reduction Co., of San Francisco, have been satisfactory, a 95% extraction is reported as having been made.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Oct. 2, 1913, were as follows: From Mason Valley mine, 2237 tons; from Nevada-Douglas, 797 tons; from other mines, 1032; total, 4066, or a daily average of 581 tons. During the same week four cars of matte were shipped.

SMITH VALLEY MINES CO. (Smith Valley)—A branch line from the Pine Grove power line will be built, and complete electric equipment will be installed. It is reported that a six-mile branch from the Nevada Copper Belt R.R. will be built. Ore of good grade has been struck in the tunnel being driven to connect with the shaft.

### Mineral County

EXCELSIOR MOUNTAIN MINING CO.—This property, 17 miles south of Hawthorne, has increased its force recently and is doing extensive development work. A power line extension from the Lucky Boy is contemplated.

BLUE LIGHT (Mina)—The owners of this property, after having a complete examination made, have decided to reopen it. In the past a considerable tonnage of copper ore assaying well in gold and silver was shipped.

### Nye County

PLACER MINING AT ROUND MOUNTAIN has been discontinued for the winter on account of the shortage of water. These placers are among the most profitable now being worked in the state, some of the gravel assaying $5 per cubic yard.

SULLIVAN & LONN (Millett)—The new 10-stamp mill is operating steadily, and treating ore from the mine which assays $25. A shipment of bullion was made recently.

## NEW MEXICO

### Socorro County

OAKS (Mogollon)—A new winze has been started in tunnel "B" of the East End tunnel group and will be sunk 50 ft. and drifts will be driven from the bottom.

PACIFIC MINES CO. (Mogollon)—Drifts on the 240-ft. level are being advanced both north and south. This work recently encountered two oreshoots not exposed in upper levels.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—The road to the property in Cooney has been rebuilt up the cañon and the new sinking pump will be delivered and installed as soon as possible.

MAUD MINING CO. (Mogollon)—The water line extending up Silver Creek, through Mogollon, about two miles from the mill, is being taken up and new pipe laid in many places. The compressor plant recently installed is giving satisfaction.

TREASURE MINING & REDUCTION CO. (Mogollon)—The electric hoist is being overhauled and other work done preparatory to placing a large crew in the mine. Some changes in the milling plant are contemplated. Power is obtained from the company's hydro-electric plant on Whitewater

## TENNESSEE

### Polk County

TENNESSEE COPPER CO. (Copper Hill)—The remarkable gas conditions continue by virtue of the regular and systematic use of the ore beds recently described in the "Journal"

## UTAH

### Beaver County

MOSCOW (Star District)—During September, 12 cars of ore were marketed. Good progress is being made in the work between the 700- and 800-ft. levels, and the new three-compartment shaft is down over 40 ft. This shaft is to be sunk to the 1000-ft. level, and will connect with the workings from which ore is being extracted.

LEONORA MINING & MILLING CO. (Star District)—This property adjoins the Red Warrior, Moscow, Cedar-Talisman and Majestic. An examination has recently been made, and a report to stockholders states that the surface showings are as good or better than at the adjoining producing properties. A campaign of development has been outlined, including the sinking of a shaft to the 300-ft. level.

### Juab County

SEPTEMBER SHIPMENTS FROM TINTIC amounted to 595 cars, or approximately 29,750 tons of ore. This output came from 26 shippers, and is slightly less than normal. The highest output of any month this year has been that of May amounting to 901 cars.

LEHI TINTIC—Operations are to be resumed.

IRON BLOSSOM (Silver City)—A meeting will be held Oct. 10, when the usual dividend is expected.

COLORADO (Silver City)—Milling ore has been developed below the old stopes and east and west of the main ore channel.

VICTORIA (Robinson)—The Eagle & Blue Bell Co. is said to have an option on this property, which expires in the near future. A strike was made recently on the 1200 level.

OPOHONGO (Mammoth)—About 350 ft. of drifting was done during August and September, in the tunnel. The objective point is the main vein, which, it is thought, will be cut in the next 200 ft.

TINTIC MINING & DEVELOPMENT (Mammoth)—Operations have been suspended for the time being at this property, which adjoins the Gold Chain, Opohongo, and Mammoth. Work has been done to a depth of 800 feet.

GRAND CENTRAL (Robinson)—Shipments have been suspended while the shaft is being retimbered between the 400-ft. level and the surface. The retimbering is expected to take about two weeks, after which production will be resumed. Much ore is reported to be in sight.

EAGLE & BLUE BELL (Eureka)—The annual meeting was held Oct. 4, and the old board of directors reëlected. During the last year dividends were started, and three were paid. The earnings for the first nine months were approximately $140,000. It is generally understood that this company's option on the Victoria expired Sept. 30, and a continuation was not granted.

### Salt Lake County

SOUTH HECLA (Little Cottonwood)—Active development is being done at this property, and the raise from the Dwyer level will soon reach the No. 1 stope. This will greatly facilitate the handling of ores. Drifting is being done toward the old Wedge shaft, in promising ground.

BINGHAM MINES (Bingham)—This property, formerly the old Bingham Consolidated, was recently visited by eastern directors. Beside the Dalton & Lark, Brooklyn and Commercial mines in Bingham, the company owns 78% of the outstanding Eagle & Blue Bell stock, and has received a good share of the latter company's dividends.

CARDIFF (Big Cottonwood)—Progress is being made in the work on the lower tunnel. On Oct. 1, the face was in 1415 ft. This beyond the upper workings, and is about 300 ft. vertically under the old Prince tunnel. The quartzite-limestone contact is being followed. Ore is being mined from an 85-ft. winze on the level above. During the last year 600 tons of ore were shipped from the upper workings.

MONTANA-BINGHAM (Bingham)—The development and transportation tunnel being driven by this company is in over half of the proposed length, and progressing at the rate of three to five feet daily. The face is in porphyry, showing pyrite and some chalcopyrite. About 300 ft. of mineralized ground has been cut. The tunnel will prospect and eventually develop a part of the eastern section of the camp, including the Fortuna, Keystone, Conger and other ground.

## WASHINGTON

### Ferry County

KNOB HILL (Republic)—Regular daily shipments averaging 55 tons are being made to the San Poil mill.

HOPE—This company has a force of men breaking ore in the course of development, and is making occasional shipments.

BEN HUR (Republic)—The shaft is being sunk to the 600-ft. level, and about 1500 tons of ore are ready for shipment.

HALL CREEK (Meteor)—A power plant and concentrator with a capacity of 75 tons per day are being built at this property, and will be in operation soon.

### Okanogan County

PRIZE (Oroville)—This mine, owned by the Ellemeham Operating & Development Co., has been equipped with electric power, and a 90-day test run will be made in the near future.

### Spokane County

TUNGSTEN-KING—Operations at this mine have been resumed. A strike has been reported at the property of the Harrison-Beard company. Both properties are located about 10 miles north of Spokane. All of the tungsten properties in this locality are showing more activity than for some time past.

### Stevens County

SECURITY COPPER (Chewelah)—Just as soon as the wagon road is completed, operations will begin.

## WISCONSIN

### Platteville District

WEST HILL (Platteville)—This prospect is showing up well and a concentrator will be built.

VINEGAR HILL (Strawbridge)—This company is drilling the Charles Smith land east of Strawbridge and also the Kennedy land at Vinegar Hill.

BIDDICK (Livingston)—Bock, Meyer & Brown have opened up a rich orebody on this land which appears to be a continuation of the Coker range at Livingston.

GREAT WESTERN (Galena)—A big run of heavy sheet jack has been opened up by shaft on the Brown land, formerly known as the Pittsburgh, four miles south of Galena. Pittsburgh men are interested in the property.

MARTIN (Benton)—The Vinegar Hill Zinc Co. has completed shaft sinking and the construction of a 150-ton mill on the Martin land one mile south of Benton; the Cottingham and Strawbridge adjoining, and embracing in all 300 acres, have been thoroughly proved by churn drill.

## CANADA

### British Columbia

BRITANNIA (Britannia Beach)—This company, which is installing a plant for the separation of its ore by a flotation process, has ordered more Hardinge mills therefor, which will make the present installation comprise nine mills.

### Ontario

PEARL LAKE (Schumacher)—It is officially stated that the mill will not be built until next year.

MAPES JOHNSTON—A winding up order has been granted by the courts against this company, which is working a claim near Silver Lake in the Montreal River district.

SCHUMACHER (Timmins)—A new main working shaft is being made by a raise from the 100-ft. level of the old workings. The shaft will be timbered to the 100-ft. level and be sunk to 200 feet.

HOLLINGER (Timmins)—This mine has completed its first year as a dividend payer, 13 four-weekly disbursements having been paid, amounting in all to $1,170,000. Up to Aug. 17, $1,597,065 had been realized in profits.

HUDSON BAY (Cobalt)—The production for August amounted to $73,150. The holding company known as the Hudson Bay Mines, Ltd., has declared a dividend of 2½% which with the cash on hand, will permit the operating company to pay three dividends of 300%.

NIPISSING (Cobalt))—In crosscutting from No. 64 shaft at the 650-ft. level, the vein encountered is 16 in. wide, but carries low-grade ore as at the 440- and 270-ft. levels. An additional 250 ft. of sinking is to be done, making a total depth of the shaft of 900 ft. or the deepest in the camp. This work is of interest as being the first attempt to explore the Keewatin formation at depth.

McKINLEY-DARRAGH (Cobalt)—High-grade ore has been struck in the face of No. 40 vein at the 150-ft. level. The ore is stated to run 10,000 oz. per ton. It is too heavy to crush and is being hand-sorted. The vein was cut a month ago and the general average of the ore has been over 5000 oz. Vein 36 has shown improvement and a shoot of 2000-oz. ore is being developed. The production in August was 212,098 oz. of which 142,662 was from the Savage mine.

DOME (South Porcupine)—For the five months, April to August inclusive, 58,885 tons of ore were milled, giving a gross return of $519,666. The average value of the ore for the five months was $9.62 per ton and the average operating costs $3.86 per ton. During August, the average value of the ore was $6.31 per ton, which is about the grade the management expect to have to handle in the future. With the additional 40 stamps which are being installed, the costs should be reduced to about $3.50 per ton.

## MEXICO

### Durango

CIA MINERA DE PENOLES (Mapimi)—The mines at Ojuela and the smelting works at Mapimi were closed down about the first of October. With a few exceptions Americans and other foreigners have left the district. Rudolf Weniger, the assistant superintendent of mines, went to Torreon just before the exodus to arrange for the leaving of the foreigners. He was murdered somewhere between Torreon and Mapimi. Telegraphic inquiries from New York have elicited no details.

## NICARAGUA

### Pis Pis District

BONANZA (Bluefields or Cape Gracias)—This and several other nearby mines have been sold to the Canadian Agency, Ltd., of New York. The mine was discovered and operated up to the time of sale by Joe Lapierre. He operated a mill of eight or ten 3½-ft. Huntington mills, and a cyanide plant. Several years ago the property was examined for F. W. Bradley and associates, of San Francisco, but a question of legal rights of acquiring the extension of the orebody precluded a sale. The ore is in a hill and is mined by a system of adits and glory holes. While not much developed a good quantity of $9 gold ore was considered in sight with an enormous tonnage in prospect.

## FRANCE

A COLLIERY DISASTER is reported to have occurred Oct. 14 in the south of France.

## SPAIN

THE RAILROAD STRIKE has been renewed on the road of the Rio Tinto mines to Huelva. Later dispatches state that a general strike has been voted at Rio Tinto.

## WALES

A COLLIERY EXPLOSION is reported to have killed many miners in the Universal mine at Senghenydd, 10 miles from Cardiff, Oct. 14.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Oct. 15

The metal markets have not been active, but rather quiet. At the same time there are no signs of depression and the undertone is generally good.

## Copper, Tin, Lead and Zinc

**Copper**—Consumers both in this country and Europe continue to hold aloof, but from all reports, they are busy and will soon have to replenish their depleted stocks. The statistical position of copper is so strong that the danger that any accidental reduction in production will create a scarcity of copper is ever present, on account of the exceedingly low stocks. In consequence of this, the principal producers have steadily maintained their asked price of 16⅞c., delivered, usual terms, being confident that the market will speedily come back to that figure. In the meanwhile dealers, traders, and the agencies having facilities for arbitrage transactions have accepted materially lower figures. The range of prices in the London standard market has permitted the cheap offering of refined copper and the covering of such sales by the purchase of raw material. During the last week electrolytic has been freely offered at 16⅜@16¼c., delivered, usual terms, and 16⅛c. was accepted on some business.

The situation in Lake copper remains the same as last week. Two or three of the small mines have a little to sell and occasional carloads are disposed of, but outside of them no one has this kind of copper except the Calumet & Hecla, which is taking care of its regular customers on private terms. This market is difficult to quote. The occasional carloads fetch about 16¾c. The C. & H. copper undoubtedly is billed higher. We quote this market at 16¾@17c. nominally.

At the close we quote electrolytic in cakes, ingots and wirebars at 16@16.10 cents.

Casting copper has again been rather pressed for sale. We quote 15.85@15.90c. as an average for the week.

The London standard market has been under pressure of bear selling and declined steadily, reaching £70 10s. for spot and three months on Tuesday, Oct. 14. On Wednesday, Oct. 15, the market reacted, and closes at £71 12s. 6d. for spot and £71 13s. 9d. for three months.

Speculative sentiment in copper is affected by the general feeling of caution and hesitancy which pervades the other speculative markets, and it is believed that if this feeling should change, the intrinsic strong position of the metal would again lead speculators to take hold, and that this might find immediate expression in the London standard market, which is comparatively low.

Base price of copper sheets is now 22c. for hot rolled and 23c for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Exports of copper from New York for the week were 7267 long tons. Our special correspondent gives the exports from Baltimore at 2957 tons for the week.

**Tin**—The market continued exceedingly dull. Efforts were made by domestic dealers to market quantities of tin by underquoting the London market to the extent of about ¼c. per lb., without, however, attaining their object. Prices declined to a slight extent in the London market and became firmer again at the close, when they stand at £184 15s for spot and £185 for three months, and about 40⅜c. for October tin here.

Messrs. Robertson & Bense report the receipts of tin ore and concentrates at Hamburg, Germany in September at 3230 tons, all from Bolivia.

Shipments of tin from the Straits in September were 5160 long tons. For the nine months ended Sept. 30 the total shipments were 40,440 tons in 1912, and 46,860 in 1913, an increase of 6420 tons.

**Lead** continues pressed for sale, and lower prices have again been accepted. For desilverized 4.50c has been paid, which is still the price of the American Smelting & Refining Co., and sales of Missouri lead have been made at 4.45@4.47½c., but as early as Oct. 10 some tonnage business was placed at 4.40c. At the close we quote New York at 4.40@4.45c. and St. Louis at 4.25@4.30 cents.

The London market is somewhat lower, Spanish being quoted £19 17s. 6d., and English lead £1 higher.

**Spelter**—The market has been somewhat more active, due to the fact that consumers having held off some time, have now reached the point where they must again come into the market. The concessions offered to them by sellers have, moreover, been attractive. The demand that has manifested itself has not yet been large, and it has been freely met, but there is a rather more hopeful feeling. At the close spelter is quoted at 5.10@5.15c., St. Louis, and 5.25@5.30c., New York.

Good ordinary spelter at London is quoted £20 12s. 6d., and specials £21 17s. 6d. per ton.

Base price of zinc sheets is now $7.75 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Extras and discounts unchanged.

The Mineral Point Zinc Co. has started its eighth block at Depue, Ill., giving seven blocks in operation, one of the old blocks being out for repairs.

### DAILY PRICES OF METALS

NEW YORK

| Oct. | Sterling Exchange | Silver | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 9 | 4.8550 | 60⅞ | *16¾ @17 | 16.15 @16.25 | 40½ | 4.40 @4.50 | 4.25 @4.35 | 5.30 @5.35 | 5.15 @5.20 |
| 10 | 4.8565 | 60⅞ | *16¾ @17 | 16.10 @16.20 | 40¼ | 4.40 @4.50 | 4.25 @4.35 | 5.25 @5.30 | 5.10 @5.15 |
| 11 | 4.8560 | 61¼ | *16¾ @17 | 16.05 @16.15 | 40¼ | 4.40 @4.50 | 4.25 @4.35 | 5.25 @5.30 | 5.10 @5.15 |
| 13 | | . | | ........ | . . | . . | 4.25 @4.35 | ...... | 5.10 @5.15 |
| 14 | 4.8555 | 61⅜ | *16¾ @17 | 16.00 @16.10 | 40¼ | 4.40 @4.45 | 4.25 @4.30 | 5.25 @5.30 | 5.10 @5.15 |
| 15 | 4.8555 | 61¼ | *16¾ @17 | 16.00 @16.10 | 40⅜ | 4.40 @4.45 | 4.25 @4.30 | 5.25 @5.30 | 5.10 @5.15 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Oct. | Silver | Copper | | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spot | | | | | | | | | |
| | | £ per Ton | Cts per Lb. | 3 Mos | Best Sel'td | Spot | 3 Mos | £ per Ton | Cts. per Lb. | £ per Ton | Cts. per Lb |
| 9 | 28¼ | 72⅜ | 15.72 | 72⅜ | 78¾ | 185¼ | 186 | 20¼ | 4.40 | 20¾ | 4.51 |
| 10 | 28¼ | 71¼ | 15.48 | 71¼ | 77¾ | 184¼ | 184½ | 20⅛ | 4.37 | 20¾ | 4.51 |
| 11 | 28¼ | | | | | | | | | | |
| 13 | 28¼ | 71⅛ | 15.45 | 71⅛ | 77 | 184 | 184½ | 20⅛ | 4.37 | 20½ | 4.45 |
| 14 | 28 5/16 | 70½ | 15.32 | 70½ | 77 | 184½ | 184½ | 19⅞ | 4.32 | 20½ | 4.45 |
| 15 | 28¼ | 71⅝ | 15.56 | 71 11/16 | 77¾ | 184¾ | 185 | 19⅞ | 4.32 | 20⅝ | 4.48 |

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is £1 per ton = 0.2173c. per lb., approximately. Cols. 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

## Other Metals

**Aluminum**—The market continues dull, with light sales. Quotations are a shade lower at 20@20½c. per lb. for No. 1 ingots, New York. The foreign market is reported firm.

**Antimony**—A fair business has been done chiefly in moderate sized orders. Cookson's is quoted at 7.50@7.70c. per lb.; Hallett's at 7⅛@7⅜c. Hungarian Chinese and other outside brands have been a little irregular; 6⅜@6⅝c. per lb. is now asked.

**Quicksilver**—Business is fair, but prices are rather lower. New York quotations are $38 per flask of 75 lb., with 55@56c. per lb. for retail lots. San Francisco, $38 for domestic orders; special terms for export. London, £7 5s. per flask, with £7 quoted from second hands.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London remained steady at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. Egypt is still taking a large amount of gold, and Germany was also a buyer.

Imports of gold at New York week ended Oct. 11 were $453,694, chiefly from Cuba and South America. There were no exports.

**Iridium**—The price shows no change, dealers getting $83@85 per oz., New York.

**Platinum**—The market is rather unsettled yet, but the tendency is stronger. The leading dealers still ask $45, but sales have again been made at $43@44, which may be taken as the market. Hard metal is $49@52 per oz., according to grade.

Our Russian correspondent writes under date of Sept. 29, that decreased foreign demand and an increase in production brought about a decline from 9.75 to 9.35 rubles per zolotnik in August. In September the position has improved and current quotations for crude platinum, 83% metal, are 9.50 rubles per zolotnik—equal to $35.72 per oz.—at Ekaterinburg, and 36,400 rubles per pood—$35.67 per oz.—for large quantities of the same grade at St. Petersburg.

**Silver**—The market is quiet around 28¼d. Change in price depends largely upon the action of China. The chances are that the India government will not soon be in the market again; but possibly later in the fall, additional purchases may be made on that account.

Shipments of silver from London to the East, Jan. 1 to Oct. 2, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £7,843,200 | £6,189,000 | D. £1,654,200 |
| China | 933,500 | 652,000 | D. 281,500 |
| Total | £8,776,700 | £6,841,000 | D.£1,935,700 |

Exports of silver from New York week ended Oct. 11 were $1,010,702, all to London and Paris. Imports were $143,132 in value.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Oct. 11

The base price pid this week for 60% zinc ore was $42@43 per ton. The base price paid for 80% lead ore was $55 per ton.

SHIPMENTS WEEK ENDED OCT. 11

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,113,650 | 120,700 | 1,331,930 |
| Year to date | 116,415,560 | 5,416,340 | 46,453,540 |

Shipped during week to separating plants, 2,996,300 lb. zinc ore.

### JOPLIN, MO.—Oct. 11

The high price of zinc blende is $47, the base per ton of 60% zinc, $40@44 for choice grades. Concentrates carrying over 4% iron sold on a metal base of $41@42. In such buying only an assay for zinc content is made and the price based on the metal thus shown, no account of the iron content being considered. Such buying, on the blende bought by this method, is equivalent to a base of $45@46 on the present market, if the iron was assayed and deducted. Despite the declining price of blende no change is made in calamine, which is still selling at $21@23 per ton of 40% zinc, and the average of all grades is $41.60 per ton. Lead sold as high as $58, on a metal base of $54 for concentrates 80% lead. The average of all grades is $54.68 per ton.

SHIPMENTS WEEK ENDED OCT. 11

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Total sales this week | 9,887,430 | 761,410 | 1,965,160 | $276,385 |
| Total sales 41 weeks | 449,204,550 | 32,912,160 | 74,000,720 | 12,266,549 |

Blende value, the week, $212,220; 41 weeks, $9,865,246. Calamine value, the week, $10,335; 41 weeks, $425,084. Lead value, the week, $53,830; 41 weeks, $1,976,219.

## IRON TRADE REVIEW

### NEW YORK—Oct. 15

The United Statese Steel Corporation's tonnage report for September proved unexpectedly favorable, the unfilled tonnage at the close of the month being 5,003,785 tons, indicating a loss during the month of 219,683 tons, when a loss of 300,000 to 400,000 tons had been forecasted. It is estimated that the corporation ran at 92% of rated capacity, which means practically full, and booked a tonnage equal to about 74% of capacity, or about 80% of the actual shipments, a very good showing in view of current pessimistic reports as to trade activity. It is thought that the corporation's selling policy is more aggressive than that of the independents.

The passage of the new tariff has thus far occasioned no material readjustments in prices. The market continues to show a sagging tendency, but this can be explained by current trade conditions. Orders being placed are for immediate shipment, for which foreign steel could hardly be considered. The whole market is waiting, with eyes upon the railroads as likely to furnish the first important forward buying.

Pig iron in Eastern territory shows an additional number of sales and better demand, both for foundry and basic pig. Prices are generally firm. The putting of pig iron on the free list seems to have had little or no effect on the market.

**Pig-Iron Production**—The statements of the blast furnaces, as collected and published by the "Iron Age," show that on Oct. 1 there were 256 coke and anthracite stacks in blast with a total capacity of 83,375 tons daily; an increase of 975 tons over Sept. 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in September was 2,541,000 tons; for the nine months ended Sept. 30, it was 24,220,700 tons. Of this total 16,969,200 tons, or 70.1%, were made by the furnaces owned or operated by steel companies.

### PITTSBURGH—Oct. 14

Among the Pittsburgh and Valley mills there are no definite signs of the curtailment in output, which has been so long predicted. The mills seem still able to maintain practically full operations, though, of course, they are not running under extreme pressure, and it is admitted that in the majority of lines they have to make up their rolling schedules from week to week, having no accumulation of specifications except such as are dated for shipment at specified intervals. In some lines there remains an accumulation. The Carnegie Steel Co. is filled on structural shapes for three months, and on new orders cannot promise any earlier delivery than January. In merchant bars most of the mills are almost filled for as long a time. In wire products shipments are heavy, but the high point in the mill movement against the fall trade has now been passed. Tinplate specifications are relatively light, and production is at about 75% of capacity, the same being true of sheets. Plates are more frequently than formerly sold under 1.40c., while 1.40c. has become very common on shapes. Bars remain firm at 1.40c., but there is little new business to test the market; specifications against old contracts are good.

**Pig Iron**—The market continues stagnant, and with not enough nnquiry to develop what prices could really be done in bessemer or basic. In foundry iron limited inquiry has developed Valley quotations 15c. below the former market of $14. On the whole the furnaces are standing quite firm. The market stands quotable as follows, though quotations are largely nominal: Bessemer, $15.75; basic, $14; malleable, $14.25; No. 2 foundry, $13.85@14; forge, $13.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market has been quiet, but there are rumors of small lots having been sold at slight cuts. The regular quotation for prompt or forward is $50, Baltimore, with $2.16 freight to Pittsburgh.

**Steel**—The market continues soft, but definite market prices are difficult to quote since the mills are making liberal adjustments with their contract customers and thus preventing much inquiry from coming into the market. A round quotation is $23 for billets and $24 for sheet bars, at bessemer or openhearth, at maker's mill, Pittsburgh or Youngstown, but these prices could doubtless be shaded 50c. or more on inquiry for any desirable tonnage. Rods are weak at $26.50, Pittsburgh.

### IRON ORE

Settlements for imported ore in the East are now being made at 12c. off for Cuban and 15c. for other ore, the duty being removed.

Lake Superior iron ore shippers have notified owners that they will move all the ore contracted for and that they need expect no cut in allotments this fall. The announcement was a surprise to vessel owners.

Shipments of Lake Superior iron ore by ports for the season to Oct. 1 are reported by the "Iron Trade Review" as follows, in long tons:

| Port | 1912 | 1913 | Changes |
|---|---|---|---|
| Escanaba | 4,010,985 | 4,297,223 | I. 286,238 |
| Marquette | 2,567,578 | 2,573,604 | I. 6,026 |
| Ashland | 3,623,161 | 3,558,802 | D. 64,359 |
| Superior | 11,097,276 | 10,810,391 | D. 286,885 |
| Duluth... | 7,729,187 | 9,830,726 | I. 2,101,539 |
| Two Harbors | 7,310,195 | 8,194,738 | I. 884,543 |
| Totals | 36,338,382 | 39,265,484 | I. 2,927,102 |

The total September shipments were 7,258,413 tons. Deliveries to Lake Erie ports for the month were 6,047,446 tons, or 83.3% of the total.

### COKE

The coke market is still unsettled, though strong efforts are being made by the Connellsville producers to maintain the price.

**Coal Consumption in France** half-year ended June 30, metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal mined | 20,194,394 | 20,611,592 | I. 417,198 |
| Imports | 9,059,300 | 11,344,200 | I. 2,284,900 |
| Total | 29,253,694 | 31,955,792 | I. 2,702,098 |
| Exports | 1,251,034 | 891,914 | D. 359,120 |
| Consumption | 28,002,660 | 31,063,878 | I. 3,061,218 |

No allowance is made for stocks carried, but it is believed that there was no increase in these this year.

**Fuel Exports and Imports in Germany** seven months ended July 31, in metric tons:

| | Exports | Imports | | Excess |
|---|---|---|---|---|
| Coal | 19,399,643 | 6,078,982 | Exp | 13,320,661 |
| Brown coal | 36,779 | 4,147,033 | Imp. | 4,110,254 |
| Coke. | 3,972,676 | 353,585 | Exp. | 3,619,091 |
| Briquettes | 1,892,186 | 82,414 | Exp. | 1,809,742 |
| Total | 25,301,284 | 10,662,014 | Exp | 14,639,270 |

Of the briquettes exported this year 496,775 tons were made from brown coal or lignite.

### SAULT STE. MARIE CANAL TRAFFIC

The movement of freight through the Sault Ste. Marie Canals in August was 11,489,442 short tons. For the season to Sept. 1 the total movement was:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| East-bound | 31,315,627 | 35,656,964 | I. 4,341,337 |
| West-bound | 10,169,299 | 13,505,965 | I. 3,336,666 |
| Total ... | 41,484,926 | 49,162,929 | I. 7,678,003 |

The total number of vessel passages this year was 14,290, giving an average cargo of 3440 tons. The mineral freights included in the totals were, in short tons except salt, which is in barrels:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 8,990,020 | 12,362,602 | I 3,372,582 |
| Iron ore | 27,753,132 | 30,814,562 | I. 3,061,430 |
| Pig and manuf. iron | 378,163 | 238,069 | D. 140,094 |
| Copper | 60,772 | 68,931 | I 8,159 |
| Building stone | 2,282 | 5,973 | I 3,691 |
| Salt, bbl. | 405,742 | 448,272 | I 42,530 |

Iron ore was 62.7% of the total freight and coal 25.2% this year.

## CHEMICALS

### NEW YORK—Oct. 15

The general market continues fairly active with a good deal of business forward.

**Arsenic**—The market remains quiet and quotations are about the same, $3@3.25 per 100 lb. being asked. Some German material is being dumped on this market.

**Copper Sulphate**—The market is steady and fairly active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—There has been rather a break in the market. During the recent rush of orders in Europe, it appears that jobbers overbought from importers, and the importers from producers. A sudden stop of orders brought about a collapse in prices. Current quotations are unsettled; 2.25c. per lb. is asked for spot, 2.30c. for November, 2.32½c. for December, and 2.37½c. for January and forward deliveries.

### PETROLEUM

Production of oil in California in August was 8,807,186 bbl.; deliveries, 8,502,110 bbl. The number of new wells completed during the month was 50. There were 63 new rigs put up and started drilling.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | May | June | July | August | September |
|---|---|---|---|---|---|
| Alaska shipments | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 | 2,261,216 |
| Anaconda. | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 | . |
| Arizona, Ltd... | 3,200,000 | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 |
| Copper Queen . | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 | . |
| Calumet & Ariz.. | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 | 4,000,000 |
| Chino.. | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 | 4,308,296 |
| Detroit.......... | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 | |
| East Butte | 1,268,595 | 1,055,646 | 1,060,257 | 1,162,007 | .... |
| Giroux*. | 625,000 | 610,000 | 610,000 | 605,000 | .. |
| Mason Valley | 1,186,560 | 1,097,014 | 908,892 | 867,060 | .. |
| Miami.. | 1,943,900 | 2,612,000 | | | .... |
| Mammoth. | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 | 1,750,000 |
| Nevada Con | 5,933,275 | 6,344,863 | 5,403,919 | 5,989,973 | ........ |
| Ohio.. | 650,071 | 537,400 | 601,700 | 689,000 | 685,900 |
| Old Dominion ... | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 |
| Ray | 4,384,400 | 4,392,612 | 4,097,000 | 4,269,519 | |
| Shannon. | 1,080,000 | 924,000 | 880,000 | 1,248,000 | 1,232,000 |
| South Utah | 200,000 | 185,000 | 140,000 | 223,498 | . |
| Tennessee.. | §1,037,115 | 1,379,220 | 1,247,804 | 1,101,019 | 1,309,985 |
| United Verde*.. | 3,000,000 | 2,900,000 | 3,000,000 | 3,000,000 | . |
| Utah Copper Co. | 10,003,227 | 11,637,949 | 9,849,043 | 10,302,251 | . |
| Lake Superior*.. | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 | 6,950,000 |
| Non-rep. mines* | 6,300,000 | 6,000,000 | 6,200,000 | 6,200,000 | |
| Total prod | 109,824,500 | 104,051,138 | 101,758,167 | 96,769,606 | .. |
| Imports, bars, etc. | 22,205,942 | 18,255,267 | 29,029,990 | | |
| Total blister. | 132,030,442 | 122,306,405 | 130,788,157 | | |
| Imp. ore & matte | 10,528,562 | 7,497,002 | 8,527,046 | | |
| Total Amer | 142,559,004 | 129,803,407 | 139,315,203 | | 2,688,000 |
| Miami† | | . | 2,890,000 | 3,097,500 | |
| Shattuck-Arizona | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 | |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,076 | 634,238 | 618,379 | | |
| Granby. | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 |
| Mexican Cos.: | | | | | |
| Boleo†. | 2,424,800 | 1,984,640 | 2,240,720 | 2,264,640 | |
| Cananea | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 | 3,148,000 |
| Moctezuma... | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 | |
| Other Foreign: | | | | | |
| Braden, Chile. | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 |
| Cape Cop., S. Af. | 387,520 | 414,400 | | | |
| Kyshtim, Russia | 1,490,000 | 1,000,000 | 2,500,000 | | |
| Spassky, Russia | 721,280 | 835,520 | 660,800 | 1,048,320 | |
| Exports from Chile | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 | 5,600,000 |
| Australia. | 7,840,000 | 7,616,000 | 10,304,000 | 7,720,000 | 6,944,000 |
| Arrivals-Europe‡ | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 | 9,661,120 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U. S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| IX, '12 | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII.. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X | | | | 29,793,094 | 53,625,600 | 83,418,694 |

Note.—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Mining Companies—United States

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt. |
| Acacia, g | Colo | 1,438,989 | $ 1 | $ 129,618 | Jan '11 | $0.01 |
| Adams, s.l.c | Colo | 80,000 | 10 | 778,000 | Dec '09 | 0 04 |
| Ahmeek, c | Mich | 50,000 | 25 | 1,950,000 | July '13 | 5 00 |
| Alaska Mexican, g | Alas. | 180,000 | 5 | 3,241,381 | Aug. '13 | 0.30 |
| Alaska Treadwell, g. | Alas. | 200,000 | 25 | 13,385,000 | Aug. '13 | 1.00 |
| Alaska United, g | Alas. | 180,200 | 5 | 1,397,150 | Aug. '13 | 0 60 |
| Am. Zinc, Lead & Sm. | U. S. | 165,360 | 25 | 985,820 | Apr. '13 | 0 50 |
| Anaconda, c | Mont | 4,332,500 | 25 | 78,168,750 | July '13 | 0.75 |
| Argonaut, g | Calif. | 200,000 | 5 | 1,200,000 | June '10 | 0.05 |
| Arizona Copper, pf | Ariz. | 1,426,120 | 1.20 | 1,831,011 | May '13 | |
| Arizona Copper, com. | Ariz. | 1,519,896 | 1 20 | 15,983,475 | July '13 | 0.48 |
| Bagdad-Chase, g., pf. | Calif. | 84,819 | 5 | 202,394 | Jan. '09 | 0.10 |
| Baltic, c | Mich. | 100,000 | 25 | 7,750,000 | Dec. '12 | 7.00 |
| Bingham N. H., c. | Utah | 228,690 | 5 | 317,088 | Sept. '13 | 0.10 |
| Bonanza Dev., g | Colo | 300,000 | 1 | 1,425,000 | Oct. '11 | 0.20 |
| Bunker Hill Con., g | Calif. | 200,000 | 1 | 771,000 | Sept. '13 | 0 05 |
| Bunker Hill & Sul., l.s | Ida | 327,000 | 10 | 14,500,350 | Sept. '13 | 0 20 |
| Butte-Alex Scott, c. | Mont | 74,000 | 10 | 111,000 | June '13 | 0.50 |
| Butte & Ballaklava, c | Mont | 250,000 | 10 | 125,000 | Aug. '10 | 0.50 |
| Caledonia, l.s.c | Ida | 1,300,000 | 1 | 52,000 | June '10 | 0.01 |
| Calumet & Arizona, c | Ariz | 596,353 | 10 | 15,179,882 | Sept. '13 | 1.25 |
| Calumet & Hecla, c | Mich. | 100,000 | 25 | 122,650,000 | Sept. '13 | 10.00 |
| Camp Bird, g.s | Colo | 1,100,051 | 5 | 9,650,812 | Aug. '13 | 0.24 |
| Centen'l-Eur., l.s.g.c | Utah | 100,000 | 5 | 3,750,000 | Apr. '13 | 1.50 |
| Center Creek, l.z. | Mo | 100,000 | 10 | 425,000 | July '13 | 0.05 |
| Champion, c. | Mich | 100,000 | 25 | 8,000,000 | June '13 | 1.00 |
| Chief Consolidated, s.g.l. | Utah | 876,453 | 1 | 175,290 | Sept. '13 | 0.10 |
| Cliff, g | Utah | 300,000 | 1 | 120,000 | Jan '13 | 0.10 |
| Cliff, g | Alas. | 100,000 | 1 | 180,000 | Nov. '12 | 0.05 |
| Colo. Gold Dredging | Colo | 100,000 | 10 | 300,000 | Aug. '13 | 0.25 |
| Colorado, l.s.g. | Utah. | 1,000,000 | 0.20 | 2,570,000 | Dec. '12 | 0.03 |
| Columbus Con., g.s | Utah. | 285,540 | 5 | 226,832 | Oct. '07 | 0.20 |
| Commercial Gold | Ore. | 1,750,000 | 1 | 43,750 | Dec. '10 | 0.00½ |
| Con. Mercur, g | Utah. | 1,000,000 | 1 | 3,415,313 | July '12 | 0.03 |
| Continental, z.l. | Mo. | 22,000 | 25 | 297,000 | July '13 | 0.50 |
| Copper Range Con., c. | Mich | 393,445 | 100 | 13,788,175 | July '13 | 0.75 |
| Daly Judge, s.l. | Utah. | 300,000 | 1 | 585,000 | June '13 | 0.15 |
| Daly West, s.l. | Utah. | 180,000 | 20 | 6,606,000 | Jan. '13 | 0.15 |
| Doctor Jackpot, g | Colo. | 3,000,000 | 0.10 | 45,000 | Mar. '11 | 0 00½ |
| Doe Run, l | Mo | 65,782 | 100 | 3,500,974 | Sept. '13 | 1 00 |
| Elkton Con., g | Colo | 2,500,000 | 1 | 3,079,460 | Aug. '13 | 0.02 |
| El Paso, g | Colo | 490,000 | 5 | 1,658,545 | Mar. '13 | 0.12½ |
| Ernestine, g.s | N.M. | 300,000 | 5 | 400,000 | Dec. '12 | 0 00½ |
| Fed. M. & S., com | Idaho. | 60,000 | 100 | 2,708,750 | Jan. '09 | 1.50 |
| Fed. M. & S., pf. | Idaho | 120,000 | 100 | 9,207,851 | Sept. '13 | 1.50 |
| Florence, g | Nev. | 1,050,000 | 1 | 840,000 | Apr. '11 | 0.10 |
| Frances-Mohawk, g | Nev. | 912,000 | 1 | 546,000 | Jan. '08 | 0.05 |
| Free Coinage, g | Colo | 10,000 | 100 | 180,000 | Dec '09 | 1.00 |
| Fremont Con., g | Calif. | 200,000 | 2 50 | 206,000 | Sept. '13 | 0.02 |
| Frontier, z | Wis. | 1,250 | 100 | 173,772 | Sept. '13 | 2.00 |
| Gemini-Key'ne, l.g.s | Utah. | 5,000 | 100 | 2,110,000 | May '13 | 10.00 |
| Gold Chain, g | Utah. | 1,000,000 | 1 | 130,000 | May '13 | 0.03 |
| Gold Coin of Victor. | Colo. | 1,000,000 | 1 | 1,350,000 | Feb. '09 | 0.02 |
| Gold Dollar Con | Colo | 2,500,000 | 0.10 | 100,000 | Dec. '12 | 0.00½ |
| Gold King Con., g. | Colo. | 5,750,370 | 1 | 1,407,319 | Dec. '11 | 0.03 |
| Golden Cycle, g | Colo | 1,500,000 | 5 | 2,531,000 | Sept. '13 | 0.02 |
| Golden Star, g. | Ariz. | 400,000 | 5 | 140,000 | Mar. '10 | 0.05 |
| Goldfield Con., g | Nev. | 3,558,367 | 10 | 24,906,811 | Apr. '13 | 0.30 |
| Grand Central, g | Utah. | 500,000 | 1 | 1,545,750 | Sept '13 | 0.05 |
| Granite, g | Colo. | 1,650,000 | 1 | 269,500 | Nov. '12 | 0.01 |
| Hazel, g | Cal | 900,000 | 1 | 873,000 | Nov. '12 | 0.01 |
| Hecla, l.s | Idaho | 1,000,000 | 0 25 | 2,910,000 | Sept. '13 | 0.02 |
| Hercules, l.s | Idaho. | 1,000,000 | 1 | 3,650,000 | July '11 | 0 06 |
| Homestake, g | S. D | 218,400 | 100 | 33,531,045 | Sept '13 | 0.65 |
| Horn Silver, l.s.z | Utah. | 400,000 | 25 | 5,662,000 | Sept '07 | 0 05 |
| Iowa, g.s.l | Colo | 1,666,667 | 1 | 216,832 | July '13 | 0 00½ |
| Iowa-Tiger Leasing g.s | Colo. | 12,655 | 1 | 13,921 | Jan. '12 | 0 10 |
| Iron Blossom, s.l.g. | Utah. | 1,000,000 | 0.10 | 1,670,000 | July '13 | 0.10 |
| Iron Silver, s.l.g | Colo | 500,000 | 20 | 4,700,000 | Apr. '13 | 0.10 |
| Jamison, g | Cal | 390,000 | 10 | 378,300 | Jan. '11 | 0.02 |
| Jerry Johnson, g | Colo | 2,500,000 | 0 10 | 150,000 | Aug '11 | 0 01 |
| Kendall, g | Mont | 500,000 | 5 | 1,475,000 | Nov '12 | 0 02 |
| Kennedy, g | Cal | 100,000 | 100 | 1,831,001 | Apr. '10 | 0.03 |
| King of Arizona, g | Ariz. | 200,000 | 1 | 396,000 | Aug '09 | 0 12 |
| Klar Piquette, z.l | Wis. | 20,000 | 1 | 162,500 | Dec '12 | 0.50 |
| Knob Hill, g | Wash | 1,000,000 | 1 | 45,000 | May '12 | 0.00½ |
| Liberty Bell, g | Colo | 130,551 | 5 | 522,093 | Oct. '10 | 1.00 |
| Little Bell, l.s | Utah | 300,000 | 1 | 75,000 | Mar. '11 | 0.05 |
| Little Florence, g | Nev. | 1,000,000 | 1 | 430,000 | Jan. '08 | 0.03 |
| Mammoth, g.s.c | Utah | 400,000 | 25 | 2,300,000 | July '13 | 0 05 |
| Mary McKinney, g | Colo | 1,309,252 | 1 | 1,051,373 | July '13 | 0.02 |
| May Day, g.s.l | Utah. | 800,000 | 0 25 | 148,000 | Feb. '13 | 0.03 |
| Mexican, g.s | Nev. | 201,600 | 2 50 | 20,160 | Aug. '11 | 0.10 |
| Miami, c | Ariz. | 664,993 | 5 | 2,216,708 | Aug. '13 | 0 50 |
| Modoc, g.s | Colo. | 500,000 | 1 | 275,000 | Dec. '11 | 0.01 |
| Mohawk, c | Mich. | 100,000 | 25 | 3,175,000 | Aug. '13 | 2.00 |
| Monarch-Mad'a, g.s.l | Colo | 1,000,000 | 1 | 40,000 | May '11 | 0.01 |
| Montana-Tonop., s.g. | Nev. | 921,865 | 1 | 530,000 | Dec. '12 | 0.10 |
| Mountain, c | Cal. | 250,000 | 25 | 4,216,250 | May '08 | 0.44 |
| National, g | Nev. | 750,000 | 1 | 570,000 | May '11 | 0.10 |
| Nevada Con., c | Nev. | 1,999,394 | 5 | 12,987,776 | Sept. '13 | 0.37½ |
| New Century, z.l | Mo | 330,000 | 1 | 237,600 | Oct. '09 | 0.01 |
| New Idria, q | Cal | 100,000 | 5 | 1,720,000 | Sept. '13 | 0.10 |
| North Butte, c. | Mont. | 410,000 | 15 | 11,070,000 | July '13 | 0.50 |
| North Star, g | Cal. | 250,000 | 10 | 3,936,989 | Sept. '13 | 0.20 |
| Old Domin'n, M. & Sm. | Ariz. | 162,000 | 25 | 3,158,500 | July '13 | 1.25 |
| Ophir, s.g | Nev. | 201,600 | 3 | 2,068,360 | Jan. '12 | 0.10 |
| Opohongo, g.s.l | Utah. | 898,978 | 0 25 | 80,907 | Jan. '13 | 0.02 |
| Oroville Dredging | Cal. | 700,000 | 5 | 1,383,036 | Dec '09 | 0 12½ |
| Osceola, c | Mich. | 96,150 | 25 | 11,698,925 | July '13 | 3.00 |
| Parrot, c | Mont. | 229,850 | 10 | 7,255,750 | May '13 | 0.15 |
| Pearl Con., g. | Wash. | 1,909,711 | 0 05 | 181,422 | Dec 10 | 0.02 |
| Pharmacist, g | Colo | 1,500,000 | 1 | 87,500 | Feb. '10 | 0.00½ |
| Pioneer, g | Alas. | 5,000,000 | 1 | 4,041,526 | Oct. '11 | 0.03 |
| Pittsburgh-Idaho, l | Ida | 803,000 | 1 | 216,810 | Oct. '12 | 0.04 |
| Pittsburgh Silver Peak, g | Nev. | 2,790,000 | 1 | 667,600 | Sept. '13 | 0 02 |
| Portland, g | Colo | 3,000,000 | 1 | 9,337,080 | Aug '13 | 0.02 |
| Quilp | Wash | 1,500,000 | 1 | 67,500 | Feb. '13 | 0.01 |
| Quincy, c | Mich. | 110,000 | 25 | 20,842,500 | Sept. '13 | 1.25 |
| Republic, g | Wash. | 1,000,000 | 1 | 85,000 | Dec. '10 | 0.01½ |
| Rochester, l.z. | Mo. | 4,900 | 100 | 188,396 | Dec. '10 | 0.50 |
| Round Mountain, g. | Nev. | 866,426 | 1 | 363,365 | Aug. '13 | 0 04 |

## Mining Companies—United States—*(Continued)*

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt |
| Seven Troughs Coal, g. | Nev. | 1,500,000 | $ 1 | $ 37,500 | July '12 | $0 02½ |
| St. Joseph, l | Mo | 1,000,000 | 10 | 8,960,357 | Sept. '13 | 0 10 |
| Shannon, c. | Ariz. | 300,000 | 10 | 750,000 | Jan. '13 | 0 50 |
| Shattuck-Arizona, c. | Ariz. | 350,000 | 10 | 1,400,000 | July '13 | 0 50 |
| Silver King Coal, l.s. | Utah. | 1,250,000 | 5 | 2,159,885 | Apr. '13 | 0.15 |
| Sioux Con, s.l.g | Utah. | 745,389 | 1 | 872,097 | July '11 | 0.04 |
| Skidoo, g | Cal. | 1,000,000 | 5 | 275,000 | May '12 | 0 02½ |
| Smuggler, l.s.z | Colo. | 1,000,000 | 1 | 2,235,000 | Nov. '06 | 0 03 |
| Snowstorm, c.g. | Ida | 1,500,000 | 1 | 1,169,610 | July '13 | 0 01½ |
| South Eureka, g | Calif | 299,981 | 1 | 366,881 | Apr. 12 | 0 07 |
| Standard Con., g.s. | Cal | 178,394 | 10 | 5,229,809 | Jan. '12 | 0 10 |
| Stratton's Ind., g. | Colo. | 1,000,000 | 0.60 | 486,000 | May '13 | 0 06 |
| Success, z. | Ida | 1,500,000 | 1 | 925,000 | May '13 | 0 02 |
| Superior & Pitts., c | Ariz. | 1,499,793 | 10 | 5,369,262 | Sept. '13 | 0.38 |
| Tamarack, c | Mich. | 60,000 | 25 | 9,420,000 | July '07 | 4 00 |
| Tennessee, c | Tenn. | 200,000 | 25 | 3,631,520 | Sept. '13 | 0.75 |
| Tomboy, g.s. | Colo | 300,000 | 4 85 | 3,069,090 | June '13 | 0.48 |
| Tom Reed, g | Ariz. | 909,555 | 1 | 1,482,439 | Sept. '13 | 0 06 |
| Tonopah Belm't, s.g. | Nev. | 1,500,000 | 1 | 4,718,003 | July '13 | 0 25 |
| Tonopah Ext., g.s. | Nev. | 943,433 | 1 | 377,370 | July '13 | 0 02½ |
| Tonopah of Nev., s.g. | Nev. | 1,000,000 | 1 | 10,850,000 | July '13 | 0.40 |
| Tri-Mountain, c. | Mich | 100,000 | 25 | 1,250,000 | Dec. '12 | 3 00 |
| Tuolumne, c | Mont. | 800,000 | 1 | 520,000 | May '13 | 0 10 |
| Uncle Sam, g.s.l | Utah. | 500,000 | 1 | 495,000 | Sept. '11 | 0 05 |
| United Cop. Min., c | Wash. | 1,000,000 | 1 | 120,000 | July '13 | 0.01 |
| United (Crip. Ck.) g. | Colo | 4,000,100 | 1 | 440,435 | Jan. '10 | 0.04 |
| United Globe, c | Ariz. | 23,000 | 10 | 1,357,500 | July '13 | 7.50 |
| United Verde, c. | Ariz. | 300,000 | 10 | 32,572,000 | Aug. '13 | 0.75 |
| Utah, s.l. | Utah | 100,000 | 10 | 325,000 | Dec. '10 | 0.02 |
| Utah, c. | Utah. | 1,562,599 | 10 | 19,803,111 | Sept. '13 | 0.75 |
| Utah Con., c | Utah. | 300,000 | 5 | 7,800,000 | July '13 | 0.50 |
| Valley View, g | Colo | 1,000,000 | 1 | 240,000 | Dec. '10 | 0.04 |
| Victoria, g.s.l | Utah. | 250,000 | 1 | 207,500 | Mar. '10 | 0.04 |
| Vindicator Con., g | Colo | 1,500,000 | 1 | 2,722,000 | July '13 | 0.03 |
| Wasp No. 2, g | S D. | 500,000 | 1 | 431,965 | Sept. '13 | 0.02 |
| Wellington Mines, g | Colo | 10,000,000 | 1 | 260,000 | July '13 | 0.00½ |
| Wolverine, c | Mich | 60,000 | 25 | 7,940,000 | Apr. '13 | 5 00 |
| Work, g. | Colo | 1,500,000 | 1 | 172,500 | July '08 | 0 00½ |
| Yak, s.l | Colo | 1,000,000 | 1 | 1,727,655 | July '13 | 0.02 |
| Yankee Con., g.s. | Utah. | 1,000,000 | 1 | 167,500 | Jan. '13 | 0.01 |
| Yellow Aster, g. | Cal | 100,000 | 10 | 1,166,789 | Sept. '13 | 0.05 |
| Yellow Pine, l.z.s. | Nev. | 950,000 | 1 | 294,508 | Sept. '13 | 0.02 |
| Yukon Gold, g | Alas. | 3,500,000 | 5 | 5,250,000 | Sept. '13 | 0 07½ |

## Iron, Industrial and Holding Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Amalgamated, c | Mont. | 1,538,879 | $100 | $78,968,110 | Aug. '13 | $1.50 |
| Am. Sm. & Ref., com | U. S. | 500,000 | 100 | 24,833,333 | Sept. '13 | 1.00 |
| Am. Sm. & Ref., pf | U. S. | 500,000 | 100 | 45,481,333 | Sept. '13 | 1.75 |
| Am. Smelters, pf. A. | U. S. | 170,000 | 100 | 7,875,000 | July '13 | 1.50 |
| Am. Smelters, pf. B. | U. S. | 300,000 | 100 | 11,982,000 | July '13 | 1.25 |
| Cambria Steel | Penn. | 900,000 | 50 | 17,897,500 | Aug. '13 | 0.62½ |
| Greene Cananea | U. S. | 2,471,314 | 25 | 2,426,877 | Mar. '13 | 0.25 |
| Guggenheim Expl | U. S. | 831,732 | 25 | 16,977,248 | Sept. '13 | 0.62½ |
| Inter'l Nickel, com | U. S | 115,826 | 100 | 10,089,316 | Sept. '13 | 3 00 |
| Inter'l Nickel, pfd. | U. S | 89,126 | 100 | 4,140,503 | Aug. '13 | 1.50 |
| Inter'l Sm. & Ref. | U. S | 100,000 | 100 | 3,300,000 | Aug. '13 | 2.00 |
| National Lead, com. | N. Y | 206,554 | 100 | 7,540,308 | Sept. '13 | 0.75 |
| National Lead, pf | N. Y. | 243,676 | 100 | 27,569,940 | Sept. '13 | 1.75 |
| Old Dominion, c | Ariz. | 293,245 | 25 | 4,313,579 | July '13 | 1.25 |
| Phelps, Dodge & Co. | U. S | 450,000 | 100 | 28,309,304 | Sept. '13 | 4 50 |
| U. S. Steel Corp., com | U. S | 5,083,025 | 100 | 194,403,851 | Sept. '13 | 1.25 |
| U. S. Steel Corp., pf. | U. S | 3,602,811 | 100 | 338,768,739 | Aug '13 | 1.75 |
| U. S. S., R. & M., com | U.S.-Mex. | 486,320 | 50 | 5,308,85[illegible] | July '13 | 0.75 |
| U. S. S., R. & M., pf. | U.S.-Mex. | 351,105 | 50 | 12,539,695 | July '13 | 0.87½ |

## Canadian, Mexican and Central American Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Ajuchitlan, g.s. | Mex | 50,000 | $ 5 | $ 200,000 | Oct. '12 | $0 25 |
| Amparo, g.s. | Mex | 2,000,000 | 1 | 1,166,884 | Aug. '13 | 0 04 |
| B. C. Copper | B C. | 591,709 | 5 | 615,398 | Jan. '13 | 0.15 |
| Beaver Con., s. | Ont. | 1,996,490 | 1 | 409,879 | Dec. '12 | 0 03 |
| Buffalo, s | Ont. | 1,000,000 | 1 | 2,907,000 | Aug. '13 | 0 03 |
| Cobalt Townsite, s. | Ont. | 1,000,000 | 1 | 450,000 | Aug. '13 | 0 24 |
| Coniagas, s | Ont. | 800,000 | 5 | 5,000,000 | Aug. '13 | 0.45 |
| Con. M & S. Co. of Can | B. C. | 58,052 | 100 | 1,120,165 | July '13 | 2 00 |
| Crown Reserve, s. | Ont. | 1,768,814 | 1 | 5,341,820 | Sept. '13 | 0 02 |
| Crow's Nest Pass C. Co. | B. C. | 248,506 | 25 | 2,182,864 | Mar. '11 | 0 25 |
| Dominion Coal, com. | N. S. | 150,000 | 100 | 5,550,000 | Jan. '13 | 1 00 |
| Dominion Coal, pf | N. S | 50,000 | 100 | 4,915,000 | Aug. '12 | 3 50 |
| Dos Estrellas, g.s. | Mex | 300,000 | 0.50 | 14,580,000 | Sept. '13 | 1.25 |
| El Oro, g.s. | Mex. | 1,147,500 | 4 85 | 8,947,261 | July '13 | 0.24 |
| Esperanza, s.g. | Mex. | 455,000 | 4.85 | 11,330,455 | July '13 | 0.36 |
| Granby, s.l.c. | B.C. | 148,496 | 100 | 5,364,794 | Sept. '13 | 1.50 |
| Greene Con., c | Mex. | 1,000,000 | 10 | 8,044,400 | Feb. '13 | 0.45 |
| Guanajuato D., pf., s. | Mex. | 10,000 | 1000 | 274,356 | Jan. '11 | 3.00 |
| Hedley Gold. | B. C. | 120,000 | 10 | 1,044,000 | Sept. '13 | 0 50 |
| Hollinger, g | Ont. | 600,000 | 5 | 1,080,000 | Sept. '13 | 0.15 |
| Kerr Lake s. | Ont. | 600,000 | 5 | 4,770,000 | Sept. '13 | 0.25 |
| La Rose Con., s | Ont. | 1,498,407 | 5 | 4,263,147 | July '13 | 0 25 |
| Le Roi No. 2, g | B. C. | 120,000 | 24.30 | 1,471,580 | Jan. '13 | 0.36 |
| Lucky Tiger Com., g. | Mex. | 715,337 | 10 | 1,932,865 | Sept. '13 | 0.05 |
| McK.-Dar. Sav. s. | Ont. | 2,247,692 | 1 | 3,663,165 | July '13 | 0.10 |
| Mines Co. of Am. (new) | Mex. | 1,700,000 | 10 | *1,215,000 | July '13 | 0 12½ |
| N. Y. & Hond. Ros. | C. A. | 150,000 | 10 | 3,192,500 | Sept. '13 | 0.20 |
| Nipissing, s. | Ont. | 1,200,000 | 5 | 10,440,000 | July '13 | 0 37½ |
| Peñoles, s.l.g | Mex. | 80,000 | 25 | 6,551,688 | Sept. '13 | 1.25 |
| Peregrina M. & M., pf. | Mex. | 10,000 | 100 | 328,656 | Sept. '10 | 3.50 |
| Pinguico, pf., s | Mex. | 20,000 | 100 | 600,000 | Oct. '11 | 3.00 |
| Right of Way Mns†s. | Ont. | 1,685,500 | 1 | 202,260 | Dec. '11 | 0.02 |
| Rio Plata, s. | Mex. | 373,437 | 5 | 345,714 | Feb. '13 | 0.05 |
| San Rafael, g.s | Mex | 2,400 | 25 | 1,439,780 | Oct. '12 | 0 90 |
| San Toy, g.s | Mex. | 6,000,000 | 1 | 540,000 | July '13 | 0.01 |
| Sopresa, g.s | Mex. | 19,200 | 20 | 1,517,438 | Jan. '11 | 34 00 |
| Stand'd Silver-Lead. | B. C. | 2,000,000 | 1 | 875,000 | Sept. '13 | 0 02½ |
| Timiskaming, s | Ont. | 2,500,000 | 1 | 1,534,155 | Apr. '13 | 0 06 |
| Tem. & Hud. Bay, s | Ont. | 7,761 | 1 | 1,823,835 | Aug. '13 | 3.00 |
| Trethewey, s | Ont | 1,000,000 | 1 | 961,998 | Jan. '13 | 0 10 |
| Wettlaufer-Lorrain, s. | Ont | 1,416,590 | 1 | 566,636 | Jan. '13 | 0 05 |

*Previous to reorganization, $5,258,881

†Previous to January, 1910, $324,644.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Arizona Enterprise, Ariz | Oct. 10 | Oct. 31 | $0 005 |
| Big Elk, Ida | Oct. 13 | Nov. 5 | 0 001 |
| Challenge, Nev | Sept. 30 | Oct. 21 | 0 05 |
| Cons. Virginia, Nev | Oct. 3 | Oct. 24 | 0 10 |
| Demijohn Cons., Utah | Oct 17 | Nov. 4 | 0 0025 |
| Honolulu, Ida | Sept 23 | Oct. 24 | 0 0011 |
| Hypotheek, Ida | Oct. 9 | Nov. 4 | 0.004 |
| Michigan Copper & Gold, Utah | Oct. 8 | Oct. 25 | 0 0025 |
| Midnight Bell, Utah | Oct. 1 | Oct. 20 | 0 0015 |
| Montello, Utah | Oct 11 | Nov. 1 | 0.005 |
| Moonlight, Ida | Sept. 30 | Oct. 30 | 0 005 |
| Overman, Nev | Oct. 2 | Oct. 23 | 0 05 |
| Raymond-Illinois, Utah | Oct. 11 | Oct. 27 | 0 005 |
| Royal Copper, Ida | Sept. 29 | Oct. 29 | 0 001 |
| Saltese, Ida | Sept. 27 | Oct. 25 | 0 002 |
| Sandstorm-Kendall, Nev | Sept. 19 | Oct. 24 | 0 01 |
| Santaquin Chief, Utah | Oct. 13 | Oct. 31 | 0 0025 |
| Santaquin King, Utah | Oct. 9 | Oct. 27 | 0.0025 |
| Sierra Nevada, Nev. | Sept. 25 | Oct. 25 | 0.10 |
| Sunrise, Ida | Sept. 28 | Oct. 28 | 0.002 |
| Sunset, Ida | Oct. 18 | Nov. 12 | 0 002 |
| Tar Baby, Utah | Sept. 29 | Nov. 3 | 0 0025 |
| Tintic Standard, Utah | Oct. 11 | Nov. 1 | 0 005 |
| Tuscumbia, Ida (postpo'd) | Aug. 23 | Oct. 23 | 0 003 |
| Utah-Arizona, Ariz | Oct. 15 | Oct. 31 | 0 005 |
| Utah United, Utah | Oct. 11 | Nov. 1 | 0 01 |
| West Century, Utah | Oct. 1 | Oct. 30 | 0 01 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53 795 | 56.260 | 62.938 | 24 865 | 25.887 | 28.983 |
| February | 52 222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52 745 | 58 375 | 57.870 | 24.324 | 26.875 | 26 669 |
| April | 53 325 | 59.207 | 59.490 | 24 595 | 27.284 | 27.416 |
| May | 53 308 | 60.880 | 60.361 | 24 583 | 28.038 | 27.825 |
| June | 53 043 | 61.290 | 58.990 | 24 486 | 28.215 | 27.199 |
| July | 52 630 | 60.654 | 58.721 | 24.286 | 27.919 | 27 074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28 375 | 27.335 |
| September | 52 440 | 63.078 | 60.640 | 24 209 | 29.088 | 27.986 |
| October | 53 340 | 63 471 | ...... | 24 594 | 29 299 | ...... |
| November | 55 719 | 62 792 | .... | 25 649 | 29.012 | ...... |
| December | 54 905 | 63 365 | .... | 25 349 | 29.320 | ..... |
| Year | 53 304 | 60 835 | ..... | 24 592 | 28 042 | ... |

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14 094 | 16 488 | 14 337 | 16 767 | 62 760 | 71.741 |
| February | 14 084 | 14.971 | 14.329 | 15 253 | 62 893 | 65 519 |
| March | 14 698 | 14.713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15.741 | 15 291 | 15 930 | 15 565 | 70.294 | 68 111 |
| May | 16 031 | 15.436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17 234 | 14.672 | 17 443 | 14 871 | 78 259 | 67 140 |
| July | 17 190 | 14 190 | 17 353 | 14 563 | 76 636 | 64.166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78.670 | 69 200 |
| September | 17 508 | 16 328 | 17 698 | 16 799 | 78.762 | 73 125 |
| October | 17 314 | . | 17 661 | | 76.389 | . |
| November | 17 326 | . | 17 617 | | 76 890 | ... |
| December | 17 376 | | 17 600 | | 75 516 | . |
| Year | 16 341 | | 16 560 | | 72 942 | |

New York, cents per pound, London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 410 | 223 762 | 193 074 |
| October | 50 077 | | 228 353 | |
| November | 49 891 | | 227 619 | |
| December | 49 815 | | 226 875 | |
| Av. year | 46 096 | | 209 322 | |

New York in cents per pound London in pounds sterling per long ton

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4 435 | 4 321 | 4.327 | 4.171 | 15 597 | 17.114 |
| February | 4 026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4 073 | 4.327 | 4 046 | 4.177 | 15.997 | 15.977 |
| April | 4 200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4 194 | 4 342 | 4.072 | 4.226 | 16 509 | 18.923 |
| June | 4 392 | 4 325 | 4 321 | 4.190 | 17.588 | 20 226 |
| July | 4 720 | 4 353 | 4 603 | 4 223 | 18.544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4.550 | 19 655 | 20 406 |
| September | 5 048 | 4 698 | 4 924 | 4 579 | 22 292 | 20 648 |
| October | 5 071 | | 4 894 | | 20 630 | |
| November | 4 615 | | 4 463 | . | 18 193 | . |
| December | 4 303 | | 4 152 | | 18 069 | |
| Year | 4 471 | | 4 360 | | 17 929 | |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6 442 | 6 931 | 6.292 | 6.854 | 26 642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25 338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6 679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6 877 | 5 124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20 592 |
| August | 7 028 | 5 658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7 426 | ... | 7.276 | ..... | 27.543 | .... |
| November | 7 371 | ..... | 7.221 | .... | 26 804 | ..... |
| December | 7 162 | ..... | 7 081 | .. | 26 494 | .... |
| Year | 6 943 | .. | 6 799 | . | 26 421 | ...... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18 15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15 03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14 95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13 90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.65 | 16 03 | 15.04 | 15 63 | 14.93 |
| October | 17.90 | .... | 17 18 | ..... | 17.22 | ..... |
| November | 18 07 | . . | 17 09 | .. | 18.00 | .... |
| December | 18.15 | . | 17.45 | . | 18.73 | . . . |
| Year | $16 01 | | $14.93 | | $15.28 | .... |

# STOCK QUOTATIONS

**COLO. SPRINGS** Oct. 14

| Name of Comp. | Bid. |
|---|---|
| Acacia | 02¼ |
| Cripple Cr'k Con | .01 |
| C. K. & N. | 09 |
| Doctor Jack Pot | 06 |
| Elkton Con | 53 |
| El Paso | 2 90 |
| Findlay | ‡ 02¼ |
| Gold Dollar | 06½ |
| Gold Sovereign | 02¼ |
| Isabella | 09¼ |
| Jack Pot | 05 |
| Jennie Sample | 05 |
| Jerry Johnson | .03½ |
| Lexington | ‡ 005 |
| Moon Anchor | ‡ 006 |
| Old Gold | 01¼ |
| Mary McKinney | 55½ |
| Pharmacist | 01½ |
| Portland | 97 |
| Vindicator | 84 |

**SALT LAKE** Oct. 14

| Name of Comp | Bid. |
|---|---|
| Beck Tunnel | .05 |
| Black Jack | 08¼ |
| Cedar Talisman | 00¾ |
| Colorado Mining | .10 |
| Columbus Con. | ‡ .00½ |
| Crown Point | 00½ |
| Daly-Judge | 6 00 |
| Grand Central | 48 |
| Iron Blossom | 1 15 |
| Little Bell | ‡ 10 |
| Lower Mammoth | 00½ |
| Mason Valley | 2 00 |
| May Day | 05½ |
| Nevada Hills | 75 |
| New York | ‡ 03 |
| Prince Con | 30 |
| Silver King Coal'n | 3 52½ |
| Sioux Con | 01 |
| Uncle Sam | 05 |
| Yankee | ‡ 08 |

**TORONTO** Oct 11

| Name of Comp | Bid | Name of Comp | Bid. |
|---|---|---|---|
| Bailey | 06 | Foley O'Brien | 18 |
| Coniagas | 7 50 | Hollinger | 16 85 |
| T. & Hudson Bay | ‡70 00 | Imperial | ‡ 02 |
| Timiskaming | 18 | Jupiter | 10 |
| Wettlaufer-Lor | 07 | Pearl Lake | 17 |
| Apex | ‡ 01 | Porcu. Gold | 07 |
| Big Dome | 10 00 | Preston E. D. | 03 |
| Crown Chartered | ‡ 00¼ | Rea | 10 |
| Dobie | 10 | Swastika | 02 |
| Dome Exten | 07 | West Dome | 08 |

**SAN FRANCISCO** Oct. 14

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| **Comstock Stocks** | | Misc. Nev. & Cal. | |
| Alta | 05 | Belmont | 6 80 |
| Belcher | ‡ 21 | Jim Butler | 60 |
| Best & Belcher | .06 | MacNamara | 08 |
| Caledonia | 2.05 | Midway | .34 |
| Challenge Con | 11 | Mont.-Tonopah | 1.12½ |
| Chollar | 03 | North Star | 35 |
| Confidence | 35 | West End Con. | 1.35 |
| Con. Virginia | 16 | Atlanta | .14 |
| Crown Point | 30 | Booth | 02 |
| Gould & Curry | 03 | C.O.D. Con. | 03 |
| Hale & Norcross | 08 | Comb. Frac. | 03 |
| Mexican | 1 12½ | Jumbo Extension | .11 |
| Occidental | 70 | Pitts.-Silver Peak | .35 |
| Ophir | 19 | Round Mountain | .40 |
| Overman | ‡ 50 | Silver Pick | .04 |
| Potosi | 03 | Tramp Con. | ‡.01 |
| Savage | .07 | Argonaut | 2.75 |
| Sierra Nevada | .10 | Bunker Hill | 1.75 |
| Union Con. | .09 | Central Eureka | .13 |
| Yellow Jacket | .38 | So. Eureka | 2.00 |

**N. Y. EXCH.** Oct. 14

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 70¼ |
| Am. Agri Chem | 42 |
| Am.Sm.&Ref.,com. | 62½ |
| Am. Sm. & Ref., pf. | 99½ |
| Am. Sm. Sec., pf. B | 81¼ |
| Anaconda | 34¼ |
| Batopilas Min. | ‡1¼ |
| Bethlehem Steel,pf. | 69¼ |
| Chino | 38½ |
| Federal M. & S., pf. | 38½ |
| GreatNor.,ore.,ctf. | 31¼ |
| Guggen. Exp. | 43½ |
| Homestake | 106 |
| Inspiration Con. | 15 |
| Miami Copper | 22¼ |
| Nat'l Lead, com. | 44 |
| National Lead, pf. | 103 |
| Nev. Consol | 15 |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 88¼ |
| Quicksilver, pf. | 3 |
| Ray Con. | 18¼ |
| Republic I&S,com. | 18½ |
| Republic I&S, pf. | 78 |
| SlossSheff'd,com. | 29 |
| Sloss Sheffield, pf. | 88 |
| Tennessee Copper | 30 |
| Utah Copper | 51¼ |
| U. S. Steel, com | 54¼ |
| U. S. Steel, pf | 104¼ |
| Va.Car.Chem.,pf. | 94 |

**N. Y. CURB** Oct. 14

| Name of Comp. | Clg. |
|---|---|
| Ariz. Belmont | 13 |
| Barnes King | 1⅞ |
| Beaver Con | .29 |
| Big Four | .19 |
| Braden Copper | 7 |
| B. C. Copper | 2¼ |
| Buffalo Mines | 2¼ |
| Can. G. & S | .17 |
| Caribou | .55 |
| Con Ariz. Sm | 3/16 |
| Davis-Daly | 2¼ |
| Diam'field-Daisy | .02 |
| Ely Con | 06 |
| Florence | 22 |
| Giroux | 1¼ |
| Gold Hill Con | 21 |
| Goldfield Con | 1 1/16 |
| Greene Cananea | 30 |
| Greenwater | 04 |
| Internat S. & R. | ‡115 |
| Kerr Lake | 3¾ |
| Keystone | ‡1¾ |
| La Rose | 1 11/16 |
| McKinley-Dar-Sa | 1¼ |
| Min. Co. of A. new | 2¼ |
| Nipissing Mines | 8¼ |
| Ohio Copper | 1/16 |
| Pacific Sm. & M | ‡1¼ |
| Puebla S. & R | 2¾ |
| South Utah M&S | 3/16 |
| Stand'd Oil of N J | 378 |
| Stewart | 1 9/16 |
| Tonopah | 4¾ |
| Tonopah Ex | 1 11/16 |
| Tonopah Merger | 58 |
| Tri-Bullion | ½ |
| Tularosa | ½ |
| Union Mines | 08 |
| United Cop., pfd | 3 |
| Yukon Gold | 2 |

**LONDON** Oct 4

| Name of Comp | Clg |
|---|---|
| Camp Bird | £0 16s 0d |
| El Oro | 0 15 0 |
| Esperanza | 0 18 9 |
| Mexico Mines | 5 17 6 |
| Oroville | 0 5 6 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 6 |
| Tomboy | 1 6 3 |

**BOSTON EXCH** Oct. 14

| Name of Comp. | Clg |
|---|---|
| Adventure | 1½ |
| Ahmeek | 281 |
| Alaska Gold M. | 21½ |
| Algomah | 1½ |
| Allouez | 33½ |
| Am. Zinc | 18½ |
| Ariz. Com., ctfs. | 4½ |
| Bonanza | .32 |
| Boston & Corbin | .75 |
| Butte & Balak | 4 |
| Calumet & Ariz | 62 |
| Calumet & Hecla | 410 |
| Centennial | 12¼ |
| Cliff | 1½ |
| Copper Range | 38¼ |
| Daly West | 2 |
| East Butte | 11½ |
| Franklin | 8 |
| Granby | 70½ |
| Hancock | 15 |
| Hedley Gold | 30 |
| Helvetia | .25 |
| Indiana | 3½ |
| Island Cr'k, com | 48½ |
| Island Cr'k, pfd | 83½ |
| Isle Royale | 18 |
| Keweenaw | 1½ |
| Lake | 8½ |
| La Salle | 3½ |
| Mass | 2 |
| Michigan | 1½ |
| Mohawk | 40¼ |
| New Arcadian | 1½ |
| New Idria Quick | 2½ |
| North Butte | 25¼ |
| North Lake | 1¼ |
| Ojibway | .70 |
| Old Dominion | 47½ |
| Osceola | 76 |
| Quincy | 57 |
| Shannon | 6½ |
| Shattuck-Ariz | 26¼ |
| Superior | 23½ |
| Superior & Bost | 2¼ |
| Tamarack | 27¼ |
| Trinity | 4¼ |
| Tuolumne | .60 |
| U. S. Smelting | 37 |
| U. S. Smelt'g, pf. | 46¼ |
| Utah Apex | 2 |
| Utah Con | 8½ |
| Victoria | 1¼ |
| Winona | 1½ |
| Wolverine | 40 |
| Wyandot | ‡ 50 |

**BOSTON CURB** Oct 14

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 5¼ |
| Boston Ely | 49 |
| Butte&Lon'nDev | 27 |
| Cactus | 02 |
| Calaveras | 1 1/16 |
| Chief Cons | 1⅞ |
| Corbin | 80 |
| Cortez | 30 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | 96 |
| First Nat. Cop | 2¾ |
| Houghton Copper | 3¼ |
| Majestic | 24 |
| Mexican Metals | 45 |
| Moneta Porc | ‡ 07 |
| Nevada-Douglas | 2 |
| New Baltic | 60 |
| Oneco | 80 |
| Raven Copper | 07 |
| Rhode Island Coal | 01 |
| Smokey Dev | 75 |
| So. Lake | 3½ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | 30 |
| Trethewey | 28 |
| United Verde Ext | 50 |

‡Last Quotation

The Engineering and Mining Journal

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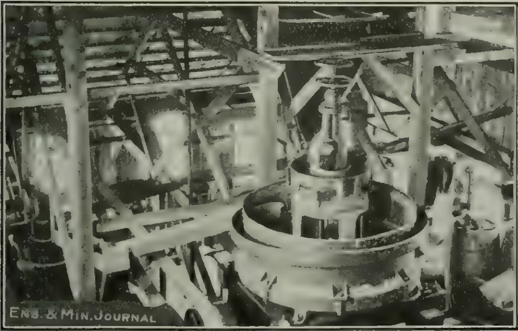
# Requirements of Small Cyanide Mills

By Algernon Del Mar*

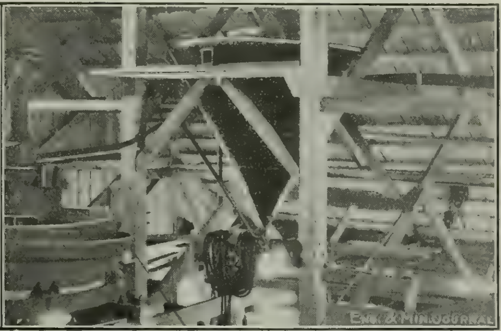
*SYNOPSIS—A discussion of ways and means of constructing small cyanide plants in the presence of money scarcity. Comparison of the machinery which may be adapted to such cases with that installed in large, expensively constructed installations. Special emphasis is placed upon grinding pans to replace the usual tube mill.*

⁂

One of the most difficult problems confronting the metallurgical engineer is the designing of all-sliming plants for mills of small size or for mining companies of limited means. As most of the free-gold ores in the United States yield a fair percentage of the gold content by amalgamation, this process must usually precede cyanide treatment.



Grinding Pan Installed



Callow Cone for Thickening

### Several Machines for Same Work

It is known to the practical worker in the field covered by this article that the most useful machines for crushing ores are rockbreakers, rolls, stamps, pans, chilean mills, and tube mills and that each type of machine has its greatest usefulness in crushing particles of ore of certain sizes to certain other sizes. To take the most notable comparison, the rockbreaker would not be used for crushing particles of any size to 200 mesh, any more than would the tube mill be recommended for crushing masses of ore to 2-in. cubes. There are, however, some machines that come so close to doing the same quality of work, as with rolls, stamps and chilean mills, that the choice is at times a difficult one and these machines often compete. The chilean mill probably has the widest range of usefulness, for it competes with rolls, stamps, pans and tube mills.

### First Cost a Compelling Factor

In designing a mill for a company whose finances are limited, we must choose the cheapest form of grinding machine, not only in first cost, but in the cost of repairs and renewals, that will do the work. We eliminate rolls, for our ores are usually damp and contain a certain amount of clay and also because, with rolls, an amalgamating scheme is at a disadvantage. We must have a rockbreaker of small size, so we begin with this. One rockbreaker is of little use in crushing to smaller than 1-in. cubes, so we must follow with a machine capable of taking large lumps of ore and crushing to such a size that the following machine will deliver a product fine enough for treatment in the all-sliming plant. Our choice lies between stamps and chilean mills. Ball mills will not be considered, as they have not proved their ability to compete with the others. A stamp mill, in my experience, performs its best work on ore particles larger than economical for a chilean and delivers a somewhat coarser product. As the chilean is a good amalgamator, the choice between the stamps and chileans is more or less determined by the size of the rockbreaker product. The first cost is in favor of the chilean.

Having now our rockbreaker and intermediate machine, either stamps or chilean, according to individual fancy, and as far as I am concerned it would be the former, we must now choose our fine-grinding machine. We will take for granted that preliminary tests have shown that the amount of extraction of the precious metals depends upon the fineness to which the ore is ground, for otherwise an all-sliming plant might not be necessary.

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*Mining engineer, South Pasadena, Calif.

We now come to the machines that will do the fine grinding and the choice lies between chileans, pans and tube mills. Of the latter, there are the conical and the cylindrical types, these occupying positions which overlap in the center of the scale, say, between 40 and 200 mesh, each being more efficient at one end of the scale, the conical between 40 and 100 and the long cylindrical between 100 and 200 mesh. The chilean, not being able to make a 200-mesh product with economy, is discarded, so that our choice lies between the pans and the cylindrical tube mill. There is no doubt of our preference being for the tube mill, but here the question of first cost for machine, transmission machinery and motor to drive it must be the deciding factor and for a company of small means, the tube mill is out of the question, so we fall back upon pans as being the most suitable, but perhaps not the most economical, although this is open to argument.

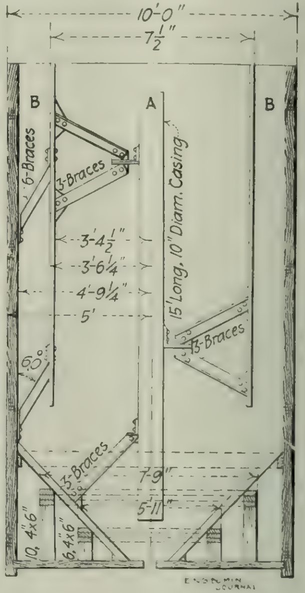
Pans do good work if the pulp is thickened before entering them, but do little or no work with a dilute pulp, for then the coarse particles separate from the mass, the centrifugal force sending them to the periphery of the pan, where they escape in the overflow, while the finer particles, needing the least grinding, settle to the bottom. By taking the pulp from the center of the pan instead of at the periphery, this condition may be somewhat corrected, but the separation of coarse particles takes place just the same unless the pulp is thick enough. The ordinary Wheeler pan can be arranged to take the pulp from near the center by running a pipe through the drain exit at the bottom of the pan to a point near the spider.[1] M. W. von Bernewitz says from 1½ to 4 parts of water to one of ore may be used. I have found for a particular ore, 2½ parts of water to one of ore to be about right. Mr. von Bernewitz says: "The pan is an excellent machine and I would certainly advise its installation in a small mill where the expense of a tube mill is not justified." This is also my own opinion. Each 5-ft. pan requires about 7 hp. and costs, set up ready to run, about $800.

### Pans Installed as Fine Grinders

I had an occasion for such an installation in a case where sufficient funds to buy a tube mill were lacking, and while the results obtained with the pan were satisfactory for the purpose intended, amalgamating and fine grinding, the two functions combined do not produce ideal grinding work. For amalgamating, the pan speed must be kept as low as 30 r.p.m.; for grinding alone, about 45 r.p.m. The pulp for amalgamating is also kept more dilute than is required for proper grinding.

In a small plant the cost of running pans is nothing for labor; and for repairs, only inexpensive cast iron. The iron used in some Homestake pans is given at 1.23 lb. per ton of ore ground, and in those of the Vulture mill, Arizona, at one pound per ton. My own experience shows about two pounds per ton. This is the only expense to the pans, and while its costs are lower than with tube mills when making 10- to 150-mesh product, the reduction to a 200-mesh or finer product is more difficult to obtain.

The pulp going to pans should be classified so that the pans do no useless work on ore already ground sufficiently fine. We then must consider classifying, dewatering and thickening devices and while every engineer would recommend such standard machines as Dorr classifiers and thickeners, Pachuca tanks and Moore filters, the small operator must be content with some form of continuous or intermittent decantation eliminating all complication in machinery. When planning the small plant, provision should be made for the installation of these standard machines at some future time, a classifier before the pans, the replacement of pans by tube mills, a thickener before the agitating tanks and a dewaterer before the filter. In the present case we are compelled to use hydraulic cones for classifying and thickening, and choose the Callow cone as answering the purpose, a 6-ft. cone for 10 stamps and a 4-ft. one for five stamps, as classifiers, and an 8-ft. cone for thickening in each case.



Air-Agitation Tank

### Simple Agitating Device

We now come to agitation, and for this purpose I chose a continuous-decantation system with the pulp flowing in the opposite direction to the solution. The tank I designed, four of which were installed, combines agitation with decantation. This is the type of tank designed by Spaulding, except that he decants from a central suspended pipe, while I decant from an annular space at the periphery. This idea has been used to a limited extent by other operators, but I make it the sole method of decanting clear liquid. The details of the tank are shown in the illustration where *A* is the central agitating column which, as well as the air jet, may be provided with means of lowering or raising to suit conditions. *B* is the annular settling space, 15 in. wide and 12 ft. deep, where no agitation takes place. In the bank of four tanks used, the last being a decanting tank, the air jet and central lift pipe are placed somewhat above the bottom.

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[1] See paper on "Economical Fine Grinding in Pans," "Eng. and Min. Journ.," Sept. 27, 1913.—Editor.

In my preliminary tests I used a tank 8 ft. in diameter and 8 ft. deep with the annular settling space 1 ft. wide and 6 ft. deep, and obtained clear solution from the overflow and had an extraction of about 84% with 12-hr. agitation. This extraction could have been increased by finer grinding but not by longer agitation. This tank was flat bottomed with four air jets in 4-in. pipe casing extending to within a foot of the top of the tank and to within 6 in. of the bottom. In designing the final tanks, it was thought better to have the tanks higher and equipped with conical bottoms and one central jet. The cost of four of these tanks 18 ft. high and 10 ft. diameter, with all piping, will be about $1500. If a centrifugal pump be used for agitating, the pulp may be delivered below the surface and in such a way that the mass has a circular motion in the tanks.

The system of milling devised began with a rockbreaker and was followed by stamps with narrow discharge mortars, classifying in cone, regrinding in pans, overflow from cone to a Callow tank, used as a dewaterer, thickened pulp from pans to agitator with the underflow from dewaterer, overflow from dewaterer to gold-solution tank together with an overflow from decanter-agitator tank and discharge of impoverished pulp from fourth tank. The second, third and fourth tanks were used for washing with barren solution. The efficacy of this system depends upon the rate at which a particular pulp will settle. In the example in question, the ore did not readily slime to a colloid state and the sand, even as fine as 200 mesh, settled with ease so that the annular space left for settling was more than sufficient. The amount of solution drawn off, and, consequently, the amount of gold solution taken from the pulp in its several washings, depends entirely upon the rate of settling, but with this possible exception on some ores, I believe this style of tank may be used to advantage in many cases where the cost of a filter installation is so high as to be out of the question.

⁂

## Grindstone Manufacture

The Berea grit of northern Ohio is a stone of considerable economic importance. One of the important products of the quarries is grindstones. Their manufacture is described by Wilbur Greeley Burroughs (*Econ. Geol.*, August, 1913). All sizes are turned, ranging up to 7 ft. in diameter, with a thickness of 14 in. The blocks of stone, as taken from the quarry, are sawed to nearly the desired thickness; then cut by hand to a roughly circular shape. A small hole is cut in the center with a pick. The lathe is passed through this hole and the stone firmly clamped. As the stone revolves rapidly in the lathe, the workman holds the end of an iron bar, called a "turning iron" against the sides, which are thus smoothed, the stones being cut to exactly the desired width. The stone is made circular by cutting a groove a little way back from the edge. When this is cut to a moderate depth, the lathe is stopped and the rim of stone knocked off with a hammer. If the groove is too deep, the rim may fly off with dangerous velocity. The rough edge which is left is smoothed by once more revolving the stone with the turning bar against the edge. The rough surface, where the stone was clamped to the lathe, is smoothed by hand after the stone is otherwise finished.

⁂

## Chenhall's Tin-Extraction Process

A short description of Chenhall's tin-extraction process will be found in the Journal of Apr. 26, 1913, p. 855. A longer report on it from the *Mining Journal*, Sept. 26, 1913, is printed below.

The Chenhall process is a chemical one, by which the metals contained in the ore are made soluble in acid solutions, and recovered therefrom by means of precipitation.

The ore is first crushed, then mixed with fine coal dust or other carbonaceous material, and heated in a closed furnace until the oxides of the metal are decomposed, leaving the metals distributed throughout the roasted ore in the form of fine metallic grains, care being taken to prevent reoxidation of the metal, or metals, during cooling.

The gas disengaged during the roasting is collected and stored, and when the flow of gas from the mixture of coal and ore almost ceases, that which has been stored is returned to the furnace, so that during the whole of the time the ore is in the furnace it is in an atmosphere of coal gas. The coal mixed with the ore, being converted into coke, keeps the ore open, and allows the gas in the furnace to permeate the whole of the ore, as well as to act as a deoxidizing agent.

The cool roasted ore is afterward submitted to treatment with acid solutions. When tin is the predominant metal, the first solution consists of sulphuric acid and water, and should there not be sufficient iron in the ore to produce iron sulphate, a little iron is added; about 85% of the tin contained in the ore is dissolved out by means of this solution. The ore is now washed with water, and the final solution (hydrochloric acid and water) is added, by which the remaining tin is dissolved out. When any copper is present in the solution, which is always the case when it is present in the ore, it is precipitated from the solutions by means of metallic iron (wrought scrap). Any insoluble material in the liquor is allowed to settle, and the clear liquors treated with sulphureted hydrogen, which at once precipitates the tin in the solutions in the form of sulphide, which is collected, dried and heated, slowly at first and then to a dull-red heat, which converts the sulphide into oxide of tin, and the sulphurous acid conducted to chambers for the production of sulphuric acid.

The waste liquors, after the tin has been extracted, are evaporated. The first solution for the manufacture of sulphate of iron, and the second chloride solution for the manufacture of red oxide of iron (rouge), by this means the excess of acid necessary through the presence of iron in the ores is converted into a salable product, thus recovering the value of the acid so used as a valuable by-product.

The acid solutions are continually passed over fresh lots of roasted ore until practically all the acid is combined with the metals, and the ores receive a sufficient number of fresh acid solutions on them so that the whole of the soluble metals are dissolved out. The amount of acid consumed depends on the character of the ore to be treated, ores from different mines varying in the amount of soluble materials they contain.

When there is sulphur or arsenic, unless present in small quantities, it becomes necessary to give the ore a preliminary roast, when the arsenic is recovered in the form of white arsenic (arsenious acid), and the sulphur, when the sulphur is high enough to give a sulphurous-acid gas of from 2½ to 5%, is made use of for the manufacture of sulphuric acid, which is largely used for the extraction of the tin contents of the ore.

Tungstic acid, when in the ore, remains in the residue, and is extracted by means of an alkaline solvent, and recovered from the solution as very pure tungstic acid. The loss of tungstic acid with the present methods of recovery of the wolfram in tin ores is 75% of the wolfram in the ore.

The plant needed for this process is that required for the manufacture of the two acids (sulphuric and hydrochloric); suitable closed furnaces in which during the roasting of the ores and their cooling, the air is excluded, and the presence of carburetted-hydrogen gas is maintained during the roast; the means for effectively leaching the roasted ores, precipitating the tin, and the recovery of the byproducts, including the acid used, when not sold in the form of byproducts.

The cost of the process will vary with the metallic contents of the ore, and the amount of byproducts there is to recover from the ore. The roasting will cost from 4s. 6d. to 5s. 6d. per ton, and the leaching a further 1s. 6d. to 2s. per ton. The cost of the production of the necessary acid (sulphuric) will be, say 45s. to 50s. per ton, and the (hydrochloric) about 80s. to 85s. per ton. A large percentage of the acid used will be recovered for further use in the process.

Mr. Chenhall has treated successfully ores from the Dolcoath, Carn Brea & Tincroft, East Pool & Agar, South Crofty and other mines, also residues from the Red River and the Fal River, and other waste heaps.

## Johannesburg Notes

The shortage of natives still continues, the deficit for August being 12,000. The Jupiter mine has suspended crushing, all the natives having been transferred to the Knights Deep mine, to enable that company to make profits. The Cinderella Consolidated has stopped sinking its eastern shaft, thus postponing the time of resumption of crushing and hanging up the scheme of development. Men are everywhere being dismissed, and among them some leading unionists. This has led to charges of victimization and some of the leaders have been threatening another strike, but of that there is no chance. Some of the leaders are being tried for seditious speeches made since the strike and the government has now a firm grip of the situation. Meanwhile, it is preparing to give legal effect to several of the just demands of the men, which have been granted, and the 8½ hours bank to bank is now being enforced.

The mining industry has invited Colonel Gorgas from the Panama Canal to visit the Rand and advise regarding health conditions. The Modderfontein Deep has secured capital to place the mine on a producing basis. The Modderfontein Deep has secured capital to place the mine on a producing basis. The worst feature of the outlook for the future of the Rand, is that when the State Mines shaft strikes the reef, there will be only one shaft (at Daggafontein) on the whole Rand being sunk to develop new ground. There should be six or eight started on the East Rand at once. The Chamber of Mines has arranged with Rhodesia to take the tropical natives who were debarred from coming to the Rand, and will receive in exchange certain natives who are now recruited for Rhodesia in territory the Rand can draw from.

## Mineral Production of Oregon in 1912

The value of the production of gold, silver, copper and lead, in Oregon, in 1912, according to Charles G. Yale, of the U. S. Geological Survey, was $849,886, against $669,016 in 1911. The total yield of gold was $770,041, an increase of $136,631 over the 1911 production. Of the gold output, $580,945 came from placers. There was an increase in production from hydraulic mining of $38,131, but there was a small decrease in the yield from drift and surface mines. About 50% of the placer gold recovered came from the mines in Josephine and Jackson Counties. The gold recovered from deep mines amounted to 28,103 fine ounces, valued at $580,945, of which 27,278 oz. were derived from siliceous ores, 616 oz. from copper ore, and 209 oz. from lead ores.

The southwestern counties of Oregon, Coos, Curry, Douglas, Jackson, Josephine and Lane, which form an extension of the California gold belt, made a combined production of $217,565 in gold, and of $10,343 in silver. Northeastern Oregon, comprising Baker, Crook, Grant, Malheur and Wheeler Counties, reported a gold production of $552,476, of which Baker County contributed $484,041, or 87.6%. The silver production of Oregon was 57,081 fine oz., valued at $35,105, compared with 45,221 oz., valued at $23,967, in 1911. Of the 1912 production, 1941 oz. came from placers, 44,018 oz. from siliceous ores, 10,555 oz. from copper ores, and 567 oz. from lead ores.

The copper production increased in Oregon from 93,136 lb., valued at $11,642, in 1911, to 260,429 lb., valued at $42,971 in 1912. All the copper except 6049 lb. was derived from ores mined in Josephine County. The production of lead in Oregon in 1912 was 39,317 lb., valued at $1769. The output came from a small quantity of lead ore mined in Jackson County and from concentrates shipped from Lane County.

There were 210 producers of gold, silver, copper or lead in 1912, compared with 176 in 1911. Of the 210 producers, 54 were deep mines and 156 were placers. Of the placers, 102 were hydraulic mines, eight drift mines, and 46 surface or sluicing mines. There was no recovery of gold by dredging reported in 1912. The total quantity of ore sold or treated in 1912 amounted to 90,945 tons, which was 7613 tons less than in 1911. The average recovery from siliceous ores in gold and silver increased from $5.03 in 1911 to $6.84 in 1912. The recovery of gold and silver from copper ores increased from $3.32 to $4.21 per ton. Though the ore sold or treated in 1912 was less than in 1911, the value of the gold recovered from deep mines was $115,813 greater than in 1911, and the average recovery in gold and silver from all classes of ore increased from $4.96 a ton in 1911 to $6.76 per ton the year following.

# Righting an Overturned Gold Dredge

By Lewis H. Eddy*

*SYNOPSIS—Natomas No. 5 dredge was sunk starboard side down in 49 ft. of water, June 8, 1913, a hole having been punched in the starboard side. The water was immediately pumped out of the pond, the dredge righted without further damage than was caused by sinking, and was ready for repair on July 15, 1913.*

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Dredge No. 5, owned and operated by the Natomas Consolidated, of California, in the Natomas field of the American River district, was built by the Western Engineering & Construction Co., for the Folsom Development Co. It was equipped with seventy-nine 9-cu.ft. Bucyrus buckets and Bucyrus machinery, and was placed in commission at Rebel Hill, in December, 1905. It was taken over by the Natomas Consolidated in 1909. Seven and one-half years is a good record for a wooden-hull dredge. The fact that the wooden parts and the machinery withstood the strain of sinking and righting, leaving the boat in good condition for repair, attests the quality of the material used, excellence of machinery and the accuracy of design and construction.

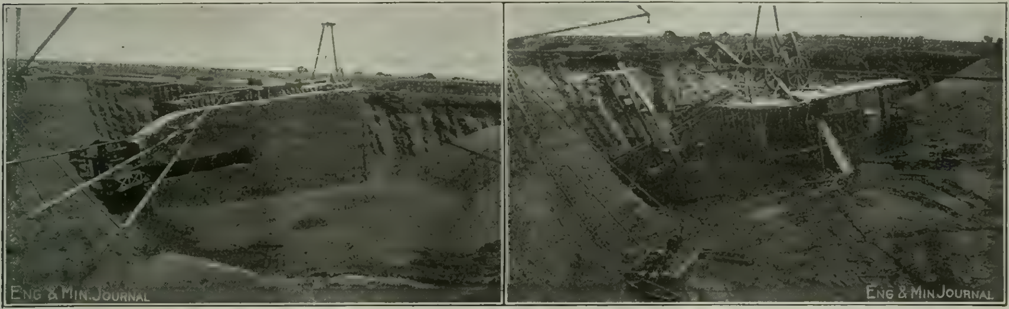

Fig. 1. Cables Attached, Sand Bed Prepared, Taking Initial Pull, and Testing Cable

Fig. 2. After Being Righted, Water Pumped Out of Pond Ready for Final Inspection

### Loosened Bolt Cause of Sinking

The hole which caused the sinking of the dredge was punched 11 sets forward from the stern. It was 16 in. long and 8 in. wide, and resulted from a loosened bolt in rotten wood. The boat began to list immediately after the water started to flow through the hole, and an effort was made to stop the leak from the inside. When this was found impossible, owing to the amount of water flowing in, a piece of canvas to which iron bars were attached was let down on the outside to cover the hole sufficiently to lessen the volume of water flowing in and to enable the men to work inside. The pressure was too great for the canvas and the water continued to pour in through the hole. M. E. Tong, dredgemaster, made a second visit inside and tried to shift the canvas toward the stern in order to entirely cover the hole. The boat continued to settle and Tong had been in the hold only four or five minutes when the water began pouring in through the hatchway, and it was only because of the assistance of the winchman and oiler that he was able to drag himself against the stream and through the hatchway to the deck. The three men had remained on the boat 10 min. after the leak was discovered. They cut out the electric switches and jumped off the gangplank to the shore as the dredge turned over starboard side down and began to settle rapidly to the bottom of the pond.

The dredge sank on Sunday, at 10:45 a.m., and on Monday preparations were made for pumping out the pond. The initial pumping was done with a two-step, 5-in. pump. When the water had been lowered as low as this pump could reach, two single-stage pumps were placed on a barge floated in the pond. As the barge settled with the lowering of the water, the pipe was lengthened until the pond was cleared. As soon as the water was out of the pond a general inspection of the dredge was made. The revolving screen was slightly twisted and some of the smaller machinery parts were broken. The general appearance of the hull was favorable to righting the boat, but some doubt was entertained as to the condition of the timbers, until close inspection had been made. As the dredge was an old one, there was some doubt expressed as to whether or not it could be righted without going to pieces or being badly racked.

The position of the dredge, lying flat on the starboard side, made the inspection, partial dismantling and preparation for righting feasible and convenient. The hull dimensions are 135x48x10 ft.; displacement about 1000 tons. The empty pond was about 200 ft. wide and 200 ft. long, from the face of the cut to the tailing piles, and 60 ft. deep. The dredge had been digging 49 ft. below the water line against an 11-ft. bank.

The outer walls were badly rotted. There were many rotted boards in other parts of the hull, but comparatively few rotted timbers, and none badly rotted in the bottom. The timbers and boards that were badly rotted were on the outside or in position of exposure to the beating or dripping of water. The former practice in dredge building of boring holes in timbers and running rods through them was responsible for some of the timber rotting. This practice has since been abandoned and yokes extending around the timbers are now used for holding the rods.

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*3430 Peralta St., Oakland, Calif.

### SUMMER- AND WINTER-BUILT DREDGES, WEATHER- AND KILN-SEASONED TIMBER

Comparison of No. 5 with No. 6 dredge in the same field is interesting, and the disclosed facts, which have not been published, should be of value to builders of wooden dredges. No. 6 was drydocked in May, 1913, and required a new hull besides other repairs.[1] This boat was in service five years and three months, No. 5 had been in service seven years and six months, and was in much better condition after sinking than No. 6 at the time of drydocking. Both dredges were built under the supervision of R. G. Hanford, and the timbers and lumber for both were selected by D. P. Cameron. Both men are experts. No. 5 dredge was built in the summer, of weather-seasoned wood. No. 6 dredge was built in the winter, of kiln-seasoned wood. Careful observation and close record in the American River, Yuba Basin and Feather River districts by the W. P. Hammon interests, during the general management of Newton Cleaveland, disclosed these facts. That wooden dredges built in the summer have outlasted those built in the winter; and that weather-seasoned timber and lumber used in dredge construction have longer life than timber and lumber that is kiln-seasoned.

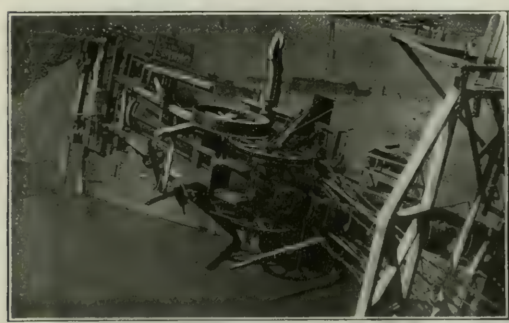

FIG. 3. TOP VIEW, SHOWING PARTS AFTER TOP HOUSING AND PILOT HOUSE HAD BEEN REMOVED. WATER BEGINNING TO FILL POND

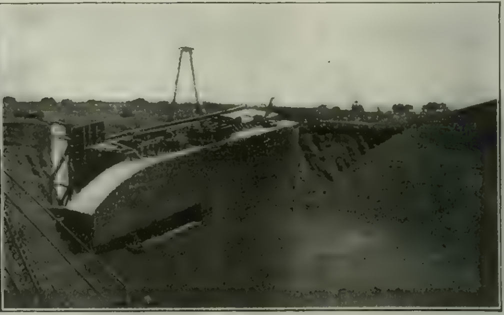

FIG. 4. BOTTOM AND PORT SIDE OF DREDGE. A PULL IS BEING TAKEN WHILE WATER IS RUNNING INTO THE POND

When No. 5 dredge sank, the bucket line went clear of the digging ladder at the lower tumbler, leaving the ladder in position to be easily cut in two. The bucket line was first broken by blasting in three places, and half the line was taken out. The bucket pins were removed and the buckets lifted out singly with a derrick installed at the edge of the pond. The lower tumbler was also hoisted out with the derrick. When the lower end of the ladder was clear the point was burned off at the first butt in the side plates and hoisted out with the derrick. The upper end of the ladder, with the remaining buckets in line, was hauled up with the derrick to the deck line and within the well hole between the timbers of the bow gantry, where it remained while the boat was being righted.

The derrick is of 15-tons capacity; the mast is 90 ft. high, the boom 90 ft. long. The foundation sills of the derrick rested on the cemented gravel on the edge of the shore, flush with the pond, and were set 4 ft. below the shore surface in a cut made for the purpose. The solidity of the cemented gravel which the dredge had been digging was well shown by the placing of the derrick in this position.

The two spuds, having a total weight of 116,000 lb., were hauled out of their casing with a six-part tackle from a 38-ft. A-frame and left leaning against the bank. When the boat went down the stacker struck the bank, broke loose from the dredge and dumped over the motor. When the pond was pumped down the stacker was removed to the shore in the same way as the spuds. The hauling power in both cases was a tractor engine. The stacker frame was a lattice-girder type, 138 ft. long, weighing 39,280 lb., and provided with a 36-in. conveyor belt 280 ft. long. All the housing on the upper deck was removed. Several loosened parts of machinery and some smaller parts that were broken were removed and a portion of the wire screen around the gold-saving tables was cut out so as to make access easy to various parts of the boat.

While the lines were being rigged for pulling the boat over to rest on the keel, a foundation or bed was constructed of tailings sand, which, during the operation of the dredge had been deposited apart from the heavy gravel. This sand carries a large amount of cementing material, and when leveled and tamped becomes hard and solid. This property made it an ideal material with which to make a bed for the righted dredge to rest upon.

A sling of 2-in. cable was placed around the upper tumbler and brought out and up over the boat to the side of the deck and attached to a sheave. A 1½-in. cable was run through the sheave and out to the shore. A winch was placed on the shore about 50 ft. off the bank of the pond opposite the forward end of the boat. A 1½-in. cable was connected to the winch, and on July 3 a pull was taken with a view to easing up the forward end of the boat and testing the strength of the timbers and the general structure to decide whether or not the structure would hold together in withstanding the strain of a pull equal to lifting 200 to 300 tons. The sheave placed on the top of the boat through which this cable was run was a cast-iron sheave and did not hold. The improper placing of a clip on the shore end of the cable, where it was connected with the shore sheave, caused the cable to break during the first hard strain after the cable had been tightened.

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[1] "Eng. and Min. Journ.," Aug. 23, 1913, p. 340.

### Rigging for Righting Dredge with Winch

Three hitches were then made ready before turning water into the pond. Four parts of 1½-in. plough-steel line were passed around the upper tumbler shaft and up over the tumbler and bucket line, through the spokes of the gear, through the upper deck, to a point at the edge of the lower deck about amidships. These parts were attached to a 2½-in. wire-center bridge cable (256 tons) by a double deadeye in a rope socket (open) with a 4½-in. pin. At the shore end of the cable, 300 ft. long, a heave shore sheave was engaged, through which was passed a 2-in. plow-steel line, 144 tons, one end of which was made fast to a deadman, 24x28 in., by 20 ft. long, which was anchored on a rock pile and covered about 12 ft. deep. The other end of the 2-in. line was made fast to the headblock of a six-part tackle, 1⅛-in. line, with about 100 ft. drift. On the fall of this tackle a jig tackle of four parts of ¾-in. line was rigged with about 125 ft. drift, the fall of which ran to an A., H. & D. Co. winch, with a pull of about five tons. The jig tackle was fleeted four times. The pennants slacked quite perceptibly when the hull was at about 45°. Although this hitch showed severe strain, nothing parted or gave way. The probable load was 200 tons.

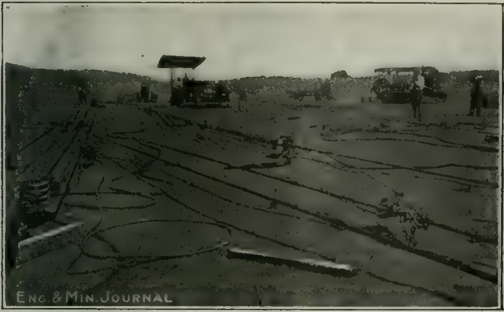

Fig. 5. Cable Rigging, Winches and Traction Engine Used to Right Dredge

Fig. 6. A-Frame and Derrick, Rigging Ready for Pulling Dredge Over

A second hitch was made by passing a 2½-in. center-wire bridge cable over the other strap on the upper tumbler, down through the decks on the lower side to the main keelson, which supports the batter post of the athwartship truss at the main gantry. This line was passed once around the keelson and fastened with five 2½-in. Crosby clips. To the other end of this pennant, 300 ft. long, was attached a shore sheave through which passed a 1½-in. plow-steel line, one part of which passed through a sheave on shore and returned to a becket on the first sheave. The other end of this line was attached to the headblock of a six-part tackle, on the fall of which was placed a four-part jig tackle the same as the one previously described. On the fall of the jig tackle was hooked a 9-ton Holt gas tractor. The tractor was too fast for the winch and parted four of the seven strands of the 2½-in. pennant about midway. To the end on board, a 2-in. bridge cable was clipped with eight 2½-in. Crosby clips. In the open rope socket in this line was then engaged the headblock of a four-part, 1¼-in. tackle, single sheave ashore, and the dead end was fastened to a deadman. A four-part jig tackle was rigged to the fall, the fall of which was led to the tractor. This gave about 100 tons pull before slipping the clips. This hitch was not a right-angle pull, but led forward at about 60° from fore-and-aft center line.

A third hitch was rigged from the stern by passing a 2-in. plow-steel line around on the starboard spud casing, blocking it well between the line and the casing, and passing under the line. This was clipped back upon itself with three Crosby clips. The other end of this line was passed over the main trusses at the rear of the revolving screen and down through the main deck to the keelson supporting the after screen-support. In the bight of this line, which was about 200 ft. long, was hung a heavy short sheave, around which was passed a 1½-in. plow-steel line with dead end ashore and to the other end of which a six-part tackle was attached. On the fall of this tackle a three-part jig tackle was placed, the fall of which led to the winch previously described. This hitch was not at a right angle to the center line, but led forward at about 60°. The breaking strength of this haul was about 180 tons and about 100 tons strain was kept on it till the hull passed the 45° angle, when all the hauls slacked perceptibly for a short distance. All the tackles were then fleeted and the hauling continued until the hull was nearly level athwartship. A four-part tackle was then rigged on the bow-gantry cap and the trusses were pulled into alignment before pumping down the water that had been turned into the pond to lighten the strain of the hauls. The final hauls settled the hull in the mud and sand in a very easy position, about six feet lower at the bow than at the stern, and entirely accessible on all sides for necessary repair.

It was expected that the boat might settle rapidly after passing the 45° angle and the hull would strike hard on the bottom of the pond, causing a jarring of the machinery and twisting of the wooden parts. On the contrary, a continuous strain on the cables was necessary after one slackening of the hauls until the hull settled. The ease with which the boat settled was due to the fact that the starboard wall of the hull had been buried in mud, and the water turned into the pond did not wash the starboard side of the hull clear, but merely loosened the mud and at the same time loosening the sand bed on which the hull finally rested, so that the starboard side of the hull had to be pulled out of the mud, and the hull settled gradually on the bottom of the pond.

The entire work was done in 36 days, and six days of the time were occupied in pumping the pond dry. This is record time for this character of work, and is exceptionally good time considering the caution necessary to prevent racking. All the work was done by the Natomas Consolidated under the supervision of L. D. Hopfield, general superintendent, and the direct superintendency of T. C. Parker.

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# The Production and Consumption of Chemical Fertilizers in the World

A publication of the Bureau of Agricultural Intelligence and Plant Diseases of the International Institute of Agriculture (Rome) has recently been issued, entitled "*Production et consommation des engrais chimiques dans le mode.*" This has been summarized in the *Journal* of the Society of Chemical Industry.

PRODUCTION IN METRIC TONS

| Phosphatic fertilizers | 1903 | 1910 | 1911 |
|---|---|---|---|
| Mineral phosphates | 2,433,779 | 5,344,981 | 6,055,073 |
| Basic slag | 2,243,500 | 3,275,845 | (3,485,500) |
| Superphosphates | 5,130,900 | 9,604,260 | |
| Guano. | (56,000) | (66,044) | |
| Potash salts (for agriculture). | | | |
| Potash salts (calculated as pure potash) | 301,144 | 766,583 | 840,000 |
| Indian salpeter. | 20,570 | 15,581 | 15,273 |
| Other potash fertilizers (calculated as pure potash) . | | | 40,000 |
| Nitrogenous fertilizers: | | | |
| Nitrate of soda | 1,466,993 | 2,432,949 | 2,487,000 |
| Sulphate of ammonia | 537,520 | 1,045,905 | 1,187,425 |
| Cyanamide | | 30,000 | 52,000 |
| Nitrate of lime | 25 | 25,000 | 50,000 |
| Total nitrogenous fertilizers | 2,004,538 | 3,533,844 | 3,786,425 |

It is believed that 1,000,000 metric tons of chloride of potash, corresponding to 630,000 metric tons of pure potash, could be produced yearly in the United States from seaweeds. It has also been proposed in the United States to use feldspars for the extraction of potash in a soluble form; a yield of 100,000 metric tons of pure potash could thus be obtained yearly. The production of sulphate of ammonia has increased fivefold in 20 years. The Mond-Frank-Caro process would allow of the manufacture of 88 to 176 lb. of sulphate of ammonia per metric ton of peat. The production and probable consumption of synthetic nitrogenous fertilizers has been calculated for the years 1913 and 1914. The figures which have been estimated are inclosed in brackets:

| | Calcium cyanamide metric tons | Nitrate of lime metric tons |
|---|---|---|
| 1903 | ...... | 25 |
| 1904 | .... | 550 |
| 1905 | ...... | 1,600 |
| 1906 | 500 | 1,600 |
| 1907 | 2,200 | 15,000 |
| 1908 | 8,300 | 15,000 |
| 1909 | 16,000 | 25,000 |
| 1910 | 30,000 | 25,000 |
| 1911 | 52,000 | (50,000) |
| 1912 | 95,000 | (75,000) |
| 1913 | (97,000) | (140,000) |
| 1914 | (208,000) | |

The world's consumption of fertilizers in 1911 represented a value of about £80,000,000, and was made up as follows:

| | Metric tons |
|---|---|
| Lime phosphates | [illegible] |
| Superphosphates | [illegible] |
| Basic slag | 3,500,000 |
| Guano | 70,000 |
| Potash salts | 4,100,000 |
| (Pure potash) | (818,400) |
| Nitrate of soda | 2,314,450 |
| Sulphate of ammonia | 1,100,000 |
| Other nitrogenous fertilizers | 100,000 |

Data are given on the consumption of fertilizers per unit of area in the different countries. Belgium, Mauritius and Luxemburg use upward of 278 lb. per acre of cultivated area; Germany and the Netherlands from 89 to 178 lb. per acre; Denmark, United States (Southern States), France, England, Australia, Italy and Switzerland from 45 to 89 lb. per acre; next follow the countries consuming from 9 to 45 lb. per acre of cultivated land: Austria, Hungary, Spain, United States (North-East), Norway, Dutch East Indies, Portugal, Sweden. All the remaining countries consume less than 9 lb. per acre or an unknown amount.

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# Sulphuric Acid Manufacture in Great Britain

According to the report of the British Alkali Inspector for 1912, operations at sulphuric acid works were carried on actively for the greater part of the year and were less interfered with than some others by the coal strike. A slow but steady reduction in the number of works is recorded, but an increased aggregate production, the works closed being generally of small capacity. The different forms of mechanical burner, as also fans, came into more extended operation during the year, and there is a general tendency to appreciate the advantage of increased Gay-Lussac tower space. In the Widnes district large fans, running at low speed, are said to be more in favor, and are generally placed between two Gay-Lussac towers.

As a striking instance of the advantage of reduced chamber space, mention is made of a works where two chamber sets were formerly worked without towers, the chamber space of 24-25 cu.ft. per lb. of sulphur charged per day, whereas after denuding one set and increasing the height of the first and second chambers of the other (3-chamber) set from 18 to 25 ft., introducing towers of liberal size, fan draft, and water spray in lieu of steam, 28% more acid was produced with 67.7% of the original chamber space and 11.4 cu.ft. of space per lb. of sulphur charged per 24 hours.

A novel method of introducing nitrous gases by spraying niter solution into the first chamber is reported to have given satisfactory results at another works and appears likely to extend. The "Opl" system referred to in the last report (Eng. and Min. Journ., Feb. 13, 1913, p. 378) has continued in constant use, and a second installation has been put into successful operation. A fatality caused by the inhalation of nitrous vapors is recorded; this occurred during the removal of coke packing from a Gay-Lussac tower, although previously well washed out. Means recommended for reducing to a minimum the dangers associated with the operation in question are: (1) washing the tower with strong sulphuric acid prior to washing with water and steam, (2) the maintenance of a downward draft, and (3) the use of a "safety pipe," fitting with a pneumatic pad against the face of the operator, as required by the special rules of the United Alkali Co. The use of fans in place of the steam jet form of draft inducer in Kessler plants for concentrating sulphuric acid is on the increase. The "cascade" system of concentrating continues to gain in favor and is now in widely extended operation, silica and "tantiron" evaporating vessels being used.

## Dust in Johannesburg Mines

The Miners' Phthisis Prevention Committee has issued another interim report to the minister of mines. It notes that the dust found in the lungs of victims of silicosis is exceedingly small in size, the great bulk being only 0.001 mm. in diameter, with odd grains up to 0.01 mm. An apparatus consisting of an exhausting apparatus, a fine screen to arrest dust larger than 0.06 mm. and a filter of moist sugar was devised for estimating the finer dust underground. Earlier determinations of fine and coarser dust in underground air drilling without water in 1903 showed 307 mg. per cu.m.; in 1910, 170 mg. Cornish mines showed 460 mg. In Jumpers Deep mine, in 1912, dry drilling showed 59 mg. of fine dust; when drilling wet, with sides of drive wet, the amount was 13 mg., and in the City Deep mine, only 4 to 8 mg. The committee is satisfied that dust-catching arrangements are of little use; but that dust formation must be prevented by the use of water in drilling all holes.

Regarding dust from blasting without water blasts or sprays, a sample 200 ft. from face of drive showed 151 mg., with two sprays installed, 91 mg. One hour after blasting, only 8 mg. remained and two hours after, only 2 mg. Where a water blast was used, 30 min. after blasting showed 12 mg. and one hour 6 mg. In slopes, while wet holes were being drilled and shoveling was proceeding, 4 to 6 mg. were present. Shoveling dry rock showed the presence of 18 mg., and when the rock was wet, only 2 mg. The dust in the air of the Aurora West mine showed itself most difficult of settlement after blasting by sprays and water blasts. The amount in the return airway from several stopes 21 min. after blasting was 286 mg.; devices reduced this to 80 mg. I understand, however, that there is some peculiarity in the dust from this mine, as the dust from other mines was settled much more readily. In the Village Deep mine the amount of dust in the air passing the exhaust fan was at 2 p.m., 3.5 mg.; 2:40 p.m., 1 mg.; 3:15 p.m., 9.0 mg. (blasting time 3 to 4 p.m.); 4:40 p.m., 12.5 mg.; 5.45 p.m., 9.0 mg.; 6:40 p.m., 5.5 mg.; 8:45 p.m., 3.0 mg. Experiments with upcast air in the Simmer Deep mines showed a large diminution of dust, owing to the use of water underground.

DUST TESTS IN SIMMER DEEP UPCAST

| Time | Sept. 1911 No Sprays Used | April 1912 Sprays and Wetting | Sept. 1912 Sprays and Wetting |
|---|---|---|---|
| 9.10 a.m...... | 280 mg. per cm | 32.0 mg. | 3.3 mg. |
| 11.30–12.30. | 130 | 21.0 | 0.2 |
| 2–3 p.m... | 80 | 39.0 | 2.1 |
| 4.15–5.15... | 100 | 14.0 | 17.1 |

Except immediately after blasting at the City Deep, the average was 1.6 mg., Brakpan min 1.5 mg. The dust in Johannesburg streets was 2 to 16.5 mg. in April and May and in Paris 7.5 to 23 mg.

Respirators were found inefficient in catching dust when amounts of 50 mg. or over were present. The dust is fine and sharply angular in character, 10% being over 0.007 mm. in diameter and the remainder 0.003 to 0.001 mg. Analysis and examination tends to show that the dust resisting settlement by sprays probably contains a large proportion of talcose or argillaceous (greasy) material which will not moisten. This dust should be less harmful than the silica dust. Most of the dust found in lumps appears to be from blasting and some resembles that from drilling. Dump dust and dust from streets are not found; 15% of the samples examined, collected underground, especially on ladderways, showed presence of tubercular germs. Experiments and tests underground generally showed a vast improvement of recent years, and if the miners could only be induced to do their share, phthisis might be eradicated.

## Developments on the Michigan Iron Ranges

Marquette Correspondence

The Judson Mining Co., in which E. J. Longyear, of Minneapolis, and Joseph Sellwood, of Duluth, are interested, is sinking a shaft on its property in the Mastodon field on the Menominee range, where have been made the most notable of the recent discoveries of iron ore in the Michigan ranges. Mine buildings and a group of dwelling houses are being built at Alpha, a town now but in its infancy. A second shaft is contemplated, and shipments will begin next year, as the overburden is but 100 ft. deep and ore will be encountered soon after it is penetrated.

Extensive drilling operations are under way on the Mastodon field as well as considerable work preliminary to the opening of mines. North of the Judson and between it and the town of Alpha, Pickands, Mather & Co., of Cleveland, are commencing the development of the Balkan tract, a property that has been determined by drilling to be of great value. It is planned to work the mine as an openpit, despite the fact that there is considerable overburden; the shaft now being sunk is for drainage. North of Alpha, the Cleveland Cliffs Iron Co. and the U. S. Steel Corporation control extensive tracts that are being explored. A number of smaller companies are drilling in the surrounding territory.

Alpha promises to be a good-sized town. The employees of the Judson and the Balkan companies will live there, as well as the men employed at other mines that will doubtless be opened. Much of the district lies in a well defined mineral belt and important developments are expected within the next few years. It is planned to build Alpha on an adequate scale. As the town is laid out at present there are 256 lots. A $30,000 school building and sewerage and conduit systems are contemplated.

The U. S. Steel Corporation has been employing two steam shovels in loading ore from the stockpiles at the Chapin mine at Iron Mountain, on the Menominee range, the product going to the docks at Escanaba over the St. Paul R.R. The daily shipments, including the amount hoisted from the shafts, has ranged between 100 and 135 carloads. On the Marquette range, the Cleveland-Cliffs Co. has a steam shovel at work at the stockpile at the Imperial mine at Michigamme.

The mining properties in the Baraga County division of the Marquette range include the Ohio, Portland, Imperial, Webster, Beaufort, Titan and Catherine, west of Michigamme, and a graphite mine near L'Anse. Although many millions of tons of ore have been proved up, but little work is now being done. The ore is of a quality that cannot be generally used to advantage and there is no particular demand for it at present. The formation extends for several miles. The ore lies close to the surface in the greater part of the zone. Should the time ever come when the demand for limonite ore is heavy, the district can furnish an enormous tonnage. Several of the mines are equipped to produce heavily. The Rogers-Brown Ore Co. has completed the installation of an ore crusher and an aërial tramway connecting the Ohio and Portland properties. With the exception of this improvement work the two mines are idle, as are all the others in the field, excepting the ore loading in progress at the Imperial.

The Lake Superior Iron & Chemical Co., operating charcoal-iron furnaces and chemical works at several places in Michigan and at Ashland, Wis., has for several months been experimenting with a new byproduct and has about perfected its manufacture. The commodity is a wood preservative and is manufactured from material that now goes to waste at the various plants. A carload of this new product was shipped from the Manistique works recently and as soon as a market can be created apparatus will be installed in all plants for its manufacture. The works at Newberry, Mich., will have a daily capacity of about 700 gal., and the Manistique plant a capacity of 300 gallons.

M. A. Hanna & Co., of Cleveland, is opening a mine on the Gogebic iron range. The property is the Wakefield, south of the village of Wakefield, Mich. The ore was discovered by Seldon Rose, of Marquette. The deposit lies so close to the surface that it is the intention to strip the overburden and mine the ore with steam shovels. Rose, who is a mining engineer and geologist, was attracted by the rock formations of the vicinity and he decided to do exploratory work. He procured a lease to the tract from the Keweenaw Association, of Boston, the owner of the fee. A churn drill was used and ore was encountered from 30 to 70 ft. from the surface. The deposit has been proved to be of large proportions. The ore is of the highest grade. Since this discovery several drills have been put into commission to the east and the west by other men. This ore is found considerably farther south than any heretofore located in the Wakefield district, with indications the deposits will prove more extensive than those of the ore measure to the northward.

The Breitung interests of Marquette, operating on the Marquette range, will this season make the heaviest shipments in their history. It is expected that 600,000 tons of ore will be sent down the lakes. Of this, 100,000 tons will be forwarded from the Mary Charlotte and 100,000 from the Breitung Hematite, both at Negaunee, and 100,000 from the Baron mine at Humboldt. The mines are being worked with large forces, though these are not the largest employed at any time since the properties were opened. Much of the shipments to date have been from the stockpile and have represented last winter's output. There are still 150,000 tons in stock at the Mary Charlotte, practically all of which will, it is expected, be sent out this season.

## Production of Bauxite and Aluminum

The production of bauxite in the United States in 1912 was 159,865 long tons, according to the U. S. Geological Survey. Compared with the output of the preceding year, these figures represent an increase of 4275 long tons. The states which produced bauxite in 1912 were, as heretofore, Alabama, Arkansas, Georgia and Tennessee. Arkansas led in production, as usual, but the output from this state was not so great as in 1911. In 1912 bauxite was mined for the first time on a commercial scale by the National Bauxite Co., in Carter County, Tenn., the exact location being about one mile northeast of Keenburg, a station on the Virginia & Southwestern Ry., about 4 miles north of Elizabethton, the county seat.

Though bauxite deposits are being found from time to time and though the present demand does not appear to tax unduly the known supply of the lower-grade material, the interest now being taken in the preparation of pure aluminum from clay, or other silica minerals, is worthy of note. As soon as a process for the extraction of aluminum from clay is put on a commercial basis, great quantities of low-grade bauxite, containing considerable admixtures of clay, will become available. That there is a large tonnage of such materials associated with most of the Southern Appalachian bauxite, is well known. This material should first be experimented upon before the non-bauxite clays, containing the smallest amount of alumina, are utilized.

There was an increase in the domestic production of metallic aluminum during 1912, but the large increase of the domestic consumption is chiefly due to the increase in import. Production of aluminum in pounds in the United States for 1912 was 65,607,000. The exports amounted to 1,347,621 pounds.

## Tungsten Ore in Burma

Ores of tungsten and tin have been discovered practically all over the Tavoy and Mergui districts, in Burma, according to a letter from H. B. Osborn, United States Consul at Rangoon. A number of concessions are being worked. Wolframite is the main object of exploitation, cassiterite being a sort of byproduct, although at times the tin ore forms a larger percentage of the alluvial deposits than the wolframite.

It is practically impossible at this stage of development to give any figures showing what percentage of wolframite or cassiterite occurs in the lodes, as little lode mining has been done, but judging from the abundant alluvial deposits scattered over the hillsides near the lodes and by the appearance of the lodes themselves, there is ample justification for prospecting some of the lodes by adits. It is said that work of this nature is being carried out on several concessions.

The greatest part of the output of wolframite from the Tavoy district is obtained from the float deposits. The extent of float areas cannot at present be even estimated, but judging merely from the topographical features of the country in which they occur, they are of varying and often considerable extent and will yield ore in paying quantities for a long time to come. They are being exploited on the contract system, a miner being paid a certain fixed sum per agreed weight. The concentrates resulting from this class of work are very rich and sell well. The percentage of tin in the alluvial ground very often becomes an important factor, notwithstanding the fact that it occurs in practically negligible quantities in the lodes.

As mining in Tavoy is in its infancy, statistics of actual mining work cannot be given, but it appears that the laborers are continuously improving in efficiency. The natives work the deposits with pan, sluice box and rocker, and earn up to 48c. per day. It is estimated that the present cost of a ton of concentrates carrying 65 to 70% tungsten trioxide is about \$300 delivered in England. This leaves the sellers a good profit at present prices, which are \$7@7.50 per unit.

# Allgemeine Deutsche Bergmannstag

By O. H. Hahn

*SYNOPSIS—An account of the meeting of the German mining engineers society. This is marked by many social features, and by interesting excursions.*

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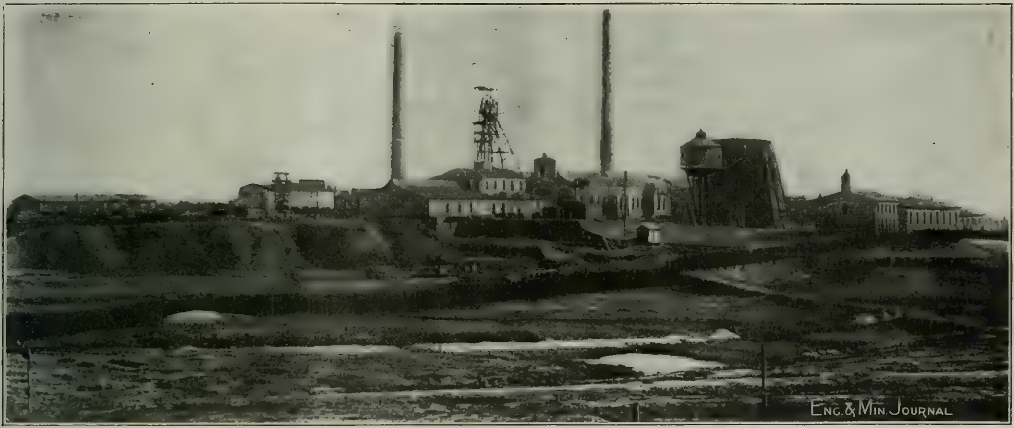
The twelfth Allgemeine Deutsche Bergmannstag (general convention of German mining men) was held at Breslau, the capital of the province of Silesia, Prussia, from Sept. 2 to 5. This is an informal organization similar to the International Geological Congress, the membership being optional from meeting to meeting. Only those are admitted as members who occupy a leading position in mining and metallurgical circles, or who are engaged in scientific pursuits relating to mining and metallurgy. Foreigners are admitted as members at the discretion of the executive committee. The meetings take place every three years in the first half of the month of September when an executive committee is elected to serve for the next term.

## Proceedings at the Technical Sessions

The first day of the twelfth meeting was spent by visitors registering at the business office of the committee, receiving members' badges and tickets of admission to the various entertainments arranged for, and renewing old acquaintances. In the evening of Sept. 2 there was a civic reception by the city authorities in the stately old city hall, a fine monument of Gothic architecture. The customary collation was served in the various halls of the building, and speeches of welcome were made by the lord mayor and the chairman of the committee. In the morning of the following day the members of the convention assembled in Leopoldina Hall of the university, where the formal meeting was called to order at 9:30 a.m. by the chairman of the committee, "Berghauptmann" Schmeisser, the chief of the provincial mining department, in the presence of the Prussian minister of commerce and public works, the governor of the province of Silesia, the rector of the university, the prorector of the "Technische Hochschule" and other high dignitaries. Herr Schmeisser, who is well known, through his report on the gold resources of the Rand and of Western Australia to the Prussian government, in a well set speech extended a cordial welcome to the visitors, at the same time thanking the town authorities for their coöperation in the work of the committee to make it pleasant for them. Other speeches of welcome and thanks followed, whereupon the business portion of the meeting was taken in hand. A speech by the minister of commerce in which he asserted that the climax of the industrial boom had been reached and that we were now on a downward grade elicited considerable stir and comment in the press.



Hillebrand Shaft, Gottessegen Colliery, Upper Silesia

At the close of the business proceedings the prorector of the "Technische Hochschule" rose and conferred the degree of doctor engineer on Herr Schmeisser, on behalf of his institution, in recognition of the eminent services rendered by that gentleman to the mining profession. Papers were then read by the following gentlemen: (1) Professor Michael on the geological foundations of mining in eastern Germany; (2) Herr Bunzel on some observations on the sagging of the ground in consequence of sand filling in the mines of upper Silesia; (3) Herr Werne on carbonic-acid outbursts in lower Silesian mines; (4) Dr. Leimbach on the exploration of the interior of the earth by means of electric waves; (5) Herr Heimann on German mining ventures in the protectorates and in foreign countries; (6) Herr Schorrig on the employment of electric safety lamps in mines; (7) Herr Iversen on selection of modern safety devices for steam hoisting engineers; (8) Herr von Poellnits on architectonic ornamentation of industrial buildings with special regard to structures at mines in olden and modern times.

When the last speaker had finished the session was adjourned and the visitors repaired to the exposition grounds where an exquisite luncheon awaited them in the grand restaurant, tendered by the committee. The remainder of the afternoon was spent according to the inclination of the individual members, some of them inspecting the exhibits on the exposition grounds, others repairing to town. Most all of them returned, however, in the evening to attend a grand banquet in the festival hall, an immense dome-like building destined just for such purposes and for concerts. After the conclusion of the banquet the visitors were given an opportunity to listen for a while to the majestic strains of the grand organ in the hall, said to be the largest in Europe, followed by a dance in the arena to gratify the tastes of the younger folks. The assemblage broke up about 2 a.m., Sept. 4.

### Excursions to the Mining Districts

This day was devoted to an excursion into the mining districts of Upper Silesia. As about 1400 members, many accompanied by ladies, had signified their intention to participate, the committee had to divide the excursionists into as many groups as there were works to be visited, the number in a group being limited to 50 or 100, according to the size of the works and their ability to take proper care of their charges. The greatest rush had been for admission to the government works near Gleiwitz and to the von Giesche possessions near Kattowitz. Those who had been too late with their applications for admission were assigned to other groups.

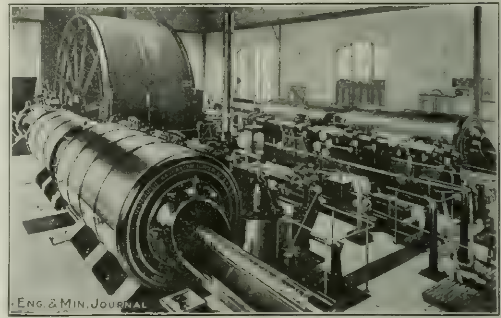
I, for one, was attached to the party bound for the works of the Silesia Mining & Zinc Reduction Co., at Lipine, and the Hillebrand shaft of the Gottessegen colliery, near Antonienhütte, belonging to the Counts Henckel von Donnersmarck. Two special trains pursuing different routes were provided by the committee to convey the visitors comfortably to the station nearest the place they wished to see. A three-hours' train ride landed me at Morgenroth, my getting-off station. Here carriages were in waiting to take the parties belonging to our group to the Silesia company's hotel at Lipine. On the way there we could observe smokestacks galore belching out volumes of smoke, and head gears and immense dumps of coal mines in close succession interspersed with settlements of brick buildings, indicative of an intense industry. Arrived at the hotel we were ushered into a large hall, presumably the dining hall, where, at the bidding of Herr Remy, the managing director of the Silesia company, we had to sit down to a substantial breakfast before proceeding to business.

At the conclusion of the breakfast Herr Remy favored us with an instructive lecture on the processes involved in the manufacture of zinc from the time the ore is extracted from the mine until it reaches the reduction works and leaves the rolling mill as finished product on the railroad. The lecture was assisted by an exhibit of the ores, smithsonite and sphalerite, both in the raw and the roasted state, of fuel and fluxes, crude and refined zinc, cadmium, sulphurous and sulphuric acid, cast and rolled metal, spikes, disks, etc., geological maps showing the mode of occurrence of ore and coal in Upper Silesia and drawings of the works and furnaces. At the conclusion Herr Remy gave each visitor permission to take along a souvenir from the specimens piled up on the table besides presenting us with a pamphlet on the "Schlesische Aktien-Gesellschaft für Bergbau und Zinkhuttenbetrieb," which contains an outline of its organization, history, etc., and some statistical notes. Thus prepared we proceeded under the leadership of Messrs. Remy and Köhler, the works manager, to the reduction works, where the grinding machinery for the ore, the sulphuric-acid plants, the roasting appliances, the smelting furnaces, the machinery for manufacturing muffles and finally the rolling mill were inspected.

The company treats principally ores from its own mines located about the town of Beuthen and in Sweden, but receives also a limited amount of custom ores. It also owns a number of coal mines, one close to the works and others near the boundary line of Russia. There is enough oxidized ore left in the mines to make a favorable mixture of carbonate and sulphide of zinc possible. The zinc mines have dressing works attached to them, so that there is only a comparatively small quantity of blende that has to be ground up at the reduction works. The concentrates merely require drying before going through the roasting furnaces which are for the most part three-story muffle furnaces of the Rhenania type, only a few of the old Freiberg furnaces being left.

### Strict $SO_2$ Regulations in Silesia

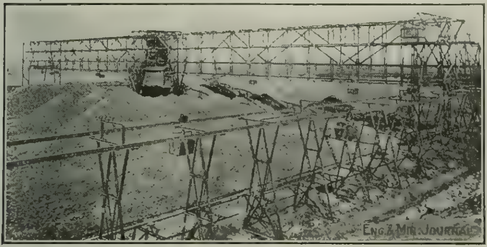
The reason for this is that the government regulations against the pollution of the air by the discharge of noxious gases are strict nowadays, so that the works where roasting is going on have been compelled to trap their sulphurous acid fumes and convert them into sulphurous or sulphuric acid. The Silesia company manufactures its sulphuric acid both by the lead chamber and by the contact process, the latter being the method practiced by the Grillo works, Oberhausen, Westphalia. It also makes a small quantity of anhydrous sulphurous acid for regular customers. In 1912 the Silesia works produced 51,117 metric tons chamber acid of 50° Bé, 7704 metric tons of contact acid and 2855 tons of anhydrous sulphurous acid. The chamber acid is used in the manufacture of fertilizers such as superphosphate and sulphate of ammonia, the contact acid in manufacturing dynamite and the sulphurous acid is sold to celluloid factories. Unfortunately Upper Silesia is too remote from the places of consumption of these articles to derive any profit from their sale, excessive competition and prohibitive railroad rates on acid are the contending factors.



Winding Engine, Hillebrand Shaft

The zinc-distilling furnaces are distributed over seven large and lofty buildings; 100 of them are equipped with one tier of the large-sized Silesia muffles, 28 with three tiers of the smaller Rhenish muffles. The former are made by hand, the latter by machinery. The fire-places of the furnaces with the Silesian muffles are supplied with undergrate blast, while the three tier furnaces are provided with gas producers and recuperators. The mixing of the charges is done by machinery, but the charging and discharging of the muffles are still performed by hand. The Lipine works turned out some 35,000 tons of crude zinc in 1912, besides 468 tons of lead and 11.8 tons of cadmium. Experiments made with smelting in the electric furnace have given negative results, the expense for current being excessive. Nor has electrolysis been successful.

The rolling mill has 11 steam engines, their respective horsepower ranging from 80 to 120. The exhaust steam from these and other auxiliary engines is stored in an accumulator and, in conjunction with live steam, used for feeding a steam turbine coupled to a three-phase dynamo, with surface condensation and auxiliary pumps and cooling tower. This plant furnishes current for power and light to the Lipine works. To guard against emergencies it is duplicated. A narrow-gage railroad conveys coal, ore and other material to the works. The company owns additional works in other parts of the country.



Coal-Storage Plant, Hillebrand Shaft

### The Hillebrand Coal Mines

Taking leave of our obliging hosts and guides upon our exit from this interesting establishment, we mounted our carriages again and were driven through the town of Antonienhütte to the Hillebrand pit already mentioned. Our first stop was at the rescue station of the mine where we saw the rescue crew and the fire brigade drilling. Then we moved on to the shaft proper, which is some distance off. Here we were received by the general manager and the mine manager amidst the blare of the Donnersmarck brass band in the hall of the club house, which was lighted by electric lamps, presumably to show the glass image of Santa Barbara, the miners' patron saint, conspicuous over the podium, to its best advantage. Successively we were shown over the hoisting works which are provided with Thomson hoisting gear, the engine and boiler rooms, the electric plant and the electrically driven plant for storing and loading coal which has some features in common with the Hulett unloader, and is considered of great value in the case of strikes. The dumping capacity is 200 tons per hour, the loading capacity 100 tons. The main shaft has two compartments and is a downcast one. Its section is 21.3 m., and its depth 509.8 m. It has a hoisting capacity of 2200 tons per eight hours. As an auxiliary an upcast air shaft may be used, which has a capacity of 750 tons per eight hours. The underground hauling is done entirely by electric locomotives, no animals being used. There are also five electric winches underground. The drainage is performed by hydraulic engines. The counts Henckel von Donnersmarck own coal concessions in upper Silesia aggregating approximately 73,000,000 sq.m., and are being developed through three collieries which turn out 2,200,000 tons annually with a crew of 5000 workmen. These notes are taken from a booklet with which we were presented by the management and do not pretend to exhaust the subject.

According to the program laid out for us our sightseeing expedition ended here and the balance of the day was given over to social intercourse. To begin with, we were invited by the managers to enter the miners' recreation grounds, which are separated from the premises of the shaft by a board fence and gate, and do justice to the good things laid out on a long row of tables while the miners' band discoursed gay music from a pavilion. Polish maidens in their national attire served coffee, liqueur and champagne, while the weed was dispensed by a boy moving about with a hand cart. A pretty incident was the distribution of packages of picture postcards to the visitors as they entered, by two young boys disguised as gnomes, who were stationed at the posts of the entrance gate. At the conclusion each visitor was handed a souvenir in the shape of a miniature mine car carved out of coal by an artistically inclined miner.

The afternoon was pretty far advanced when we left again in the carriages for Benthen, O. S., a fine, solidly built mining town of modern aspect. We were driven to the public play grounds where part of the other groups had already settled down to enjoy the hospitality of the town in the shape of a five-o'clock tea. The Prince of Pless's miners' band enlivened the place with music. At dark we drove in long procession to the concert hall, where, to cap the climax the town authorities had tendered us a final banquet. Needless to say that it was a great success! At last it was announced that our train would arrive at 8.45 p.m., and so we repaired to the depot to be taken back to Breslau by midnight. For Sept. 5, the last day of the convention an excursion had been arranged for the mountains of Lower Silesia, also by special train. While Upper Silesia presents a multitude of technically interesting objects, Lower Silesia has not much to show in this regard outside of its coal mines in the Waldenburg district and the fireclay pits of Neurode, which furnish the material for the muffles of the zinc works. The trip was, therefore, mainly one of pleasure and wound up in the "Kurgarten" of Bad Salzbrunn, a spa belonging to the prince of Pless, one of the largest landed proprietors in Silesia. A banquet in the Kurpark hotel and a grand illumination of the gardens concluded the entertainments, whereupon the members of the party returned to Breslau to disperse next day in all directions of the compass.

Great credit is due to the parties who combined in making the meeting such a grand success: The executive committee, the government authorities, the managements of the Prince of Pless', the counts Henckel von Donnersmarck's, the von Giesche possessions, the town corporations, and last, but not least, the "Oberschlesische Berg- und Hüttenmännische Verein," which caused the publication and distribution of five handsome volumes of monographs on the geology of eastern Germany and the mining industry of Silesia in particular with geological maps attached. A map which will be particularly appreciated by new comers in Silesia is the one showing the occurrence and extent of the ore deposits of Upper Silesia in different colors according to the metal prevailing. Most of the mining papers, such as *Metall und Erz, Kohle und Erz, Braunkohle, Kali, Glückauf* and *Deutsche Bergwerkszeitung*, came out with special editions to honor the occasion.

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## The Government and the Steel Corporation

The following pertinent and sensible communication appeared in the New York *Sun* of Oct. 7, 1913:

In view of the present depression of general business, brought about by the uncertainties of an untried fiscal system, the Administration may well inquire into the wisdom of further prosecuting the suit, inherited from its predecessor, by which the dissolution of the United States Steel Corporation is sought. Here is a huge industrial unit that, by the perfection of its organization, has revolutionized a whole industry, simplified and cheapened processes, improved products, developed an impressive foreign trade, reformed the relations of capital and labor, raised the standard of living of its employees, and by its ramifications has linked its fortunes with almost every other important business concern in the country. The prosperity of half a million stockholders and their dependents, and the welfare of a million employees and their families, are more or less affected by this litigation, which none but the most aggressive "trust buster" believes to have been commenced in good faith, and which, whatever its final legal outcome, can be productive of nothing but injury to the nation's best interests.

For 10 years the Steel Corporation flourished under the ægis of the government itself. New mills were erected, railroads were built, steamships bought, ore and coal deposits acquired, bonds were sold and shares were purchased by investors, all under the protection of the existing law; and the President of the United States himself stood sponsor for the act for which it has been most blamed. Most unjust and unfair it was when, for a transitory political effect, the very Administration that had assisted at the birth of this great industrial organization and openly rejoiced at its growth set in motion the legal machinery to destroy it. And equally unjust and unfair, as well as unwise, will be the present Administration if, indifferent to consequences, it continues the destructive work of its predecessor. Whatever political effect may have been sought prior to the Presidential election by this suit to dissolve the Steel Corporation, it has fully served its purpose and has now thoroughly exhausted itself. It should be quietly dropped into the oblivion that has overtaken the rest of the campaign material.

The phenomenal growth and success of the Steel Corporation is something of which the nation should be proud. Before its formation our foreign trade in iron and steel was practically nil, consisting mainly of the dumping of an occasional surplusage for which no home market was available. Last year our exports of finished iron and steel amounted to over $300,000,000. Of this 80% was the product of the Steel Corporation. Eleven years ago we imported 135,000,000 lb. of tin plate; last year less than one-twentieth of that amount, a change largely due to the Steel Corporation. At present we are annually making nearly 600 lb. of steel for every man, woman and child in the country. This is 10 times as much as is done by the rest of mankind. The manufacture of iron and steel, with all that it implies, is the most comprehensive measure of a nation's progress in the arts of civilization. It is a proud distinction for America that in this she leads the world.

While impressive in itself, the foreign trade which the Steel Corporation is rapidly building up has implications of supreme interest and importance, and any legislative obstruction to this trade must have far-reaching consequences. With the growth of the United States from 65,000,000 people to 95,000,000 in 20 years, a complete revolution has taken place in our industrial system, a revolution by no means unnoticed in itself but generally ignored in its effects.

The claims of the Steel Corporation for legislative sanity are manifold. It is in no sense a monopoly, nor has it at any time sought to restrain trade. On the contrary, it has won for our nation supremacy in the leading industry of the world. Before its time steel was graphically described as either a prince or a pauper; the prince has been deposed and the pauper elevated. A hundred millionaire capitalists have been supplanted by 150,000 shareholders. The autocratic rule of a small industrial oligarchy has been replaced by a democracy of small shareholders. It has elevated a commonplace business to intellectual levels. It has centralized manufacture and standardized products; by scientific experimentation it has improved processes and output; it has effected economies formerly undreamed of by reducing waste motion and effort; by comparative administration it has combined and concentrated the intelligence of managers upon constantly recurring problems of manufacture and distribution; it has eliminated business risks by a comprehensive system of mechanical accounting; it has given stability to the trade by scientific regulation of output to demand; it has established warehouses throughout the world where large stocks of steel, finished and unfinished, are kept ready for instant delivery, thus simplifying sales and abolishing market fluctuations. With all this it has humanized the business of converting crude ore into finished steel. It has taught the ignorant workman; it has elevated his home life, educated his children, and generally raised his standard of living. In sickness it has provided him with nurses, medical care and comfort. When injured or overtaken by old age it has pensioned him and driven the fear of penury from his mind.

That these results and more have been achieved in spite of political hostility and threatened legislative obstruction is the strongest kind of a reason why this hostility and obstruction should now cease. The abandonment of the government suit against this great organization might fittingly inaugurate a new Age of Reason.

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**Disappointment is Felt in the Swastika District** over the fact that so little outside money has come in. With the exception of some of the local people, no strong mining company has taken up any property in the camp. This is due partly to the fact that the discoveries are over-rated, and partly on account of high prices and terms. There are several companies in the field which are prepared to take up properties provided they can acquire them on a reasonable basis, but so far little has been done

# Increase of Well Temperature with Depth

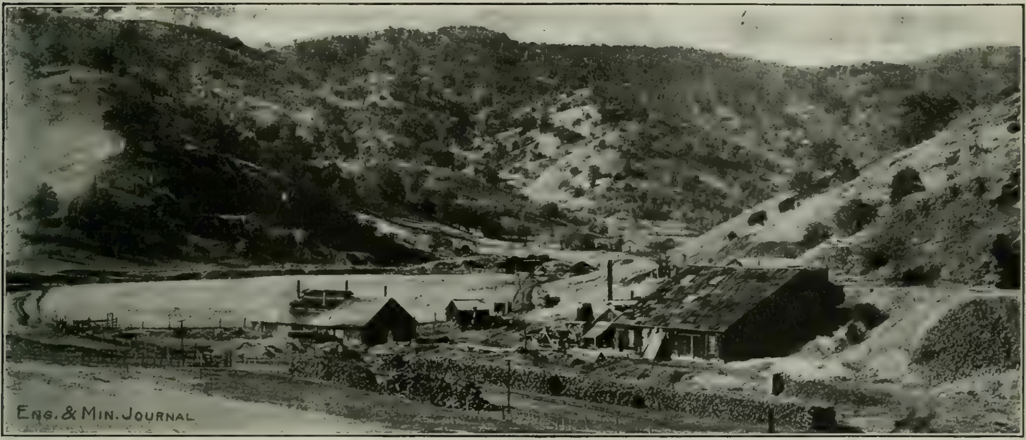
An oil well drilled to considerable depth at a point near Findlay, Ohio, was examined by the U. S. Geological Survey and the increase of the temperature with depth was measured by John Johnston. The results of his investigation are published in the *American Journal of Science,* August, 1913. Readings were taken at eight points in the well, beginning at the 100-ft. and finishing at the 2980-ft. point. In this distance the temperature after correction increased from 51.8° F. to 82.1° F., equivalent to a total increase of 30.3° F. This is an increase per 100 ft. of 1.052° F., or an increase of 1° F. per 95 ft. of depth. The figure is about an average, as determined previously in mine workings.

The method of obtaining the thermometer readings is of interest. Three thermometers were used, of the maximum-reading type. The object of using three was to check any errors that might result from jarring in raising the instruments. As a matter of fact, the readings checked closely. The three thermometers were inclosed in a thin-wall open copper tube, being held fast by short pieces of rubber tubing of appropriate size slipped about ½-in. over each end of each thermometer and kept in compression between the constricted lower end of the tube and a kind of a hinged lid at its upper end. The tube itself was suspended between two spiral springs in a sort of a cage built of stout wire. The cage again was attached, top and bottom, by open links to 100-ft. lengths of ⅛-in. steel-wire cable. The lower cable carried a weight, the upper was attached to the bottom of the bailer, which in turn hung as usual on the sand line and was raised and lowered with the engine. The weight minimizes the possibility of jarring, but it must be far enough below the thermometer so that the heat absorbed by it is not abstracted from the zone in which the thermometer is registering the temperature. A similar precaution must be taken with the bailer.

# Concentration of Cinnabar Ores

By George V. Northey*

The milling process of reduction of cinnabar ores employed at the Manzanita Quicksilver mine in Sulphur Creek district, Colusa County, Calif., should be of interest to quicksilver miners, especially to those who have large deposits of low-grade ore that would not warrant the installation of furnaces. The Manzanita mine has produced a total of 2000 flasks of quicksilver, the largest part of which was produced in the eight years ending with 1912. All of this quicksilver was recovered by retorting the concentrates reduced from the cinnabar ores by milling and concentration. The ore is delivered from the mine to a No. 1 Gates breaker and broken so as to pass a 1-in. screen. From the crusher the ore passes to a 5-ft. Huntington mill where it is pulverized to 20-mesh; after which, without any sizing, the material is passed over six Gilpin County bumping tables. The tailings from these tables is put into cone separators, the lighter material flowing off and the heavier material passing over another concentrator where the remaining cinnabar is extracted.



Manzanita Quicksilver Mine, Sulphur Creek, Colusa County, Calif.

Large building housed the mill; the smaller the retort furnaces. The milling plant has since been removed to the Aetna mine, Napa County.

The Huntington mill is provided with regulating arms and screws which regulate the pressure of the rollers on the inside of the large ring or die. This insures not only steady pressure against the die, but also saves the wear of the roller rings and die. Before installing the regulating arms the roller rings in this machine wore into very irregular shapes and in doing so did not return against the die more than two-thirds of the time. By the use of this appliance the roller rings work smoothly against the die and fully 25% more material passes through the mill, and the results of the grinding are proportionately better than without the regulation. Another point gained by the regulating screws is that the cinnabar, as soon as crushed to the proper size, immediately passes through the screens, and is not crushed by pounding, which slimes the cinnabar, while by the other plan, that is, with the use of regulating screws, the cinnabar passes through the screens immediately and a small amount of slime is produced.

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*Former owner and operator, Manzanita Quicksilver mine, Williams, Calif.

The amount of ore capable of being passed through the mill depends entirely upon the gangue carrying the cinnabar. In actual work at the Manzanita mine we have passed through the mill from two to five tons of ore per hour, at the same time making concentrates averaging from 35 to 40% quicksilver, and in many cases as high as 68%, while the tailings for several months' milling averaged from 5 to 10c. per ton.

These concentrates are dried in the usual way and mixed with the proper percentage of lime, which varies from 10 to 25% lime. The concentrates are then placed in a D retort, or pipe retort, and heated to a dark red, commonly called cherry red, from 600 to 1000° F., according to the size of the material placed in the retort. The time required is from 10 to 12 hours to complete a thorough extraction of the mercury, after which the mercury is cleaned and placed in 75-lb. flasks in the usual manner.

The power required for this plant is about 25 hp., including the breaker and mill. The concentrators are driven by a separate engine to insure steady motion and using about ½ hp. to each machine. The motive power used is a 25-hp. four-cycle distillate engine, which is so arranged as to take the proper amount of gas (according to the amount of work being performed) at every cycle, making an absolutely steady motion. The water-cooling system is somewhat different from the system usually employed in engines of this description. In the usual system the water enters at a point near the exhaust valve and then passes out through an opening directly over the piston at the front end of the cylinder. With such system in operation during the summer time it was impossible to keep the engine cool, and it was sometimes necessary to shut down and let the engine cool off as a means of safety. After several delays on this account the system was changed, and instead of putting in the water at the exhaust valve, it was put in at the front end of the cylinder directly over the piston, and the regulating valve was placed in the water pipe above the cylinder. In operating this system the water was turned on in sufficient quantities to keep the exhaust valve cool. In other words, the water leaving the exhaust valve was 160° F. The result was that the front end of the cylinder was always cool, and the amount of lubricating oil was reduced more than one-third, while the combustion end of the cylinder was kept at the point at which the most effective work was accomplished. Some engineers may contend that the valve will heat and require more or less grinding. That this is not the case is proved by the fact that this engine was run constantly for nine years, and not a single valve in the engine has ever been reground.

The cost of milling during the time of operation and working of several thousand tons of ore, and including fuel, wages, deterioration, etc., was 60c. per ton of ore treated. This does not include the office expenses, but does include the wages of all the men in the mill. This cost is based upon the treatment of an average of two tons of ore per hour. Under some favorable conditions the cost of milling was reduced as low as 25c. per ton of ore treated. This low cost applied to ore that occurred in the form of sand, the common name in the camp being "brown sugar." The average value of the ore was about $5 per ton, or about 0.5% quicksilver.

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# Byproduct Coke Ovens in the United States

The accompanying list of byproduct coke ovens in the United States, Jan. 1, 1913, is taken from the advance chapter on coke from the "Mineral Resources of the United States" published by the U. S. Geological Survey. The number after each name represents the number of ovens.

*Semet Solvay Ovens*—Tennessee Coal, Iron & R.R. Co., Ensley, Ala. (240); Central Iron & Coal Co., Tuscaloosa, Ala. (40); Byproducts Coke Corporation, South Chicago, Ill. (280); North Shore Gas Co., Waukegan, Ill. (13); Indianapolis Gas Co., Indianapolis, Ind. (54); Kentucky Solvay Co., Ashland, Ky. (41); Solvay Process Co., Delray, Mich. (172); also at Syracuse, N. Y. (40); Empire Coke Co., Geneva, N. Y. (46); Cleveland Furnace Co., Cleveland, Ohio (100); Dunbar Furnace Co., Dunbar, Penn. (110); Philadelphia Suburban Gas & Electric Co., Chester, Penn. (40); Pennsylvania Steel Co., Lebanon, Penn. (90); also at Steelton, Penn. (120); National Tube Co., Benwood, W. Va. (120); Milwaukee Coke & Gas Co., Milwaukee, Wis. (160).

*Otto-Hoffmann Ovens*—New England Gas & Coke Co., Everett, Mass. (400); Camden Coke Co., Camden, N. J. (100); Hamilton-Otto Coke Co., Hamilton, Ohio (50); Pittsburgh Gas & Coke Co., Glassport, Penn. (120); Lackawanna Iron & Steel Co., Lebanon, Penn. (228); Northwestern Iron Co., Mayville, Wis. (36); Cambria Steel Co., Johnstown, Penn. (60).

*United Otto Ovens*—Citizens' Gas Co., Indianapolis, Ind. (100); Maryland Steel Co., Sparrows Point, Md. (200); Michigan Alkali Co., Wyandotte, Mich. (30); Zenith Furnace Co., Duluth, Minn. (50); Camden Coke Co., Camden, N. J. (50); Lackawanna Steel Co., Buffalo, N. Y. (188 ovens completed; 564 contracted for); Hamilton-Otto Coke Co., Hamilton, Ohio (50); Carnegie Steel Co., South Sharon, Penn. (212); Cambria Steel Co., Johnstown, Penn. (312).

*Koppers Ovens*—Woodward Iron Co., Woodward, Ala. (140); Tennessee Coal, Iron & R.R. Co., Corey, Ala. (280); Coal Products Manufacturing Co., Joliet, Ill. (35); Illinois Steel Co., Joliet, Ill. (280); Indiana Steel Co., Gary, Ind. (560); Inland Steel Co., Indiana Harbor, Ind. (65); Maryland Steel Co., Sparrows Point, Md. (6); Minnesota Steel Co., Duluth, Minn. (92); Republic Iron & Steel Co., Youngstown, Ohio (68).

*Rothberg Ovens*—Lackawanna Steel Co., Buffalo, N. Y. (282); Cleveland Furnace Co., Cleveland, Ohio (25); Lackawanna Iron & Steel Co., Lebanon, Penn. (5).

In addition to the above, the Central Indiana Gas Co., of Muncie, Ind., has 22 Klönne ovens, and the Lehigh Coke Co., South Bethlehem, Penn., has 300 Didier ovens, of which 150 were not completed at the beginning of the year.

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**The Canadian Pacific Ry. Will Use Oil** in place of coal for fuel on the Vancouver-North Bend division, as soon as the locomotives can be converted from coal to oil burners at the railway shops in Vancouver. There are about 60 locomotives used on the division, and it will require a considerable time to make the change.

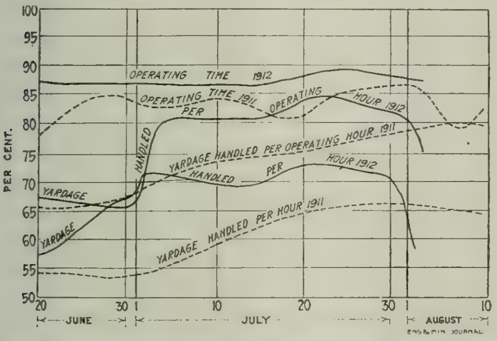
# DETAILS OF PRACTICAL MINING

## Results of Incentive Bonus

By Dr. Henry M. Payne*

An interesting illustration of the results of an incentive bonus is to be found in the records of one of the large gold-dredging companies operating in the Yukon Territory. As is known, the open season there averages only about 150 days, from the middle of May to the middle of October, and a careful study of the 1911 records developed the fact that the maximum operating efficiency is never reached before the latter part of August, and then quickly begins to drop off preparatory to closing down early in October.

In designing a bonus system to meet existing conditions, there were many contingencies to consider. The question of a proper thawing of the ground, thorough washing of the material dredged, freedom from stoppages, etc., all entered into the problem. The results which it was desired to attain were:



Graphic Representation of the Results of a Bonus System in Dredging

(1) To increase the average operating efficiency of the entire group of dredges, thus increasing the net revenue therefrom; (2) to reach the maximum operating efficiency of the group early in July, instead of the latter part of August; (3) to enable an intelligent selection from the available men for such promotions as might be open; (4) to secure real coöperation on the part of all concerned.

The dredge efficiencies were increased by: (1) Reducing the frequency and length of total stoppages; (2) increasing the average proportion of capacity utilized while operating. The relative efficiency of the different operators was likewise determined by comparative records of operating time maintained and percentage of capacity utilized.

The dangers to be safeguarded against were: (1) Paying prize money or bonuses without actual equivalent return to the company; (2) slighting of valuable material for the sake of making large yardage records; (3) false records and unfair reports; (4) loss of discipline; (5) committing the company to a possibly undesirable precedent.

It was then recommended that for each 1% of increase over the average efficiency for 1911, 10% of all the silver returns from the cleanups of this period be donated for prize money. These prizes were to be awarded on the bases of: (1) Highest percentage of possible operating time; (2) highest percentage of possible capacity utilized while dredging; (3) best net record of total time and capacity; (4) best single-shift record. Handicaps were allowed for dredges having badly worn buckets; dredges were rated for capacity at a normal voltage; allowance was made for gravel and bedrock dug and for frozen material, etc.; falsification of any record penalized the offender by elimination from any participation.

A comparison of the relative curves for 1911 and 1912 in the accompanying chart shows the results attained. The operating time, which always before had been a fluctuating quantity, now became regular. The yardage handled per hour (24-hr. basis) and per operating hour exceeded the highest previous record and maintained this efficiency until the close of the month, when word having gone out that the experiment would not be in effect the following month, everything dropped back to subnormal.

The psychology of the incentive bonus, thus again demonstrated, proves conclusively that the solution of the labor-capital problem lies largely in combining the cupidity of the employee with a fair division of the excess profits of the employer, through a carefully devised system, which will insure improved product as well as increased output, and which at the same time guarantees a minimum wage to the employee.

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## Mechanical Efficiency in Hoisting

Tests made on some of the hoists in Butte indicate that the chief friction losses in hoisting take place elsewhere than in the engine ("Bull." A. I. M. E., September, 1913). This was proved by the fact that in all cases the percentage of friction was less when hoisting out of balance with one drum or reel held by the brake than when hoisting in balance. Thus it was found that for hoisting from a depth of 2200 ft. the friction of the engine, rope, skip and cage, including windage, was as follows: Speculator shaft, 21.1% in balance, 13% out of balance; High Ore shaft, 23% in balance, 17.5% out of balance; Diamond shaft, 29% in balance, 10% out of balance.

The friction was determined by hoisting a weighed load and taking continuous indicator diagrams over the trip. The total friction is the difference between the indicated work and the work performed in the shaft. The percentages just given are referred to the indicated work. Defects in the shaft are responsible for many of the high percentages of friction, and in some cases it was found that one compartment was more defective than the other. In the Diamond shaft this condition existed, accounting for the great difference in friction loss whether hoisting in balance or out of balance, that is, with both cages or with one. In another shaft the extremely high friction loss of 40% was found, but this shaft was shown to be in bad shape at the time. The lowest friction losses were obtained with hoisting at a low speed, and the increases of loss with high speed indicate that the effect of windage is greater than has been generally assumed. Few data are available on the friction losses in hoisting.

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*Chief of Staff, Stephen T. Williams & Staff, Inc., 50 Church St., New York.

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# Results of Drill-Steel Tests on the Rand

The Mines Trials Committee on the Witerswatersrand has published a report of the tests conducted for it by Robert Allen, on various kinds of steel for rock-drill bits. The object of the test was to determine the steel most suitable for use in the Rand mines and also to standardize the heat treatment. The report is of value to a certain extent, but the tests, extensive as they are, leave much to be desired from the standpoint of American practice. We publish herewith a table, showing the most significant results, compiled from a series of tables accompanying the report. The table covers the most satisfactory steels, as evidenced by the efficiency factor adopted in the report. It is limited to the steels of which more than 20 pieces were tested, the maximum number of pieces of any one steel which were tested being 243, this steel being the second of those rated at 179 in the last column. Only the results on the starters are included since the followers, whether three or four in number, were all made with a chisel bit. The cross-bit starters themselves, made of 1¼-in. cruciform steel, had a low center instead of the high center which is rapidly becoming standard in America and which seems both theoretically and practically the correct shape. Chisel bits also are rarely used in this country: it seems logical that the use of as many cutting edges as possible on the bit would enable it to stand up longer, probably to cut faster, and it seems in practice also to make it less liable to fitcher the hole.

While not specifically stated, it appears that no hand steel was tested, but whether a piston or hammer machine was used is not stated. It has been found in America that drill steel receives much harder service in hammer than in piston machines. No observations seem to have been made on shank breakage. This is a most troublesome feature of drilling, causing delays, loss of steel and increased labor in the blacksmith shop. It seems probable that the drills were sharpened by hand only. No mention of machine sharpening is made, although the machine sharpener is now pretty generally admitted not only to increase the output of the blacksmith shop, but to furnish a much better, especially a more uniform bit.

TABLE OF RESULTS OF DRILLING TESTS ON THE MORE EFFICIENT CRUCIFORM STARTERS

| Method of manufacture | % C | % Si | % S | % P | % Mn | Alloy | Inches drilled | Appearance | Starting diam., in. | Finishing diam., in. | Diam. lost, in. | % reduction, hole area | % reduction, hole area, per in. | % of drills, chipped | % of drills flaked | Grams lost in drilling | Grams lost per in. drilled | Grams lost, reducing | % of drills cut off | Grams lost, cutting off | Total grams lost | Price, cents per lb. | Cents per in. drilled | Drilling efficiency factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 0.39 | 0.77 | 0.01 | 0.011 | 0.33 | a | 13.4 | 8.4 | 1.93 | 1.85 | 0.08 | 8.1 | 0.61 | 0 | 0 | 6.4 | 0.48 | 8.9 | 23 | 20.2 | 35.5 | 18.0 | 0.106 | 289 |
| S. B. | 0.67 | 0.15 | 0.01 | 0.023 | 0.23 | | 13.4 | 8.5 | 1.93 | 1.85 | 0.08 | 8.1 | 0.60 | 3 | 3 | 6.7 | 0.50 | 8.2 | 0 | 0.0 | 15.6 | 8.0 | 0.020 | 283 |
| O. H. | 0.68 | 0.19 | 0.01 | 0.025 | 0.32 | | 12.8 | 8.0 | 1.94 | 1.86 | 0.08 | 8.1 | 0.63 | 15 | 9 | 5.9 | 0.46 | 6.6 | 15 | 11.6 | 24.1 | 6.5 | 0.028 | 276 |
| C | 0.83 | 0.10 | 0.01 | 0.017 | 0.33 | b | 13.5 | 8.0 | 1.93 | 1.86 | 0.07 | 8.1 | 0.60 | 9 | 10 | 7.1 | 0.52 | 5.9 | 64 | 68.9 | 82.4 | 13.0 | 0.170 | 258 |
| O. H. | 0.68 | 0.06 | 0.01 | 0.021 | 0.22 | | 14.1 | 7.5 | 1.94 | 1.85 | 0.09 | 9.0 | 0.64 | 4 | 4 | 6.8 | 0.48 | 8.9 | 21 | 36.9 | 52.6 | 7.0 | 0.056 | 242 |
| C | 0.78 | 0.12 | 0.01 | 0.027 | 0.23 | | 14.7 | 8.3 | 1.93 | 1.83 | 0.10 | 9.9 | 0.68 | 6 | 0 | 7.6 | 0.52 | 6.7 | 11 | 5.5 | 19.8 | 9.0 | 0.024 | 237 |
| O. H. | 0.64 | 0.09 | 0.02 | 0.022 | 0.32 | | 12.3 | 8.1 | 1.94 | 1.86 | 0.08 | 8.6 | 0.70 | 7 | 4 | 6.1 | 0.50 | 6.5 | 7 | 5.7 | 19.1 | 7.0 | 0.022 | 231 |
| C | 0.80 | 0.14 | 0.01 | 0.016 | 0.32 | | 13.5 | 8.0 | 1.93 | 1.83 | 0.10 | 9.6 | 0.71 | 9 | 7 | 6.8 | 0.50 | 7.1 | 15 | 12.3 | 26.2 | 12.0 | 0.050 | 222 |
| C | 0.83 | 0.07 | 0.02 | 0.023 | 0.27 | | 15.4 | 7.9 | 1.93 | 1.83 | 0.10 | 9.7 | 0.63 | 11 | 21 | 8.7 | 0.56 | 5.2 | 25 | 23.6 | 37.5 | 9.1 | 0.048 | 219 |
| C | 0.71 | 0.08 | 0.02 | 0.028 | 0.40 | | 13.1 | 7.8 | 1.93 | 1.83 | 0.10 | 10.5 | 0.70 | 20 | 17 | 7.5 | 0.52 | 6.6 | 60 | 63.5 | 77.6 | 8.9 | 0.106 | 211 |
| C | 0.82 | 0.07 | 0.01 | 0.022 | 0.27 | | 12.5 | 7.6 | 1.96 | 1.87 | 0.09 | 9.0 | 0.72 | 14 | 11 | 6.3 | 0.50 | 6.3 | 3 | 7.8 | 1.5 | 8.5 | 0.024 | 211 |
| O. H. | 0.65 | 0.08 | 0.02 | 0.024 | 0.40 | | 13.2 | 7.5 | 1.92 | 1.83 | 0.09 | 9.1 | 0.71 | 6 | 6 | 8.2 | 0.55 | 4.8 | 25 | 14.5 | 27.5 | 9.0 | 0.032 | 208 |
| C | 0.65 | 0.15 | 0.01 | 0.016 | 0.34 | | 13.2 | 8.1 | 1.94 | 1.85 | 0.09 | 9.0 | 0.68 | 2 | 8 | 7.8 | 0.59 | 6.5 | 48 | 14.0 | 58.6 | 9.0 | 0.086 | 203 |
| C. | 0.88 | 0.09 | 0.01 | 0.020 | 0.33 | c | 14.1 | 7.5 | 1.92 | 1.83 | 0.09 | 9.1 | 0.63 | 19 | 17 | 8.6 | 0.60 | 6.7 | 18 | 13.2 | 28.6 | 9.0 | 0.040 | 198 |
| C | 0.81 | 0.10 | 0.01 | 0.016 | 0.24 | | 14.7 | 8.0 | 1.93 | 1.83 | 0.10 | 10.1 | 0.69 | 17 | 39 | 8.9 | 0.61 | 7.1 | 14 | 7.5 | 24.2 | 11.25 | 0.040 | 191 |
| O. H. | 0.65 | 0.06 | 0.02 | 0.009 | 0.32 | | 13.7 | 8.2 | 1.95 | 1.83 | 0.12 | 11.9 | 0.87 | 3 | 2 | 7.0 | 0.51 | 7.7 | 5 | 4.1 | 18.8 | 7.0 | 0.022 | 187 |
| C | 0.72 | 0.07 | 0.02 | 0.025 | 0.38 | | 12.0 | 7.8 | 1.93 | 1.84 | 0.09 | 9.3 | 0.76 | 7 | 12 | 6.6 | 0.55 | 8.3 | 31 | 27.1 | 42.0 | 8.0 | 0.062 | 186 |
| C | 0.71 | 0.11 | 0.02 | 0.022 | 0.36 | d | 13.5 | 7.7 | 1.94 | 1.84 | 0.10 | 10.0 | 0.74 | 16 | 19 | 7.7 | 0.57 | 6.4 | 67 | 78.1 | 92.2 | 12.0 | 0.180 | 183 |
| C | 0.84 | 0.08 | 0.02 | 0.026 | 0.35 | | 14.1 | 6.5 | 1.93 | 1.83 | 0.10 | 10.0 | 0.71 | 8 | 18 | 8.5 | 0.60 | 7.2 | 11 | 6.8 | 22.5 | 7.75 | 0.028 | 179 |
| C | 0.69 | 0.20 | 0.01 | 0.039 | 0.37 | e | 13.5 | 7.9 | 1.95 | 1.83 | 0.10 | 10.1 | 0.64 | 4 | 16 | 7.9 | 0.48 | 7.6 | 60 | 55.7 | 71.7 | 9.0 | 0.102 | 179 |
| C. | 0.73 | 0.15 | 0.01 | 0.033 | 0.39 | | 10.5 | 7.9 | 1.91 | 1.83 | 0.08 | 8.2 | 0.78 | 5 | 20 | 6.5 | 0.62 | 6.8 | 0 | 0.0 | 13.3 | 7.5 | 0.022 | 165 |
| O. H. | 0.61 | 0.06 | 0.01 | 0.032 | 0.21 | | 14.2 | 7.9 | 1.94 | 1.82 | 0.12 | 12.0 | 0.84 | 20 | 16 | 8.2 | 0.58 | 8.0 | 0 | 0.0 | 16.2 | 9.25 | 0.022 | 161 |
| C | 0.77 | 0.02 | 0.01 | 0.022 | 0.26 | | 12.8 | 7.8 | 1.91 | 1.81 | 0.10 | 10.7 | 0.84 | 6 | 12 | 7.8 | 0.59 | 8.2 | 22 | 17.6 | 33.3 | 9.0 | 0.052 | 156 |
| C | 0.69 | 0.18 | 0.03 | 0.015 | 0.47 | | 14.2 | 7.8 | 1.93 | 1.82 | 0.11 | 11.3 | 0.79 | 11 | 11 | 8.9 | 0.63 | 16.7 | 64 | 92.3 | 117.9 | 9.5 | 0.171 | 156 |
| E | 0.69 | 0.13 | 0.02 | 0.026 | 0.18 | | 13.0 | 7.3 | 1.93 | 1.83 | 0.10 | 10.5 | 0.81 | 8 | 11 | 7.6 | 0.58 | 7.5 | 1 | 2.1 | 17.2 | 8.5 | 0.024 | 155 |
| C | 0.80 | 0.07 | 0.01 | 0.023 | 0.25 | | 13.5 | 7.6 | 1.97 | 1.87 | 0.10 | 10.0 | 0.76 | 6 | 10 | 9.0 | 0.67 | 6.7 | 1 | 3.0 | 18.7 | 8.5 | 0.026 | 149 |
| E | 0.79 | 0.15 | 0.02 | 0.023 | 0.21 | | 15.1 | 7.7 | 1.90 | 1.78 | 0.12 | 12.3 | 0.82 | 6 | 0 | 9.9 | 0.65 | 6.2 | 0 | 0.0 | 16.1 | 8.5 | 0.018 | 145 |
| C | 0.74 | 0.04 | 0.01 | 0.027 | 0.32 | f | 14.8 | 7.1 | 1.91 | 1.79 | 0.12 | 12.2 | 0.83 | 7 | 17 | 8.7 | 0.59 | 12.0 | 44 | 24.5 | 45.2 | 7.5 | 0.050 | 145 |
| C. | 0.63 | 0.03 | 0.02 | 0.034 | 0.51 | | 14.5 | 7.2 | 1.94 | 1.83 | 0.11 | 11.0 | 0.76 | 5 | 27 | 9.8 | 0.68 | 7.5 | 87 | 92.5 | 109.8 | 8.0 | 0.134 | 141 |
| O. H | 0.68 | 0.11 | 0.02 | 0.027 | 0.30 | | 14.3 | 7.5 | 1.92 | 1.81 | 0.11 | 11.3 | 0.79 | 1 | 29 | 10.2 | 0.72 | 6.2 | 23 | 19.2 | 36.2 | 7.0 | 0.036 | 134 |
| C | 0.46 | 0.15 | 0.01 | 0.033 | 0.31 | | 14.1 | 7.8 | 1.94 | 1.82 | 0.12 | 12.3 | 0.87 | 7 | 0 | 9.5 | 0.67 | 6.8 | 0 | 0.0 | 15.9 | 11.5 | 0.038 | 132 |
| C. | 0.70 | 0.11 | 0.01 | 0.015 | 0.33 | | 12.3 | 7.1 | 1.93 | 1.82 | 0.11 | 10.8 | 0.88 | 5 | 5 | 10.3 | 0.84 | 9.1 | 21 | 34.9 | 54.3 | 10.0 | 0.096 | 96 |
| C | 0.80 | 0.40 | 0.02 | 0.033 | 0.37 | | 10.1 | 7.7 | 1.93 | 1.83 | 0.10 | 10.8 | 1.07 | 19 | 19 | 8.7 | 0.86 | 5.2 | 64 | 91.3 | 105.2 | 10.0 | 0.228 | 84 |

a Vanadium, 0.06%, tungsten, 1.92%. b Aluminum, 0.22%. c Aluminum, 0.20%. d Chromium, 0.87%. e Chromium, 0.20%, vanadium, 0.05%. f May contain chromium. C — Crucible. O. H. — Open hearth. S. B. — Swedish bessemer. E. — Electric.

Referring to the table, the analyses of everything but carbon were made on octagonal bars; they are, however, probably approximately correct for the cruciform bars on which the drilling tests here recorded were conducted. The rating for appearance refers to the general appearance after drilling and is based on a possible 10. The diameter of the bit is the reaming diameter, that is the largest diameter possible across the bit. "Chipping" is described as the loss, during drilling, of small flat pieces not exceeding $\frac{3}{16}$ in. in diameter. "Flaking" is the loss of larger pieces in drilling. "Scaling" refers to the material lost by the formation of oxide in heating. The "cutting-off" process is necessary with drills that have lost pieces so large as to deform them. The efficiency factor of the last column is got by dividing the figure given as the rating for general appearance by the percentage reduction in hole area per inch drilled and dividing the quotient again by the loss in weight per inch drilled.

The report states that the alloy steels, so called, although often giving good drilling results (one of them heads the list) require so delicate a heat treatment as to make them unserviceable even without considering their higher price per pound. This has also been found true in America. A good, clean, high-carbon steel gives results most satisfactory in all respects. After eliminating from consideration the steels for which more than 20% of the pieces had to be cut off and those of which more than 20% of the pieces flaked in drilling, those whose heat treatment was difficult and those whose drilling efficiency was low or cost of steel per inch drilled high, and making some further allowances, the report averages the analyses of the remainder and obtains as the best formula for the drill steel: Carbon, 0.66%; silicon, 0.09%; sulphur and phosphorus together, 0.036%; and manganese, 0.28%.

It is noted that the ends of a bar are usually inferior to the inside portion and are therefore unsuitable for a bit. Inasmuch as a shank is equally sensitive and a weld also requires good metal, it would appear that the only safe rule is to throw away the ends of the bars. No advantage seems to accrue to any one type of manufacture, crucible, openhearth, Swedish bessemer and electric steels appearing in the list, although the electric steels are near the bottom, possibly because few of them were tested.

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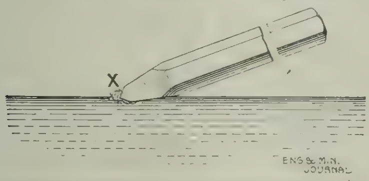
# Tempering Hand-Drill Steel

By Albert G. Wolf*

A simple but satisfactory method of tempering hand-drill steel was originated by John Sommers, foreman of the Blue Jay mine of the Mason Valley Mines Co., and is in use at that mine. It consists of heating the drill to a dull red for a distance of about 1 in. back from the edge of the bit, then placing one side of the bit just flush with the surface of the water, as shown in the illustration. The water will climb up on the bit at *X* as long as sufficient heat remains in the steel. When the water ceases to climb, remove the steel and allow it to cool slowly. At the time of removal the temper is extremely hard, but the heat remaining in the steel will draw back into the bit and toughen it. Drills sharpened in this manner never check, as the first cooling is almost uniform throughout; corners of the bit are rarely broken off; and the edge of the bit is resistant to the wear against hard rock. The temper can be regulated closely by the degree of water cooling.



Convenient Method of Hand-Steel Tempering

⁂

**Hoisting Curves for Drum and Reel Engines** showing the variations in speed in different parts of the trip are rather dissimilar. Thus for a typical drum hoist (A. I. M. E. Bulletin, September, 1913), a rapid acceleration is represented by a rising speed line, which gradually falls off and becomes relatively flat over a period of 20 sec., the speed being almost constant; this is followed by a sharply dropping line representing the retardation. For the reel hoist, however, acceleration continues for half the trip, as indicated by a rapidly rising speed curve, and the remaining half of the trip is the retardation period represented by a dropping line. There is practically no time when the hoisting speed is uniform.

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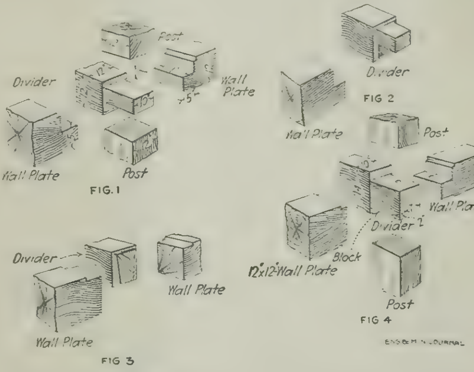
*Mason, Nevada.

# Wall-Plate Splices

The use of spliced wall plates is becoming increasingly common in Butte. Not only is long timber more difficult to obtain but the spliced plate is more convenient to handle in the shaft bottom, particularly when heavy ground makes it necessary to keep the bottom set close to the bottom of the shaft. The use of a spliced plate, however, doubles the number of hanging bolts necessary. (A. I. M. E. Bulletin, August, 1913.)

The splice in most general use is that shown in Fig. 1. It offers the advantage of supporting the divider while the step is being blocked. In case operations are conducted by sinking two or more compartments and then enlarging to the full size by raising, a splice like that shown in Fig. 2 is used. In this case the miter is omitted, inasmuch as dirt, which is likely to get into the joints, has less opportunity to throw the straight-framed joint out of line. While the shaft is being sunk, the opening left under the divider by this method of framing is filled with a block of wood; this is chopped or picked out again when the set is reached in raising and it becomes necessary to place the other half of the wall plate.



Various Butte Methods of Splicing Wall Plates

In Fig. 3 is shown a spliced joint, which is easy to frame, but with which it is necessary to support the divider, while the set is being blocked. This support is effected usually by nailing the divider to the wall plate after the posts have been placed. At the Tropic shaft, the set is blocked at both sides of the center of the divider temporarily, the end blocks are set and then the blocks on each side of the divider are removed, the set brought to line and blocked permanently. In some cases a temporary post is stood under the divider to hold it while being blocked. This method of splicing is cheaper to frame, but more expensive to place in position.

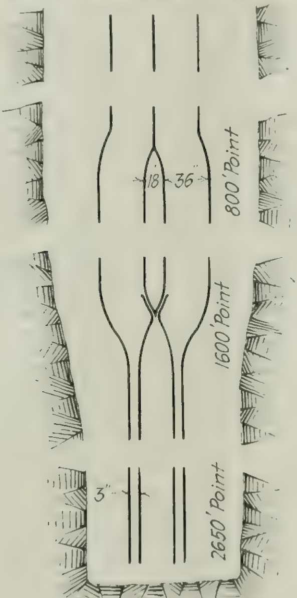
In Fig. 4, the method of splicing used by the High Ore mine is exhibited. It is applicable to cases where a small shaft is being sunk, with the possibility that more compartments will be added later. A 2-in. block is nailed to the divider before it is sent down the shaft and the corner between this divider and the half of the wall plate is held with a pin. When it becomes necessary to enlarge, the other half of the wall plate can be easily pushed in, since the distance is small. The splice is not so strong as that shown in Fig. 1.

It should be noted that sinking the whole shaft at one operation is cheaper than sinking part of it and raising the rest. In soft ground, however, it becomes undesirable to open up too much country at once and the Anaconda company then finds it of advantage to sink and raise.

⁂

## Novel Incline Track Arrangement

The sinking shaft of the Sterling Iron & Ry. Co., at Lakeville, N. Y., is in the orebody and follows approximately the flat-dipping foot wall. The foot wall is extremely irregular and while some of the rolls are followed by the shaft, it was necessary to cut through some of the sharper ones. In order to reduce the width of these cuts and also to save a certain amount on rails and ties, a rather ingenious method of arranging the tracks was resorted to. Hoisting is done in balance from several levels so that provision had to be made for the skips to pass. From the top of the headframe to the 800-ft. point, three rails are used. This is not an unusual method on inclined planes and results in saving the cost of one rail, a certain amount in the length of the ties and some rock cutting. At the 800-ft. point a change is made to four rails, two complete tracks, in the manner shown, no switch being necessary. The tracks are continued to the 1600-ft. point and the two skips can pass anywhere between these points. From the 1600-ft. point down, it was desired to carry the shaft as narrow as possible, but the management was unwilling to risk possible accident from the use of the switch which would have become necessary if a single track, that is, two rails were there used. The safety of a hand-operated switch at such a point depends on the memory of the operator as to which track the last skip was sent over, and an automatic switch is liable always to get out of order. The scheme illustrated was conceived and has given excellent satisfaction. While it uses four rails, no increase in the length of the ties is necessary and not much in the width of the cut over that required for a single track and the saving over the three-rail system used in the upper part of the shaft is appreciable. No switch is required at the 1600-ft. point to change to the two-track portion. The arrangement continues to the bottom of the shaft at 2650 ft. below the collar.



Method of Economizing Excavation in Incline Double-Track Shaft

It should be stated that there are no compartments in the shaft, no timber whatever being required with the excellent hanging; the shaft is quite open, really a part of the stopes in places.

⁂

## Safety Rules—Ropes and Sheaves*

(1) All ropes or cables used for hoisting or lowering either men or material, except in test pits, shall be composed of iron or steel wires with a factor of safety prescribed by the mechanical department.

(2) New rope or cable shall supersede an old rope or cable either when the number of breaks in any running foot of said rope exceeds 10% of the total number of wires composing the rope, or when the wires on the crown of the strands are worn down to less than one-half their original diameter, or when the specified inspection provided for in these rules shows marked signs of corrosion.

(3) All rope should be superficially inspected once in every 24 hr. by some competent person designated for that purpose, and there shall be an examination made once in every three months of a section of every rope or cable then in use for hoisting and lowering in the mine. If upon inspection any hoisting rope or cable is found to be below the requirements it shall be disused for such purpose forthwith.

(4) Every rope used for hoisting or lowering should be securely fastened to its drum and when in use shall never be fully unwound, but at least two full turns shall remain on the drum.

(5) The further end of the hoisting rope should either be securely fastened within a tapered socket or else it should be bound around an oval thimble and then fastened to itself by not less than six clamps or bolts.

(6) Every hoisting rope shall be treated with oil or some suitable rope compound at least once every month. This compound should be chemically neutral and of such consistency as to penetrate the strand and not merely cover the surface of the rope.

(7) Worn or broken places in ropes shall be reported at once to the proper person.

(8) Sheave stands should be provided with convenient stairs or ladders. Railed platforms should be provided at the sheaves convenient for oiling.

(9) If practicable, sheaves should be guarded to prevent anyone from getting his hand caught between cable and sheaves.

(10) Sheaves in shaft houses should be railed and arranged so as to be easily accessible.

(11) Where a hoisting rope crosses a roadway at a point lower than 14 ft. above the road, protection should be provided thereunder.

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*From Inland Steel Co.'s book of rules.

# DETAILS OF METALLURGICAL PRACTICE

## Water Spray for Dust Settling

According to the report of the British Alkali Inspector for 1912, at smelting works much improvement has resulted from the use of water sprays to assist in the deposition of the finely divided solid particles carried away from the furnaces along with the smoke, but the diminution of the amount of acid gases sent into the air from many works of this class is regarded as a problem still awaiting a satisfactory solution. Experience suggests that it would be advantageous to bring works in which blende is calcined under the same regulations as now apply to arsenic works treating ores containing a considerable proportion of sulphur. Objections have been raised to the use of water spray in large flues or chambers for the removal of fume, etc., on the ground of the reduction of temperature involved, but it is pointed out, as not generally known, that the weight of gas or air removed by a chimney is almost at its maximum at a temperature of 250° F. (175° C.) above the atmospheric temperature, and observation of the temperature of the chimney gases is recommended as an easy way of controlling the amount of water spray to be used. Water-spray jets should be in such a position that the spray is at once directed into the full current of the gases and carried along with them.

⁂

## Cleaning Dwight & Lloyd Grates

At one of the lead-smelting works where Dwight & Lloyd sinterers are used it was formerly necessary to keep a man at each machine to punch open the slots of the grates. This man was eliminated by casting the grates with the slots parallel with the longitudinal axis of the machine, this permitting the installation of a simple mechanical cleaner. The latter consists of a series of ordinary iron washers, strung on a rod with intervening separators, so that each washer registers with a slot in the grate. The rod carrying these washers is hinged at the ends. The movement of the grate lifts the rods with its washers and causes it to fall in one row of slots which are thus effectually cleaned. On the next movement of the grate the washers are lifted and on the next they fall into the next row of slots, all the movements being suitably timed, of course. This device was an invention in the works. A patent has been applied for.

⁂

**The Manufacture of Paving Bricks from Blast-furnace Slag** has become an important and flourishing industry in the Middlesborough iron district in England. Several companies are engaged in the work. The bricks are molded by machine from the molten slag and after hardening are annealed in a special furnace. About 160 brick to the ton of slag is the usual output.

## Study of Leaching Processes

A basis for the study of leaching processes is explained in the September issue of the *Colorado School of Mines Magazine*, by Robert B. Elder, of the Chiksan Mining Co., Chosen. According to this system, the solution from a leaching vat is measured for successive short periods of time, samples being taken meanwhile, which are assayed and analyzed. The total leaching period of the charge is covered by the samplings, each of which, however, should be of short duration in order to differentiate the constantly changing rates of solution.

Results from a set of samples covering the treatment of a charge may be plotted, as shown in the accompanying diagram, different colors being used to represent the different elements. Plotted thus, the ordinate of any point on the gold-production curve represents the rate in dollars per hour at which the gold comes from the tank, and the area under the line represents the amount of gold delivered. This is, of course, upon the supposition that the rate of change in assay is a constant in the period between taking consecutive samples. However, it is plain that while this condition is not exactly fulfilled, the error is negligible.

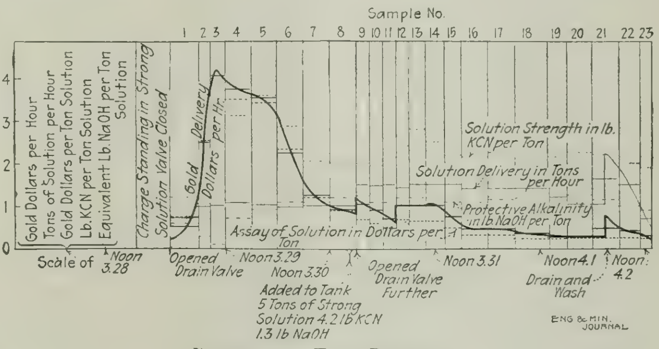


Diagram of Test Results

Suppose the cost of allowing the percolation to continue be ascertained and plotted on the sheet in terms of the same units as the gold production. The time at which the percolation should be discontinued and the tank recharged in order to obtain the greatest net profit per ton under those conditions of operating, is at the point of intersection of the gold-extraction line and the cost line. In order that this may be strictly true, however, the gold-extraction line must be corrected to allow for the losses and cost of precipitation and melting.

At the cyanide plant of the Chiksan Mining Co., Chosen, treating accumulated tailings from a 40-stamp mill, the information derived in this way has enabled us to increase the extraction from 75% to 85% on $2 material at an increased treatment cost of 5c., giving, therefore, an additional net profit of 15c. per ton treated. The present cyaniding cost is $0.44 to $0.46 per ton.

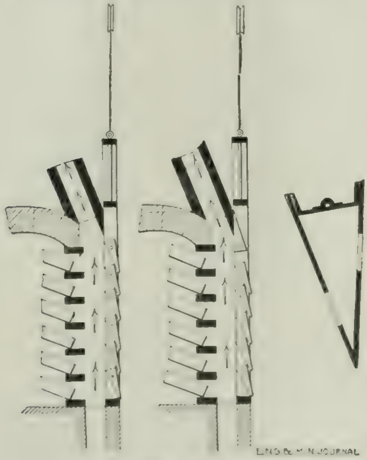
The ore here is quartz carrying free gold and small amounts of auriferous pyrite. It is stamped through 40-mesh screen, amalgamated, and concentrated on Standard tables. The tailing is held in two settling ponds and the mill water, containing slime equal to about 12% of the original ore, is run to waste. The tailing from these settling ponds is loaded into the cyanide leaching vats by native coolies. Lime equivalent to 1½ lb. CaO per ton ore is added with the charge.

Explanation of the diagram: At 6 p.m., Mar. 18, the charging was completed and solution carrying 3.5 lb. KCN and protective alkalinity, equal to 1.3 lb. NaOH per ton, was added till the charge was covered. This was allowed to stand till midnight, when the drain valve was opened. As the solution was drawn off, solution carrying 2 lb. KCN and 1.2 lb. protective alkalinity was added, so that the charge was always covered. Between the hours of 4 and 5 p.m. on Mar. 30, instead of weak solution five tons of strong solution were added. This began to appear in the discharge about 10 hours later and its results are apparent in the lifting of the KCN, gold delivery and assay-value lines.

⁂

## Zinc-Furnace Shield

A shield for the front of zinc-distillation furnaces, as used by the Société Anonyme G. Dumont & Frères, in Sclaigneaux, Belgium, is shown in the accompanying engraving. The pivoted slats, which are hollow, have openings in order to permit the circulation of air through them.



SHIELD FOR ZINC FURNACES

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## Safety Rules—Hooks, Ropes, Blocks*

(1) All crane chains and hooks should be examined frequently, and annealed as often as necessary according to working conditions.

(2) Cables of suitable strength and flexibility shall be provided. All cables should be frequently inspected and replaced at stated periods or whenever necessary.

(3) Chains and rings should be made of double-refined standard wrought iron. The same iron should be used in replacing broken links. All chains on rings should be of equal length unless for some special purpose.

(4) Guaranteed, long fiber, manila rope should be used if possible.

MAXIMUM WORKING LOAD FOR TWO DOUBLE BLOCKS AND NEW MANILA ROPE

| Size of blocks in in. | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 |
|---|---|---|---|---|---|---|---|---|---|
| Regular or Light Pattern, Wood Shell— | | | | | | | | | |
| Safe load in lb | 200 | 300 | 500 | 1000 | 1500 | 3000 | 8000 | | .... |
| Heavy and Thick Mortise, Wood Shell— | | | | | | | | | |
| Safe load in lb | | | | 1500 | | 5000 | 10000 | 20000 | 30000 |

Note:—A set of double and triple blocks will hoist considerably more, and a single and double correspondingly less. This should be borne in mind as above estimate is figured close and you should not take any chances.

(5) All crane and chain hooks, other than on cranes handling hot metal, should be made of soft basic open-hearth steel.

(6) Laminated plate hooks, containing several thicknesses of plate riveted together, should, if possible, be provided for all hot-metal cranes.

(7) All hooks, where practicable, should be provided with safety handles.

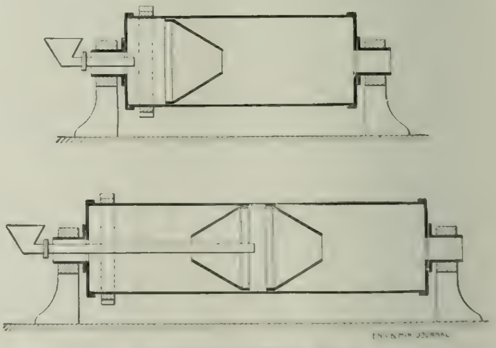
(8) Hooks with the opening between point and shank guarded should be used where there is danger of the load's catching or unhooking.

Safe hoisting strengths for blocks are given in an accompanying table.

⁂

## Combination Tube Mill

In order to combine the advantages of the ordinary cylindrical tube mill with those of his conical mill, H. W. Hardinge has patented a combination (U. S. pat. No. 1,041,783) two forms of which are shown in the accompanying drawing. The first form shows a single cone into which the mill feed first enters, the idea being that only the finer pieces will get out for grinding in the cylinder, which is the most efficient sliming apparatus. The second form shows a double cone in the middle of a long cylinder, and is less practical on account of the feed pipe leading into the cone and the inconvenience of discharging from the feed end of the contrivance.



COMBINATION TUBE MILL

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**For Fighting Underground Fires at the Mt. Morgan mine** in Queensland, the air mains underground have been connected with a water reservoir on the surface, it is stated in the annual report, so that in the case of an outbreak of fire a large supply of water would be available immediately in every one of the stopes. Hydrants and hoses will be placed on the various levels.

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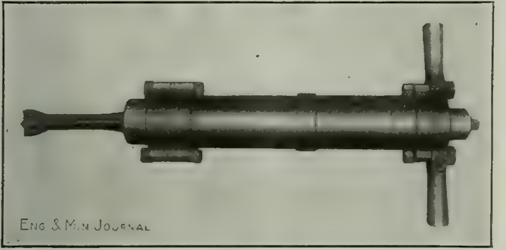
*From Inland Steel Co.'s book of rules.

# MINING AND METALLURGICAL MACHINERY

## Hardsocg Automatically Rotating Plugger

The accompanying illustration shows a new machine put out by the Hardsocg Wonder Drill Co., of Ottumwa. Iowa. It is designed to drill down holes, as in sinking, etc. Hollow hexagon steel with a collared shank and a six-point bit is used, the steel being automatically rotated by the mechanism of the drill. The advantages of this are well known and obvious. The air-hose attachment is in the thick portion shown in the middle of the cylinder. The machine is built in two sizes; one weighing 40 lb. has a 1⅞-in. piston and uses ⅞-in. steel; the other, weighing 50 lb., has a 2⅛-in. piston and uses 1-in. steel. In its operating principles, the drill follows the well known Hardsocg system.



Hardsocg Rotating Plugger

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## A New Centrifugal Pump

A new pump, operating on the centrifugal principle, but embodying new features has been placed on the market. It is said to give a high efficiency under varying loads when new, and to maintain this efficiency in service. The construction is such that wear is greatly reduced.

The pump combines the centrifugal-pump principle with the principle of the reaction turbine. The rotor contains an impeller of the closed type with vanes shaped as in the usual centrifugal-pump runner. Around the impeller, but forming part of the rotor, is an annular chamber, the outside of which is closed by a ring, having openings, or nozzles. It is these nozzles which give the turbine effect. Thus the impeller, pressure-chamber and turbine rotate together as one piece. The impeller discharges into the chamber where the water is held at about constant pressure without friction, centrifugal force maintaining the pressure. The water leaving the pressure chamber passes through the rim portion, which is designed similarly to a reaction turbine. The whole, then, presents the combination of a centrifugal pump discharging with a constant pressure and a turbine discharging from a constant pressure, ideal conditions in each case.

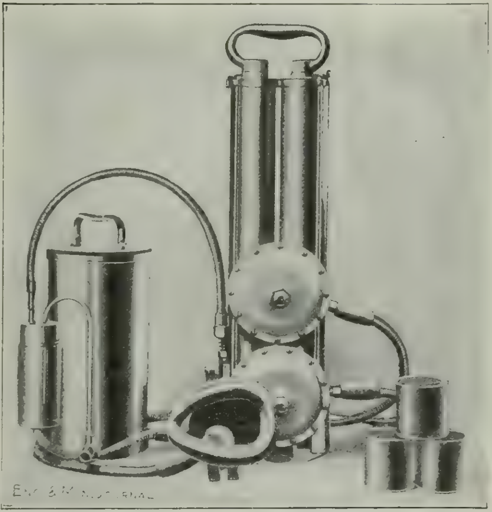
The advantages claimed for the type are that a change of head does not make a large difference in efficiency; that the water in the pressure chamber is practically stationary, as regards the chamber itself, thus reducing friction and wear; and that it is self-regulating. Furthermore, since the wear of the important parts is small, the shape of these is not changed and the pump does not become less efficient as it is used.

The pump has been developed by the Rees Roturbo Manufacturing Co., of Wolverhampton, England. In the United States the Manistee Iron Works Co., Manistee, Mich., controls the manufacturing and selling rights.

⁂

## The Lungmotor Artificial Respirator

The device herewith illustrated is intended for use in resuscitating people apparently dead from suffocation and in other cases where artificial respiration is necessary. It differs from other devices on the market particularly in the fact that it is hand operated. It is capable of pumping air alone, or oxygen alone, or a combination of the two in any desired ratio. In operation, one cylinder pumps in the air-oxygen mixture, and the other exhausts the consumed air from the lungs. The machine is equipped with a pin on the upper part of the right-hand cylinder with which adjustments for different volumes of air can be made, varying the amount from that necessary for a new-born infant to that necessary for a large adult.



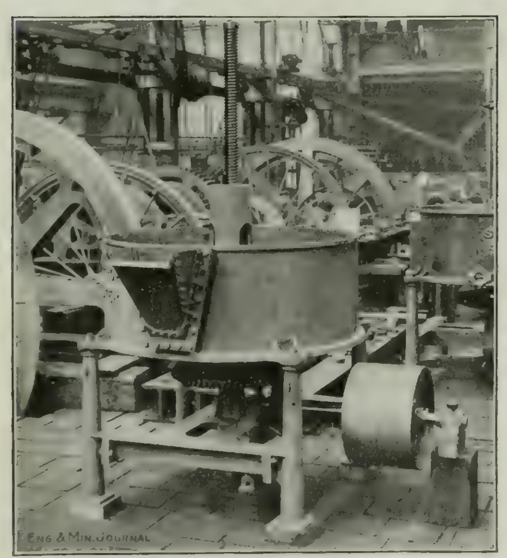
Portable Artificial Respirator

For attachment to the patient, either a face mask can be used or a tube which is inserted in the throat. The use of the latter device permits free passage of water from the lungs, in the case of drowning. The advantages claimed for the device are: Ability to vary the proportion of air and oxygen; ability to vary the amount pumped per stroke and the number of strokes per minute; a choice between the face mask and the throat tube; portability, the oxygen being generated by cartridges in the small device shown; ability to supply the tidal volume of air, that is, the amount of air normally displaced with a single respiration, about 35 cu.in., whereas, with other devices the vital capacity of the lungs, about 230 cu.in. per inspiration, must be supplied. The complete outfit weighs a little over 30 lb., and is listed at $125 f.o.b., Chicago. It is manufactured by the Life Saving Devices Co., 1330 Chamber of Commerce, Chicago, Ill.

⁂

## A New Grinding Pan

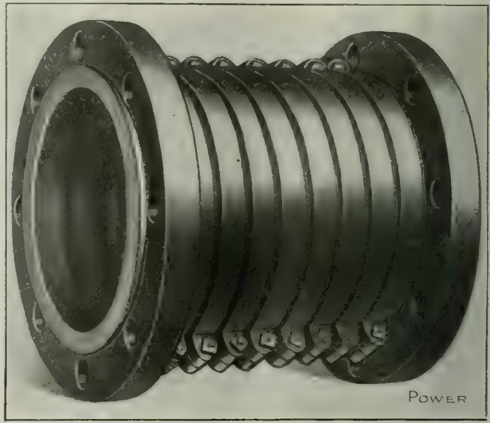
As an illustration of recent practice in grinding equipment the figure showing a grinding pan which has recently been constructed by Messrs. Sandycroft, Ltd., of Chester, for the Broomassie mine may be of interest. This pan is made of cast iron and is 3 ft. in diameter. The central vertical driving shaft is driven by bevel gearing from the countershaft, the muller plate being provided with cast-iron shoes working on cast-iron dies fixed to the bottom of the pan. The pan itself is lined with mild steel protecting plates $\frac{3}{8}$ in. thick, while the shoes, dies and protecting plates are renewable. The vertical position of the shoes can be adjusted by means of a handwheel and screw on the top of the central shaft. The [illegible] is arranged with a lip to allow a copper amalgamating plate to be fixed over its full width. The vertical spindle is supported in a foot-step bearing of gun-metal with a hardened-steel toe piece. The countershaft runs at [illegible] r.p.m. and the bevel gearing has a ratio of two to one. The pan is supported on cast-iron pillars and can be fitted to a timber foundation. The drive may be from below if required.



NEW FORM OF GRINDING PAN

## The Badger Corrugated Expansion Joint

As a substitute for the slip joint, usually leaky and always hard to pack, or for the awkward long-sweeps and loops, a compact corrugated expansion joint has been devised. It is made of copper, and in order to distribute the movement and strain over more than one corrugation, the external rings shown in the illustration are applied. They transmit the movement from one corrugation to the next and thus guard against overstrain. For low pressures, only two or three corrugations in a joint are necessary. For high pressures and superheated steam, more corrugations in a joint are required. The rings also increase the strength of the joint, and in the case of exhaust pipes, stiffen them against collapse.



RING AND CORRUGATION EXPANSION JOINT

The joint is made by E. B. Badger, Sons & Co., 63 Pitts St., Boston. A complete line drilled to A. S. M. E. standards is made for all pressures, both high and extra heavy. The diameter of the joints is the same as that of a pipe, and they are made in oval, rectangular, circular and special forms.

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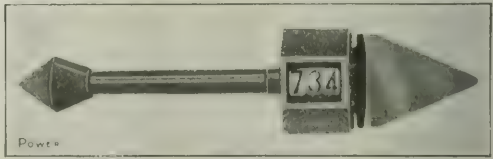
## Vest-Pocket Revolution Counter

The handy little speed counter illustrated herewith, is suitable for carrying in a vest pocket. The counter reads right or left. One end is made with an arrow point for cleaning out the countersunk shaft end of any accumulation of dirt or oil. The counter is made by the American Steam Gauge and Valve Manufacturing Co., Camden St., Boston, Mass.



HANDY COUNTER FOR SHAFT REVOLUTIONS

# American Institute of Mining Engineers

*SYNOPSIS—Special correspondence covering the meeting of the Institute day by day.*

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The fall meeting of the Iron & Steel Section of the Institute began at the Engineering Building in New York on Thursday, Oct. 16. In the absence of Charles Kirchoff, chairman of the Iron & Steel Committee, who was unfortunately detained by illness, Prof. J. W. Richards presided at all the sessions but the closing one. The meeting was called to order at 10 a.m. and after a few brief preliminaries, proceeded at once to business, as a number of important papers were waiting to be read. Nearly all of the papers had been published in advance, so that they were read only in abstract and the discussions proceeded promptly; in some cases written discussions being submitted.

The first paper read was by W. A. Forbes on "Blast Furnace Gas Cleaning," describing the process of cleaning blast-furnace gas and preparing it for use in gas engines. This paper was interesting but called out only a brief discussion. It was followed by a paper on the "Slagging Producer," by W. H. Blauvelt, which described the type of gas producer in which the ashes are fluxed and run off as slag. This was one of the earliest types made, but has not been very widely adopted, as it is not suited to many types of coal, although it is an ideal apparatus for gasifying coals having a fusible ash and also for many clinkering coals. A short discussion followed the reading of this paper, and some interesting data were promised as to comparative performance of producers.

The third and fourth papers were taken together, being on almost identical subjects. One was by Prof. F. Peter, of Leoben, Austria, on the "Generation of Steam by Waste Heat from Furnaces," while the other was on the same subject by G. C. Stone. Professor Peter's paper went at great length into the quantity of heat available for this purpose and the necessity of using it if any degree of economy in manufacture is to be attained. He referred to various uses which might be made of the waste heat, as in heating air for blast, superheating steam, etc., reaching the conclusion that its application to raising steam was the most economical method. He also treated of the various forms of boiler which were best adapted for the utilization of the waste heat, describing several which had been used in practice, and commenting upon their strong and weak points. Mr. Stone brought forward a number of instances in which waste heat from metallurgical furnaces had been used for raising steam, in some cases with a carefully prepared installation and in others, with such material and appliances as happened to be at hand. His conclusions coincided very nearly with those of Professor Peter. A long debate followed the presentation of these papers, in which many interesting notes of experience were brought forward by different members. The general conclusion was that the application of waste heat to the raising of steam was desirable, and that the simplest forms of apparatus possible were the best.

The morning session concluded with a paper by W. R. Shimer on the "Over-Oxidation of Steel," in which he briefly called attention to the troubles arising from this source in the manufacture of steel on a large scale.

### THE AFTERNOON SESSION

After lunch the session was resumed. A group of three papers on the "Use of Powdered Coal as Fuel" was presented by Dr. Richard K. Meade, Prof. H. R. Barnhurst and W. S. Quigley. These three were supplemented by a note from G. W. Shinn. Doctor Meade's paper treated very thoroughly of the mechanism and methods of different kinds used in preparing powdered coal for use in the furnace, and the conditions under which it could best be employed. Professor Barnhurst and Mr. Quigley spoke of the different kinds of coal best adapted for use in this form, and Mr. Shinn gave a very interesting account of experience with powdered fuel at the Lebanon and Reading steel plants. The use of powdered coal, which has been general in cement furnaces, presents many points justifying its adoption in reverberatory and other furnaces. The coal best adapted for use in this form is a long-flamed coal, Pennsylvania gas coal being well suited for this purpose. The main point of difficulty in metallurgical furnaces is the disposition of the ash, which, of course, is easily made in the cement furnace. A long and interesting debate, bringing out various experiences with powdered coal, followed the reading of these papers, many members taking part in the debate.

Two papers on "Briquetting" followed, one by E. Stuetz, describing the "Scoria Process" for the manufacture of briquettes from fine ore and flue dust, also slag brick for building purposes, the binding material being granulated slag. The other paper, by Felix A. Vogel, described the "Schumacher Process" of making briquettes from similar material. The discussion of these papers rather degenerated into an argument on their respective merits, and was cut short to give way to the final paper of the day, an interesting one by Richard H. Lee, on the "Use of Nodulized Ore in the Blast Furnace." This paper referred to the relative quantities of fuel required in smelting different ores, the preferable qualities of coke and a number of other points, and noted the advantages obtained by the use of a nodulized ore. Some experiences were given of a furnace owned by the Pennsylvania Steel Co., at Lebanon, running exclusively on nodulized Cornwall magnetite. It had been shown there that there was no difficulty of running on this material exclusively with a hard and regular coke. A brief discussion followed this paper.

### THE SECOND MORNING SESSION

The morning session on the second day was occupied largely by a group of papers of very technical character. These included three papers by Prof. H. M. Howe, on "Determination of the Position of Ae$_3$ in Carbon-Iron Alloys"; "Discussion of the Existing Data as to the Position of Ae$_3$"; and on "Ae$_1$. The Equilibrium Temperature for A$_1$ in Carbon Steel." In these papers, Professor Howe gave a lucid discussion of his recent experiments in the heat treatment of steel, and illustrated them by a number of diagrams and sections. These papers were discussed by Professors Stanchfield, Richards and others, and a long letter from Professor Le Chatelier was read by way of a written discussion. Incidentally the wish was expressed by some of the speakers that a method might be found of applying Professor Howe's tests and experiments more directly in the critical treatment of large quantities of steel. Two papers of much interest and of similar character followed, one by G. K. Burgess and J. J. Crowe, on the "Critical Ranges $A_2$ and $A_3$ of Pure Iron," and another by the same authors on the "Thermal and Microscopical Examination of Professor Howe's Standard Commercial Steels." These papers, like Professor Howe's, cannot be well summarized on account of their extremely technical character. In the discussion, incidentally, a description was given of some apparatus for the determination of alloy steels by spectrum annalysis, which presented a very interesting method.

### THE CLOSING SESSION

At the afternoon session on Friday, Dr. R. W. Raymond presided and referred to the long series of iron and steel investigations conducted under the auspices of the Institute and beginning with the epoch-making investigations of the late Doctor Dudley on rail steel and of W. S. Metcalfe on the composition of steel.

The first paper of the afternoon was by R. R. Abbott, on "The Influence of Various Elements on the Absorption of Carbon by Steel," which brought out a brief discussion. A paper by J. H. Hall on "Shock Tests of Cast steel" was discussed at considerable length, many members taking part in the discussion, including Messrs. Chancelor, Knox, Webster, Johnson, Campbell and others. Some curious instances of the failure of steel castings under shock after successfully passing other tests, were brought forward.

The most important paper of the afternoon was a description of a large number of tests on "The Influence of Copper on the Physical Properties of Steel," by G. H. Clevenger and B. Ray. This treated at length on a subject which has attracted a great deal of attention lately, and about which many rather loose statements have found currency. A short debate followed, the chief point brought forward being that the Pennsylvania Steel Co. had experimented on a large scale in the use of copper in steel as a preventive of corrosion, without attaining any encouraging results.

The paper contains many tables giving results and can best be summarized by the conclusions which follow:

1. In making copper steel by the crucible process it is necessary to "kill" the metal before adding the copper, and just before pouring it is advisable to add a small amount of some deoxidizing agent.

2. In forging the ingots, containing from 0.437 to 0.065% of carbon, traces of "red-shortness" began to be shown with a copper content of 4.512%. Up to this point the steel forged about like machine steel.

3. Up to 0.846% of copper our steels gave satisfactory welds. At 1.857% the weld was much weaker, and above this point the steel could not be welded.

4. There appears to be a marked tendency for copper to eliminate sulphur.

5. In the series of steels studied the segregation of copper toward the bottom of the ingot begins to be slightly noticeable with 0.846% of copper. With 2.773% of copper the segregation is more noticeable, and with 4.512% of copper it is very marked.

6. The presence of small percentages of copper up to 0.4% has a most marked effect in preventing the corrosion of steel by dilute sulphuric acid. As the percentage of copper increases, the loss by corrosion increases until with 2.773% of copper the loss is greater than when the steel does not contain copper.

7. As the percentage of copper increases the structure becomes finer, due to the more even distribution of fibrous cementite. This is more apparent in the forged than in the annealed specimens.

8. The point $Ar_1$ was lowered from 730 deg. C. in the steel containing no copper to 635 deg. C. in the steel containing 4.512% of copper.

9. The elastic limit in both the annealed and the unannealed specimens increases steadily until with 4.512% of copper it was increased more than 100% over that of steel containing no copper.

Within the limits investigated the ultimate strength appears to increase almost in direct proportion to the amount of copper present.

With the unannealed specimens the actual breaking strength in all cases was the same as the ultimate strength. The actual breaking strength in the case of the annealed specimens shows an increase with the increase of copper.

In the annealed specimens the elongation is somewhat irregular, but in general decreases up to 1.857% of copper and then increases and reaches a maximum at 4.512% of copper.

The general tendency in the annealed specimens is to decrease the elongation up to 1.85% of copper and then up to 4.512% of copper to gradually increase it. In the unannealed specimens the general tendency is to decrease the elongation throughout the series.

10. The hardness of the steel increases with increasing copper content and corresponds fairly well with the tensile tests.

W. E. Ruder presented a paper, illustrated with sections and diagrams, on "Grain Growth in Silicon Steel," and short papers were read by J. H. Hall on "The Life of Crucible Steel Furnaces," and by H. F. Miller, Jr., on "A New Design of Regenerators for Openhearth Furnaces." Two papers were laid over for want of time, one by C. P. Linville, on "A Chart for Use in Connection with Wet and Dry Bulb Thermometers in Making Psychrometric Determinations," and the other one on "The Future of the Chilled Car Wheel," by P. H. Griffin. Both of these papers were published in the "Transactions" in advance of the meeting.

The meeting was notable for the large attendance, the close attention paid to the papers, notwithstanding the rather severely technically character of some of them, and the general participation in the discussions.

It concluded with dinner at the Engineers' Club on Friday evening, Oct. 17, at which over a hundred members and guests were present, and which was much enjoyed.

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## A Blast Furnace for New York

Rumors have been persistently current for some weeks to the effect that strong interests were about to establish a blast furnace plant somewhere close to New York, and to this end were obtaining control of many of the iron mines along the Hudson and at other points in the vicinity.

It is now reported by the *Iron Trade Review* that interests including Witherbee, Sherman & Co. are to erect two 400-ton stacks at Boynton, N. J., on Arthur Kill, opposite Staten Island. It is stated that the expectation of a general stimulus to trade following the opening of the Panama Canal, is the fact that the forthcoming opening of the barge canal from Buffalo to the Hudson and the enlargement of the canal from Lake Champlain to the Hudson, will permit cheap delivery in New York of Lake Superior and Lake Champlain ores, together with the existence of a market in the immediate vicinity of New York capable of absorbing a large tonnage of pig iron annually, are the considerations which have led to the decision to build the plant. This report seems well substantiated.

It is also stated that other interests associated with the estate of the late Anthony N. Brady contemplate the construction of a furnace in the same general locality, and also a railroad to give communication to Port Morris, involving a bridge across the Hudson. The authenticity of this rather elaborate program cannot be determined.

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## Progress in the Kennedy Extension-Argonaut Suit

The Kennedy Extension-Argonaut apex suit, on trial before Judge F. V. Wood, in the Superior Court of Amador County, closed for the plaintiff on Sept. 29, with the evidence of Mr. Devereaux, manager of the Melones mines, as to the junction of veins in the Kennedy Extension ground, and documentary evidence by Mr. Perry, of counsel for the Kennedy Extension, of ore extracted and milled from the disputed ground since Jan. 1, 1913. Judge Curtis H. Lindley opened the case for the defendant with a concise statement, showing the situation of the Pioneer claim owned and mined by the Argonaut, and of the Jackson claim, owned and mined by the Kennedy Extension. These claims cover the chief ground in dispute.

Judge Lindley recited records showing the priority of the Pioneer over the Jackson location, but maintained that the question of priority is not one of consequence in the suit, because the defendant company does not believe nor admit that there is any such vein as the Jackson vein involved in the controversy. It is the contention of defendant that the Jackson vein claimed by plaintiff does not exist; that it is merely a constructive theory and entitled to no consideration as a vein as affecting the orebodies in dispute; that the plaintiff has not established anything like what the law requires as the apex of such a vein; and that, if it could be contended that the Jackson vein had a potential existence, there is no showing either on the strike or dip of any Argonaut vein joining another vein in the Jackson ground. It is contended by the defendant that the only joining or junction of veins is entirely in Argonaut ground north of the end line of the Jackson claim extended.

R. S. Rainsford, manager of the Argonaut Mining Co., identified and explained the maps and models of the defendant and described the mining geology and physical features of the Argonaut, including the Pioneer and other mining claims embraced in the disputed ground. Besides a general map there are two models, and two other diagrammatic maps illustrating one of the models. One model is of structural character constructed of sectional copper rods representing the Argonaut shaft and the drifts and crosscuts down to the lowest level, an incline depth of 3900 ft. This model is held in a wire frame, rests on a white-print base plat, and stands on a wooden base. The other model is constructed of nine separate glass sheets set edgewise in a wooden frame, illustrating the shaft, the formation and the orebodies mined, in colors. This model also rests on a white-print base plat. Both models are built on a scale of 80 ft. to 1 in.

Mr. Rainsford will be followed by Professor Lawson, of the University of California, Prof. W. H. Wiley, of Los Angeles, and Frederick Searles, of Nevada City. The expert testimony offered on behalf of the plaintiff respecting the geologic and physical features of the mine was by John W. Finch, Professor George, state mineralogist of Colorado, F. I. Martin, superintendent of the Utica mines, at Angels Camp, and William Devereaux, manager of the Melones mine.

The contention of plaintiff is that the Argonaut has no vein apexing within the surface of its claims beyond the flat vein near the surface that underlies a lava cap; that the deeper portions of the Argonaut vein form the Jackson vein which it is claimed has its apex within the boundaries of the claims owned by the Kennedy Extension.

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## American Mining Congress

Members of the American Mining Congress opened their annual convention in the Bellevue-Stratford Hotel, in Philadelphia, on Oct. 20. Appeals were made for the enactment of workmen's compensation laws in every state and for the conservation of the coal deposits.

David W. Brunton, of Denver, Colo., retiring president of the congress, arraigned at the reception on the opening evening what he declared to be a gigantic smelting monopoly that has the miners of the West by the throat:

> Years ago there was ample competition among the numerous smelting companies, and the miner could be sure of obtaining all that his ore was worth.
>
> Today most of the plants have passed into the hands of a few great corporations, which practically amount to a gigantic monopoly, which not only tell the miner what they will pay for his ores, but in some instances just how much ore they will permit him to produce.

The crying need of the mining industry, according to Mr. Brunton, is a complete revision of the present mining laws.

On Oct. 21, the industrial display proved a strong drawing card. Thousands of visitors spent the afternoon or evening in Horticultural Hall, the chief interest centering around the model mine in the basement.

There was no afternoon session of the congress, the delegates enjoying a trip of inspection on the Delaware River, but in the evening a number of addresses were delivered. Chief among these was a paper upon "Mine-Rescue and First-Aid Operations," read by J. W. Paul, of Pittsburgh, Penn.

In an address upon "The Use and Abuse of Explosives," Robert W. Gunnell, of Pottsville, Penn., declared that one of the great necessities for the preservation of life was to teach the miners to use care and brain work in the planting of charges and to realize that the strongest explosive was not always the best.

E. C. Sargeant, of Chicago, spoke upon "The Use of Concrete in Mining Operations," while Dr. W. R. Crane, of State College, delivered an illustrated address, in which he pointed out the vast coal resources of Alaska. While drawing attention to the labor required to make mining a success in the northern territory, he added that in time this country would have to turn to that district for its coal.

The chief subject of the morning session in the Bellevue was "Taxation of Mining Property." Addresses were delivered by R. V. Morris, Wilkes-Barre; Dr. H. M. Chance, Philadelphia; D. L. Webb, Denver; J. B. L. Hornblower, Pittsburgh, and S. A. Taylor, Pittsburgh.

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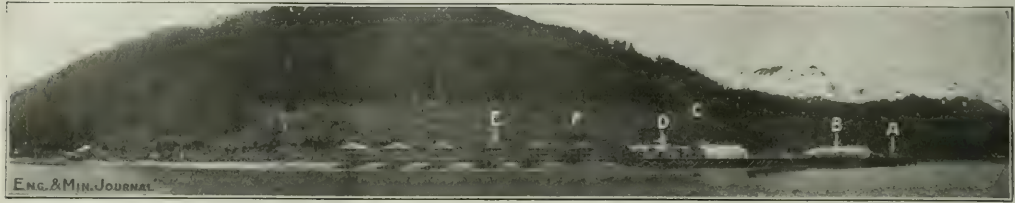
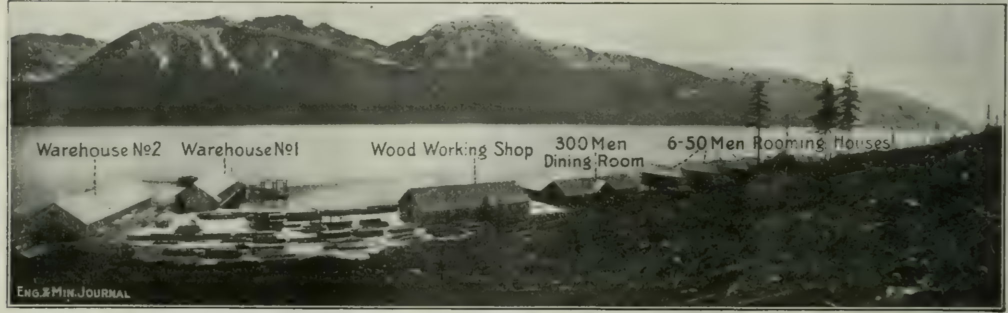
**Utah's Production of Gold and Silver** in 1912 as shown by figures of the Mint was gold, valued at $4,312,600, and fine silver 13,076,700 oz. The production of silver shows a marked increase over 1911, and gives Utah second place among the states in the production of this metal, being exceeded only by Nevada.

# PHOTOGRAPHS FROM THE FIELD



View from Gastineau Channel of Alaska Gastineau Millsite, Three Miles East of Juneau

A, wharf; B, warehouses; C, incline tramway to Sheep Creek tunnel; D, boarding house; E, rooming houses; F, clearing for millsite, on which will be built a mill of an initial capacity of 6000 tons of ore per day.



General View of Gastineau Channel and Alaska Gastineau Buildings from Millsite

The point from which this view is obtained is marked C, in the view above.

Experimental Mill of the Alaska Gastineau Mining Co., at Sheep Creek

Here tests are being made to determine the practice in what will be the largest gold mill in the world

Roads between Juneau and the Perseverance Mine

This road is to be used for hauling all supplies and materials during construction and development periods. At many places the surface of the road is supported by timber as shown in this view.

The Gold Creek road. Auto trucks, horses, railroads, incline tramways and water haulage solve the transportation problem.

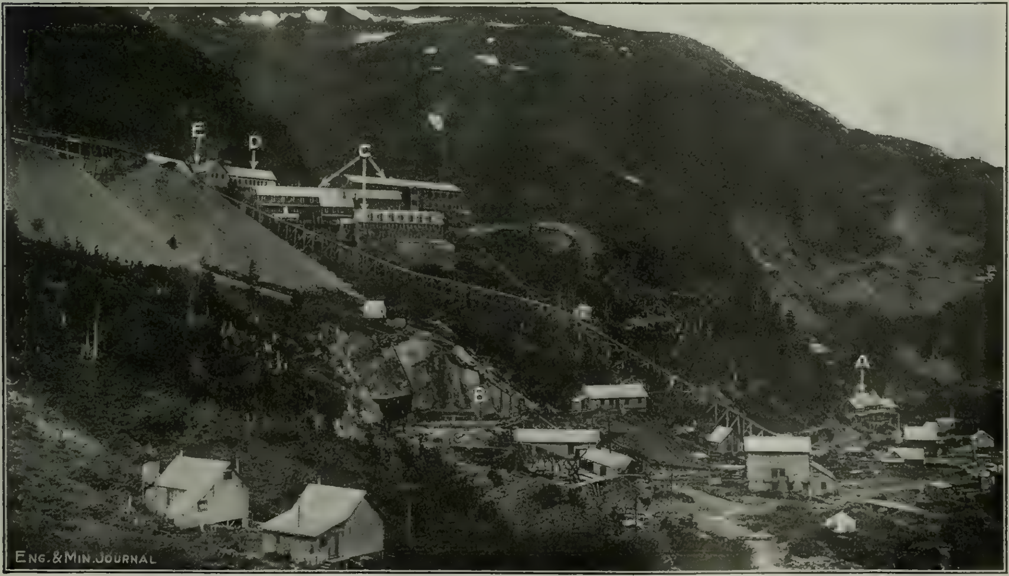
Portal of Sheep Creek Tunnel

The view is looking down Sheep Creek basin.

Head of Gold Creek Canyon

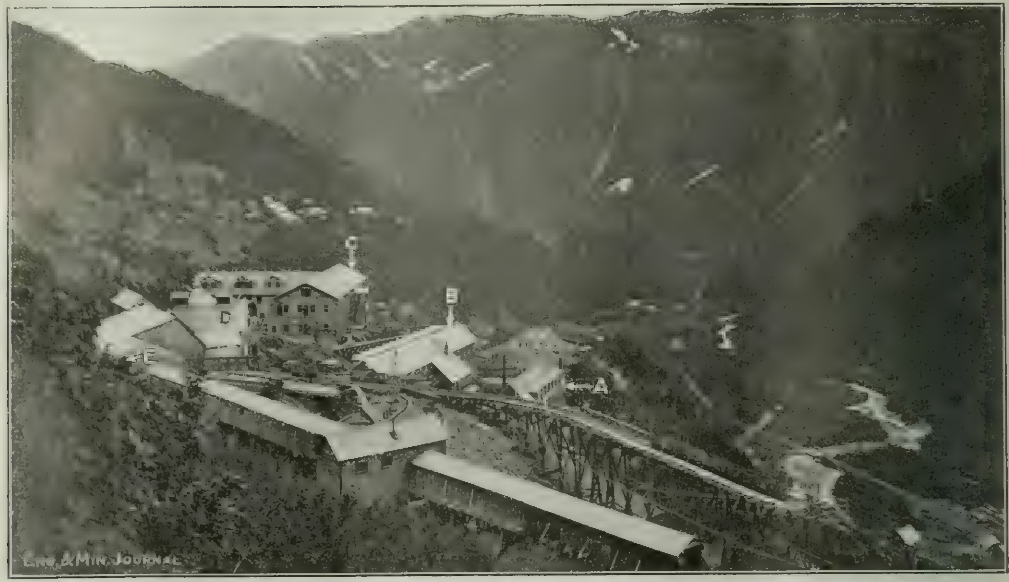
The buildings are at the Perseverance mine.

A narrow-gage railroad connects the millsite with the Sheep Creek tunnel, which is being driven to become the main outlet for the mine. Besides the Perseverance and Sheep Creek, the company owns the Silver Bow Basin, Ground Hog and other claims totaling 1200 acres, and a maximum length of more than two miles on the Gold Creek lode system.



Structures at the Perseverance Mine of the Alaska Gastineau Mining Co.

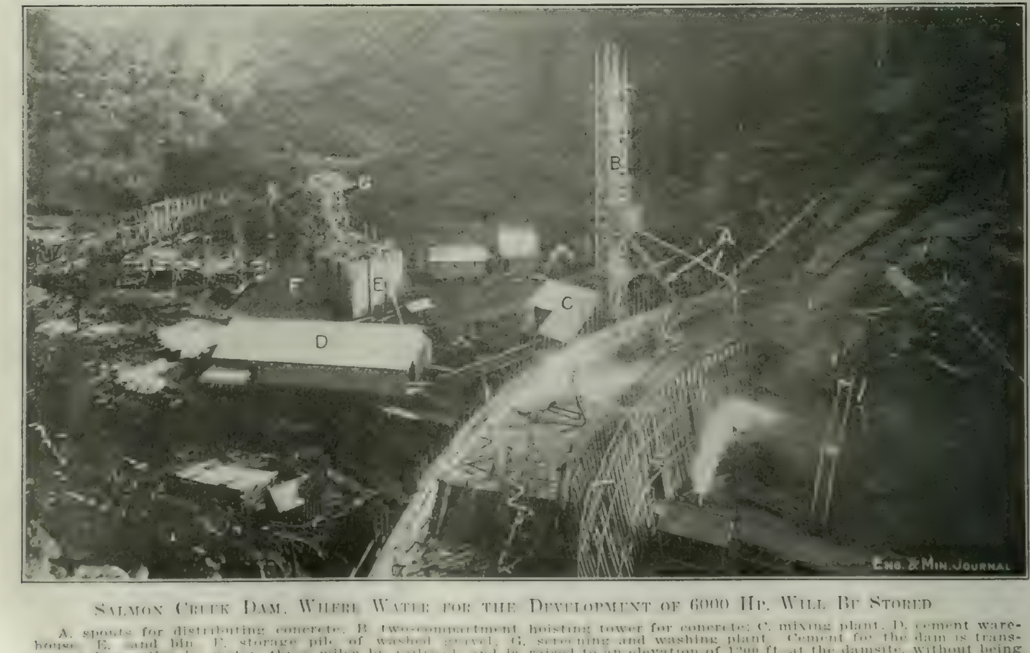
A, staff house; B, site for new compressors; C, rooming and boarding houses; D, shops; E, portal of Alexander crosscut.



PERSEVERANCE MINE BUILDINGS OF THE ALASKA GASTINEAU MINING CO.

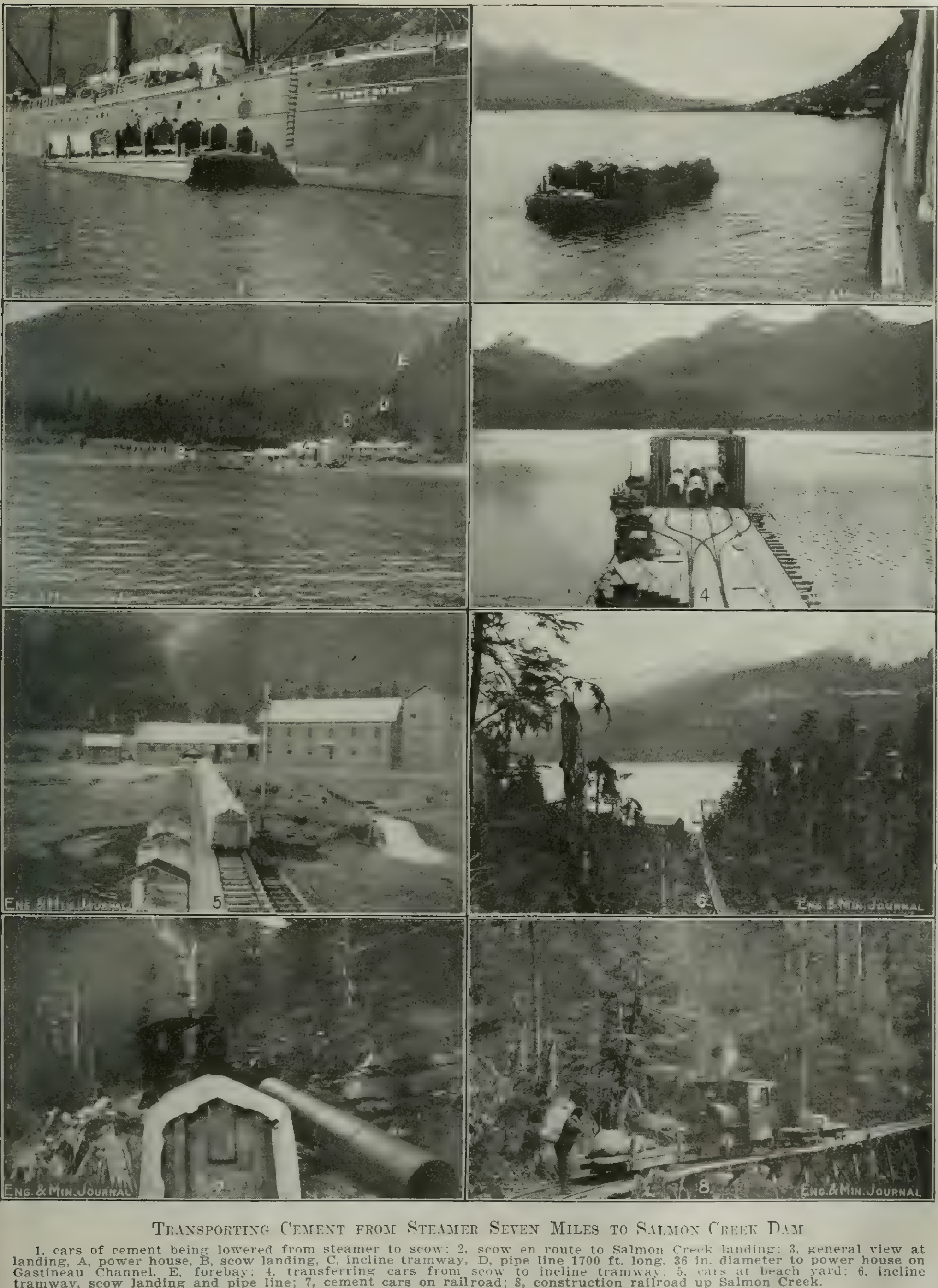
A, rooming house; B, rooming house; C, boarding house for 500 men; D, shops; E, portal of Alexander crosscut.

A 500-ton mill was operated on this claim prior to the acquisition of the Alaska Gastineau properties by the Alaska Gold Mines Co., the present holding company, of the Alaska Gastineau Mining Co., but because of shortage of water, it could be operated only a few months in summer. Up to the end of 1911 it had treated 300,000 tons of Perseverance ore. The Sheep Creek tunnel, 700 ft. deeper than the Alexander crosscut, is being driven parallel to and mostly in the Perseverance vein. A still deeper tunnel may be driven later.



SALMON CREEK DAM, WHERE WATER FOR THE DEVELOPMENT OF 6000 HP. WILL BE STORED

A, spouts for distributing concrete; B, two-compartment hoisting tower for concrete; C, mixing plant; D, cement warehouse; E, sand bin; F, storage pile of washed gravel; G, screening and washing plant. Cement for the dam is transported four miles by water, three miles by railroad, and is raised to an elevation of 1200 ft. at the damsite, without being removed from the cement cars, as shown in the views on the opposite page.



Transporting Cement from Steamer Seven Miles to Salmon Creek Dam

1, cars of cement being lowered from steamer to scow; 2, scow en route to Salmon Creek landing; 3, general view at landing, A, power house, B, scow landing, C, incline tramway, D, pipe line 1700 ft. long, 36 in. diameter to power house on Gastineau Channel, E, forebay; 4, transferring cars from scow to incline tramway; 5, cars at beach yard; 6, incline tramway, scow landing and pipe line; 7, cement cars on railroad; 8, construction railroad up Salmon Creek.

## Developments in Sudbury Nickel Properties

The [illegible] demand for nickel during the last nine or ten months has had a marked effect upon the development of nickel-copper properties in the Sudbury district in Canada. The old Murray mine was optioned by the Dominion Nickel Co., about 10 months ago, was drilled, and a considerable body of ore proved. The company sold it to the Canadian Nickel Corporation along with its other holdings in the district, amounting to several thousand acres on the nickel belt; the price for the entire group amounted to several millions of dollars. Drilling operations were continued by the new owners, with the result that now the Murray mine has between 10,000,000 and 11,000,000 tons of first-class ore.

The new company, with Dr. F. S. Pearson at its head, has mapped out an extensive development policy, a smelter and refinery is to be erected three miles west of Sudbury. Extensive preparations have already been made and considerable work has been done on the foundation of this new plant. This will, if erected, be the first refinery for nickel-copper ore in the Dominion of Canada and will mean much to Sudbury and the whole nickel industry.

The Mond Nickel Co. blew in its new smelter last June. It has been running smoothly ever since. This company has secured options on several valuable tracts of nickel land and has been doing extensive diamond drilling. At present eight diamond drills are running on what is known as the Levack group and three more are being put in commission. It is reported on reliable authority that an extensive body of rich ore has been blocked out on what is known as No. 1 property; the owners have already received two payments on the purchase price.

## CIVIL SERVICE EXAMINATIONS

The Civil Service Commission announces an examination on Nov. 10, for assistant metallurgist, to fill a vacancy in the Bureau of Mines, at from $2000 to $3000 per year. The duties of the position will be to investigate smeltery fumes and other metallurgical problems in smelter operations. Competitors will be rated on: (1) General education and technical training, 40; (2) professional experience and fitness, 40; (3) publications or reports, 20. An educational training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics, metallurgy and mineralogy; and not less than three years' experience in chemical and metallurgical work in smelting, or not less than one and one half years at such chemical and metallurgical work and one and one-half years' experience in metal-mining operations, are requisite. Under (3) the applicant must have demonstrated ability to prepare reports as shown in manuscript reports or published papers. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who meet the requirements and desire this examination should apply for Form 304, Metallurgist (male), No. 1086.

The Civil Service Commission announces an examination, on Nov. 10, for metallurgical engineer, for work in iron blast-furnace operations, to fill a vacancy in the Bureau of Mines, at from $2500 to $4000 per year, to investigate safety and efficiency problems in iron blast-furnace operations. Competitors will be rated on: (1) General education and technical training, 40; (2) professional experience and fitness, 40; (3) publications or reports, 20. A training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics and metallurgy, and not less than four years' experience in the operation of the blast furnace, are requisite. Under (3) the applicant must have demonstrated ability to prepare reports as shown in manuscript reports or in published papers. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who meet the requirements and desire this examination should apply for Form 304, Metallurgical Engineer (male), for work in iron blast-furnace oprations, No. 1087.

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The Civil Service Commission announces an examination on Nov. 10, for metallurgical engineer, for work in iron and steel, to fill a vacancy in the Bureau of Mines, at from $3000 to $4000 per year, to conduct investigations into safety and efficiency problems in the metallurgy of iron and steel. Competitors will be rated on: (1) General education and technical training, 30; (2) professional experience and fitness, 40; (3) publications or reports, 30. A training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics and metallurgy, and not less than six years' experience in the metallurgy and operation of iron and steel mills, are requisite. Under (3) the applicant must have demonstrated a capacity for preparing reports as shown in manuscript reports or published papers. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who desire this examination should apply for Form 304, Metallurgical Engineer (male), for work in iron and steel, No. 1088.

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The Civil Service Commission announces an examination on Nov. 10, for assistant petroleum chemist, to fill a vacancy in the Bureau of Mines, at from $1800 to $2160 per year, to assist in chemical researches in petroleum, and especially the refining of petroleum or petroleum products. Competitors will be rated on: (1) General education and technical training, 50; (2) professional experience and fitness, 30; (3) publication or reports, 20. An educational training equivalent to that required for graduation from a college or university of recognized standing is requisite. It is desired, if possible, to secure a Ph.D. in chemistry and physics who has had at least one year's experience in chemical and physical researches in petroleum. Under (3) the applicant should have demonstrated ability to record and report observations through manuscript reports or published papers. Applicants must have reached their twenty-fifth but not their thirty-fifth birthday on the date of the examination. Persons who meet the requirements and desire this examination should apply for Form 304, Assistant Petroleum Chemist (male), No. 1089.

# EDITORIALS

## The Situation in Mexico

The situation in Mexico is now about at its worst. A large part of that country has relapsed into barbarism. Industry has ceased. Mines have been closed for the reason that necessary supplies are no longer obtainable. The fields lie fallow because the *rancheros* cannot afford to plant corn and raise cattle merely to have them taken by marauders. Assassination and murder are done everywhere.

Up to a year ago, the plundering and murdering was limited to the Mexicans themselves. Their own resources having been consumed, there being no more to take in native quarters, attacks on foreigners and foreign property began.

The whole story of the hellish deeds that have been done in Mexico has never been told. The Associated Press does not cover that sparsely settled country and such events as the looting of the city of Durango by the bandit Urbino have passed unchronicled.

We do not believe that the Washington government has heard about things, or has had an accurate conception of conditions. The attitude of Mr. Bryan toward certain well informed persons, who have made representations to him, has not been encouraging.

The administration may be correct in refusing to recognize Huerta, may have good reasons for that, and by excluding Mexico from money supplies may hasten her reversion to barbarism in the hope that out of anarchy some solution will perforce be found, but there is nothing constructive in this policy.

One of the best summaries of the true condition of the government in Mexico is written by Louis C. Simonds, a member of the staff of the *Mexican Herald,* in the *Atlantic Monthly* for October, who says:

> The truth is that Mexico's greatest misfortune is that she adopted a constitution unsuited to her needs and to the genius and character of her people. The instrument in question dates from the year 1857, when feeling ran high between Clericals and Liberals. The latter, having for the time the upper hand, and admiring the greatness of the United States, but lacking a philosophical insight into the causes of that greatness, patterned the new Mexican Constitution very largely on the constitution of the United States, overlooking the fact that the Mexican people, of whom 80% are still illiterate, could not be expected to make an intelligent use of a political system devised for the most advanced and enlightened of modern democracies.
>
> General Porfirio Diaz undoubtedly realized the inadaptability to Mexico's needs of the constitution of 1857. But not even he, with all the immense authority which he at one time wielded, ever ventured to propose a radical reform of that constitution, so as to do away with the Federal system and establish in its stead a strong centralized government, with a restricted suffrage. And he did not venture on this step, because he knew that to the Liberals of Mexico the constitution of 1857 has ever been a fetish, and that to attempt to modify it radically, even though avowedly it remained largely a dead letter, would be to precipitate a civil war.
>
> De facto, General Diaz did establish a strong centralized government, and, as for popular suffrage, he practically nullified it. But where the facts and theories of government are in chronic conflict, there can be no enduring political peace. A clamor will be raised from time to time for the strict enforcement of the constitution, and reproaches will be launched against the government for its nonobservance. Such, in effect, was the outcry that gave force to the movement headed by Senor Madero.

Something will have been gained when the President of the United States ceases to talk about having a fair election in Mexico. There never was one. It will be many years before there will be one. Huerta may be impossible, but the restoration of order in Mexico will come only through the exercise of a strong, ruthless hand, and if such appears in any quarter, Washington will do well to help it, irrespective of any form of election. Press dispatches from Washington indicate that something of this kind is seeping into the minds of the Administration. It is said that there is some reason to believe that the sympathies and also the hopes of the Administration now lie with the "constitutionalists" controlling several of the northern and middle states, and the notion is beginning to prevail that the Administration would welcome some action by the revolutionists, which would give a new turn to the present unsatisfactory situation. This is construed as meaning that the overthrow of the Huerta government by violence and the triumph of the rebel leaders would be regarded as a solution which the United States might be able to accept.

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## Meetings of Societies

Not long ago, we called attention to the constantly recurring conflicts in the dates of meetings of technical societies, rendering it impossible to secure the attendance at any one of them that the officers would like. We suggested a clearing house to obviate such conflicts. Our suggestion has excited a good deal of approving comment. It is now proposed to arrange some sort of a clearing house, or better, we might say some sort of a "block signal service," in the United Engineering Building in New York.

During the present month there has been such an epidemic of collisions among the several societies that a stranger might think that the managers of the New Haven R.R. were running things. In New York last week there were meetings of the American Institute of Mining Engineers and of the American Electrochemical Society. The New York Section of the Mining and Metallurgical Society waived its regular date in order to avoid there being three technical meetings on the same day, and in the same city, and postponed its meeting a week, but was unable to avoid collision with the American Mining Congress.

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## Quotations for Copper

A disingenuous contemporary in Chicago remarked in a recent issue:

> The U. S. Geological Survey has issued its annual general report on the copper industry of the United States for 1912 as an advance chapter from "Mineral Resources." Probably the most important feature of this report to a majority of the copper producers is the average monthly prices given for copper. These figures, in comparison with the prices estab-

lished by the "Engineering and Mining Journal," and on which the American Smelting & Refining Co., the so called smelter trust, claims to settle, are from ⅛c. to ¼c. a pound more. The query that naturally arises is why is it that the U. S. Geological Survey, with its great staff of experts and statisticians, gives out such figures in the face of the considerably lower price as established by the "Journal"? We expect that all figures given us by the Survey shall be authentic, or that they will be omitted.

Our contemporary alleges that it "wants to know" and says it is "high time" the copper producer be "accorded fair play." Of course the *Mining World* knew that the Geological Survey specifically credited its figures to a minor trade paper and that the Geological Survey said with reference to those quotations:

> The New York quotations are the basis on which copper is sold by the mines to custom smelters and are used by the United States Geological Survey in calculating the value of both mine and smelter output. It is well known, however, that this average yearly price only approximates the actual average price received for copper sold during the year. The average selling price received by several large producers of electrolytic copper, as given in their annual reports, varies from 15.51c. to 16.58c., with an average of 15.77c., which indicates that the **average as indicated by the quotations was considerably above the actual average price realized by producers."**

If the Chicago paper had had any idea of being honest it would, of course, have quoted the Geological Survey to the above effect. Its failure to do so is *prima facie* evidence of its maliciousness.

As for the Geological Survey, "its great staff of experts and statisticians" clearly does not know what it says, viz., that the quotations adopted by it are "the basis on which copper is sold by the mines to custom smelters," which is not the case; nor has the Geological Survey any particular information about the copper market, anyway. Up to its last report it used the JOURNAL's quotations without credit. Early in this year the Geological Survey charged the JOURNAL with using some of its statistics without giving credit, we retorted *tu quoque*, and there was an acrimonious discussion. The substitution in the last Geological Survey report may have had something to do with this. We don't know.

As to the JOURNAL's quotations for copper, interested persons and contemporaries with axes to grind like to cultivate the idea that they are too low. They are not too low. If anything, they are too high. The fact that poorly informed newspapers give higher prices does not signify anything more than that theirs are much too high. The producers do not realize such prices. Examination of their annual reports shows that they have difficulty in coming up to the JOURNAL's quotational average. Some producers may beat it one year, some another, inasmuch as everybody does not sell at the same price or always to the same advantage, but the sale of the whole copper product of the country does not fetch quite the JOURNAL's quotational average.

The American Smelting & Refining Co., which is referred to by the Chicago paper, sells on commission the copper of the Nevada Consolidated and of the Utah Copper Co. During the last three years those companies have reported as follows:

| Year | Utah, pounds | Average | Nevada, pounds | Average | E. & M. J. average |
|---|---|---|---|---|---|
| 1910 | 84,502,475 | 12.67 | 62,772,342 | 12.75 | 12.74 |
| 1911 | 93,514,419 | 12.65 | *78,541,270 | 12.50 | 12.38 |
| 1912 | 91,366,377 | 15.84 | 63,063,261 | 15.98 | 16.34 |

*Eighteen months

We do not imagine that the A. S. & R. Co. sells its own purchased copper to any better advantage than it does these large outputs. We are not sure that the prices above reported do not include delivery charges and are correspondingly higher than the New York basis.

In September last, the newspapers had the price of copper at 16⅞c. (which price was merely a priced asked by some producers who were not selling copper, and, anyway, included delivery charges). Our average for that month was 16.328c. An important agency that was selling copper right along realized on all of its sales 0.05c. more in one week, 0.036c. less in another, and came within a small decimal fraction in a third week of the period during which comparison was made.

The mistaken idea about prices for copper higher than our quoted average emanates generally from the fact that the newspapers in New York are in the habit of reporting alleged transactions at the highest possible price, perhaps with the idea of influencing the stock market, perhaps simply out of ignorance; and include in such prices the delivery charges. Anybody who reckoned on realizing such prices on the average sale of his output would simply find that he had been living in a fool's paradise.

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## What is the Copper Market?

When the big producers of copper are holding out for a price that they would like to get, and ultimately they may or may not get, they are more or less irritated to see the market fall off on the transactions of dealers, traders, and the class commonly referred to as "second-hands" (although there are generally some first-hands among them). The big producers would naturally like to see the market at what they demand.

The fact that frequently it is not so is a condition, not a theory. There are only two conceivable remedies. One is to organize a pool and cause all the copper to be sold through it. If the monopoly were complete, any desired price might be named and consumers would have to pay it, or go without. However, the laws of the United States do not permit this.

The other remedy is simple and lawful. Persons who would like to see a high price have only to go into the market and buy all the copper that is offered cheaply. The price goes off when there are no buyers, or only a few, and they more or less timid, and attracted only by concessions. Of course, there is danger in this expedient, which M. Secretan discovered, and that no doubt is the reason why it is not more commonly tried.

The natural market in copper, steel, stocks and everything else is the price at which some people are willing to buy and other people are willing to sell. The participation of both parties is necessary. The willingness of one party to sell at a price that the other party is unwilling to give, or *vice versa*, does not make a market in anything wherein there is open trade. Of course, things are different in the case of monopolies.

The recovery in the price this week upon the strength of European buying shows that this time the producers who stood aloof succeeded in carrying their point as we indicated they probably would do in reviewing the situation several weeks ago.

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## Practical Effect of Bonus System

The attempt to reduce dredging costs by the institution of a bonus system, described in this issue by Dr. H.

M. Payne, represents an application to mining of one of the principles of scientific management. The results of the bonus and of the competition between the various dredges are rather remarkable. There are possibilities here which are generally overlooked in mining. A reduction of costs, as a result of what may be termed unit profit sharing, could undoubtedly be effected in many branches of mining. It is not uncommon in some districts to pay the muckers and trammers a bonus for each car over a fixed minimum. Theoretically, the system could be extended to drilling, hand picking, etc. Practically, there are difficulties in the way other than those enumerated by Doctor Payne.

In the first place, the cost of ascertaining the amount of work done may be more than the saving effected. Thus, when muckers are paid by the car, one or several trusted company employees must be detailed to keep track of the cars delivered and with miners paid by the foot of hole, rapid work is necessary between the completion of drilling and blasting time, on the part of the company representatives, who measure up. But a more serious obstacle is the opposition of the unions, which have always fought contract, piecework, or bonus systems in their various forms. From their own point of view, the unions are likely justified. Payment by any other method than day's pay gives an opportunity to beat down prices against which they have no recourse. It is a pity, however, that mutual distrust between employee and employer should prevent the application of human effort in the most efficient manner, with resulting profit to both parties.

It is to be regretted that Doctor Payne does not chronicle the conclusion of the experiment. Why was it discontinued before the close of the season?' Was it begun again in 1913, and with what results? On the face of the figures given, it would seem to be a scheme well worth while and full of promise.

## BY THE WAY

According to a New York daily, "the heaviness of steel is due to the new tariff." So is the lightness of hydrogen, we imagine.

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The production of crude copper by the mines and smelteries in August, 1913, according to our statistics, was 128,415,428 lb., compared to 139,315,203 lb. in July. The check in the production of the Michigan smelters, due to the strike, showed its effect for the first time in the August statistics.

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And here is a miracle, a modest inventor: "I cannot say we have obtained anything like perfection yet with the process, but we have amply proved that gold can be successfully, economically, and simply recovered. Rome wasn't built in a day, and a perfect gold-extraction process cannot be built up in a few weeks." And working on some lines, one never does get it.

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Report comes by way of the *Daily Consular and Trade Reports* that a discovery of hematite has been made on the Kleena River, in British Columbia. It is said that "a large body of ore has been moved by a glacier and deposited over an area a mile square." It is not stated where the glacier got it. Water transportation of iron ore on the Great Lakes is deservedly famous, and cheap ocean freights, we hear, are going to do for Chile and Brazil what they have done for Cuba, in rendering remote iron deposits available. But this water transportation has nothing on the glacial method for cheapness. Glacial freights ought to approach absolute zero. We omit consideration of the time element.

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A prominent iron-mining man, of Duluth, who formerly was active in the logging business, was reminded of an interesting reminiscence the other evening. It was suggested by some remark incident to the special election in Duluth on a liquor issue: "There is a chap writing articles in Chicago about the high cost of living, and he begins each of them with the question: 'Who gets the money?', and I often wonder who eventually got the money that was spent by the woodsmen whose headquarters was Seney, Mich., about 20 to 25 years ago. I mean the money that was squandered. Seney had a population of about 300 and there were 42 saloons there in the early days, and 7000 to 10,000 woodsmen worked in the territory near Seney. It is no exaggeration to say that 90% of the men blew their wages in those booze dens. We can trace the money that far, but when I recall that practically every one of those saloonkeepers left Seney broke, and they did not spend the money building up the town, it makes me wonder what became of it. That is an interesting problem for some of those chaps who are inclined to nosing out statistics."

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It is hard to understand why any miners stay in this country. Read these menus from the Robinson Deep mess on the Transvaal:

| LUNCHEON | DINNER |
|---|---|
| Soup: | Soup: |
| Giblet. | Printanière. |
| Fish: | Fish: |
| Boiled Stock Fish and Egg Sauce. | Crumbed Silver Fish. |
| Entrees: | Entrees: |
| Grilled Rump Steak and Chips.<br>Macaroni Cheese | Stuffed Roast Chicken.<br>Scotched Eggs and Brown Sauce |
| Cold Joints: | Hot Joints: |
| Roast Sirloin of Beef.<br>Roast Leg of Mutton.<br>Roast Lamb and Mint Sauce.<br>Boiled Pressed and Corned Beef.<br>Potted head, Polony. | Roast Sirloin of Beef and Yorkshire Pudding.<br>Roast Haunch of Mutton.<br>Roast Lamb and Mint Sauce |
| Vegetables: | Vegetables: |
| Mashed and Boiled Potatoes | Baked, Boiled and Mashed Potatoes, Cabbage, Boiled Onions. |
| Sweets: | Sweets: |
| Blanc Mange and Fruit Salad.<br>Fruit, Cheese, Salad, Tea, Coffee. | Apple Charlotte.<br>Fruit, Cheese, Tea, Coffee. |

And you get this for $32.50, $30 or $22.50 per month, depending on what you are earning. The control of the table is in the hands of a committee of the mine employees, according to the *South African Mining Journal*, and the same fare is served to the department heads, their subordinates and the workmen. The surroundings of the dining rooms are stated to be unusually pleasing and the service excellent. We have seen equally attractive menus in this country, following which the meal itself was a disaster in quality or quantity, or both. It is affirmed, however, that these eats were of unsurpassed quality, or good as could be had in the Park Station restaurant of the South African Railways. This is probably equivalent to saying, "as good as the Harvey House in El Paso." And for a dollar a day! Why did the Rand miners strike and why is there difficulty in getting good men?

## PERSONALS

Loyal W. Trumbull is now State Geologist of Wyoming.

J. V. Culbert is now superintendent of the Wasabika mines, West Shiningtree, Ontario.

Arthur V. Davis, president Aluminum Co. of America, Pittsburgh, has sailed for Europe.

John Power Hutchins was married to Miss Elizabeth McNear on Oct. 15, at St. James Church, Paddington, London.

A. B. Lucas, superintendent of coke ovens for the Dominion Iron & Steel Co., at Sydney, N. S., was in New York last week.

Stanley Graham has been appointed professor of Mining Engineering in the Nova Scotia Technical College at Halifax.

Dwight E. Woodbridge, who has been attending, as a witness, the hearings in the Steel Corporation case, has returned to Duluth.

Dr. James Douglas is in Arizona on one of his regular visits of inspection. He is expected to return to New York early in November.

George E. Farish has left Nelson, B. C., and will stop in San Francisco on professional business, until Nov. 1, before returning to New York.

N. O. Lawton has resigned as superintendent of the Miami mine, at Miami, Ariz. F. W. Maclennan, assistant manager, is in charge of the mine.

Prof. J. C. Gwillim has returned to Kingston, Ont., to resume his duties at the School of Mining, after spending several months in Western Canada.

J. B. Tyrrell, Toronto, Ont., is sailing from New York for London on the "Olympic" on Oct. 25. His address will be 224 Salisbury House, E. C., London, England.

Geo. H. Garrey, chief geologist of the American Smelting & Refining Co., contemplates severing his connection with that company in order to go into consulting work.

L. O. Kellogg, of the editorial staff of the "Journal," is visiting the iron mines of Minnesota, Wisconsin and Michigan, among which he will spend about two months.

I. N. Beavers, of Reading, Penn., and George P. Young, of Belvidere, N. J., have been appointed receivers of the Pahaquarry Copper Co., in Warren County, New Jersey.

W. L. Cummings, geologist of the Bethlehem Steel Co., has returned from a six-months trip to South America. During this time he examined properties in Chile and Brazil.

L. B. Smith, geological engineer of the Associated Geological Engineers, Pittsburgh, has started on a trip to the West Indies for the purpose of examining supposed oil properties.

Charles V. Bobb has severed his connections in Nevada and in future will be located in the Realty Bldg., Spokane, Wash., as consulting engineer, specializing in cyaniding and oil flotation processes.

The Associated Geological Engineers of Pittsburgh, are engaged in examinations of oil properties in the state of Vera Cruz, Mexico, the fieldwork being in charge of L. G. Huntley, geological engineer.

The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., announces that A. E. Borie has resigned as vice-president and has been elected chairman of the board of directors and that L. W. Jones and W. L. Wright have been elected vice-presidents.

W. L. Kluttz has resigned as general superintendent of the furnaces of the Republic Iron & Steel Co. at Thomas, Ala., and on Nov. 1 will succeed J. W. Shook as vice-president and general manager of the Central Iron & Coal Co., Tuscaloosa.

R. N. Dickman, of Chicago, has become associated with Robert W. Hunt & Co. in the United States and with Robert W. Hunt & Co., Ltd., in Canada. His headquarters will be in the Insurance Exchange, Chicago. He is now engaged upon the examination of gypsum and coal properties in Western Canada.

C. C. Whittier has been made treasurer and general manager of Robert W. Hunt & Co., Ltd., with headquarters at the McGill Building, Montreal. He has been residing in [illegible] in charge of the company's business in that district but has moved to Montreal. T. C. Irving, Jr., has been reelected vice-president of the company and will remain in charge of the business in Toronto and the surrounding district.

## OBITUARY

John Fallon died at Wilkes Barre, Penn., Oct. 14, aged 62 years. He was for many years an active member and officer of the United Mine Workers of America, and was especially prominent as assistant to John Mitchell at the time of the great anthracite strike of 1902. He was also active in securing the passage of the present mining laws of Pennsylvania.

Wilhelm Schulte died suddenly in Overpelt, Belgium, in his sixty-second year. He was a self-made man and was prominently identified with the zinc industry in Europe. He was closely associated with all industrial enterprises of Beer, Sondheimer & Co., and the Tellus Aktiengesellschaft and built up the Companie des Metaux Overpelt-Lommel, one of the most uptodate zinc smelting plants in Europe. He was the moving spirit in this enterprise from its inception 25 years ago. He had the reputation of being one of the ablest zinc-smelting men in Europe and was also well known in this country, having been here in a consulting capacity at different occasions.

Donald C. Mackinnon, who, with his brother Alexander, discovered iron ore in the Iron River district of Michigan, died at Iron River, Oct. 11. He and his brother walked to Iron River from Commonwealth, Wis., which was then the terminal of the railroad, in 1878. The two pioneers, believing that the district was to prove a valuable one, located what is now known as the village of Iron River. They also located the lands on which are now the Kinney, Baltic and Youngs mines, and did some test-pit work but not enough to prove that they really contained the large orebodies which have since been shown up. The first mine opened by them was the Beta. In all, six mines have been opened on the Mackinnon holdings. Donald C. Mackinnon made quite a fortune, part of which be invested in real estate in California, where he usually spent the winter months. He was a geologist of reputation and had an excellent knowledge of the entire Lake Superior region.

## SOCIETIES

**Society of Chemical Industry**—The next meeting of the New York Section will be held Oct. 24 at Rumford Hall, 50 East 41st street. The program for the evening will be: "Report on the 1913 Meeting of the Society in Liverpool," by Marston T. Bogert; "Chemistry as Affecting the Profitableness of Industry," by G. W. Thompson; "Some Problems in Industrial Development," M. C. Whitaker.

## INDUSTRIAL NEWS

The Allis-Chalmers Manufacturing Co. announces the removal of the sales and engineering office of its Mining Machinery Department from Chicago to the Milwaukee works at West Allis, on or before Oct. 6. The Chicago shops will also be removed to Milwaukee in the near future. The advantages to be gained by concentrating all departments, both commercial and manufacturing, at one plant are the reasons for this move.

General Electric Co., Schenectady, N. Y., report the following orders recently received: The Witherbee-Sherman Co., Mineville, N. Y., for 300-hp. motors, three 100-kw. and three 300-kw. transformers and two switchboards. The Alaska Treadwell Gold Mining Co., Treadwell, Alaska, have ordered for Alaska Juneau Mine a 937-kv.-a. Curtis turbo-generator with 7-kw. motor-generator exciter set, three 333-kv.-a. water-cooled transformers and a switchboard. The Inspiration Consolidated Copper Co., Miami, Ariz., four large 2000-kv.-a. water-cooled transformers, a 500-kw. 4-unit flywheel motor-generator set with controlling equipment, two 580-hp. motors, switchboard and accessories. The Alaska Treadwell Gold Mining Co., Juneau, Alaska, four motors of 10 hp., 35 hp., 75 hp. and 100 hp., respectively, switches, etc.

The William Powell Co., Cincinnati, Ohio, Manufacturers of Powell valves especially the "White Star" valve, have just issued a circular on the Powell Union Composite Disc Valve for steam and hot-water heating, describing the new design and illustrating it. Copies of the circular will be mailed to any engineer on request.

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Oct. 16

**The Petroleum Industry of California** will be the subject of a special bulletin to be issued by the State Mining Bureau, the preparation of which was lately begun. This bulletin will cover the occurrence of oil-producing sands, the geology, the production, transportation, refining, marketing and various uses of petroleum. It is the purpose of the state mineralogist to include as full information as possible regarding every known petroleum occurrence in the state. Data will be gathered and published concerning methods, costs and results of drilling, pumping, refining and storage; the transportation costs by rail, water and pipe line and the capacity of pipe lines.

**The Mother Lode Region** in Amador County produced the largest amount of gold of any county in California in 1912, being credited with a production of $2,796,194. The four other counties of the Mother Lode region, Calaveras, Eldorado, Mariposa and Tuolumne, produced an aggregate of $2,341,542, making a total gold production in the Mother Lode region of $5,137,736. After Amador, the largest producers in their order were Yuba, $2,753,408; Butte, $2,346,229; Nevada, $2,081,958; Sacramento, $1,712,587; Tuolumne, $1,113,291. Gold was produced in 32 counties but only the counties named produced as much as $1,000,000. The total tonnage of treated ores produced in the state in 32 counties was 2,641,497 tons. Amador County produced 737,148 tons; Calaveras, 430,128 tons; Shasta, 415,116 tons; Nevada, 270,148 tons; Tuolumne, 228,823 tons; Kern, 168,226 tons. The large tonnage in Shasta County consisted chiefly of copper bearing ores. Shasta County's gold production was comparatively small. The small tonnage treated in Yuba County and the no tonnage in Sacramento County, while those counties were large producers of gold, is due to the fact that the production was from dredging operations. There is comparatively little quartz mining in Humboldt, Los Angeles, Merced, Stanislaus, Sacramento, San Luis Obispo and Yuba Counties, although they are all gold producers to a large or small extent. The total average value of all the ore sold or treated in California in 1912 was $6.71 per ton.

### DENVER—Oct. 18

**Lawlessness in the Southern Coal Fields** continues, the strikers being apparently encouraged by the failure of the state authorities to make any decisive move to restrain them. The situation on Oct. 14, was marked by the capture of 15 deputy sheriffs by a mob of 200 striking miners at Trinidad, and an attack on Marshall Corey, of Segundo, by armed strikers, who dragged him from his horse, stole his gun and beat him badly. Guards came to his rescue and several shots were fired but no one was hurt. The 15 deputies, bound for Ludlow, were taken prisoners at the Colorado & Southern station, hustled to the headquarters of the union and held prisoners for more than an hour, while Sheriff Grisham and a number of deputies stormed and argued in an effort to obtain their release. They were set free only after a show of force had been made. However, state officials began making final preparations, Oct. 15, for calling out the militia if necessary, as it became apparent that a crisis in the strike situation was not far off. The state auditing board authorizes issuance of certificates of indebtedness to finance the troops, and the clearing-house bank heads met with the governor to make arrangements for floating these certificates. General passenger agents of railroads also met the chief executive to complete traffic arrangements for transportation of militia. Ammunition has also been sent to Trinidad and Pueblo for the southern coal fields, and also to the northern fields for the use of the militia if it becomes necessary. The operators assert that the number of miners out on strike is 5000, or approximately 30% of the total number of men employed under normal conditions. The officials and the headquarters of the miners' union say that strike benefits were paid during the first week of the strike to 11,232 men in the southern fields alone, and that a few applications have come since that date Both sides are prepared for a long struggle and it is feared that the strike will continue many months. If it lasts another 30 days it is estimated that the cost to the state will be $150,000 per day.

### BUTTE—Oct. 15

**A Slime Concentrator** will be built by the Anaconda company at the Washoe works at an estimated cost of $650,000. The plant will comprise 20 of the 20-deck round tables that have already been tested in an experimental plant and will have capacity for treating about 2500 tons of material per 24 hr. The new plant will recover about 1,000,000 lb. of copper per month from slime that heretofore has been running into the pond.

**Coal Rates,** according to orders given by the interstate commerce commission, must be placed high enough on coal shipped from Sheridan, Wyo., to Montana points to protect the operators in the Bear Creek, Mont., coal fields. These rates are a considerable increase over the original ones and were obtained as the result of the Montana commission asking for a rehearing, in which evidence was offered to prove that it costs more to produce coal in Montana than in Wyoming, and that under the original rates ordered. Montana mines would have to suspend operations.

### SALT LAKE CITY—Oct. 16

**Improvements at the Garfield Plant** of the American Smelting & Refining Co. are now being made. The new steel bridge over the railroad tracks north of the plant leading to the slag dump north of the old dumps has been finished. This will give an extensive area for slag dumping, as the ground originally used is not adequate. Arrangements are being made for a new stack near the one now in use, and excavating for the flues and stack has been finished. Work of laying concrete is in progress. The stack is to be 350 ft. in height, and 25 ft. in diameter. The stack now in commission is 300 ft. high, and 30 ft. in diameter. It is planned to use both stacks at the same time. All the reverberatory furnaces at Garfield have been equipped for burning crude oil, as those equipped experimentally, some time ago, gave satisfactory results. The largest tonnage in the history of the company is being treated, which includes concentrates from the Utah Copper, Ohio Copper, ore from the Yampa, etc.

### CALUMET—Oct. 18

**The Copper Country Commercial Club** appointed a committee to investigate conditions and offer its offices in an endeavor to bring about a settlement of the labor dispute in the Lake Superior copper region. The committee has completed its report and submitted it to Governor Ferris and the public. The report covers the history of the district and a comparison is drawn with this district and Butte, going into details on the copper contents of the ore, the cost of mining, living conditions and the cost of living, etc. The report takes up the various demands made by the Federation and contains several tabulations, showing hours worked, wages paid, men employed, and working conditions in the various mines insofar as the committee was able to obtain from personal observations and investigations. The officials of the Federation were asked to present their side of the question to the controversy but refused. The tracks of the Keweenaw Central R.R. were blown up by dynamite this, Saturday, morning. Two coaches of men employed as mine guards for the Mohawk Mining Co. were being taken to the property over this route. When near Copper City the engineer noticed the fuse burning and stopped his train about 100 ft. from the point where the explosion almost immediately after the train was brought to a stop, wrecked the track. Nearly all incoming trains are bringing men to work in the various mines. At the Calumet & Hecla two large bunk houses have been built and two more are underway, and this property is rapidly increasing its force. Night shift was started in three more shafts during the week and the next week will see practically all of the shafts operating full time. At the mills 22 heads have been operating all week and it is likely that one of the mills will run the regular 24-hr. shift next week. During the week, a number of the employees of the Wolverine mine met and started a back-to-work movement. Conditions throughout the north end of the district are bad and lawlessness and disorder continue despite the injunction.

### DULUTH—Oct. 18

**Enjoinment Was Refused** by both the state of Minnesota and the federal court at Duluth when an effort was made to get out an injunction to prevent the Wisconsin Steel Co. from discoloring the waters of Swan Lake, on the Mesabi range, by the washing of its ores. A resident of the vicinity applied for a restraining order. The state's attorney general took the position that the state would not feel justified in injuring so important an industry for so slight a cause, whereupon appeal was made to Federal Judge Page Morris. Attorney C. O. Baldwin, opposing the petition, declared that the principle of preventing mining companies from washing their ores because waters of comparatively little use were affected would seriously embarrass the mining of 100,000,000 tons in the western part of the Mesabi, so Judge Morris refused to issue the order.

### MARQUETTE—Oct. 20

**Industrial Accidents,** not including those that resulted fatally, have cost the iron mines of the state $30,062. According to the state industrial commission the statistics show that 15,939 men are employed in mining iron ore. There have been 817 accidents, exclusive of fatalities, since Jan. 1, and the average amount of the settlements has been $36.79. The cost to the companies per employee was $1.88. In practically all cases the mining companies carry their own risks, and the compensation they have to pay is carried as a charge against production. The copper-mine accidents were slightly more numerous than those of the iron-mining industry. With 18,456 men employed, prior to the strike, 895 accidents were reported. The total outlay in settlements was $37,209, a cost for the average case of $42.80 and for each man employed of $2.01. For the 2971 men employed in coal mining $2168 was paid to 54 beneficiaries, an average of $40.15 per case and 73c. per man. The cost of hospital and medical attendance for the coal mines was $1191. This item is not reported for the iron and copper mines, the figures given covering only the payments of money to workers. If hospital and medical attendance be included, the cost of the accidents in these industries would be increased by many thousand dollars. A summary shows that 37,366 men are employed in the mining industry in Michigan. Since Jan. 1 the industrial commission has a record of 1766 non-fatal accidents among them, for which $69,439 was paid in compensation.

### LEAD, S. D.—Oct. 20

**Land in the Limestone Range,** within the forest reserve, has been opened to settlement as homesteads. The forest service desires to have these lands occupied partially to afford fire protection, and to settle what is at present nonproductive land. The lands are within easy reach of the markets in the mining camps of the Black Hills, and under cultivation will produce good crops of grain, potatoes, hay, etc., which would be of great benefit to the miners.

**The Mining Industry in the Black Hills** is in a prosperous condition as is evidenced by the receipts of bullion at the U. S. Assay Office, at Deadwood, which were $2,018,500, during the quarter ended Sept. 30. This is one of the largest totals ever handled in a similar period of time at this office. These figures represent only the bullion production from the mills of the district. Proceeds of ores shipped to smelters at Denver, Omaha, and other places, figures for which are not available, formed a considerable item. At the present rate of production South Dakota should exceed its production record of last year, which was the greatest in its history.

**A New Slime Thickener** has been invented by H. M. Gunn, of Deadwood. It may also be used as an agitator or a settler. The inventor has recently completed a small machine in which tests are being made. The device consists essentially of a tank with conical bottom, in which is set a hollow shaft to which are attached two sets of propeller-shaped blades. They are so arranged that they may be adjusted to various positions. Attached to the lower set of blades are perforated pipes, connected with the hollow shaft, and through which either air, water or solution may be admitted. Running at 4 r.p.m., the machine is an efficient thickener, the blades tending to hasten settling by giving the material a downward impetus. Running at 12 r.p.m. and introducing air through the pipes connected with the lower blades, the contents are subjected to a violent and apparently thorough agitation.

**Good Roads in the Mining Districts** of the Black Hills are rapidly becoming an assured feature. During the last two years Lawrence County alone has spent upwards of $150,000 in what may be classed as permanent improvements in the construction of first-class highways through the mountains. The campaign is to be continued from year to year until all parts of the Hills are connected with good automobile roads. During the present summer $30,000 has been spent on what is called the Lead-Crossing road, westward from Lead to Spearfish cañon, and passing through the Ruby Basin mining district. A branch is being constructed to Terry, the principal camp of the Bald Mountain district. A portion of the funds comes from the government, which gives to the various counties a portion of the moneys received from sales of timber within their boundaries. The other mining counties, Pennington and Custer, are not far behind Lawrence in the good-road movement and the time is not far distant when the entire Hills will be traversable over the finest class of macadamized roads.

### COBALT—Oct. 18

**An Amalgamation** of the properties controlled by certain English interests in Cobalt is rumored. The syndicate in question originally controlled the Townsite and Casey Cobalt mines, and subsequently purchased the City of Cobalt and the Cobalt Lake. A short time ago the Northern Customs Concentrator was taken over, in order to treat the low-grade ore from the Townsite and City of Cobalt. If this amalgamation goes through, as seems altogether probable, it will be one of the largest combinations in Northern Ontario, and will rank with the Nipissing in the total value of its production.

### TORONTO—Oct. 20

**Iron Carbonate Ores** of the Magpie mine, near Sault Ste. Marie, have been experimented with and the possibility of roasting these ores and obtaining a high-grade product has been successfully demonstrated on a commercial scale. Development of this property has proved a large tonnage of siderite, which carries about 35% iron, and for some time past the company has been experimenting with processes for roasting the ore and raising the grade to about 56%. One unit of the plant has been in successful operation for several months, and it is now stated that the company will install five additional units.

**The Sterling Mines** near Arsenic Lake in Northern Ontario, which have been in litigation for a number of years, were purchased at auction by the Montreal Trust Co. for $230,000. The properties were originally owned by Major R. G. Leckie, who sold them to William Marshall for $250,000, of which it is stated $210,000 remains unpaid. The action for this unpaid balance was carried through the Ontario courts to the Privy Council, but so many complications arose that the master-in-ordinary was authorized to sell the properties at public auction. The properties were first put up last July and sold to M. B. Sullivan, of Boston, for $300,000. The purchaser failed to pay over the money so they were again put up and sold to the Montreal Trust Co. Deposits of gold, silver, copper and arsenical pyrite ores exist in the mines and when first developed, it was planned to build a smelting works which would also treat the ores from Cobalt.

### MONTREAL—Oct. 18

**The Canada Iron Corporation** lately went into liquidation, and pending reorganization arrangements are being made to continue the operation of the various plants. A special meeting of the holders of both first and second mortgage bonds was called for Oct. 17 to pass resolutions to enable the Montreal Trust Co. to make the necessary arrangements to permit operations being continued. One resolution would authorize the trustees to borrow money from time to time for carrying on the business and other purposes of the corporation, but these sums are not to exceed $250,000 at any one time. Such money as may be necessary will be secured by mortgages which will rank in priority to the existing bonds.

**The Canadian Coal & Coke Co.** recently failed and in this connection and its subsidiary companies, the Western Coal & Coke Co., Pacific Pass Coal Fields, the St. Albert Collieries and the Lethbridge Collieries, it is stated that these companies have not been vested in the Canadian Coal & Coke Co. The authorized capital of the Canadian Coal & Coke Co. is $15,000,000 of which $4,000,000 is preferred and $11,000,000 common. Of this amount, $3,750,000 preferred and between $9,000,000 and $10,000,000 common stock has been issued. The Canadian Coal & Coke Co. has also authorized an issue of $3,000,000 bonds, the proceeds of which will be appropriated to discharge current liabilities incurred by the above companies in carrying through their development work and the balance for completing the development and equipment of the properties and for working capital. Negotiations for the passing of these bonds are now in progress.

# THE MINING NEWS

## ALASKA

A SHIPMENT FROM FAIRBANKS was received at the U. S. Assay Office in Seattle, Oct. 3. The gold bullion was worth $140,700.

AT THE AMERICAN MINING CONGRESS Alaska will be represented by the following delegates appointed by Governor Strong: B. L. Thane, Juneau; R. A. Kinzie, Treadwell; Charles S. Sulzer, Sulzer; B. F. Millard, Valdez; John Ronan, Fairbanks; R. S. Ryan, Katalla; William Maloney, Nome and Milo Kelly, Knik.

DOCTOR HOLMES HAS RETURNED from a six-months' investigation of the Matanuska and Nenana coal fields. He says there are both anthracite and bituminous deposits in the Matanuska fields. The Government has just completed mining 900 tons of anthracite there for tests by the navy and Dr. Holmes would express no opinion concerning its quality. In the Nenana field, tributary to Fairbanks, there are vast deposits of lignite, which will be of use in the territory in operating steam plants and railroads.

IN THE SHUSHANNA DISTRICT more work will be done this winter than last summer. Tons of supplies will be carried in, and preparations will be made for the coming season's operations. Travelers will be coming and going all winter. The question arises of what route is best to follow. Those acquainted with the northern camps will not hesitate to choose the route patrolled by the Northwest mounted police. That route lies up the White River. Three police posts already have been established there. The gold dust has come out, largely by this route, and should continue to come this way. The White River is not only to be patrolled by the police, but good roadhouses are to be provided every 20 miles along the route. Mushers coming in from the outside can go down the White Pass route, then go up the White River, either from the Stewart or Dawson and be within call of the police all the way.

ALASKA TREADWELL (Douglas)—The main shaft house has been destroyed by fire, at a loss of $40,000. It was only through heroic efforts that the rest of the plant was saved from complete destruction. In August 80,973 tons of ore were crushed for a yield of $200,971 in gold and concentrate, or at the rate of $2.50 per ton. The net profit was estimated at $95,368.

## ARIZONA

### Gila County

ARIZONA COMMERCIAL (Globe)—An electric hoist has been installed on the 1200 level, preparatory to sinking to the fourteenth level. Considerable improvement is noticeable on the surface, a 30-ft. change room having been built.

GIBSON COPPER (Globe)—This property has been acquired by St. Louis men. The mine began producing high-grade ore on a large scale about eight years ago, and during the last two years more than $2,000,000 worth of high-grade copper ore has been taken out. It is estimated that there are about 200,000 tons of low-grade ore, valued at $1,000,000, now on the dump awaiting treatment. The new owners will erect a concentrator.

OLD DOMINION (Globe)—All construction work in the new crusher plant and sampling mill is practically completed. It was anticipated that the A shaft would be in commission for hoisting ore with skips by Oct. 20, and soon after that date ore hoisting at the Kingdon shaft was to be discontinued. The A shaft is being repaired and lined between the cage and skip compartments. Development work and ore extraction in the mine for the last three weeks has been reduced considerably, owing to the repairs at the A shaft, which prevented hoisting. Erection of the steel work on the new concentrator is making good headway.

INSPIRATION CONSOLIDATED (Miami)—Several raises are being lifted and sublevels have been started in the Colorado orebody, making it seem certain that this orebody will be worked in the same manner as the Joe Bush orebody, which is being blocked out for caving. Work is being rushed in the drift on the sixth level to connect the incline with the Scorpion shaft, and it is probable that all waste will be taken out the incline shaft to the pocket on the third level, and be carried from there out through the tunnel or be hoisted at the Colorado shaft. Connection is about to be made on the fourth level between the main east and west shafts, but stations will not be cut at once as the shafts will be concreted for their entire depth. All the Inspiration, and maybe all the Live Oak ore, will be hoisted through the two main hoisting shafts. Rapid progress is being made with the concrete pouring at the coarse-crushing plant site. All of the machinery for the crushing plant which will supply the test mill with its 600 tons daily, is now at the Scorpion shaft, from which the ore will be taken. The test mill will not be ready for several weeks yet. Superintendent Webster, of the American Bridge Co., states that about 75% of the steel to be used in the mill is now on the ground. Another gang of steel workers left Chicago Oct. 8. Considerable steel construction has already been finished at the machine shop and warehouse section of the concentrator.

### Yuma County

BILLY MACK (Parker)—There is an old, dismantled stamp mill on this gold- and copper-ore property. More gold went out in the tailings than was caught on the plates in the days when the mill was in operation.

A. L. P. GROUP (Parker)—At this mine ore assaying from $15 to $50 per ton is being developed. At one place on a peak 200 ft. high, three veins come together, one of which is 25 ft. wide. Some well-advised prospecting work is being done here and bonanza ore may be opened.

MAMMOTH—A 75-ton cyanide plant has been installed on this property owned by the Young Mines Co. The ore from the dumps mixed with mine ore is being used in a test run. If satisfactory results are obtained the plant will be enlarged. The old Mammoth 10-stamp mill is used to crush the ore, the coarse gold being recovered by amalgamation.

ROBERTS-ALLEN, MAVIS (Parker)—This mine is on the north side of the Carnation. A 5-ft. copper-gold orestreak has been opened all the way down the 100-ft. incline shaft. Half of the streak is smelting ore, which is shipped to the Phelps-Dodge plant, at Douglas. It returns better than $50 per ton net. The vein crops above the collar of the shaft for a height of 50 feet.

CARNATION (Parker)—The ore in this mine occurs in a dome-shaped hill, 200 ft. high by 300 ft. in diameter, that has been sampled all over its surface, yielding average results of $27 in copper and gold per ton. A 300-ft. shaft has been sunk from the bottom from which an 80-ft. drift has been driven, all in copper and gold ore, that assays from $40 to $80 up to $200 per ton on shipments. The ends of this oreshoot have not yet been reached. All this work has been done by hand, using a whim-hoist.

## CALIFORNIA

### Amador County

FREMONT (Drytown)—It is reported that the company contemplates adding one or more units of 20 stamps to the 40-stamp mill. The mine is a steady producer and dividend payer.

ZEILA (Jackson)—It is reported that negotiations are again in progress for the sale of the mine and mill. No supplies are being ordered for continued work by the present owners. The mill is still running on ore from near the surface and all material carrying any gold is said to be going through. The taking over of the property by a strong company is expected, and in that case there is no doubt that the exploration of orebodies below the present working will be undertaken.

### Butte County

GARDELLA DREDGES (Oroville)—Dredging at Honcut has stopped temporarily on account of water shortage. Water has been furnished by the Palermo Water Co.

BERRY CREEK (Berry Creek)—This mine, owned and operated by Kinkaid & McClung, is reported shut down temporarily on account of water shortage.

BOSTON NO. 4 (Oroville)—This dredge, operating in the Thermalito field, across the river from Oroville, has been facing a shortage of water. It has been necessary to pump water from old dredge ponds.

### Shasta County

FIELD SMELTING PLANT (Redding)—The new process furnace, invented by A. U. Field, will be installed at Redding. It is reported that the Western Pipe & Steel Co., at Richmond, has the contract for building the furnace, and that the plant is expected to be in operation in November. This is to be a practical furnace for the treatment of sulphide ores by a process that it is claimed will eliminate the fumes. The money for the installation of the trial furnace has been raised by Redding men chiefly. Dr. Sherman T. White, S. D. Furber and George Baker represent the subscribers.

### Siskiyou County

OSGOOD (Yreka)—A 5-stamp mill has been purchased and will be installed immediately. The mine has been prospected and developed for the last three years, showing sufficient ore to warrant the mill.

### Sierra County

WHITE BEAR (Downieville)—Rapid progress is being made in a 130-ft. raise to gravel in the New York tunnel, and pay gravel is expected.

TIGHTNER (Alleghany)—A $50,000 pocket has just been extracted from the main workings and much new ground is being opened, making the chances good for additional rich strikes. The new 10-stamp unit of the mill will be ready for operation Nov. 1, and the property is being put in shape for uninterrupted winter work of mining the milling ore already exposed and the reserves which are being steadily augmented. On what is considered reliable authority, it is stated that the output is approximately $2000 per day, with operating expenses of $6000 per month.

WYOMING (Alleghany)—This old mine in the Deep Blue gravel diggings is being reopened by the Dead River Mining Co., composed of Pennsylvania people. While being worked as a drift mine several years ago, a rich vein was encountered in the west rim, and all energy was then directed to its development. Litigation arose and delayed operations until a recent amicable settlement and a new treasury fund permitted renewal. A force of 15 to 18 men is employed in reexcavating and retimbering the caved portion of the long tunnel, and preparing for work throughout the winter. The vein was originally exposed under the lava in two places, 300 ft. apart, showing from 2 to 5 ft. of ore, carrying free gold and arsenical sulphides, one shipment of which, after sorting, returned $800 per ton in gold.

## COLORADO

### Clear Creek County

SHIPMENTS FROM BLACK HAWK to the Denver reduction works totaled 38,000 tons of concentrates in September.

FRONTENAC—This mine, in Willis Gulch, which was sending from 10 to 15 carloads of ore daily to the Frontenac mill, in Black Hawk, has all been closed down pending a change of managers.

CALHOUN—At the 400 level of this mine, in Leavenworth Gulch, an 8-in. streak of high-grade smelting ore is being mined and a big tonnage of milling ore is also being produced. A retort of 35 oz. of gold has just been sent out.

DONALDSON—The Rockford Leasing Co., under the management of John Larson, has secured a lease on this and the [illegible] groups of mines on Donaldson Mountain. Development has been resumed, and it is reported that the lessee has ample funds to carry out the proposed scheme of exploration. The east drift on the Donaldson vein will be advanced an indefinite distance.

### Gunnison County

A DEPOSIT OF MARBLE, said to be 1500 ft. wide and five miles in length, has been opened, it is stated, in the Quartz Creek district. It is one mile from Quartz Station, in the South Park of the Colorado & Southern R.R. The deposit contains the white and gray variety and also the variegated marble misnamed "onyx." This new find near Pitkin adds another big industry to the resources of the state. The work of exploring this deposit has continued for two years, but it has been kept quiet by the owners, who are chiefly citizens of Pitkin.

### Lake County

AN INVESTIGATION OF LOW-GRADE ORES, at Leadville, is being made by F. W. Horton ,of the Bureau of Mines, and F. B. Laney. The object is to determine the best milling process. Samples are being sent to the experimental station at Denver for analysis, and the coöperation of the mining men of the district has been freely given. Twenty members of the Empire Zinc Co. are also in Leadville, ascertaining the amount of zinc ores blocked out in the company's properties. They will also visit the other zinc producers.

### Pueblo County

COLORADO FUEL & IRON CO. (Pueblo)—At the recent annual meeting President Welborn reported satisfactory progress in handling the strike. Operations in the fuel department, it is said, will soon be on a normal basis. It is rumored that provision will be made for paying off the 39% accumulated dividends on the $2,000,000 preferred stock.

### Summit County

COLORADO GOLD DREDGING CO. (Breckenridge)—This company, operating on Swan River, produced 1000 oz. of gold, which was shipped to the Denver Mint, Oct. 2, in two bricks, valued respectively at $8600 and $6800. In the five years during which their Bucyrus boat No. 2 has been operating, it is credited with a probable gross revenue of $400,000 per year.

### Teller County

GOLDEN CYCLE (Goldfield)—A report is current in Denver that the Golden Cycle mine, mill and coal mines, have been sold to Englishmen for $5,000,000, by Allan Burris, president of the El Paso company, and who is now in London. No official confirmation of the rumor, however, has been obtained. At the same time it should be remembered that a suit is pending between the Vindicator Consolidated and the Golden Cycle, to recover the value of $2,000,000 worth of ore, which, it is alleged, the latter wrongfully abstracted from the former's territory. The suit is set for trial within a short time and it is hardly probable that the British syndicate is buying a lawsuit.

## IDAHO

### Cœur d'Alene District

CALEDONIA AND BUNKER HILL & SULLIVAN litigation will be settled and a compromise brought about, states William A. Nicholls. He says that the agreement reached between representatives of the interested corporations provides for increasing the capital stock of the Caledonia to 2,600,000 shares, twice the present outstanding capitalization, half of which will be taken over by the Bunker Hill & Sullivan. In addition the Caledonia is to be consolidated with a number of surrounding properties owned by the Bunker Hill & Sullivan to eliminate all possibility of future litigation over boundaries and apex rights, and an incline raise is to be cut upward from the lower Bunker Hill tunnel into the Caledonia workings tapping the orebodies not less than 300 ft. below the present lower workings. This will permit hauling all the Caledonia ore through the Bunker Hill main working tunnel, where an electric haulage already is installed, and provision has been made to set aside one unit of the Bunker Hill mill for treatment of the product. This means a big reduction in mining and milling cost for the Caledonia, besides obviating the necessity of building a new mill, at an expense of not less than $200,000, which would have been necessary even had the Caledonia company won out in the suit with the Bunker Hill now pending in the Federal courts. The negotiations will be advanced sufficiently in the next few days to permit resuming operations at the Caledonia, unless unforeseen obstacles intervene.

### Nez Perce County

SLAUGHTER HOUSE GULCH—Frederick Forsman, of [illegible], has made a discovery in the gulch. The vein is exposed [illegible] in. wide and samples of the ore show free gold visible to the naked eye. The find was made near Pierce.

POT MOUNTAIN DISTRICT—W. P. Bounds, of Lewiston, reports that a stampede is in progress to this district in the upper North Fork country, where copper ground is being located. A rumor that the Northern Pacific is to build through the North Fork country has revived interest in the mining properties.

## MICHIGAN

### Iron

ALGOMA—The overloading and wrecking of the company's receiving dock at Sault Ste. Marie, Ont., precipitating thousands of tons of ore into the water, has resulted in the cancellation of the contract for iron ore made last spring between the Algoma Steel Co. and the Newport Mining Co.

GROVELAND (Iron Mountain)—Due to the litigation in which the stockholders have become involved, resulting in the appointment of a receiver, the mine was shut down a short time ago. Only a small force had been employed as only exploratory work was being carried on, but every man was laid off.

MILWAUKEE-DAVIS (Negaunee)—Operations have been suspended and the workings will be allowed to fill with water. All of the available ore has been mined and shipped. The property is owned by the Mary Charlotte Mining Co., which has laid off about 200 men at its other Negaunee properties, namely, the Breitung Hematite and the Mary Charlotte.

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—The Gladstone furnace, owned and operated by this company, was closed down last week. The charcoal pig iron manufactured there is not readily disposed of due to the condition of the iron market, and so it was deemed advisable to suspend for awhile. The plant has operated continuously for five years, and the management will now make needed repairs. The company's plant at Marquette is still in operation.

JONES & LAUGHLIN (Ishpeming)—This company is making preparations to open up its Iron Mountain Lake property where work was abandoned several years ago. The shaft, which is not deep, will be sunk several hundred feet further to a depth at which it is believed a body of good ore exists. No work has been done in the region, which is five miles to the south of Ishpeming, for some time, but years ago there were several mines operating within a radius of a mile or two.

VIVIAN (Quinnesec)—Pickands, Mather & Co. have abandoned the Vivian mine, and it will probably be years before it will be worked again. It was taken over by the company ten years ago and has since shipped 500,000 tons. The ore is of low grade, and the owners say that they have other ores of the same grade in other districts which can be mined for less money, and so there is no reason for continuing the Vivian. The machinery has been shipped to Iron River, where it will be installed at one of the company's newer mines.

## MINNESOTA

### Cuyuna Range

NEARLY PURE HEMATITE was found in hole No. 501 on the Jamison & Peacock property north of Crosby, now being drilled by Northern Pacific interests. One 5-ft. sample assayed 69% iron.

PENNINGTON (Crosby)—Stripping is nearly completed, but one steam shovel being now on this work.

KENNEDY (Cuyuna)—A large force has been put to work clearing and grading for the new stockpile. For the first time in two years, the Kennedy has shipped its entire stockpile.

IRON MOUNTAIN (Iron Mountain)—The new 3-compartment shaft, bottomed at 125 ft., is hoisting ore for the stockpile. A bucket is being used for hoisting, but the shaft is arranged for skips, which will be installed later. The Soo Ry. is building to the property.

BARROWS (Barrows)—Work was started on the new 5-compartment shaft Oct. 15. The shaft will be approximately 250 ft. deep, having two skip roads, one cage road, one pipe way and one ladder way. The present shaft will then be used as a timber shaft. The mine is hoisting 200 tons daily, all of which is going to the Lake Superior dock.

JONES & LAUGHLIN—On Oct. 10 the Northern Pacific interests gave this company a six-months' option for lease on the property known as the C. M. Hill Lumber Co. property. Exploration is to begin by Nov. 1. The property adjoins the Pennington on the west and will undoubtedly be operated as an openpit mine. Thomas Feigh, of Duluth, owns the fee to the property. This is the largest transaction on the Cuyuna range this season.

### Mesabi Range

AT THE NEW MESABI No. 5 DOCK at Duluth, the steel approach will be completed by Nov. 30. Concrete work on cribbing and foundation for the dock is also nearing completion, and the steel work for the pockets is started. When completed, the dock will have 385 pockets, each with a storage capacity for 300 tons.

PERKINS (Aurora)—Property shut down Oct. 13 and shipping ceased for the season. The tonnage contracted for from this property has all been shipped.

HUDSON (Aurora)—The night crew has been laid off, but operations still continue in the daytime. The mine has exceeded its contracted tonnage this season. It is an openpit mine.

INTERSTATE IRON CO. (Grand Rapids)—The hydraulic operations are expected to start Oct. 25. It is planned to discharge the overburden a distance of over 3000 ft. from the 7-in. hydraulic pump.

### Vermilion Range

WHITE LAKE IRON CO. (Ely)—This company has the construction of a crushing and concentrating plant under consideration, and if the tests now being made are satisfactory the plants will be built. The company has a large deposit of low-grade and banded ore on its lands, and the management feels that with proper process the ore can be profitably treated. Tests of the ore are being made by Witherbee, Sherman & Co., of Mineville, N. Y., and some reports have already been made, which show that 1.57 tons of crude ore as mined will produce one ton of concentrate. It is believed that finer grinding and sintering will yield better results; and the experiments will be carried further.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

KNIGHT LAND (Carl Junction, Mo.)—Drill cuttings taken from the fourth hole showed 8.64% metallic zinc.

TEMPLAR LAND (Galena, Kan.)—A company of four operators has developed a good producer on this tract; 10 acres are under lease. Both lead and zinc are found.

OHIO MINING CO. (Joplin, Mo.)—A 150-ton concentrator is being erected on the lease of 40 acres. Several shallow mines formerly were operated on the tract. Ore now is found at the 80-ft. level.

HALL & BARBEE (Joplin, Mo.)—Cuttings showing 15% ore have been taken from holes put down on a lease of the American Lead, Zinc & Smelting Co. The ore formation exists from 70 to 110 feet.

GOOD LEASE (Webb City, Mo.)—Carmean & Squires have purchased the concentrator and lease. The mill will be improved and new machinery installed. It is one of the old properties in the district.

KENTUCKY LEAD & ZINC CO. (Joplin, Mo.)—This new company has obtained a lease on 20 acres near the city and will begin a prospecting campaign soon. St. Louis and Joplin men are interested in the company.

A. B. C. (Joplin, Mo.)—Fire destroyed the concentrator last week, causing a loss of $20,000; it will be rebuilt near a new shaft. Recent improvements on the plant and a development campaign cost the company $6000.

PRODUCER (Joplin, Mo.)—Week before last the mine produced 87,620 lb. of zinc sulphides, being milled in a new concentrator. Seven months of development work has made the property one of the richest in the North Joplin field.

## MONTANA

### Butte District

BUTTE & SUPERIOR (Butte)—The Minerals Separation Co. has brought suit to enjoin the Butte & Superior from using the so called Hyde oil flotation process.

EAST BUTTE (Butte)—Operations have been resumed on the Dutton, the original property of the company. Hoisting of ore began a few days ago from the 400 level.

DAVIS-DALY (Butte)—A daily average of from 225 to 250 tons of ore is being hoisted and shipped from the Colorado shaft, the ore coming from the 1200-, 1400-, 1500- and 1900-ft. levels. In the latter part of September the company partially suspended operations for two days because of a shortage of cars, but since then the output has been about normal.

### Chouteau County

RUBY GULCH MINING CO. (Zortman)—The mill was totally destroyed by fire Oct. 7. The company carried $141,000 insurance on its holdings, a portion of which was on the mill.

### Gallatin County

MONTANA CONCRETE CO. (Logan)—This company has completed the building and equipment of a concrete-brick factory after several months' work, and is now in a position to make bricks at the rate of about 30,000 per day. Several kinds of plain and fancy-faced blocks, including the ornamental ruby brick, will be made at this plant.

### Granite County

SWASTIKA (Philipsburg)—A new compressor plant and pump have been installed, and sinking is going along steadily. The company will cut a station on the 200-ft. level and begin development work. Ore of shipping grade is being hoisted from the bottom of the shaft and the management is preparing to ship the ore on the dump.

GRANITE-BIMETALLIC (Philipsburg)—A strike of high-grade silver and gold ore has been made on the 100-ft. level. The property was considered practically worked out many years ago, and has been abandoned except for a few lessees, who have operated in a small way. It is stated that the company will put on about 35 men and thoroughly develop the orebody.

## NEVADA

### Churchill County

BROKEN HILLS—A shipment of ore which assayed $75 per ton has been made to the Western Ore Purchasing Co.'s plant at Hazen. The ore was hauled 74 miles by wagon. Further shipments will be made.

### Humboldt County

NEVADA QUICKSILVER CO. (Winnemucca)—Articles of incorporation were filed by this company recently.

PEERLESS NO. 2 (Rochester)—Lessees on this claim and on the Supreme shipped recently what is thought to be the richest car from Rochester to date. The smelters settlement was $2612 for 20 tons.

### Lyon County

A NEW POWER LINE is being built by the Truckee River General Electric Co., from the substation in Virginia City to Silver City.

BENWAY (Rio Vista)—The shaft which is 70 ft. deep has cut a quartz vein 2½ ft. wide, which carries silver and copper. The crosscut tunnel is in 103 ft., and will be driven to connect with the shaft at depth.

NEVADA-DOUGLAS (Ludwig)—A survey is being made here of a millsite for the proposed leaching plant, in order to determine the advantages of this site, if any, over those of the previously selected site at Hudson.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Oct. 9, 1913, were as follows: From Mason Valley mine, 2267 tons; from Nevada-Douglas, 1028 tons; from other mines 1029 tons; total, 4324, or a daily average of 618 tons. During the same week four cars of matte were shipped.

### Mineral County

A NEW CINNABAR DISCOVERY is reported from the camp of Cinnabar, near Mina. The discovery was made about three-quarters of a mile north of the Summerfield discovery. The ore is exposed in an opencut, and is of considerable width and of good grade.

NEVADA BLACK & GOLD MARBLE CO. (Mina)—The holdings of this company, consisting of 140 acres north of Mina, were sold recently. The initial payment of $25,000 has been made. Cranes, a compressor, channeling machines, etc., will be installed at the quarry at once. It is stated that a sawing and polishing plant will be built at Mina, involving an expenditure of $40,000. The marble will be squared at the quarry and transported on 10-ton auto trucks to the finishing plant.

### Nye County

BIG FOUR (Manhattan)—An attempt is being made to increase the water supply of the mill. If successful the capacity of the mill will be increased from 100 tons to 150 tons per day. A shoot of good-grade ore has been opened on the 100-ft. level on Block 9. An orebody east of the mill will be glory-holed.

### Washoe County

ELECTRIC MINING & SMELTING CO. (Reno)—A test run made on 300 tons of ore by the Loder process is reported to have been an entire success. The process involves the use of fuel oil as a partial substitute for coke. It is stated that a larger unit will be erected.

### White Pine County

CONSOLIDATED COPPER MINES (Ely)—Churn-drill operations on the area between the Morris shaft and Reipetown have disclosed the presence of an ore deposit beginning not far below the surface of what was considered valuable only for dumping overburden. A number of holes have been put down there recently, which resulted in finding ore 38 to 40 ft. from the surface, and recently one of the holes had reached a depth of 360 ft. and was still in ore. This ground is where one of the steam-shovel pits will be opened in the near future, according to the statement from the management.

## NEW JERSEY

### Warren County

PAHAQUARRY COPPER CO.—This company has for nearly three years past been operating the old Pahaquarry mine near the Delaware River. The returns have been small, and a floating debt of about $110,000 has accumulated. Last week, on application of some of the creditors, I. N. Beavers, of Reading, Penn., and George P. Young, of Belvidere, N. J., were appointed receivers for the company. At a meeting of the stockholders a proposal to assess the stock 20% was voted down. Another meeting is to be held. Nearly all the stock is owned in Northampton and Lehigh Counties in Pennsylvania and in Warren County in New Jersey. The mine has been worked at intervals for many years by different companies.

## NEW MEXICO

### Socorro County

ALBERTA MINING CO. (Mogollon)—This company owns a large acreage adjacent to the mother lode of the district and resumed work recently with a small crew. Plans are being matured for the extensive deveopment of the group at an early date.

ERNESTINE MINING CO. (Mogollon)—A large consignment of bullion, the cleanup for last half of September, was sent out week before last via motor truck. The mill treated 1225 tons of ore during the week. Contractors are making good progress sinking main shaft.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—No. 1 winze in main adit is being sunk at rate of 10 ft. per week; the work is handicapped by a considerable inflow of water. Hand drilling is employed in three 8-hr. shifts. The management is contemplating the installation of a small compressor plant.

## OREGON

### Josephine County

THE GRANTS PASS RAILWAY COMMISSION has purchased the right-of-way, rails, ties and a locomotive owned by a small line and will use the material in the construction of the Grant's Pass-Crescent City R.R., which work is under way. Much mining work is being done aong the line of this road looking to transportation in the near future.

ALMEDA CONSOLIDATED MINES CO. (Galice)—Thomas S. Burley, the receiver for this property, states that he has the mine in good running order, the smelting plant has started to make matte, and the camp is prosperous looking. The two-ton automobile truck recently purchased is hauling matte to Merlin for shipment, making two round trips from the mine to the railroad daily. A number of trips have been made to Gold Hill for limerock for use in smelting. These trips cover a distance of 99 miles and are made in a day of 10 hours, over fairly good roads. The truck starts from Merlin in the morning, making the run to Gold Hill, loading, then back to Almeda, unloading the limerock and loading with matte, then to Merlin to the railway station. A large force of miners is at work in the mine.

### Lane County

WEST COAST MINES CO.—It is announced that the men now in control of the stock of this company are William Zimmerman and A. C. Dixon, who have ample capital at hand to develop and operate the properties on a large scale.

### Multnomah County

GOLD FOUND IN THE CITY PARK at Portland, a short time ago attracted much attention, but has proved to be only a pocket of rich quartz. It is stated that the quartz rock assayed over $1000 per ton in gold.

## SOUTH DAKOTA

### Lawrence County

DAKOTA—P. H. Bertschy, of Deadwood, has resumed work on his lease on the Dakota property, after being idle since the Lundberg, Dorr & Wilson mill suspended. Shipments of about 15 tons daily are being made to the New Reliance mill.

RATTLESNAKE (Galena)—A 20-stamp mill is being erected. The machinery was purchased from the North Star company, at Custer, and is being delivered. The equipment will include a first-class cyanide department. A large body of porphyritic ore has been opened, showing good milling gold. Electric power will be used.

MOGUL (Terry)—Excellent progress is being made on the new mill this company is erecting in Nevada gulch. Grading has been completed, and good headway is being made with foundations and retaining walls. The old plant at Pluma, which was damaged by fire, is being razed and all available material and machinery transferred to the site of the new plant.

### Pennington County

BLACK HILLS TUNGSTEN—This company has recently completed a 50-ton concentrating plant for treating wolframite ores. Denver men are interested.

REINBOLD (Keystons)—Lithia ore is being shipped from this property to Jersey City for refining. The amblygonite of this district carries a good percentage of phosphoric acid, which enhances its natural value as a lithia mineral.

OTHO (Keystone)—At this property, a 150-ton concentrating mill is being built, which, it is hoped, will be in operation before the end of the year. Ore is disclosed in two tunnels. The values are largely in the galena, although there is some free gold. It is possible that a cyanide annex will be necessary.

HILL CITY MINING & DEVELOPMENT CO. (Hill City)—This company has recently purchased a steam mining outfit, consisting of double-drum hoist, compressor, pumps, boiler, drills, etc., and as soon as it can be installed, sinking will commence from the bottom of the 100-ft. shaft. It is planned to abandon this level and open a new level at a depth of 150 ft., and another at 300 ft. With the ore properly developed to these depths the company will erect a mill.

## TENNESSEE

### Polk County

THE CONTRACT WITH DUCKTOWN MINE OWNERS and the state has been formally signed. Under this contract the miners agree to set apart $16,500 per year to be awarded as damages to property owners in Georgia from the fumes of the smelting plants.

## UTAH

### Beaver County

SHIPMENTS FROM BEAVER COUNTY for September, exclusive of those from Newhouse and Frisco, were as follows. Moscow, 12 cars; Majestic, 28; Slag (Majestic), 8; Copper King, 1; Red Warrior, 3; total, 52 cars.

MAJESTIC (Star District)—The new shaft on the Hoosier Boy is down 70 ft. Sinking is to be continued to a depth of 200 ft.; this will make the new work 50 ft. deeper than the earlier workings from which a good tonnage was mined. On the 200 drifting will be done for the vein, which it is expected will be reached in about 30 ft.

### Summit County

PARK CITY SHIPMENTS for the week ended Oct. 3 amounted to 3,051,580 lb., this being the heaviest output in several months. During the week ended Oct. 10 a total of 3,373,770 lb. was shipped, the Silver King Coalition, Daly-Judge, and Daly-West each having shipped over 500 tons.

THOMPSON-QUINCY (Park City)—Some shipments of first-class ore are being made, while second-class ore is being sent to the Daly-West mill. Most of the ore is coming from development work. A drift to the east from one of the raises shows 3 ft. of first-class ore in places.

ONTARIO (Park City)—The ore recently opened on the 1500 level is being followed by raising, and is reported to be opening up well between the 1400 and 1500. It is thought that a vein parallel to the old productive Ontario fissure has been cut. The country rock in this part of the camp is entirely quartzite.

### Salt Lake County

COLUMBUS EXTENSION (Alta)—Operations have been suspended.

UTAH LEASING (Bingham)—A cave-in at the old Telegraph mine now being worked by this company, recently imprisoned two miners, who were rescued uninjured after five hours' digging.

LAST CHANCE—This property has recently been acquired by the U. S. Smelting, Refining & Mining Co. It consists of 14 patented claims lying between the Utah Copper and United States properties. There are three tunnels on the property, the longest of which is 3200 ft. The former owners were the old Nevada-Utah Mines Corporation.

### Utah County

ABOUT 2 FT. OF SNOW FELL in the upper cañon during the recent storms at American Fork. The ore-shipping season, however, is not yet over, as there is much good weather still in October and November. Considerable work is being done at various properties.

## WASHINGTON

### Ferry County

SUMMIT (Orient)—Operations at this mine have been resumed and the main shaft will be sunk to the 100-ft. level.

LAURIER (Laurier)—Some fine ore has been encountered and preparations are being made for regular shipments to the smelters.

## CANADA

### British Columbia

GRANBY CONSOLIDATED (Grand Forks)—After carrying the larger part of the burden of the management of the corporation since it was organized in 1899, Jay P. Graves, for years vice-president and general manager of the company, has relinquished active duties. At the recent annual meeting of the company, in New York, F. M. Sylvester, who has been assistant general manager the last year, was promoted to the position of manager and also was given a position on the executive board. Failing health is assigned by Mr. Graves as the reason for his relinquishment of the management, but he still retains the position of vice-president and will be actively associated with the company in an advisory capacity. He endeavored to be relieved at the annual meeting a year ago, but his fellow directors prevailed upon him to remain in command of operations until the Hidden Creek smelting works and development projects were advanced well toward completion.

### Ontario

ORE SHIPMENTS over the Timiskaming & Northern Ontario Ry. for September totalled 1603 tons as follows: Bailey Cobalt, 20; Crown Reserve (24.90) by Dominion Reduction Co. (28.24), 53.16; Coniagas, 205.68; Cobalt Comet, 43.04; Cobalt Townsite, 126.36; Cobalt Lake, 127.68; Hudson Bay, 124.62; Kerr Lake (113.59) by Dominion Reduction Co. (17.41), 131; La Rose, 171.08; McKinley-Darragh, 292.57; Nipissing, 128.97; Peterson Lake, 29.64; Penn Canadian, 27.93; O'Brien, 74.14; Tretheway, 47.71; 1,603.56 tons.

WETTLAUFER (Cobalt)—A cave-in of rock between the 300- and 400-ft. levels occurred week before last and wrecked the shaft. Arrangements have been made to close down at the end of the month.

## MEXICO

### Chihuahua

AMERICAN SMELTING & REFINING—Operations in Mexico are still greatly curtailed. At only three of the five centers of the company's activity in the country are the plants running. The Chihuahua plant is operating at 80% of capacity, that at Aguascalientes at about 50% capacity, and at Monterey at about one-third capacity. The Velardeña and Matehuala plants are ready to resume operations as soon as railroads are in shape to bring ore from the mines and make bullion shipments.

### Federal District

AMERICANS ARE LEAVING THE CITY, states a news dispatch as a result of private warnings received from friends in the United States. Persons who received these messages said they were apparently based on alleged inside information of impending trouble.

### Jalisco

TWO AMERICANS WERE KILLED, according to dispatches from Mexico City, dated Oct. 17. The victims were Thomas Barrett and William Kendall. Barrett was killed with an ax by a Mexican. The murderer was captured through the efforts of Kendall and another American, A. L. Johns. He was condemned to death, but his friends gathered, rescued the prisoner and shot Kendall to death. All the other Americans at the mines, 25 in number, were besieged at the mines for 45 hr. before the Federal troops came to their aid. It is not stated what mines are meant.

### Sonora

EL TIGRE (Esqueda)—The diamond drill has struck a rich body of ore at a depth of 300 ft. The ore does not show on surface, and except by drilling, would not have been discovered. The drill was started July 1, and has been running steady ever since.

## GERMANY

THE KRUPP WORKS at Essen were damaged by fire, which destroyed the steam-hammer section of the plant, Oct. 19. All the machinery was ruined. It is stated that the company will build branch works in Canada.

## AFRICA

### Transvaal

GOLD PRODUCTION IN SEPTEMBER was: Witwatersrand, 676,411 oz.; outside districts, 29,775 oz.; total Transvaal, 706,186 oz., which is 9910 oz. less than in August. For the nine months ended Sept. 30, the total was 6,813,880 oz. in 1912, and 6,730,092 oz. or $139,111,000 in 1913, a decrease of 83,798 oz. this year, which was entirely due to the miners' strike. The September output is the smallest reported since February, 1912. The number of negro mine laborers reported at the close of September was 174,319, a decrease of 6312 during the month.

## AUSTRALIA

### Queensland

MOUNT MORGAN (Mount Morgan)—Since B. Magnus took over the general managership of the mine he has been investigating the matter of coke supply, and has found a suitable coal property in Central Queensland at Blackwater, 120 miles from the mine. He is now investigating in Germany and England byproduct coke ovens, as the demand for sulphate of ammonia in Australia is steadily growing. By making coke at the company's mine in Queensland a saving can be made of £10,000 per annum now spent in freight on coke. Next year Mr. Magnus hopes to go to America to investigate the Hall process, as he anticipates that by the end of next year the process will have been tried out on a practical scale. If the process is successful and is applied to the Mount Morgan plant the sulphur recovery will not alone relieve the plant of smoke trouble, but the sulphur will be a valuable byproduct on account of the large amount of superphosphate making that is now carried on in Australia.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Oct. 22

The metal markets here have been for the most part quiet, with few changes and only a moderate demand. In London there was some excitement in copper, chiefly due to the Rio Tinto strike.

### Copper, Tin, Lead and Zinc

**Copper**—A distinctly better feeling became manifest in the copper market on Oct. 16, when some fair sales were made for shipment to Europe at about 16⅝c. delivered over there, or about 16.17½c. here. These sales continued into Friday and Saturday at gradually advancing prices. On Oct. 20 a rather sharp demand developed and sales were made at 16.45 cash, New York, by the end of the day. The buying was well distributed among a rather long list of consumers, indicating that the European need for copper is general. Some of the most important interests figured in this list. Up to this time there was scarcely any buying by domestic consumers. On Oct. 21 there was a further advance, 16.75c., delivered, usual terms, becoming the price firmly established, and on that basis some small sales were negotiated with domestic consumers. There were indications on this day and the following day that they would shortly become more generally interested.

The sales of the week of Oct. 16-22 were larger than for many weeks previous, and ran in the aggregate to millions of pounds, anyway to upward of 15 million. Three of the large agencies met the market. Two continued to hold out for the old asked price of 16⅞c., delivered, and became even more confident of its ultimate realization, although up to the close copper was otherwise available at 16¾c. However, some small sales at 16⅞c. were reported, to European "outports," whither the freight is about 10c. higher than ordinarily.

There was no change in the market for Lake cpoper, the price of which continues noncompetitive and nominal.

Casting copper was again rather pressed for sale.

The electrolytic copper in second hands and in those of the smaller producers has now been pretty well cleaned up, and at the close it looks as though consumers would have to look to the larger producers, who for some time past have been holding for 16⅞c., delivered at buyers' works, 30 days, for their supplies. The statistical position of the metal continues to improve, the supplies in Europe during the first half of October again showing a decrease. Electrolytic at the close is quoted at 16.55@16.60c., while casting copper is quoted nominally at 16@16¼c. as an average for the week.

The London standard market has been active and strong, due principally to bear covering. On Thursday, Oct. 16, spot was £72 11s. 3d.; three months, £72 8s. 9d. The next day the market was about 15s. higher. On Monday spot was £74 7s. 6d. and three months £74 2s. 6d. The following day it advanced 10s. and closed on Wednesday, Oct. 27, at £75 for spot and £74 7s. 6d. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

**Visible Stocks of Copper in Europe** on Oct. 15 are reported as follows: Great Britain, 14,180; France, 3100; Rotterdam, 2600; Hamburg, 1210; Bremen, 1040; other European ports, 1050; total, 23,180 long tons, or 51,923,200 lb. This is a decrease of 1060 tons from the Sept. 30 report. In addition to the stocks above 1350 tons are reported afloat from Chile and 3300 from Australia, making a total of 27,830 tons.

Cable reports are that all, or nearly all, of the workmen at the Rio Tinto mines went on strike Oct. 16, and that work is entirely suspended.

**Tin**—The advance which set in in the London market on Oct. 16, did not bring the expected response from this side, and was therefore only short-lived. Domestic consumers are buying their immediate wants only and have absolutely no interest in futures, which are freely offered at about ¼c. per lb. below import price. The market displayed a sagging tendency, but became firmer at the close, quotations being £185 10s. for spot and £186 for three months, and 40½c. for October tin here.

**Lead**—On Thursday, Oct. 16, the A. S. & R. Co. reduced its price at New York to 4.35c. The other producers also reduced their prices during the week, and the market has been 4.15@4.20c. St. Louis and 4.30@4.35c. New York.

The foreign market is slightly firmer, Spanish lead being quoted at £20 7s. 6d. and English lead £1 higher.

**Spelter**—The market is quiet. Consumers continue to buy from hand to mouth, notwithstanding the fact that prices have again reached a point where production of ore is being interfered with. There has been some more speculative interest in the article, which closes at 5.10@5.20c. St. Louis and 5.25@5.35c. New York.

Abroad good ordinaries are quoted £20 10s. and specials £21 per ton.

The base price of sheet zinc in carload lots on Oct. 16 declined 25c. per 100 lb. to $7.50 per 100 lb. less 8% discount, f.o.b. cars Peru, Ill., extras and discounts unchanged.

DAILY PRICES OF METALS

NEW YORK

| | | | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| Oct. | Sterling Exchange | Silver | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 16 | 4.8550 | 61¼ | *16¾<br>@17 | 16.15<br>@16.20 | 40⅞ | 4.35 | 4.15<br>@4.20 | 5.25<br>@5.30 | 5.10<br>@5.15 |
| 17 | 4.8550 | 61⅜ | *16¾<br>@17 | 16.15<br>@16.30 | 40⅝ | 4.30<br>@4.35 | 4 15<br>@4.20 | 5.25<br>@5.30 | 5.10<br>@5.15 |
| 18 | 4.8525 | 61⅛ | *16¾<br>@17 | 16.25<br>@16.35 | 40⅝ | 4.30<br>@4.35 | 4.15<br>@4.20 | 5.25<br>@5.30 | 5.10<br>@5.15 |
| 20 | 4.8520 | 61¼ | *16¾<br>@17 | 16.35<br>@16.45 | 40¼ | 4.30<br>@4 35 | 4.15<br>@4.20 | 5.25<br>@5.30 | 5.10<br>@5.15 |
| 21 | 4.8550 | 61⅛ | *16¾<br>@17 | 16.55<br>@16.60 | 40⅛ | 4.30<br>@4.35 | 4.15<br>@4.20 | 5 25<br>@5.30 | 5.10<br>@5.15 |
| 22 | 4.8535 | 61 | *16¾<br>@17 | 16.55<br>@16 60 | 40½ | 4.30<br>@4.35 | 4.15<br>@4.20 | 5 25<br>@5.35 | 5.10<br>@5.20 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0 10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| | | Copper | | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spot | | | | | | | | | |
| Oct. | Silver | £ per Ton | Cts. per Lb. | 3 Mos | Best Sel'td | Spot | 3 Mos | £ per Ton | Cts. per Lb. | £ per Ton | Cts. per Lb. |
| 16 | 28¼ | 72 9/16 | 15 76 | 72 7/16 | 78½ | 186¼ | 187 | 20⅛ | 4 37 | 20½ | 4 45 |
| 17 | 28¼ | 73¼ | 15.91 | 73⅛ | 79 | 185¼ | 185¾ | 20⅜ | 4.43 | 20½ | 4 45 |
| 18 | 28¼ | | | | | | | | | | .. |
| 20 | 28 5/16 | 74⅜ | 16.16 | 74⅛ | 80 | 184½ | 185¼ | 20½ | 4 45 | 20½ | 4.45 |
| 21 | 28¼ | 74⅞ | 16.27 | 74½ | 81 | 183⅞ | 184⅜ | 20½ | 4 45 | 20½ | 4.45 |
| 22 | 28 3/16 | 75 | 16 29 | 74⅜ | 81 | 185½ | 186 | 20⅜ | 4.43 | 20½ | 4.45 |

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0 925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately, Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

**Exports and Imports of Metals,** other than iron and steel, in the United States, seven months ended July 31, are reported as follows:

| Metals | Exports 1912 | Exports 1913 | Imports 1912 | Imports 1913 |
|---|---|---|---|---|
| Copper, long tons | 214,117 | 246,614 | 105,437 | 105,962 |
| Tin, long tons | 344 | 792 | 31,012 | 28,911 |
| Lead, short tons | 12,688 | 35,046 | 55,011 | 43,022 |
| Zinc, short tons | 6,180 | 7,525 | 3,100 | 5,537 |
| Zinc in ore, lb | 13,420,634 | 10,224,121 | 15,631,149 | 19,058,825 |
| Nickel, lb | 15,672,944 | 17,621,110 | 22,083,095 | 27,684,342 |
| Antimony, lb. | 40,992 | 54,754 | 9,419,726 | 10,904,685 |
| Aluminum, lb | 211,036 | 27,925 | 11,153,636 | 17,260,222 |
| Quicksilver, lb. | 13,770 | 30,936 | | |
| Platinum, oz | ....... | 1,191 | 56,302 | 73,306 |
| Ores, etc | | | | |
| Zinc oxide, lb... | 20,357,197 | 17,753,398 | ... .. | ........ |
| Zinc dross, lb | 403,918 | 56,696 | .... | ........ |
| Zinc dust, lb | 24,971 | 88,313 | 365,680 | 2,582,270 |
| Zinc ores, tons . | 13,766 | 10,132 | 23,026 | 18,534 |

Copper, lead, nickel and antimony include the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately last year. The exports include reëxports of foreign material.

## Other Metals

**Aluminum**—The market is not active for spot, though there is more demand for futures. Quotations are steady at 20@20½c. per lb. for No. 1 ingots, New York.

**Antimony**—There is a good jobbing business forward. Quotations are about the same as last week. Cookson's is 7.50@7.60c. per lb.; Hallett's 7⅛@7⅜c.; while 6¼@6½c. is asked for Hungarian, Chinese and other outside brands.

**Quicksilver**—Business is fair and prices rather firmer. New York quotations are $39 per flask of 75 lb., with 56c. per lb. for retail lots. San Francisco, $38.50 for domestic orders; special terms for export. London, £7 5s. per flask, with £7 quoted from second hands.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India, but the demand for Egypt has fallen off.

**Iridium**—The price continues about the same, dealers and importers getting $83@85 per oz., New York.

**Platinum**—The market is rather steadier and there is less variation in prices. Quotations may be given at $44@45 per oz. for refined platinum. Hard metal is steady, $49@52 per oz. being asked.

Our Russian correspondent writes under date of Oct. 9 that the platinum market is in a strong position. Offers of metal have been important, but the demand is strong, especially for small lots, and all offers of lower prices have been rejected by sellers. Such stocks as exist are in strong hands. Current quotations at Ekaterinburg are 9.50 rubles per zolotnik—equal to $35.72 per oz.—for crude metal, 83% platinum; at St. Petersburg, 36,100@36,500 rubles per pood—equal to $35.72 per oz.—for the same grade.

**Silver**—Under date of Oct. 10, London advices state, that the continuance of big shipments to India—this being the third consecutive week in which a million sterling has been shipped—gives the market a healthy appearance.

Shipments of silver from London to the East, Jan. 1 to Oct. 9, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India ... . | £8,124,200 | £7,188,000 | D. £ 936,200 |
| China ... | 993,500 | 652,000 | D. 341,500 |
| Total ... .. .. | £9,117,700 | £7,840,000 | D. £1,277,700 |

Pixley & Abell report as follows: "Another £1,000,000 has been shipped to India this week, making £3,000,000 in all. Two shipments of £250,000 each from Shanghai, of which the second has been made this week, may also be destined for the Indian Mints. Should this be so the Government has already secured £3,500,000 for coinage."

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Oct. 18

The base price paid this week for 60% zinc ore was $40@43 per ton. The base price paid for 80% lead ore was $55 per ton.

SHIPMENTS WEEK ENDED OCT. 18

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,459,470 | 61,000 | 811,300 |
| Year to date | 118,875,030 | 5,457,340 | 17,264,840 |

Shipped during week to separating plants 1,718,240 lb. zinc ore.

### JOPLIN, MO.—Oct. 18

The high price of zinc blende is $46, the base per ton of 60% zinc $40@43 for choice grades. Calamine is unaffected by the decline in blende, and is still quoted at $21@23 per ton of 40% zinc. The average of all grades is $39.14 per ton. Lead ore declined $2 per ton, being quoted at $52 for ores carrying 80% metal. The average of all grades is $52.28 per ton.

SHIPMENTS WEEK ENDED OCT. 18

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week. | 9,788,340 | 713,990 | ........ | $252,995 |
| Totals 42 weeks.. | 458,992,890 | 33,626,170 | 75,839,500 | $12,519,544 |

Blende value, the week, $196,820; 42 weeks, $10,062,066.

Calamine value, the week, $8450; 42 weeks, $433,534.

Lead value, the week, $47,720; 42 weeks, $2,023,939.

## IRON TRADE REVIEW

### NEW YORK—Oct. 22

Little change is reported in the iron trade. Orders for finished material are being limited to actual requirements as far as possible, probably in the expectation of some readjustment of prices. Mills generally are still busy and there has been little or no reduction in running time or forces.

Bookings of steel orders have undergone some further decrease, and to such an extent that a slight further decrease in production has been forced, since the majority of the mills are depending chiefly upon current orders for their operations. Steel production in the country as a whole is now averaging 85 to 90% of full capacity, and probably nearer 85%, with the outlook for further restriction from week to week.

Steel prices have continued to show a sagging tendency, cutting rates being more pronounced. Plates are openly quotable this week at 1.30c., making the third recession of $1 a ton in this commodity, while bars and shapes have become quite unsteady.

The views of some leading steel manufacturers have undergone a modification in the past week or two, in the direction of expecting a greater recession in activity than was at first recognized. While the fact is not openly admitted there is reason for believing that manufacturers have little hope of any definite revival before January at the earliest.

Pig iron is in fair demand, but chiefly on orders of moderate size. Foundry iron is in better demand. Prices remain fairly firm.

### PITTSBURGH—Oct. 21

A few days ago one of the smaller local plate mills began offering plates freely at 1.30c., or $1 a ton under the quotation recognized last week as representing the market, though the price even then was occasionally shaded. Some of the larger mills immediately decided that the competition would have to be met. On bars it is only a question of time until the price yields, while structural shapes can hardly remain long above plates.

Most of the mills have for several weeks been able to make prompt shipment of bars, plates and shapes, and in the past fortnight one mill just east of Pittsburgh has been particularly aggressive in soliciting even very small orders at regular mill prices, for immediate shipment. This has cut into the ordinary trade of the local warehouse of the Carnegie Steel Co. to such an extent that the absurd report was started that the warehouse was actually closed.

**Pig Iron**—A sale of No. 2 foundry at $13.75, and of gray forge at $13.40, Valley, are the lowest prices yet made on the present weakening. Basic has moved in small tonnages at $14, Valley. Bessemer is quite inactive. We continue to quote: Bessemer, $15.75; basic, $14; No. 2 foundry, $13.85@14; gray forge, $13.50; malleable, $14.25, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is quiet, and there are reports of cutting to the extent of at least 50c. We quote the regular market for prompt and forward at $50, Baltimore.

**Steel**—An evidence of the uncertainty existing as to where the market really stands is furnished in the fact that the Carnegie Steel Co. is not making this week the usual announcement it makes to contract customers as to its price for next month's deliveries. Next week it will submit to its contract customers prices at which it will book specifications for November delivery of billets and sheet bars. In the open market it is difficult to determine precisely what could be done, but there is justification in reducing last week's quotations 50c., to $22.50 for billets, $23.50 for sheet bars, and $26 for rods, at maker's mill, Pittsburgh or Youngstown.

**Exports and Imports of Iron and Steel** and of machinery in the United States eight months ended Aug. 31 are valued as below by the Bureau of Statistics of the Department of Commerce:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Exports | $190,413,532 | $203,650,894 | I. $13,237,362 |
| Imports | 18,509,065 | 23,287,336 | I. 4,778,271 |
| Excess, exports | $171,904,467 | $180,363,558 | I. $ 8,459,091 |

The gain in exports was 7%, the increase in imports 25.8%.

**Pig Iron in Germany** in August is given by the German Iron & Steel Union at 1,638,824 metric tons, being 8894 tons less than in July. For the eight months ended Aug. 31, the total make was, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Foundry iron | 2,168,180 | 2,441,769 | I 273,589 |
| Forge iron | 354,795 | 337,461 | D 17,334 |
| Steel pig | 1,403,024 | 1,711,477 | I. 308,453 |
| Bessemer pig | 256,806 | 241,558 | D. 15,248 |
| Thomas (basic) pig | 7,414,374 | 8,121,943 | I 707,569 |
| Total | 11,597,179 | 12,854,208 | I. 1,257,029 |

### IRON ORE

The question of rates on iron ore from Lake Erie ports to furnaces has been reopened by order of the Interstate Commerce Commission. The whole subject is to be investigated, including the arrangement of rate districts and the reasonableness of rates charged.

**Imports and Exports of Iron Ore** in the United States eight months ended Aug. 31, long tons.

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Imports | 1,358,821 | 1,621,309 | I. 262,488 |
| Exports | 729,080 | 595,841 | D. 133,239 |

The chief imports this year were 1,024,080 tons from Cuba, 237,082 from Sweden, 125,273 from Newfoundland and Labrador and 104,786 tons from Canada.

**Imports of Iron Ore into Great Britain** nine months ended Sept. 30 were 4,845,923 long tons in 1912, and 5,774,354 in 1913; an increase of 928,431 tons, or 19.2%, this year.

### COKE

Connellsville coke production continues steady. Shipments have been large until this week, but some trouble has arisen as to the supply of cars.

**Exports and Imports of Fuel** in the United States eight months ended Aug. 31, long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Anthracite | 2,186,330 | 2,847,443 | 30 | 30 |
| Bituminous | 9,668,352 | 11,834,511 | 1,025,388 | 919,418 |
| Coke | 556,583 | 607,767 | 61,156 | 46,802 |
| Bunker coal | 4,943,257 | 4,892,706 | | .. |
| Total | 17,354,522 | 20,192,427 | 1,086,574 | 966,250 |

The bunker coal, or coal furnished to steamships in foreign trade is practically all bituminous. The largest exports are to Canada. Imports are chiefly on the Pacific Coast and in the far Northwest. Increase in exports was 2,837,905 tons, or 16.4%; decrease in imports, 120,324 tons, or 11.1%, this year.

## CHEMICALS

### NEW YORK—Oct. 22

Business generally is much quieter than it has been, in nearly all lines.

**Arsenic**—Business is absolutely dead for the time being. There is no buying and no pressure to sell, though stocks are sufficient. Prices, at $3 per 100 lb., are nominal.

**Copper Sulphate**—The market is steady and fairly active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Potassium Salts**—Exports of potassium salts from Germany for the half-year ended June 30 were, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Crude salts | 609,390 | 758,749 | I 149,359 |
| Potassium chloride | 150,285 | 191,601 | I 41,316 |
| Potassium sulphate | 45,519 | 68,234 | I 22,715 |
| Pot.-magnesium sulphate | 38,126 | 41,859 | I 3,733 |
| Totals | 843,320 | 1,060,443 | I 217,123 |

Of the total this year 496,437 tons were exported to the United States.

**Nitrate of Soda**—The full effect of the reaction abroad to which reference was made last week—is now being felt. Business is duller than for many years. Prices are rather weak at 2.25c. per lb. for October, 2.30c. for November and December and 2.35c. for January-May delivery.

### NEW CALEDONIA ORES

Exports of ores from New Caledonia for the eight months ended Aug. 31, as reported by the "Bulletin du Commerce" of Noumea, were 55,005 metric tons of nickel ore and 32,564 tons of chrome ore. Exports of metals in August were 292 tons of nickel matte, an increase of 65 tons over July.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | May | June | July | August | September |
|---|---|---|---|---|---|
| Alaska shipments | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 | 2,261,216 |
| Anaconda | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 | 22,600,000 |
| Arizona, Ltd | 3,200,000 | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 |
| Copper Queen | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 | |
| Calumet & Ariz | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 | 4,000,000 |
| Chino | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 | 4,308,296 |
| Detroit | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 | |
| East Butte | 1,268,595 | 1,055,646 | 1,060,257 | 1,162,007 | 1,233,018 |
| Giroux* | 625,000 | 610,000 | 610,000 | 605,000 | |
| Mason Valley | 1,186,560 | 1,097,014 | 908,892 | 867,060 | . |
| Miami | 1,943,900 | 2,612,000 | .. | | |
| Mammoth | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 | 1,750,000 |
| Nevada Con | 5,933,275 | 6,344,863 | 5,403,919 | 5,989,973 | |
| Ohio | 650,071 | 537,400 | 601,700 | 689,000 | 685,900 |
| Old Dominion | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 |
| Ray | 4,384,400 | 4,392,612 | 4,097,000 | 4,269,519 | .. |
| Shannon | 1,080,000 | 924,000 | 880,000 | 1,248,000 | 1,232,000 |
| South Utah | 200,000 | 185,000 | 140,000 | 223,498 | 241,843 |
| Tennessee | §1,037,115 | 1,379,220 | 1,247,804 | 1,101,019 | 1,309,950 |
| United Verde* | 3,000,000 | 2,900,000 | 3,000,000 | 3,000,000 | |
| Utah Copper Co. | 10,003,227 | 11,637,949 | 9,849,043 | 10,302,251 | 11,462,905 |
| Lake Superior* | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 | 6,950,008 |
| Non-rep. mines* | 6,300,000 | 6,000,000 | 6,200,000 | 6,200,000 | |
| Total prod. | 109,824,500 | 104,051,138 | 101,758,167 | 96,769,606 | |
| Imports, bars, etc. | 22,205,942 | 18,255,267 | 29,029,990 | 22,474,471 | |
| Total blister | 132,030,442 | 122,306,405 | 130,788,157 | 119,244,077 | |
| Imp. ore & matte | 10,528,562 | 7,497,002 | 8,527,046 | 9,171,351 | |
| Total Amer | 142,559,004 | 129,803,407 | 139,315,203 | 128,415,428 | |
| Miami† | . | | 2,890,000 | 3,097,500 | 2,688,000 |
| Shattuck-Arizona | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 | 1,163,237 |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,076 | 634,238 | 618,379 | ........ | |
| Granby | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,424,800 | 1,984,640 | 2,240,720 | 2,264,640 | |
| Cananea | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 | 3,148,000 |
| Moctezuma | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 | |
| Other Foreign: | | | | | |
| Braden, Chile | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 |
| Cape Cop., S. Af. | 387,520 | 414,400 | | | |
| Kyshtim, Russia | 1,490,000 | 1,000,000 | 2,500,000 | 1,585,000 | |
| Spassky, Russia | 721,280 | 835,520 | 660,800 | 1,048,320 | |
| Exports from | | | | | |
| Chile | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 | 5,600,000 |
| Australia | 7,840,000 | 7,616,000 | 10,304,000 | 7,720,000 | 6,944,000 |
| Arrivals–Europe‡ | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 | 9,661,120 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U. S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| IX, '12 | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,72 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | .. |
| I 1913 | 143,479,625 | 65,210,030 | 69,382,847 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,904,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X | ... | | | 29,793,094 | 53,625,600 | 83,418,694 |

Note.—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq | Sale | Amt. |
|---|---|---|---|
| Arizona Enterprise, Ariz | Oct. 10 | Oct. 31 | $0 005 |
| Big Elk, Ida | Oct. 13 | Nov. 5 | 0 001 |
| Carlin-Nevada, Nev | Oct. 25 | Nov. 11 | 0 001 |
| Cop Mountain, Ida (postpo'd) | Sept 6 | Nov. 4 | 0 002 |
| Crown Point, Nev | Oct 20 | Nov. 12 | 0 10 |
| Demijohn Cons Utah | Oct 17 | Nov 4 | 0 0025 |
| Emerald Utah | Oct 15 | Nov 8 | 0 005 |
| Eureka, Utah | Oct 21 | Nov 11 | 0 001 |
| **Hypotheek, Ida.......** | Oct 9 | Nov 4 | 0 004 |
| Lost Josephine Utah | Oct 17 | Nov 6 | 0 002 |
| Lower Mammoth, Utah | Oct 17 | Nov 7 | 0 01 |
| Montelle, Utah | Oct 11 | Nov 1 | 0 005 |
| Moonlight Ida | Sept 30 | Oct 30 | 0 005 |
| Raymond-Illinois, Utah | Oct 11 | Oct 27 | 0 005 |
| Reindeer, Ida | Oct 20 | Nov 7 | 0 003 |
| Royal Copper, Ida | Sept 29 | Oct 29 | 0 001 |
| Santaquin Chief, Utah | Oct 13 | Oct 31 | 0 0025 |
| Santaquin King, Utah | Oct 9 | Oct 27 | 0 0025 |
| Sunrise, Ida | Sept 28 | Oct 28 | 0 002 |
| Sunset, Ida | Oct 18 | Nov 12 | 0 002 |
| Tar Baby, Utah | Sept 29 | Nov. 3 | 0 0025 |
| Tintic Standard, Utah | Oct 11 | Nov. 1 | 0 005 |
| Utah-Arizona, Ariz | Oct 15 | Oct 31 | 0 005 |
| Utah United, Utah | Oct 11 | Nov 1 | 0 01 |
| West Century, Utah | Oct 1 | Oct 30 | 0 01 |
| Western Star, Ida | Oct 23 | Nov 8 | 0 002 |
| Wisconsin, Ida | Oct 9 | Nov 10 | 0 002 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53 795 | 56 260 | 62 938 | 24 865 | 25 887 | 28 983 |
| February | 52 222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March | 52 745 | 58 375 | 57 870 | 24 324 | 26 875 | 26 669 |
| April | 53 325 | 59 207 | 59 490 | 24 595 | 27 284 | 27.416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24 486 | 28 215 | 27.199 |
| July | 52 630 | 60 654 | 58 721 | 24 286 | 27 919 | 27.074 |
| August | 52 171 | 61 606 | 59 293 | 24 082 | 28 375 | 27.335 |
| September | 52 440 | 63 078 | 60 640 | 24 209 | 29 088 | 27.986 |
| October... | 53 340 | 63 471 | ..... | 24 594 | 29 299 | .... |
| November | 55 719 | 62 792 | ...... | 25 649 | 29 012 | ... |
| December.. | 54 905 | 63 365 | .... | 25.349 | 29 320 | .. |
| Year | 53 304 | 60 835 | . | 24 592 | 28 042 | |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0 925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14 094 | 16 488 | 14 337 | 16.767 | 62 760 | 71 741 |
| February.. | 14 084 | 14 971 | 14 329 | 15 253 | 62 893 | 65 519 |
| March | 14 698 | 14 713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15 741 | 15 291 | 15 930 | 15 565 | 70 294 | 68 111 |
| May | 16 031 | 15 436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17 234 | 14 672 | 17.443 | 14 871 | 78 259 | 67 140 |
| July | 17 190 | 14 190 | 17.353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | 16 328 | 17 698 | 16 799 | 78 762 | 73 125 |
| October | 17 314 | | 17 661 | | 76 389 | |
| November | 17 326 | | 17 647 | | 76 890 | |
| December | 17 376 | | 17 600 | | 75 516 | |
| Year | 16 341 | | 16 560 | | 72 942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50.298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 410 | 223 762 | 193 074 |
| October | 50 077 | | 228 353 | |
| November | 49 891 | | 227 619 | |
| December | 49 815 | | 226 875 | |
| Av. year | 46 096 | | 209 322 | . |

New York in cents per pound London in pounds sterling per long ton

### LEAD

| Month | New York | | St Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January. | 4 435 | 4.321 | 4 327 | 4 171 | 15.597 | 17.114 |
| February... | 4 026 | 4 325 | 3 946 | 4.175 | 15 738 | 16 550 |
| March..... | 4 073 | 4.327 | 4 046 | 4.177 | 15.997 | 15.977 |
| April ... | 4 200 | 4 381 | 4 118 | 4.242 | 16 331 | 17.597 |
| May... .. | 4 194 | 4.342 | 4 072 | 4 226 | 16 509 | 18 923 |
| June. ..... | 4 392 | 4 325 | 4 321 | 4.190 | 17 588 | 20 226 |
| July .. | 4 720 | 4 353 | 4 603 | 4 223 | 18 544 | 20 038 |
| August. | 4 569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | 4.698 | 4 924 | 4 579 | 22 292 | 20 648 |
| October | 5 071 | .. | 4 894 | | 20 630 | |
| November | 4 615 | . | 4 463 | | 18 193 | |
| December | 4 303 | | 4 152 | | 18 069 | |
| Year | 4 471 | | 4 360 | | 17 929 | |

New York and St. Louis cents per pound London, pounds sterling per long ton

### SPELTER

| Month | New York | | St Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January.... | 6 442 | 6 931 | 6.292 | 6 854 | 26 642 | 26.114 |
| February | 6 499 | 6 239 | 6 349 | 6 089 | 26 661 | 25 338 |
| March | 6 626 | 6 078 | 6.476 | 5 926 | 26 048 | 24 605 |
| April | 6 633 | 5.641 | 6 483 | 5 491 | 25 644 | 25 313 |
| May | 6 679 | 5 406 | 6 529 | 5 256 | 25 790 | 24 583 |
| June | 6 877 | 5 124 | 6.727 | 4.974 | 25.763 | 22 143 |
| July | 7 116 | 5 278 | 6 966 | 5.128 | 26.174 | 20 592 |
| August..... | 7.028 | 5 658 | 6 878 | 5 508 | 26 443 | 20 706 |
| September . | 7 454 | 5 694 | 7 313 | 5 544 | 27.048 | 21 148 |
| October | 7 426 | | 7 276 | . . | 27 543 | |
| November . | 7 371 | | 7.221 | .. | 26 804 | |
| December... | 7.162 | | 7 081 | . | 26.494 | |
| Year. | 6 943 | . | 6.799 | . | 26.421 | .... |

New York and St Louis, cents per pound. London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15 12 | $18 15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February... | 15 03 | 18 15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March .. | 14 95 | 18 15 | 13.66 | 16.96 | 14.10 | 17 53 |
| April ... | 15 13 | 17 90 | 13.90 | 16.71 | 14.15 | 16 40 |
| May | 15.14 | 17 68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17 14 | 14.11 | 15.40 | 14.22 | 15 10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14 74 |
| August | 15.43 | 16.63 | 14 90 | 15.00 | 14.85 | 14 88 |
| September | 16 86 | 16.65 | 16.03 | 15.04 | 15.63 | 14 93 |
| October | 17 90 | ..... | 17.18 | .. | 17 22 | |
| November. | 18 07 | . | 17 09 | .. | 18 00 | |
| December... | 18 15 | | 17 45 | . . | 18.73 | |
| Year | $16 01 | . | $14 93 | | $15.28 | . ... |

# STOCK QUOTATIONS

| COLO. SPRINGS Oct. 21 | | SALT LAKE Oct. 21 | |
|---|---|---|---|
| Name of Comp. | Bid. | Name of Comp. | Bid. |
| Acacia | .02½ | Beck Tunnel | .05 |
| Cripple Cr'k Con | .01 | Black Jack | 09½ |
| C. K. & N | .09 | Cedar Talisman . | 00½ |
| Doctor Jack Pot | 06 | Colorado Mining.. | 10½ |
| Elkton Con | 52 | Columbus Con | .01 |
| El Paso | 2 90 | Crown Point | 00¼ |
| Findlay | .01½ | Daly-Judge | 5 50 |
| Gold Dollar | .06 | Grand Central | 52 |
| Gold Sovereign | .02¼ | Iron Blossom | 1 05 |
| Isabella | .09½ | Little Bell | ‡ 10 |
| Jack Pot | .05 | Lower Mammoth | 00¼ |
| Jennie Sample | .05¼ | Mason Valley | 3 25 |
| Jerry Johnson | 03½ | May Day | 05½ |
| Lexington | ‡ 005 | Nevada Hills | 75 |
| Moon Anchor | ‡ 006 | New York | 02½ |
| Old Gold | 01 | Prince Con | 28½ |
| Mary McKinney | 52 | Silver King Coal'n | 3 50 |
| Pharmacist | 01½ | Sioux Con... | 01 |
| Portland | 95½ | Uncle Sam | 02 |
| Vindicator | 85 | Yankee | 08 |

### TORONTO Oct 20

| Name of Comp | Bid | Name of Comp. | Bid. |
|---|---|---|---|
| Bailey | 07 | Foley O'Brien | .18 |
| Coniagas | 7 00 | Hollinger | 16.80 |
| T. & Hudson Bay | ‡70 00 | Imperial | ‡.02 |
| Timiskaming | 15 | Jupiter | .10 |
| Wettlaufer-Lor | 05 | Pearl Lake | 11 |
| Apex | ‡ 01 | Porcu. Gold | 12 |
| Big Dome | 9 75 | Preston E. D | 01 |
| Crown Chartered | ‡ 00¼ | Rea | 12 |
| Doble | 10 | Swastika | 02 |
| Dome Exten | 08 | West Dome | 08 |

### SAN FRANCISCO Oct. 21

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc Nev. & Cal. | |
| Alta. | 05 | Belmont.. | 7 17½ |
| Belcher | ‡.21 | Jim Butler | 60 |
| Best & Belcher | .05 | MacNamara.. | 10 |
| Caledonia | 1 25 | Midway | 35 |
| Challenge Con. | 07 | Mont.-Tonopah | 1.15 |
| Chollar | 02 | North Star | 37 |
| Confidence | 33 | West End Con . | 1 30 |
| Con. Virginia | 10 | Atlanta | 11 |
| Crown Point | 29 | Booth | 01 |
| Gould & Curry | 02 | C.O.D. Con | 03 |
| Hale & Norcross... | 06 | Comb. Frac | 03 |
| Mexican | 1 12½ | Jumbo Extension | 08 |
| Occidental | 70 | Pitts.-Silver Peak... | 40 |
| Ophir . | 16 | Round Mountain | 40 |
| Overman . | ‡ 50 | Silver Pick | 03 |
| Potosi . | 02 | Tramp Con | ‡ 01 |
| Savage ... . | 11 | Argonaut | 3 50 |
| Sierra Nevada. | 05 | Bunker Hill... | 1 50 |
| Union Con .. | 08 | Central Eureka... | 19 |
| Yellow Jacket | 27 | So. Eureka | ‡2 00 |

| N. Y. EXCH. Oct. 21 | |
|---|---|
| Name of Comp. | Clg. |
| Amalgamated | 76¼ |
| Am Agri Chem | 44½ |
| Am.Sm.&Ref.,com | 65¼ |
| Am Sm & Ref., pf | 100 |
| Am. Sm Sec., pf B | 81½ |
| Anaconda | 36½ |
| Batopilas Min | 1½ |
| Bethlehem Steel,pf | 70 |
| Chino | 41½ |
| Federal M. & S., pf | 37½ |
| Great Nor.,ore.,ctf | 33½ |
| Guggen. Exp... | 45½ |
| Homestake. | 105½ |
| Inspiration Con. | 15½ |
| Miami Copper | 22½ |
| Nat'l Lead, com | 44½ |
| National Lead, pf | 105 |
| Nev Consol | 15¼ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 90 |
| Quicksilver, pf. | 3 |
| Ray Con. ... | 19½ |
| Republic I&S,com | 20 |
| Republic I&S, pf.... | 81½ |
| SlossSheff'd,com | 28 |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper. | 29½ |
| Utah Copper | 54½ |
| U S Steel, com | 59 |
| U S Steel, pf . | 107 |
| Va Car Chem.,pf. | 94 |

| N. Y. CURB Oct 21 | |
|---|---|
| Name of Comp | Clg. |
| Ariz. Belmont | 15 |
| Barnes King | 1½ |
| Beaver Con | .30 |
| Big Four. | .20 |
| Braden Copper | 7½ |
| B. C. Copper | 2½ |
| Buffalo Mines | 2½ |
| Can G. & S | 17 |
| Caribou......... | 58 |
| Con Ariz. Sm | 3/16 |
| Davis-Daly | 2½ |
| Diam'field-Daisy . | 02 |
| Ely Con. | 06 |
| Florence.. | 20 |
| Giroux . | 1½ |
| Gold Hill Con | 3/16 |
| Goldfield Con | 1 3/16 |
| Greene Cananea | 28 |
| Greenwater | 05 |
| Internat S & R | ‡115 |
| Kerr Lake | 3 11/16 |
| Keystone | ‡1½ |
| La Rose | 2 1/16 |
| McKinley-Dar-Sa | 1½ |
| Min Co of A new | 2½ |
| Nipissing Mines | 8½ |
| Ohio Copper | ½ |
| Pacific Sm. & M | ‡½ |
| Puebla S & R | 3 |
| South Utah M&S | 3/16 |
| Stand'd Oil of N.J | 380 |
| Stewart | 1 9/16 |
| Tonopah | 4½ |
| Tonopah Ex | 1 11/16 |
| Tonopah Merger | 61 |
| Tri-Bullion | ¼ |
| Tularosa | 1½ |
| Union Mines | 04 |
| United Cop., pfd. | 3 |
| Yukon Gold | 2 |

| LONDON Oct 15 | |
|---|---|
| Name of Comp | Clg |
| Camp Bird | £0 15s 6d |
| El Oro | 0 14 6 |
| Esperanza | 0 17 6 |
| Mexico Mines | 5 10 0 |
| Oroville | 0 6 3 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 6 |
| Tomboy | 1 6 3 |

| BOSTON EXCH Oct 21 | |
|---|---|
| Name of Comp | Clg |
| Adventure | 1½ |
| Ahmeek | 280 |
| Alaska Gold M .. | 23½ |
| Algomah. .. | 1½ |
| Allouez........... | 34½ |
| Am. Zinc | 18½ |
| Ariz. Com., ctfs ... | 5 1/16 |
| Bonanza. | 30 |
| Boston & Corbin ... | 75 |
| Butte & Balak . | 3½ |
| Calumet & Ariz . | 64½ |
| Calumet & Hecla | 420 |
| Centennial . | 13 |
| Cliff. . | 1½ |
| Copper Range | 37½ |
| Daly West | 2 |
| East Butte. . . | 12½ |
| Franklin . | 3 |
| Granby. . | 73½ |
| Hancock.......... | 15 |
| Hedley Gold...... | 29½ |
| Helvetia..... | 75 |
| Indiana ..... . | 3½ |
| Island Cr'k, com . | 47½ |
| Island Cr'k, pfd | 84 |
| Isle Royale.. | 19 |
| Keweenaw..... . | 1½ |
| Lake .. . | ‡8½ |
| La Salle .. .. | 3½ |
| Mass .. | 2 |
| Michigan...... . | 1½ |
| Mohawk. . | 40 |
| New Arcadian..... | 1½ |
| New Idria Quick. | 2½ |
| North Butte.... | 24½ |
| North Lake | 1 1/16 |
| Ojibway.. . | 59 |
| Old Dominion.. | 50½ |
| Osceola............ | 77 |
| Quincy. . | 57 |
| Shannon . . | 6½ |
| Shattuck-Ariz | 28½ |
| Superior | 23½ |
| Superior & Bost... | 2½ |
| Tamarack . | 28½ |
| Trinity | 4½ |
| Tuolumne. | .70 |
| U. S. Smelting. | 38 |
| U. S. Smelt'g, pf | 46½ |
| Utah Apex....... | 2 |
| Utah Con | 9 |
| Victoria | 1½ |
| Winona | 1½ |
| Wolverine | 41½ |
| Wyandot | 50 |

| BOSTON CURB Oct 21 | |
|---|---|
| Name of Comp | Bid |
| Bingham Mines | 5½ |
| Boston Ely | 48 |
| Butte&Lon'nDev | 32 |
| Cactus | 02 |
| Calaveras | 1 3/16 |
| Chief Cons | 1 5/16 |
| Corbin | 80 |
| Cortez | 20 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | 1 |
| First Nat Cop | 3½ |
| Houghton Copper | 3½ |
| Majestic | 25 |
| Mexican Metals | 49 |
| Moneta Porc | ‡ 07 |
| Nevada-Douglas | 1½ |
| New Baltic.... | 60 |
| Oneco | 85 |
| Raven Copper | 06 |
| Rhode Island Coal | 01 |
| Smokey Dev | 75 |
| So Lake | 3½ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | 25 |
| Trethewey | 28 |
| United Verde Ext | 50 |

‡Last Quotation

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# The White Island Sulphur Deposit

*SYNOPSIS—White Island, on the coast of New Zealand, contains unique deposits of sulphur which are being worked. The material occurs both as superficial solid material and as a liquid product of hot springs. The island is apparently a volcanic crater and the sulphur is the result of its thermal activity.*

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An extremely interesting and apparently valuable deposit of sulphur is being worked on White Island, New Zealand. This is a small island of about 590 acres lying in the Bay of Plenty, on the east coast of the North Island, about 30 miles from the mainland. The island is the scene or the result of volcanic activity and the presence of the sulphur is attributable to this fact. The material occurs in both liquid and solid form of varying degrees of purity, the principal other substance of the admixture being gypsum.

Crater Bay, Showing Buildings in Foreground

The island itself is in somewhat the shape of a horseshoe in all three dimensions. About 150 to 200 acres are flat and a part of this area is taken up with a lake. The flat portion opens on the sea on one side, except for a hill in the center of the opening. The rim around the remaining edge of the island attains a height of 900 ft. Topography and thermal activity would indicate that the island is an old crater.

In the flat portion between the lake and the sea, rock sulphur and flowers of sulphur are found; about 6500 tons of this was in such shape as to be readily extracted. A possibly more important source of sulphur is a boiling spring behind the lake, which pours out a continual stream of liquid product. The exact quantity that could be obtained from this source is indeterminable, but estimates give several tons per hour; it is of high-grade, 94% sulphur. The possibility of tapping the underground source of this spring with boreholes and pumping the sulphur is an attractive one. Sulphur also exists in the lake bottom, which has been drained in successive cuts so as to uncover a large deposit of nearly pure material.

There was on the dumps at last report about 4000 tons of material running from 60 to 70% sulphur, and 700 or 800 tons of pure sulphur which needs practically no refining. The operating company has put up a number of sheet-iron houses, as can be seen from the illustration, and has laid track for handling the material mined. Additional equipment includes trucks, concrete water tanks and a winch. Refining is carried on in a battery of three retorts, each capable of handling about four tons per hour. These were built by the Macauley Foundry Co., of West Berkeley, Calif. The process is simple, the material being wheeled from dump to retorts, and the sulphur melted out by the introduction of superheated steam. The liquid sulphur runs out into troughs and the comb

The Lake. Steam Jet on Left

The Head of the Lake, Partly Drained. The Steam Jet on the Right Marks the Sulphur Spring

of gypsum remaining is transferred to another dump. It is hoped to dispose of the gypsum later at a profit, in the New Zealand market.

The lake is of a vivid green color and is stated to be highly acidulated with both sulphuric and hydrochloric acids. It is stated that the water has been reputed to have curative properties and has been freely taken away by tourists. The level of the lake, until it was drained, used to vary considerably, and its area correspondingly, the latter being variously given at 15 and 40 acres. Around the lake, principally on the side against the hills, there are steam blow-holes which make a roar that can be heard for miles. The cloud from these jets, hanging over the island, gave it its name. It is stated that the steam jets spring from cones of bright-colored sulphur.

The island has been known to tourists as a curiosity for a good many years. Even as long ago as 1885, Judge Wilson, who owned the property, attempted to exploit the sulphur and even shipped 600 or 700 tons of pure material to Sydney. After his death, the island was in the hands of his executors for several years and was finally sold to Andrew Gray, of Wellington, who tried unsuccessfully to interest capital in working the deposits. The island was finally purchased in January, 1912, by the White Island Sulphur Co., Ltd., a Canadian concern, after examination by an engineer, Mr. Stockings, who apparently reported favorably on the presence of the sulphur, but considered that the lack of water, the presence of sulphur fumes and the difficulties of landing, would make its working difficult or impossible. These difficulties appear to have been overcome and successful operations begun.

⁂

## The New Income Tax

WASHINGTON CORRESPONDENCE

The following summary gives those portions of the income-tax law which have a direct bearing upon the payment of the tax by mining corporations. Some important changes were made by the conference committee in this phase of the law at the last moment, embodying provisions that had not previously become known.

The provision as to allowances for depreciation in the value of mines in making report of net individual income for taxation is interesting and follows the Senate amendment to the income-tax sections. After it has provided for the so called "normal tax" on ordinary incomes the tariff bill allows certain offsets, among which is included the allowance for mine depreciation, in part as follows:

"That in computing net income for the purpose of the normal tax there shall be allowed as deductions: First, the necessary expenses actually paid in carrying on any business; second, all interest paid within the year by a taxable person on indebtedness; third, all national, state, county, school and municipal taxes paid within the year, not including those assessed against local benefits; fourth, losses actually sustained during the year, incurred in trade or arising from fires, storms, or shipwreck, and not compensated for by insurance or otherwise; fifth, debts due to the taxpayer actually ascertained to be worthless and charged off within the year; sixth, a reasonable allowance for the exhaustion, wear and tear of property arising out of its use or employment in the business, not to exceed, in the case of mines, 5% of the gross value at the mine of the output for the year for which the computation is made; but no deduction shall be made for any amount of expense of restoring property or making good the exhaustion thereof for which an allowance is or has been made. Provided, that no deduction shall be allowed for any amount paid out for new buildings, permanent improvements, or betterments, made to increase the value of any property or estate. . . ."

Subsection G of the income-tax provision is practically a reënactment of the corporation tax now in force. The conference committee, however, made important alterations in its terms, leaving it to read in part in the following form:

G. (a) That the normal tax hereinbefore imposed upon individuals likewise shall be levied, assessed, and paid annually upon the entire net income arising or accruing from all sources during the preceding calendar year to every corporation, joint-stock company or association, and every insurance company, organized in the United States, no matter how created or organized, but not including partnerships; but if organized, authorized, or existing under the laws of any foreign country, then upon the amount of net income arising or accruing by it from business transacted and capital invested within the United States during such year.

(b) Such net income shall be ascertained by deducting from the gross amount of the income of such corporation, joint-stock company or association, or insurance company, received within the year from all sources: (1) All the ordinary and necessary expenses paid within the year in the maintenance and operation of its business and properties, including rentals or other payments required to be made as a condition to the continued use or possession of property; (2) all losses actually sustained within the year and not compensated by insurance or otherwise, including a reasonable allowance for depreciation by use, wear and tear of property, if any; and in the case of mines a reasonable allowance for depletion of ores and all other natural deposits, not to exceed 5% of the gross value at the mine of the output for the year for which the computation is made. (3) Provided, that in case of indebtedness wholly secured by collateral the subject of sale in ordinary business of such corporation, joint-stock company, or association, the total interest secured and paid by such company, corporation, or association within the year on any such indebtedness may be deducted as a part of its expense of doing business; Provided further, that in the case of bond or other indebtedness, which have been issued with a guaranty that the interest payable thereon shall be free from taxation, no deduction for the payment of the tax herein imposed shall be allowed. (4) All sums paid by it within the year for taxes imposed under the authority of the United States or of any state or territory thereof, or imposed by the government of any foreign country: Provided, that in the case of a corporation, joint-stock company, or association, organized, authorized, or existing under the laws of any foreign country, such net income shall be ascertained by deducting from the gross amount of its income accrued within the year from business transacted and capital invested within the United States, (1) all the ordinary and necessary expenses actually paid within the year out of earnings in the maintenance and operation of its business, and property within the United States, including rentals or other payments required to be made as a condition to the continued use or possession of property; (2) all losses actually sustained within the year in business conducted by it within the United States and not compensated by insurance or otherwise, including a reasonable allowance for depreciation by use, wear and tear of property, if any, and in the case of mines a reasonable allowance for depletion of ores and all other natural deposits, not to exceed 5% of the gross value at the mine of the output for the year for which the computation is made; and in case of insurance companies the net addition, if any, required by law to be made within the year to reserve funds and the sums other than dividends paid within the year on policy and annuity contracts.

(c) The tax herein imposed shall be computed upon its entire net income accruing during each preceding calendar year ended Dec. 31; provided, however, that for the year ended Dec. 31, 1913, said tax shall be imposed upon its entire net income accruing during that portion of said year from Mar. 1 to Dec. 31, both dates inclusive, to be ascertained by taking five-sixths of its entire net income for said calendar year; provided, further, that any corporation, joint-stock company, or association subject to this tax may designate the last day of any month in the year as the day of the closing of its fiscal year and shall be entitled to have the tax payable by it computed upon the basis of the net income ascertained as herein provided for the year ending on the day so designated in the year preceding the date of assessment instead of upon the basis of the net income for the calendar year preceding the date of assessment; and it shall give notice of the day it has thus designated as the closing of its fiscal year to the collector of the district in which its principal business office is located at any time not less than 30 days prior to the date upon which its annual return shall be filed. All corporations, joint-stock companies or associations subject to the tax herein imposed, computing taxes upon the income of the calendar year, shall, on or before Mar. 1, 1914, and the first day of March in each year thereafter, and all corporations, joint-stock companies, or associations computing taxes upon the income of a fiscal year which it may designate in the manner hereinbefore provided, shall render a like return within 60 days after the close of its said fiscal year, and within 60 days after the close of its fiscal year in each year thereafter, or in the case of a corporation, joint-stock company, or association, organized or existing under the laws of a foreign country, in the place where its principal business is located within the United States, in such form as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall prescribe, shall render a true and accurate return under oath or affirmation of its president, vice-president, or other principal officer, and its treasurer or assistant treasurer, to the collector of internal revenue for the district in which it has its principal place of business, setting forth (1) the total amount of its paid-up capital stock outstanding, or if no capital stock, its capital employed in business, at the close of the year; (2) the total amount of its bonded and other indebtedness at the close of the year; (3) the gross amount of its income, received during such year from all sources, and if organized under the laws of a foreign country the gross amount of its income received within the year from business transacted and capital invested within the United States; (4) the total amount of all its ordinary and necessary expenses paid out of earnings in the maintenance and operation of the business and properties of such corporation, joint-stock company, or association, or insurance company within the year, stating separately all rentals or other payments required to be made as a condition to the continued use or possession of property, and if organized under the laws of a foreign country the amount so paid in the maintenance and operation of its business within the United States; (5) the total amount of all losses actually sustained during the year and not compensated by insurance or otherwise, stating separately any amounts allowed for depreciation of property, and in case of insurance companies the net addition, if any, required by law to be made within the year to reserve funds and the sums other than dividends paid within the year on policy and annuity contracts. . . . .

All assessments shall be made and the several corporations, joint-stock companies or associations, and insurance companies shall be notified of the amount for which they are respectively liable on or before the first day of June of each successive year, and said assessment shall be paid on or before the 30th day of June. Provided, however, that every corporation, joint-stock company or association, and insurance company, computing taxes upon the income of the fiscal year which it may designate in the manner hereinbefore provided, shall pay the taxes due under its assessment within 120 days after the date upon which it is required to file its list or return of income for assessment; except in cases of refusal or neglect to make such return, and in cases of false or fraudulent returns, in which cases the Commissioner of Internal Revenue shall, upon the discovery thereof, at any time within three years after said return is due, make a return upon information obtained as provided for in this section or by existing law, and the assessment made by the Commissioner of Internal Revenue thereon shall be paid by such corporation, joint-stock company or association, or insurance company immediately upon notification of the amount of such assessment; and to any sum or sums due and unpaid after the 30th day of June in any year, or after 120 days from the date on which the return of income is required to be made by the taxpayer, and after ten days' notice and demand thereof by the collector, there shall be added the sum of 5% on the amount of tax unpaid and interest at the rate of 1% per month upon said tax from the time the same becomes due.

(d) When the assessment shall be made, as provided in this section, the returns, together with any corrections thereof which may have been made by the commissioner, shall be filed in the office of the Commissioner of Internal Revenue and shall constitute public records and be open to inspection as such. Provided, that any and all such returns shall be open to inspection only upon the order of the President, under rules and regulations to be prescribed by the Secretary of the Treasury and approved by the President. Provided further, that the proper officers of any state imposing a general income tax may, upon the request of the governor thereof, have access to said returns or to an abstract thereof, showing the name and income of each such corporation, joint-stock company, association or insurance company, at such times and in such manner as the Secretary of the Treasury may prescribe.

If any of the corporations, joint-stock companies or associations, or insurance companies aforesaid, shall refuse or neglect to make a return at the time or times hereinbefore specified in each year, or shall render a false or fraudulent return, such corporation, joint-stock company or association, or insurance company shall be liable to a penalty of not exceeding $10,000.

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## Effect of Foreign Metals on the Rolling of Zinc

Ingots weighing 40 lb. were prepared by E. Prost and A. van de Casteele by casting together zinc alloys of various metals, with spelter containing Pb, 1.05 to 1.25%; Cd, 0.076 to 0.11%; and Fe, 0.03 to 0.039% (*Bull. Soc. Chim. Belge*, p. 175, 1913). The following conclusions are drawn: Cadmium is harmful above

0.25%; with 0.50% rolling is no longer possible. Arsenic, 0.02% markedly increases the hardness, and with 0.03% the metal is too brittle for practical purposes. Antimony is less objectionable than arsenic as regards hardness, as 0.07% does not increase the latter; but 0.02% is sufficient to produce a striated surface on the rolled sheet which makes it unsalable. Tin is objectionable above 0.01, and prohibitive at 0.03%. Copper is without hardening effect until it reaches 0.08, but with 0.19% the zinc is unworkable. Iron, 0.12% is a permissible maximum, but this is easily reduced in refining. Lead, though 1 to 1.25% does not interfere with the rolling, a slight increase not only seriously affects malleability but the excess of lead remains unalloyed and forms patches on the sheet. The presence of two or more impurities together results in a combination of the injurious effects of each.

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## Butte & Superior

The Butte & Superior company is now producing about 10,000 tons of blende concentrate per month and about 350 tons of galena concentrate. The former goes about 50% zinc and 20 to 25 oz. silver per ton; the latter about 35% lead. The lead concentrate is a small but not unimportant byproduct.

The Butte & Superior Mill, Butte, Mont.

The zinc concentrate goes chiefly to smelters in Oklahoma on a sliding-scale contract, based on the price for spelter. The residuum remaining after extraction of the zinc is returned to the company for realization of its silver value. This involves sending the residuum to silver-lead smelters and the ultimate recovery of silver in proportion to the content of the raw concentrates is small, while freight and smelting charges are high. It was the hope of doing better in this matter that was the inspiration of the electric smelting experiments that were made at Butte, but they were unsuccessful.

In the milling process employed at Butte as much of the blende as is possible is taken out on the jigs and tables, the proportion of concentrate secured in this way being about 6000 tons per month, assaying nearly 52% zinc. This is relatively coarse material, and is a desirable product from the standpoint of the zinc smelter.

The middlings from the jigs and tables, assaying about 20% zinc, or about the same as the original ore, are reground and submitted to the flotation process, which makes about 4000 tons monthly of concentrate going about 48% zinc. This concentrate is very fine, all of it going through an 80-mesh sieve, and about 60% of it through a 200-mesh.

This is far from being an ideal ore in the zinc smelter's view. It is more troublesome, and more expensive, to roast slime than it is ore of coarser character, and there are other drawbacks. However, the zinc smelters just now are hungry for any kind of ore, and on the whole the proportion of flotation slime is not yet very large. The Butte & Superior management hopes to secure an improvement over its present ore contract on the ground of the dearth of ore. Whether it will achieve that or not will have to be left to time to tell. One thing is certain, the zinc smelters have got to learn how to handle the flotation slime, inasmuch as the quantity of it will increase, not only from Butte, but also from other quarters.

The Butte & Superior ships its slime without drying. In fact, its whole method of handling this product is clumsy and capable of improvement. No doubt attention will be given to this as soon as the management finds time. During the last year its hands have been pretty full with various kinds of trouble, most of which have now been remedied.

The Butte & Superior mill is a conspicuous example of the type of mill built on a steep side-hill location. From flotation concentrate bins to mine feed there is a climb greater than commonly falls to the lot of the mill man. Inside of the mill things look mussy, no doubt the result of the many changes that were first made last year; however, the milling results, from the standpoint of concentration, as reported by the company, appear to be beyond criticism, captious or otherwise. The flotation process uses about 4 to 5 lb. of pine oil and about 4 to 5 lb. of sulphuric acid per ton of crude ore treated.

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## The Princes' Trust

Jena Correspondence

Last June the shares of the Hohenlohe Werke, A.-G., in Upper Silesia, suddenly commenced to tumble and, in connection therewith, it was rumored that the "Prince's trust" (sobriquet for the commercial partnership between Prince Christian Kraft zu Hohenlohe and Prince Alexander Egon von Fürstenberg, who owned a controlling interest in the concern), had become heavily involved in a number of other enterprises of more or less doubtful value in which they had embarked, such as the Deutsche Hotel Co., four partially developed potash properties, the Berlin Real Estate Co., the Berlin Omnibus Co., department stores, banks, steamship companies, etc. To save themselves from serious disaster they had to call on the Deutsche Bank for succor.

It will be remembered that in the spring of 1912 they had a falling out with the bank on account of the summary dismissal of managing director Lob, of the Hohenlohe works, which did not meet its approval and led to the withdrawal of its representatives from the board. Since then things seem to have gone wrong with the Princes' trust, especially after the death of Herr Trippe, the successor of Herr Lob. Last July a new managing director was appointed suddenly in the person of Herr Schaltenbrand and soon it became known that the Deutsche Bank was busily engaged in straightening out the affairs of the Princes' trust. A large block of its holdings in Hohenlohe and in Lower Lusatian lignite stock was sold to Herr Petschek, the head of a syndicate of Bohemian capitalists, who had been making already a big inroad into other German lignite stocks, and a number of the lesser enterprises of the trust will be liquidated.

On Sept. 27 the Hohenlohe Werke A.-G. had its annual meeting, in which eight new directors were elected. Of these there are five in the banking business, two are technical men and one is Prince Hohenlohe himself. No doubt, some of the bankers are representatives of the Deutsche Bank. Herr Petschek has also a seat on the board. Subsequently it became known that the Hohenlohe Co. and Herr Lob, the ex-manager, who had suits pending in the court, had come to a compromise, according to which the latter receives a compensation of 900,000 marks from the company, corresponding to one year's salary plus his percentage on the profits, both parties withdrawing their suit and counter-suit.

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## Iron-Ore Reserves of Cuba

In the Government's suit for the dissolution of the Steel Corporation, Charles F. Rand gave the following estimate of the iron-ore reserves of Cuba:

| Mayari District | Acres | Tonnage |
|---|---|---|
| The Spanish American Iron Co | 39,173 | 600,000,000 |
| Total Mayari | | 600,000,000 |
| Levisa Bay District | | |
| Guantanamo Exploration Co | 11,016 | 69,000,000 |
| Various individuals (estimated) | 3,000 | 15,000,000 |
| Total Levisa Bay | | 84,000,000 |
| Moa-Taco District | | |
| The Spanish American Iron Co | 45,517 | 800,000,000 |
| **Bethlehem Iron Mines Co.** | 33,000 | 370,000,000 |
| Buena Vista Iron Co | 19,841 | 300,000,000 |
| Guantanamo Exploration Co | 7,152 | 141,000,000 |
| Eastern Steel Co | 10,188 | 50,000,000 |
| Pilato Mining Co. (U. S. Steel Corp.) | 15,000 | 210,000,000 |
| Various companies and individuals (estimated) | 50,000 | 300,000,000 |
| Total Moa-Taco | | 2,171,000,000 |
| Camaguey District | | |
| [illegible] Iron Mines Co. | 37,000 | 100,000,000 |
| Total Camaguey | | 100,000,000 |
| Santiago de Cuba District | | |
| The Spanish American Iron Co | | 3,500,000 |
| Juragua [illegible] | | 2,500,000 |
| Santiago de Cuba | | 6,000,000 |
| Grand total | | 3,261,000,000 |

## W. J. Olcott on Iron Mining

In his testimony in the Steel suit, W. J. Olcott stated that if given enough time to carry on negotiations, say a year or so, he could secure a large enough supply of ore to yield 1,500,000 tons per year for 50 years. The orebodies which he would secure for this purpose include none which are now owned by steel companies, nor the properties owned by the Longyear-Bennett and Hill interests, although these two groups of properties could easily be drawn on for a similar supply. The properties he had in mind, said Mr. Olcott, are scattered about on all of the different ranges, and he thought he could secure them on leases at royalties of 35c. to 80c. per ton.

> I was more conservative about the future supply of ore 20 years ago than I am now. For instance, I figured then that the Norrie group, because of the geological formation there, would be exhausted in eight or nine years. The ore lay in a trough formed by a vein of quartzite and a dike of diorite, and I thought that when the bottom of the trough was reached the ore would be exhausted. But the ore was found to continue on the other side, below the meeting place of the quartzite vein and the dike, and the Norrie group is still being worked and there are indications that the ore will be taken out indefinitely. It is the same way with most of the other mines on the Gogebic range and the other old ranges.

Mr. Olcott said that it is just as cheap to acquire mines now as it was years ago.

He has come to the conclusion that the Baraboo, in Wisconsin, is not a range.

> There is a big reserve of water there, but not of ore. We have spent lots of money in exploring there, but have been much disappointed. It is not a mining proposition.

The witness said that an attempt to monopolize the ore reserves of the Lake Superior district would only serve to stimulate activity in exploration work and that as a consequence the amount of known tonnage would be greatly increased.

Mr. Olcott said that his whole mining experience on the old ranges has shown that mining operations may be carried down to almost any depth. The Chapin mine, on the Menominee, has been worked from 700 ft. in 1885 to 1400 ft. in 1913. The ore remains of the same quality, the vein of the same thickness, and the capacity as large. The Ashland mine, which had been worked to a level of 700 ft. in 1887, is now down to 1200 ft., and the production and quality of the ore and the thickness of the vein are the same. The mines of the Penokee-Gogebic company have been worked to levels of about 1400 ft., with the same results. In fact, said Mr. Olcott, today the prospects for depth are considered better than they were 20 years ago, as far as the old ranges are concerned. Results have shown that the ore at low levels is present in the same quantity and quality as near the surface. All that is necessary to work the lower levels is to install heavier hoisting machinery and to spend more money for fuel. The added cost per ton, however, is inappreciable. The lowest iron-ore working in Michigan, he said, is at the Newport mine, where ore is being mined at 2400 ft. The ore is of the same grade, and the vein of the same width as in former years.

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**The Ratios of Productive to Nonproductive Work** in some of the Butte shafts are as follows: Speculator, 1:2.12; Diamond, 1:1.52; High Ore, 1:3.31; Mountain View, 1:2.22 (A. I. M. E. Bulletin, September, 1913). These figures represent the ratio of effective horsepower developed in hoisting ore to effective horsepower developed in hoisting men and material. The greater consumption of horsepower in nonproductive work is largely due to the fact that such operations are conducted out of balance and the dead load of skip, cage and rope is exceedingly heavy.

# Grinding Ores for Cyanidation—I

By Herbert A. Megraw

*SYNOPSIS—A discussion of machines used for breaking, crushing and grinding ores preparatory to cyaniding. Characteristics of the machines and their applicability for different work. Results of practical operation are shown.*

⁂

However widely opinions may differ on the various details in milling, little difference is expressed about the first step of the process—rock breaking. There are a certain number of standard and approved types of machines for this work, and they all seem to be able to perform their duty efficiently and economically, without widely differing costs. If concordance is the rule in this department, however, it is about the only one of which the statement is true. After the ore has passed through the breakers and is laid in the mill bins, opinions about appropriate handling begin to diverge and remain separated more or less widely during the entire treatment.

According to the character of the rock mined, its physical condition when it reaches the surface varies. It may be principally in large boulders, or mainly in small shattered particles. Gold and silver ores may be said to fall usually in the grades varying from medium to very hard. While there are instances of ores which are soft and readily broken, these may be considered exceptional. They do not involve the use of distinct methods of reduction, so that the discussion of any machine or method of subdivision will be of equal force whatever the character, with certain exceptions which will be mentioned.

TABLE I. STAMP-MILLING PLANTS

| Mill | No. Stamps | Weight, Lb. | Drop, In. | Drops per Min. | Feed Character | Av. Size | Screen Used | Regrinding Machine |
|---|---|---|---|---|---|---|---|---|
| Goldfield Con. | 100 | 1050 | 7 | 108 | Alunite | 1½ | 4 mesh | Chilean mill |
| Homestake | 1000 | 920 | 9 | 88 | Var. | | 30-35 mesh | Tubes and pans |
| Mexican | 10 | 1250 | 6 | 104 | Quartz and clay | 2 | 4 mesh | Chilean mill |
| Dome | 40 | 1250 | 6½ | 100 | Quartz and schist | 1½ | 10 mesh | Tube mills |
| Hollinger | 40 | 1500 | 6¼ | 100 | Quartz and schist | 2½ | 6 mesh | Tube mills |
| Liberty Bell | 80 | 850 | 7 | 106 | Quartz and calcite | 3 | 12 and 14 mesh | Tube mills |
| West End, Tonopah | 20 | 1200<br>1300 | 6½ | 101 | Quartz | 1 | | Tube mills |
| Montana Tonopah | 40 | 1100 | 7½ | 102 | Quartz | 2 | 25 mesh | Tube mills |
| Tonopah Extension | 30 | 1050 | 7 | 100 | Quartz | 2 | 3 and 12 mesh | Tube mills |
| McNamara | 10 | 1400 | 8 | 98 | Quartz | 2 | 8 and 12 mesh | Tube mills |
| Nevada Hills | 20 | 1250 | 6½ | 107 | Hard quartz | 1½ | 8 mesh | Tube mills |
| Nevada Wonder | 10 | 1400 | 8 | 96 | Quartz | 2½ | ⅜ in. | Chilean and tube mill |
| North Star | 40 | 1000 | 7 | 110 | Quartz | 2 | 30-mesh size | None |
| Black Oak | 20 | 1250 | 6 | 102 | Quartz | 2 | 20 and 6 mesh | Tube mill |
| Gold Road | 40 | 1050 | 7 | 104 | Quartz and calcite | 2½ | 4 mesh | Tube mills |
| Tom Reed | 20 | 1250 | 6 | 105 | Quartz | 3 | 12 mesh | Tube mills |
| Vulture | 20 | 1600 | 6½ | 98 | Quartz | 2 | 40 mesh | Pans |

## Varied Preparation of Ore for Milling

The first breaking of ore is done in large gyratory or jaw breakers, which may be situated either at the mine or at the mill, in those instances these two points are not the same. Then the mill bins receive it and deliver to the milling system.

Ore delivered to the mill bins varies in size from heavy boulders to fine dust. The preliminary breaking machine, gyratory or jaw type, as the case may be, will usually have broken up the larger boulders, leaving pieces of a maximum diameter of perhaps four to six inches. These large pieces must be broken in smaller machines, usually of the jaw type, but before reaching these machines it is better practice to pass the whole of the ore over a grizzly, bypassing any material which does need that treatment. The size of the material delivered by these machines depends upon the type of those which immediately follow them, but may be said to be generally such that its pieces of greatest size have a diameter of from one to 2½ in. At this point diversity of opinion begins and there are a large number of machines competing for place.

## Stamps Most Popular Machines

Among the machines which are used for taking ore from the finer breakers, undoubtedly first place as to popularity must be given to the stamp mill. This machine has been so universally used through many years that it has a strong hold upon the industry which it seems impossible to loosen. There is very little doubt that, at least in many localities, it is by no means the best one for the work. It is, however, reliable, but fails most notably when cost is taken into consideration. Many operators seem to be convinced that the gravity stamp is operated more cheaply than any other crushing machine, but this has certainly not been generally proved.

Table I has been compiled to show the work which is being accompanied by some well known stamp installations. It is not given with the idea of enabling comparisons to be made, but rather to indicate that in such a diverse collection of facts, comparison is not likely to be valuable. The list is not, of course, complete; it makes no attempt at being so, but does show the tendency of modern American practice toward crushing coarsely in the mortars and regrinding in more appropriate machines. The older stamp installations are lighter, crush finer and are usually found in those plants where sand and slime are separately treated.

## Rolls as Primary Crushers

The efficiency and cost of stamping ores in comparison with other machines will be taken up later, first making a survey of the most popular devices which have been used in their stead. Among the first of these, we must mention rolls. Rolls have been very largely used as crushers for many years, but they have comparatively seldom found their way into cyanide plants. They have been used principally in concentrating mills for all kinds

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Note—This is the third of a new series of articles by Mr. Megraw. The series deals with comparative details of cyanide practice, discussing points of possible improvement. Preceding articles of this series appeared in the issues of Sept. 6, 1913, and Oct. 4, 1913. The next article will deal with "Grinding Ores for Cyanidation, II," and will appear in the issue of Nov. 15, 1913.

of ores and are, perhaps, the favorite machines where very large quantities of rock are handled.

The particular advantage of rolls, which has led to their wide use in concentrating mills, is that the distance between the roll shells is a fixed measurement. That is to say, that material which is smaller than that opening, and consequently does not require further crushing in that machine, will pass through it without receiving that crushing, and all material too large to pass the opening, will be broken so that it will pass. The passage of the undersize material without further crushing is an advantage in concentrating mills where a product of a definite size is required, but in cyanide mills this would really be no great advantage. At the same time, it is by no means a disadvantage, and constitutes no reason why the rolls should not be used in cyanide plants. As a matter of fact, stage reduction, through breakers of two or more sizes, and rolls of one or more sizes, is probably the most economical way in which ore can be broken from large pieces down to a product containing maximum-sized fragments of about ¼ or ½ in. diameter. Clearly a product of this size is not to be crushed economically to smaller size in stamp mills, and this may be one reason why rolls are not more largely used for cyanidation. The stamp mill has been such a popular reducing machine that anything which interferes with it, whether the ultimate result is better or not, is likely to receive scant attention. Plants which use rolls have no use for stamps, and the material delivered from rolls could go directly through stages of grinding machines, such as chilean mills, tube mills, or others, which will be mentioned later.

Examples of large mills which are using rolls for primary crushing, may be found in the Cripple Creek district of Colorado, where both Stratton's Independence[1], and the Portland mills use breakers and rolls without any stamp installation. The well known Mogul mill[2], in the Black Hills of South Dakota, used roll crushing in the installation which was burned down a year or two ago, and will, it is said, practically duplicate that crushing installation in the new plant, which is now under construction.

### Chillan Mills Efficient

Aside from rolls, there are a number of machines which are used, more or less, in the primary stage of ore crushing for subsequent cyanidation. Probably the most important of these machines are the chilean mills, of which there are various types, all descended from the original stone-wheel edge runner. Of chilean mills, there are two classes, those operated at high speed, usually having small diameter and small crushing wheels, and the slow-speed mills which usually have dies of larger diameter and the crushing wheels of which are large and heavy, and often multiplied in numbers, some mills having as high as six or eight runners. The high-speed mills are from 4 to 6 ft. in diameter, the diameter in this case referring to the measurement across the dies. Slow-speed mills run from 6 to 10 ft. in diameter and sometimes larger. With the high-speed mills, the crushing wheels are usually only 2 or 3 ft. in diameter, and of narrow face, 4 to 6 in. The slow-speed mills may have wheels up to 7 or 8 ft. in diameter and up to 20-in. face measurement.

High-speed chilean mills are more largely used than the slow-speed ones, and seem to have a firmer hold upon the respect of operators in general. They are used quite often as regrinding machines, following rolls, breakers, or, in some cases, even stamps. At the Goldfield Consolidated plant one sees an example of high-speed chilean mills following stamp crushing. Here the stamps put the ore through a 4-mesh screen, delivering to the chilean mills an over-size product, having a maximum diameter of somewhat less than ¼ in. The mills are Trent, 6-ft. machines, which deliver nearly 50% of a product passing a 200-mesh screen. The mills are said to crush 75 tons per day, practically all of the feed being coarsely-granular material.

### Coarse Feed Better for Chilean Mills

Due to the fact, which I believe is generally acknowledged, or at least ought to be, that the greatest efficiency of a chilean mill, either high or slow speed, is attained on material which is considerably coarser than that sent to the Goldfield chilean mills, their work may not be considered ideal, but under the conditions, good. Viewing this matter from another point, there seems to be no reason why rolls should not be used for the preliminary crushing of this ore, delivering to the chilean mills their product, the maximum size of which will vary from ¼ to ½ in. in maximum size. In this case, the cost of primary crushing would probably be considerably less than with stamps, as it is generally understood, and the chilean mills could be made to perform more efficient work. One objection which might be urged against the rolls under such circumstances is that cyanide plants usually prefer to crush in solution, and the advantage of the dissolving power in the crushing machine is lost when rolls are used. Rolls are not usually considered efficient wet crushers, although occasionally they are so used, an example being the Trojan[3] mill in the Black Hills of South Dakota. Nevertheless, in the case of the Goldfield Consolidated, crushing is performed in water and no advantage is gained in this way by the use of stamps.

Examples of just this method of crushing, namely, rolls followed by high-speed chilean mills, may be found at Stratton's Independence[4], at Cripple Creek, and at the Portland mill at the same place. The process at Stratton's Independence has already been described and the results indicated. At the Portland mill, Blake crushers are used, followed by a disk crusher and fine and coarse rolls. The material from the rolls, which will average from ¼ to ⅜ in. maximum size, is passed to 6-ft. Akron chilean mills, making 34 r.p.m., crushing through 30-mesh wire slot screens. These mills are said to crush as high as 125 tons of this material per 24 hr. At Stratton's Independence the work of the chilean mills is along the same lines and closely comparable. These data have already been published, but are appended herewith in Table II, for purposes of comparison. High-speed chilean mills are used in a large number of plants and it would be impossible to name them all. Some of the most important, however, are included in the table.

Slow-speed chilean mills are used in a number of instances but have not, up to this time, proved as popular as the high-speed machines. It is somewhat difficult to account for the general opinion of this machine, as many published reports of its work show it to be superior in many vital points to the high-speed machines. Work done by an old-style chilean mill was published by me some time ago[5], the results of which are included in Table III for comparison. Also, the work of slow-speed machines at the Gold Belt mill, published in a former issue of the JOURNAL[6], are herewith reproduced. The efficiency of the slow-speed mill has been compared with other grinding machines by Walter H. Urbiter[7], using the Stadler method of comparison. This comparison shows the slow-speed chilean mill to be of high merit as a grinding machine for producing a large amount of extremely fine material.

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[1] Eng. and Min. Journ., Feb. 8, 1913.

[2] Eng. and Min. Journ., [illegible] 1911.

[3] Eng. and Min. Journ., Dec. 28, 1912.

[4] Loc. cit.

The slow-speed machine has a decided limit in the work which it will perform. It can be considered in no sense a regrinding machine. It does its best work on coarse material, passed once through the mill, using with it a large excess of water or solution, whichever may be used in crushing. Some of the tabulations used by Mr. Urbiter are reproduced in Table IV for comparison with other machines. One passage through a slow-speed chilean mill is sufficient, almost always, to grind a very high percentage of the ore at one step to such a point that it will pass through a 200-mesh screen. The tabulated results of the product of many mills show this conclusively. It is a mistake, however, to attempt to use the chilean mill either as a regrinder or as a grinder on moderately fine material. I found that by feeding over-size, running from 80 to 40 mesh, to a slow-speed chilean mill, the product bedded and packed down upon the dies and no grinding, to amount to anything, was performed. Also, in returning over-size to a chilean mill for further grinding, together with the coarse material as originally fed, the result was to diminish largely the capacity of the mill and not to offset that disadvantage by any great increase of slime delivered by it. It is more than probable that the product of the chilean mill, speaking of slow-speed machine, should be classified, and if the over-size is to be reduced to slime it should be handled by some other machine. A slow-speed chilean is not an efficient regrinder of fine material.

TABLE II. CHILEAN MILLS

High Speed

| Mill | Type | Speed R.p.m. | Capacity Tons per Day | Screen Mesh | Feed Size | Feed Hardness | Product % +20 | +30 | +40 | +50 | +60 | +80 | +100 | +120 | +150 | +200 | —200 | Power H p. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Portland...... ........... | Akron, 6 ft. | 34 | 124 | 30 | ¼ in. | Hard | ... | .... | .... | ... | .... | .... | .... | ..... | .. | | | .. |
| Independence ........... | Akron, 6 ft. | 33 | 120 | 30 | ⅜ in. | Hard | | | | 21 | | | 12 | | 5 | 62 | | 55 |
| Goldfield........ ........... | Trent, 6 ft. | 32 | 75 | 30 | 4 mesh | Medium | | 4 | | 10 | | 16 | 9 | | 6 | 6 | 48 | 75 |
| Mogul... ........... | Monadnock | .. | 105 | 30 | 1.5 in. | Hard | | 14 5 | | | 17.8 | | 12.6 | | | 15.7 | 39.4 | 45 |

TABLE III. CHILEAN MILLS

Slow Speed

| Mill | Type | Speed R.p.m. | Capacity Tons per Day | Screen Mesh | Feed Size | Feed Hardness | Product % +20 | +30 | +40 | +50 | +60 | +80 | +100 | +120 | +150 | +200 | —200 | Power H p. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gold Belt .... ......... | Lane, 7 ft. | 18 | 25 | None | 1 in. | Hard | 0.1 | 0.27 | 0 37 | | 1.50 | 3.87 | 8.10 | ... | .... | 35.79 | 50.0 | 10 |
| Sta. Elena. .......... | 7 ft. | 15 | 25 | 40 | 2 in. | Hard quartz | | | | | 1.15 | 5.65 | 0.15 | | | 25.75 | 67.3 | 15 |
| La Union... .......... | 8 ft. | 10 | 20.0 | None | 1.5 in. | Medium | | | | | | 0.30 | 1.50 | | 13.45 | 4.75 | 80 0 | 13 |
| El Bote... ......... | A.C. 8 ft. | 12 | 18.6 | None | 2 in. | Hard | | | | | | | | | | 30 | 70.0 | 13 |
| *Defender. .......... | Lane, 10 ft. | 8 | 36 | None | * | Medium | | | 0 54 | | | 5.80 | 13 70 | | | 30.51 | 69.5 | 10 |
| *Llano..................... | Lane, 10 ft. | 8 | 48 | None | 1 in. | Very hard | | 0.42 | 0.858 | | 2.37 | 5.34 | 13.84 | 3.65 | | 3 48 | 70.0 | 10 |
| Musgrove..... ...... | Lane, 10 ft. | 8 | 25 | None | 1½ in. | Extremely hard | | | | | | | 0 00 | | | 30 | 70.0 | 10 |

Private correspondence.

TABLE IV. CRUSHING EFFICIENCIES BY STADLER'S METHOD

| Chilean Mills | Final Pulp Grading | Tons per Horsepower-Day | Relative Mechanical Efficiency |
|---|---|---|---|
| South Dakota, high-speed, 3-roller.... | 39.4% through 200-mesh screen | 2 35 | 55.73% |
| Santa Elena, 2-roller, slow-speed..... | 67.3% through 200-mesh screen | 1.84 | 49 00% |
| La Union, 2-roller, slow-speed.. | 80 0% through 200-mesh screen | 1.70 | 46 13% |
| El Bote, 2-roller, slows-peed........ | 70% through 200-mesh screen | 1.43 | 38 77% |
| Stamps and Tube Mills | | | |
| East Rand, working figures—Marriott's report | 90% through 90 mesh | 1 53 | 40 48% |
| East Rand, working figures—James' report... | 90% through 90 mesh | 1 33 | 32 20% |
| East Rand, Argall's report—10-stamp test..... | 99 5% through 90 mesh........ | 1.74 | 49.98% |

## OTHER MACHINES USED

The ball mill is another type of grinding machine which has been used for breaking down fairly coarse ore to medium size. The lack of success of this machine, in general, has led operators to exclude it from serious consideration. It is expensive in operation, has not large capacity, and in general, does not succeed in competing with either stamps, rolls or chilean mills.

For fine grinding, the tube mill, taking oversize sand from other machines, is probably the best adapted, where a total slime product is desired. Tube mills are so widely used that there is very little argument to be made about them, and nothing to be said except that they fully justify their use. Various types of tube mills have been used, and in some cases efforts have been made to increase its efficiency by somewhat changing its form. Among the machines which have been highly recommended for certain work, as developments of the tube mill, may be mentioned the Hardinge conical mill. This well known machine is simply a cone-shaped tube mill. It has been highly successful in certain lines of grinding and for making certain grades of product, but its success along these lines has unfortunately led its advocates to recommend it for work which it will not economically perform. No doubt the Hardinge mill is highly successful in producing a thoroughly fine, granular product suitable for concentration, but when it comes to producing an extremely fine slime economically, it has not proved at all successful. The chilean mill greatly excels it for this purpose, as does also the straight tube mill, and perhaps other machines.

## PANS USED FOR FINE GRINDING

Pans of the Wheeler type have been largely used for regrinding ores, and not so many years ago there was a great agitation of the question of pans *versus* tube mills for making slime. Australian metallurgists have been accustomed to use grinding pans to a large extent, with the result that their work attracted the attention of other operators and the pan received trials in competition with tube mills and other machines. Due to the outcome of these trials, the pan lost its popularity, and is now seldom used except in small installations where first cost is a controlling factor. No doubt the efficiency of pans could be increased by such methods as described by G. F. Söhnlein[8], by means of which the pulp is made to enter the center of the pan, and cannot be discharged from it except by passing under the grinding millers. The former method of simply delivering the product into the pan and expecting it to be ground, proved disappointing. The speed of the mullers threw the heavy material, the part which needed grinding, by centrifugal force to the periphery of the pan, and it was not ground to any great extent, while the pulverized, light material, which needed no further grinding, was the portion which received it. Probably the lack of efficiency for this reason was one of the points which made the pan unavailable for successful, economical work.

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[5] "Eng. and Min. Journ.," Nov. 12, 1910.

[6] "Eng. and Min. Journ.," Aug. 12, 1911.

[7] "Loc. cit."

### OTHER MACHINES USED FOR GRINDING

Among the machines which have achieved a measure of success in regrinding sand and moderately coarse material, may be mentioned the Huntington mill, which at one time had a very large following among metallurgists. The Huntington mill is a variation of the edge-runner type in which the die stands vertically and the crushing wheel horizontally hung on a shaft which is pivoted about 2 ft. above the crushing point. Familiar as these mills were at one time, they have amply shown their inapplicability to almost all kinds of grinding because of their high maintenance expense. Huntington mills are seldom used now, and one rarely finds them in cyanide plants.

The Bryan mill is really a high-speed chilean, slightly modified, but identical in all practical respects. It may be included in the class of high-speed chilean mills, and is used in many plants for identical purposes. There are a large number of variations of the chilean mill being used for grinding purposes, but it is difficult to find any of them which are an essential improvement on the standard types. Among the variations of high-speed chilean mills, one finds various types of quartz mills having freakish differences from the standard. Some of them have round-faced wheels running in a round-grooved tire, while others are concave, and run on a convex die. Others, such as the Schranz mill, are a sort of a combination, this one having beveled rollers and a beveled track. The Griffin and the Kinkead mills are other comparatively well known variations, which have seen service in some plants, but which have not become recognized as standard assistants to successful milling.

### MANY TYPES OF ORE-BREAKING MACHINES

Having discussed these variations of regrinders, it would not be well to omit mention of some of the variations of ore-breaking machines which have been suggested for handling coarse ore. Attempts have been made to apply machines successfully in coal mining work to the crushing of hard ores, but generally without any success. Most of these machines succeed in grinding themselves up about as fast as they do the ore. One which may be somewhat different is the Williams hammer mill, which has already been described[9], as installed at the San Poil mill in the Republic district, in the State of Washington. While this machine has by no means demonstrated its success as an economical crusher of coarse ore, it still has done such work as to entitle it to a further trial extending over considerable time. With machines of this class, economy is to be the deciding point. The Williams machine surely does break up ore at an extremely rapid rate, but it would seem too much to expect that the wear on the machine would not be correspondingly great. If it can be proved that it is not, the mill will have, undoubtedly, a field of useful work.

Of the many styles of gyratory, jaw and roll crushers, which differ from standard practice, it would be impossible to give any interesting account. There are too many of them, and their success or use is so problematic that they are not entitled to serious attention.

The machines already mentioned include practically all of those which have been used for regrinding in cyanide work. There have been other machines, many of them of a freak nature, which have achieved temporary renown, but they have not proved their eventual applicability. Some of them have long since passed out of the memory of the practical operator, while some others are still fighting for a foothold. Whatever may be their merits, as they have not proved them, they cannot be considered at this time as factors.

I arbitrarily divide the reduction of ore into three sections. The first of these may be called breaking, and is performed by the use of the various machines classed as rock breakers. Sometimes these machines have been referred to as crushers, but I prefer to reserve that word for the second stage, including such machines as stamps, ball mills, chilean mills, of the fast and slow types. The third stage I call regrinding, that is, reducing to a fine-granular or slime state.

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## The Photostat

The photostat is a new and useful instrument that is being introduced by the Commercial Camera Co., of 323 Grosvenor Building, Providence, R. I. Its function is to copy drawings and documents. It does this by the application of photography, the essential feature of the instrument being a camera, combined with which is a developing apparatus. The sensitive paper is supplied in a roll, from which the camera is fed. After exposure, the paper passes directly into the developing bath, where it remains for 30 seconds, whence it passes into the fixing bath, after which the paper is washed and dried ready for use, all of this being done automatically by the instrument. The result is a photograph on durable, bromide paper. The whole operation is performed in less than one minute.

The sensitive paper comes in a roll of 350 ft., 11½ in. wide. An automatic device measures off the paper in lengths of either 14 or 17 in. This determines the size of the photographs, which are either 14x11½ in. or 7x11½ in. A subject larger than 14x11½ in. may be reduced to those dimensions; if small, it may be enlarged up to that limit.

The instrument photographs any color. Consequently, a reproduction of any sort of a map may be obtained. A photostat print shows white lettering on a dark background. To make a copy with white background and black lines, as in the original, the first photostat print may be finished and then placed on the copy board and photographed, giving the result desired. The photostat may be operated by daylight, but for steady work the best results are obtained by using electric light.

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[8] "Eng. and Min. Journ.," Sept. 27, 1913.

[9] "Eng. and Min. Journ.," Apr. 26, 1913.

The instrument costs \$500. The bromide paper costs \$14 per roll of 350 ft. According to the manufacturer, the cost of a photostat print 14x11½ in. does not exceed 5½ cents.

This is an extremely convenient apparatus for the counting room, drafting room and engineering office. Two important American mining companies recently equipped themselves with it.

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# The Reduction of Ferric Oxide by Ferrous Sulphide

By Lewis T. Wright*

In a suggestive article by E. W. Walter on "Magnetite in Mattes and Slags," which appeared in the Journal of Jan. 25, 1913, reference is made to some remarks by Roberts-Austen, who in his "Introduction to Metallurgy," states that:

> When ferrous silicate containing less than 30% of silica is exposed in a molten condition to the action of the air, the iron in excess gradually becomes oxidized and crystals of magnetic oxide are formed. These fall by their superior density to the bottom of the mass. Sometimes, as when such a slag covers a bath of impure metal, the magnetic oxide thus formed gives up its excess of oxygen to the elements in the metal to be refined and again becomes ferrous oxide and thus acts as a carrier of atmospheric oxygen to the carbon which has to be oxidized.

It should be noted that Roberts-Austen states that the oxygen is given up to the elements in the metal to be refined, and only specifically in this passage mentions carbon as one of the elements. Nothing is said here about sulphur or ferrous sulphide.

However, among certain equations given in the same work, Chapter IX, Thermochemistry, p. 348, fourth edition, is one which gives to ferric oxide the power of reducing ferrous sulphide to ferrous oxide, viz.:

$$Fe\,S + 3\,Fe_2\,O_3 = 7\,Fe\,O + SO_2$$

$$23.8 + 3 \times 199.4 - (7 \times 66.4 + 71) = +\,85.2$$

This equation, so far as it indicates that three molecules of ferric oxide oxidize one molecule of ferrous sulphide to ferrous oxide and is reduced itself to six molecules of ferrous oxide and oxidizes the sulphur to one molecule of sulphur, has a familiar appearance and seems to have been accepted by metallurgists. I cannot at the moment cite any older reference, but I think I had seen it before meeting it in Roberts-Austen's work. I do not know its history; I came across it quite recently again in Laist's article on the "Chemistry of the Reduction Process in Use at Anaconda, Mont." (Bull. A. I. M. E. No. 73), without the thermochemical data. As given by Roberts-Austen, it has made for me a great deal of trouble, and I want to see it dead and buried and forgotten.

In the first place, its arithmetic is wrong because its heat value would be negative, i.e., —86.2 and not +85.2. It would be endo- and not exothermic. But in another respect it gave me trouble. I worked hard in practice to get the degree of oxidation it offers and could not succeed. It afterwards occurred to me that it might have no existence in fact and for the following reason: It is commonly believed that copper mattes contain magnetic oxide ($Fe_3\,O_4$), which is a higher degree of oxidation than ferrous oxide. I personally accept the direct and indirect evidence I have been able to get, that mattes do contain commonly more or less $Fe_3\,O_4$ and sometimes quite a good deal. Indirect, because of the deficiency resulting generally from the allocation of all the iron to ferrous sulphide and direct because of determinations of the magnetic oxide as such and production of water from the matte when heated in a current of hydrogen.

I am also satisfied that mattes contain ferrous sulphide. There is then the everyday experience that magnetic oxide and ferrous sulphide can exist together peaceably in copper matte and are neutral to each other at furnace temperature and yet, in the face of that, we have this equation that shows that ferric oxide can be reduced by ferrous sulphide to ferrous oxide. If ferric oxide is reduced to ferrous oxide, why does the ferrous sulphide not reduce the magnetic oxide? Why should the deoxidation of ferric oxide go so far as ferrous oxide, and magnetic oxide be not so deoxidized, but remain in its higher degree of oxidation in the presence of molten ferrous sulphide? The answer is that ferrous sulphide cannot reduce ferric oxide to so low a degree as ferrous oxide. It can only reduce it to magnetic oxide and the familiar equation is wrong.

Simple experiments will convince the engineer that: (1) Magnetic oxide and not ferrous oxide is produced by melting ferrous sulphide with ferric oxide; (2) that ferrous sulphide and magnetic oxide do not react to give sulphur dioxide, but are neutral to each other; and (3) that nearer 10 molecules than three molecules of ferric oxide are required to burn out the sulphur of ferrous sulphide and that the reaction is probably better represented (using the same thermochemical equivalents employed by Roberts-Austen) as:

$$Fe\,S + 10\,Fe_2\,O_3 = 7\,Fe_3\,O_4 + SO_2$$

$$23.8 + 10 \times 199.4 - (7 \times 265.8 + 71) = -86.2$$

and that the old equation should disappear from our books.

One problem often leads to another. If $Fe_3\,O_4$ is formed in our furnaces or is put into them, it must be reduced, if at all, by some other agent than ferrous sulphide. It can, of course, be reduced by carbon and carbon monoxide, and perhaps by other means.

Recently Mr. Flynn (Eng. and Min. Journ., Apr. 12, 1913) has given an account of a most interesting experience that happened to him in the use of magnetite as an iron fuse and consequent troubles with "mushy" matte. I have read few such stories with greater sympathy than this of a furnace outlet being chronically frozen up with mushy matte and the heroic efforts to keep it open, and how the trouble was finally cured.

Sixteen years ago I had a very similar experience, excepting that in my case the magnetic oxide was formed in the furnace. The blast furnaces were in a chronic state of freeze-up, owing to mushy matte blocking the spouts, a trouble that was attributed to the presence of a little zinc in the ore. The layout of the mine had been nearly ruined by endeavors to mine ore free from zinc. The metallurgy was all muscular, and night and day the sounds of hammer strokes on steel bars dominted all others and became monotonous.

One morning the smelting-works superintendent came to my office, tendering his resignation and that of the blast-furnace foreman. They were at the end of their energies and stated that they had done their best and could do no more. The situation was at the point where

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*27 Pembridge Crescent, London, W., England.

I wanted it. I did not want to lose two splendid men, but I had to have them confident in what they were doing, if they were to stay. The furnaces were being worked with a very shallow charge. I told them to fill them up level with the charging floor. This was done, and from that afternoon we never saw mushy matte again and the trouble was quickly forgotten. I do not say that the charges were always thereafter kept up to the level of the charging floor, but they were never thereafter so low as they had been during the trouble. The mushy matter was overloaded with magnetic oxide. Mr. Flynn had the same trouble and cured it in the same way. The shallow charges did not give reducing reactions a chance, and it occurred to me to try an exactly opposite condition. I was depending upon the reducing action of the carbon of the coke and I wanted to give this a full opportunity.

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# Stratton's Independence Income-Tax Case

WASHINGTON CORRESPONDENCE

The Government has filed a reply in brief with the Supreme Court in behalf of F. W. Howbert, Collector of Internal Revenue for the District of Colorado, in the case of "Stratton's Independence, Ltd.," this being the case involving the applicability of the corporation tax to mining corporations, the contested issue in which was the matter of depreciation allowance. Three questions were certified to the Supreme Court—whether the act applies to mining corporations, whether the proceeds of ores mined by corporations are income, and whether if they are income such a corporation is entitled to deduct the value of ore as depreciation.

After contending that the act is applicable to mining corporations, the Government brief goes on to argue that the proceeds of the ore are income, contending that:

> When capital is by labor changed from a fund into a flow, it necessarily changes its character from capital to income. In the case of a mine, the mineral as it lies in the ground is capital, but when it is extracted, converted into ore and sold, the result is a flow: the tree has borne fruit, and income has accrued. The argument that, since this flow necessarily results in depletion or exhaustion of capital, therefore, the flow is a flow of capital and not of income, is entirely fallacious, according to the above definitions, the understanding of business men, and the practical necessities of a tax based on income. The law takes things as it finds them: it taxes property under the character which the owner has impressed on it, and where that owner voluntarily changes his funds of capital into a flow of income the law accepts the designation and taxes him accordingly.

The brief goes on to say that an ordinary life tenant may not open new mines, but when opened he may work them even to exhaustion, while a lease by the state of the mineral under its public land would not be a sale of such lands and the payment of dividends by mining company out of the proceeds of ore is not a payment of capital. Moreover, the fact that the operation of a mine may decrease its valuation does not prevent profits not spent in dividends from being called surplus. Lastly, it has been held by the Supreme Court of Pennsylvania that oil companies and mining companies have incomes within the meaning of an income-tax act. In summing up the Government says that:

> The principle for which the mining companies contend is not applicable to them alone, and if applied generally as it must be if applied at all would seriously hamper the working of an income tax. A pension or a terminable annuity produces an income at the expense of capital, but who would think of calling such produce any the less income?

As for the claim that depreciation ought to be allowed on the ore the Government says:

> In the absence of any showing to the contrary, the word "depreciation" here must be given its ordinary meaning in business usage, and also it must be taken as similar in meaning to a "loss." So considered, depletion of capital cannot be called "depreciation," nor would any business man think of so calling it. When capital is converted into income, as when a loaf of bread is eaten, it cannot be said that the capital has "depreciated"; it has merely been converted into another form. "Depreciation" takes place when the capital, retaining its form, decreases in value owing to wear and tear, change of fashion or methods of manufacture, or the like. When a fund of capital in a mine consisting of the ore in place is converted into a flow of income resulting in money to the owners, the ore has not depreciated; it has suffered a change. Gold is mainly valuable because it does not depreciate. The buildings, machinery, shafts, etc., do depreciate. They retain their form and use, but their value diminishes at different ratios with different causes. If a man have a stock of goods and he sell some and the balance becomes worthless through a change of fashion, it would be absurd to call the two processes by the same name, nor would any business man carry the results to the same account. In fact in the Nipissing Mines Co. case, in which a writ of certiorari from this court is asked, the company in its second return abandoned the theory of depreciation and replaced it with the items "return of capital," "distribution of capital nontaxable."

In closing, the claim is made that because the mining company never actually retained any sum and applied it to depreciation, but distributed the income in the form of dividends, no claim for depreciation can justly be made. The brief further undertakes to apply the reason in the case to coal-mining companies, as well as to those engaged in metal mining.

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# Grecian Chromiferous Iron Ores

According to Herbert K. Scott (*Trans.* Iron and Steel Institute, May, 1913), chromiferous iron in commercial quantities occurs in the western part of Greece, in the states of Lokris and Boitio, and on the islands of Euboea, Skyros, and others of the Greecian Archipelago, the most important ones being situated in the district bounded by the bed of the drained Lake Copias and the west coast of Talanta Channel. They are all within a few miles of the coast, along which excellent harbors are numerous. Operations are conducted by eight important concerns, the combined output of which up to the end of 1912 was about 1,930,000 tons. The ore consists of hard grains and nodules, up to ½ in. diameter, of hematite combined with a matrix of more hydrated, amorphous and softer ore, and occurs in lenses and fissures in association with limestones and serpentine. The average composition of the ore (dried at 212° F.) from different deposits is as follows: Fe, 46 to 52; Al, 6 to 14; $SiO_2$, 5 to 11; Cr, 2 to 3; Ni and Co, 0.10 to 1.2; P, trace to 0.03; S, 0.02 to 0.05; Ti, trace to 0.30%. The cost of quarrying is about \$0.60, and of mining, about \$0.72 per ton; transport to harbor, in the most expensive case, is \$0.24; the total cost, including state charges, of putting the ore into vessels is about \$1.21 per ton, and the selling price, f.o.b., is about \$1.45 per ton. Freight rates to western Europe are now about \$1.70 per ton. The ores are similar in many respects to the Mayari ores of Cuba, and, it is thought, may be utilized in the same manner for direct smelting into special irons.

# Russian Iron and Coal

The make of pig iron in Russia for the past two years is given by a recent official report as follows, in metric tons:

| | 1911 | 1912 | Changes |
|---|---|---|---|
| Foundry iron | 681,898 | 730,942 | I. 49,044 |
| Steel making irons | 2,801,668 | 3,355,590 | I. 553,922 |
| Special iron | 109,598 | 111,106 | I. 1,508 |
| Total | 3,593,164 | 4,197,638 | I. 604,474 |

South Russia was the largest producer in 1912, making 67.7% of the total. The Ural, with 19.7%, was the second.

The production of steel ingots is given as follows, in metric tons:

| | 1911 | 1912 | Changes |
|---|---|---|---|
| Acid converter | 509,762 | 596,854 | I. 87,092 |
| Basic converter | 156,937 | 190,254 | I. 33,317 |
| Open hearth | 3,188,481 | 3,649,218 | I. 460,737 |
| Crucible, etc | 90,417 | 61,867 | D. 28,550 |
| Total ingots | 3,945,597 | 4,498,193 | Il 552,594 |

The acid converter or bessemer steel was made altogether in South Russia and the Urals.

The production of finished steel as reported was 3,320,341 tons in 1912, and 3,727,105 in 1913; an increase of 406,764 tons. The larger items of this production in 1912 were 1,286,158 tons bars, shapes, etc.; 623,914 tons rails; 457,002 tons plates; 362,403 tons sheets; 287,305 tons beams, angles and girders.

The output of coal for the two years was as follows, in metric tons:

| District: | 1911 | 1912 | Changes |
|---|---|---|---|
| Donetz basin | 19,934,460 | 21,284,172 | I. 1,349,712 |
| Dombrova | 5,914,818 | 6,461,910 | I. 547,092 |
| Urals | 694,512 | 776,412 | I. 81,900 |
| Central Russia | 178,543 | 211,302 | I. 32,760 |
| Caucasus | 55,692 | 68,796 | I. 13,104 |
| Total | 26,778,024 | 28,802,592 | I 2,024,568 |

The total increase last year was 7.6%. The Donetz basin is by far the largest producer, mining 73.9% of the total.

# Michigan Copper Mines That Will Close for the Winter

Special Correspondence

Several of the mines in the Lake Superior copper country will remain closed all winter. Among these are the Franklin, Mass Consolidated and the Tamarack, the last a Calumet & Hecla subsidiary. The Tamarack has been experiencing considerable difficulty maintaining a position where it would not show a loss in operations. When the price for copper was low the management actually considered closing the mine for some time. Only consideration for the men employed at the property prevented action of this nature. Now, however, with a scarcity of workingmen in the district there is no real reason for reopening the property. The loyal workingmen, residing in Tamarack houses, are given employment in other mines of the district. In fact, most of these already have positions at the Calumet & Hecla.

At the Franklin property nothing is to be gained by reopening the property in the immediate future. The strikers were notified some time ago, by the management, that their places would be filled by other men, whenever the company decided to reopen the mine, which will not be for some months anyway. At the Mass Consolidated the shafts have been boarded up and there will be no effort to open the mine until next spring. It is believed that by that time other miners can be secured for these properties.

At the Calumet & Hecla 1200 men are at work underground. This is two-thirds of the normal underground force. Of the trammers, about one-third have returned to work. At the Quincy 120 men have been brought in from outside the copper district. These men are working and are pleased with their jobs, their pay and the situation. Notable acquisitions to the working forces have been made recently at the Trimountain and Champion mines, mostly among miners who left in the early days of the strike and went to the iron mines or to Butte. These men are coming back to get their old places again. Their experiences in the iron district and in Butte were convincing to them that the copper mines are pretty good places in which to work.

# Method of Financing Mining Property

By S. M. Soupcoff*

Few except those well acquainted with the mining industry can appreciate the efforts being made by the various exploration and development companies, and individual mining men, to secure mining properties which possess sufficient merit to warrant development. At present all the countries of the world are being thoroughly scoured by engineers representing wealthy organizations to secure mineral-bearing ores. Thus, the Guggenheims are represented in North and South America, Africa, and other parts of the world, operating on a large scale, developing mineral deposits of various types.

The various interests seeking mineral properties can be subdivided in three classes. First: the large exploration companies, such as the Canadian Mining & Exploration Co., Guggenheim Exploration Co., United States Smelting, Refining & Mining Co., New York Exploration Co., London Exploration Co., British Venture Corporation Co., Mines Finance Co. and the Mines Selection Co. These corporations are in the business of discovering, developing and financing mining properties, and are supported financially by the wealthiest men of the world. They each possess a complete technical corps of experienced mining engineers, mining geologists and practical miners, whose purpose is to seek properties that have indications of intrinsic worth. Their field of operations is the whole world and they are amply supplied with sufficient money to undertake the development of any type of deposit, irrespective of its magnitude.

The method used by these companies for investigating the properties submitted to them is simple. They have branch offices in various parts of the world; each branch office is under the supervision of an experienced mining engineer, who is familiar with the particular section of the country in which he is operating. Under him are one or more graduates of accredited technical schools with five to ten years of experience. They are commonly known as field engineers or field scouts and their duties consist of making preliminary reports on properties and consulting with the local representative. A property reported on favorably by the field engineer is further investigated by the engineer in charge of the local office, and if he be favorably impressed, the property is then brought to the attention of the main office, and is finally examined for purchase. This last examination is thorough, and on large mining operations costs, in some cases, as high as $25,000.

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*Catlin & Powell, 25 Broad St., New York.

As a rule, a lease and bond is taken on the property, and an agreement to make periodical payments results. It is also stipulated that the company undertaking the purchase of a property shall expend a certain amount of money within a specified time to develop it. Most mining prospects are sold on this basis, and only in rare instances are outright purchases made. This occasionally happens in the case of mines which have ore blocked out and when estimates of value per ton, cost of mining and milling, and net profits can be estimated reliably.

In preparing data of a mine or prospect to be placed before one of the above mentioned companies, extreme care should be taken to provide a report on the property by a reputable mining engineer, including assay plans, maps, smelter receipts and all other data necessary in order to permit the officials of the company to decide whether the property merits further investigation. Above all, if you do not possess a property of sufficient merit to justify the utilization of their time, don't bother them, for your efforts will be given scant consideration.

The second type of seekers for mines are large operating companies, such as, for instance, the Tonopah Mining Co. and Tonopah-Belmont Development Co., of Nevada; La Rose Mining Co. and Crown Reserve Co., of Cobalt, and others too numerous to mention. They operate on the same system as large exploration companies, but to a lesser extent. Their object is to secure new mines to perpetuate the corporation and also have in view the fact that mining, when conducted on a business basis, is a profitable industry. They diminish the risk as far as possible and may expend years of effort and thousands of dollars before accepting a property for purchase. If they do purchase a good mine, they soon make up for lost time, money and effort. Out of three hundred or more properties examined by the Canadian Mining & Exploration Co. since its inception, it has not undertaken the purchase of one.

The third and last division of mine seekers consists of individuals strong enough to operate alone and a few of the more prominent are: Senator W. A. Clark, James B. Haggin, Capt. De Lamar, George Wingfield and M. J. O'Brien, of Renfrew, Ontario. These men have engineers in their employ who look up and examine all prospects and mines submitted to their attention, except in the case of Wingfield, who limits his operations to Nevada and the Western states. The others mentioned own mines in all parts of North and South America.

The statement is commonly made that money with which to finance a good mining property is difficult to secure. This is a bad mistake. Money for good, legitimate mining properties can be easily obtained from any of the above mentioned companies, but they are from "old Missouri" as a rule, and you certainly have to show them. That happens to be a difficult thing to do in ninety-nine per cent. of the cases.

The day of the rank wild-catter has passed into obscurity. Like the buffalo, he has gone to return no more. Uncle Sam, aided by the American Mining Congress, the technical publications and other forces, has made it difficult for this class of parasites to operate. If you possess good mining property, consult the nearest reputable engineer and have him assist you in communicating with capital, but remember that the principal part of the whole matter is to be sure that you have a good property before you make any efforts to communicate.

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# Quicksilver Operations in Northern California

By Lewis H. Eddy*

Quicksilver production in the northern districts of California should be largely increased in the next two or three years, due to the successful outcome of experiments being made in the metallurgy of cinnabar ores. There are a number of mines that have been closed down for several years, owing more to the expensive methods employed in the treatment of low-grade ores, than to the low price of quicksilver. These mines should be reopened when it has been practically and commercially demonstrated that the concentration of cinnabar can be economically accomplished.

This demonstration has been made in the Sulphur Creek district of Colusa County in a small way by G. V. Northey, former owner of the Manzanita mine. The mine produced in the several years of operation about 2000 flasks, all of which was recovered by milling and concentration, in a plant made up of a Huntington mill, Gilpin County bumping tables and a small canvas table. When the mine was sold recently, the bumping tables were removed to the Aetna mine in Mayacmas district, Napa County, where they have been installed by Bror Soderhjelm, who is operating the mine on a lease. The ore is here ground in a cement mill. At the Oat Hill mine in the same district, the tailing dumps are the source of supply for a concentrating plant installed by R. P. Newcomb. This experimental plant requires no grinding mill. The tailing is shoveled into a trough flume, where it is washed and then screened, the pulp passing to a crosswash-type concentrating table. In the trial runs, the recovery has equaled three pounds of quicksilver per ton of tailing. The tailing dumps of the Oat Hill mine contain many thousand tons, and there are many other mines in this and other districts of the State containing dump values equal to the Oat Hill that may be worked by similar methods of concentration at very low cost.

The method applied to ores which must be crushed or ground is also capable of low treatment costs. The Wall mine, also in Mayacmas district, has a crude but effective concentration plant treating soft ore from the mine, which is crushed by a simple grinder, and the pulp goes over a table built on the principle of the Oat Hill plant, but much simpler. At this mine the concentrate is mixed with the hard ore which goes into the pipe retort furnace.

These various experimental plants are proving the principles of concentration applied to the metallurgy of cinnabar ores. There are improvements to be made, and there will arise, no doubt, metallurgical problems which will have to be solved; but the demonstrations have been sufficient to indicate the possibilities of commercial recovery of quicksilver by concentration.

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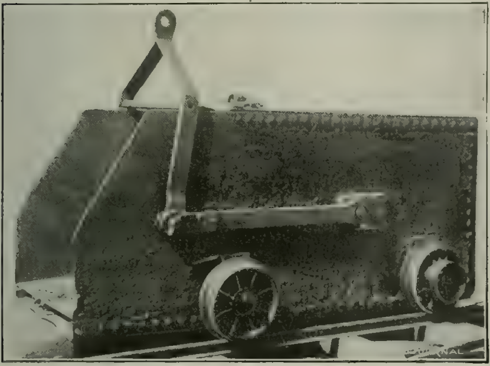
*3130 Peralta St., Oakland, Calif.

# DETAILS OF PRACTICAL MINING

## Jointed-Bail Skip

The skip herewith illustrated is the type in use on the slopes or inclined shafts of the Chateaugay Ore & Iron Co., at Lyon Mountain, N. Y. It differs from standard types chiefly in the fact that the bail is hinged in the middle as well as pivoted at the point where attached to the car. The reason for this lies in the extremely irregular grade of the track, which follows more or less closely the foot wall of the deposit. A one-piece bail would tend to lift the lower wheels of the skip from the track when going over a brow, that is, when a descending skip passed from a flat portion of the skipway to a steeper portion, or before an ascending skip passed from a steep portion to a flat. This would result from the rope's being forced by the roller at the brow to take a flatter angle than the track, thus depressing the bail till it rested on the stops above the upper wheels, when a certain component of the rope pull would tend to make the skip pivot about its upper wheels and lift the lower end. The possibility of this happening is obviated by the insertion of the joints at a point just above the stops. The upper portion of the bail thus is always continuous with the rope and the effect is to reduce to such a point the leverage of the lower portion of the bail on the stop that it cannot exert sufficient pull to lift the lower wheels from the track.



Skip for Shaft of Varying Inclination

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## Preserving Underground Survey Points

In the Cananea Consolidated, observation has shown that survey plugs driven flush with the rock of the back or slightly inside the hole are less subject to rot than when allowed to project. Protection against rot is important, not only as giving the station a longer life, but as giving more assurance to the surveyor of its not having been disturbed. A brass spad is used now in preference to those made from horseshoe nails.

When survey points have to be set in timber, especially in new timber near a face, it has been found well worth while to carry the point down from the spad in the cap to a point on the sill or on a hub in the bottom. The cap and consequently the spad is more subject to movement than the point in the bottom. Furthermore, with the point set in the floor, any movement can be readily detected.

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## A Drill Tester for the Shop

A device for obtaining graphically and rapidly many of the essential characteristics of rock drills without subjecting them to actual drilling tests, U. S. Pat. No. 1,062,662, has been devised by William D. Paynter, of Grass Valley, Calif., the machinist in charge of the repair and upkeep of machine drills of the North Star mine. Its general appearance with a stoper under test is shown in Fig. 1. Fig. 2 is a somewhat diagrammatic representation of the same arrangement.

The base has a pedestal bolted to its left-hand end in which a vertical pillar is clamped by a split collar. This pillar carries a horizontal longitudinal arm on which may be clamped an ordinary saddle for a piston or Leyner machine, or a carrier for use as a back-stop with air-feed hammer stopers. An air-feed stoper is shown suspended by hangers from a suitable support. The pillar permits vertical adjustment and the clamp gives a horizontal movement.

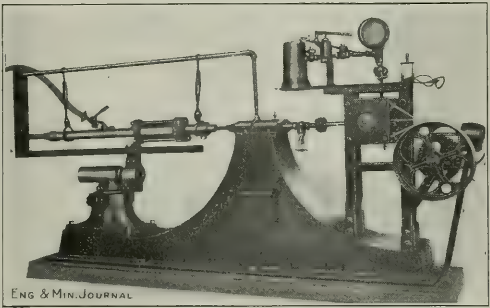

Fig. 1. The Machine with a Stoper under Test

The central part of the base rises to carry the cylinder and plunger device as shown. One end of the plunger projects through the cylinder and against this bears a bar, which is ubstituted for the bit in the drill. The other end of the cylinder communicates with a pipe to the diaphragm chamber, carried on a framework at the right-hand end of the machine.

The diaphragm chamber is shown in more detail in Fig. 3. It consists of a plate, recessed to form a chamber which is closed with a diaphragm of highly tempered steel. This diaphragm is held under a cover ring and its motion is adjustable by studs on the inside and stop rings in the nature of bushings on the outside. The cylinder, pipe and diaphragm chamber are filled with oil by a pump from the reservoir shown, and there is also connected with this oil system a pressure gage.

A rod is secured to the center of the diaphragm so as to move with it and carries a spring which governs its motion somewhat. An arm called the multiplying lever is moved by this diaphragm rod, being pivoted at one end and carrying a recording pencil on its long arm. The pencil bears against the paper on a revolving drum which is driven through worm gearing by a small motor.

The feed pressure and blows of the drill are communicated to the plunger by the bar which bears against the plunger end. They are transmitted by the noncompressible oil so as to vibrate the diaphragm, the movements of which are magnified by the pencil arm and recorded on the paper of the drum. The speed of the drum is uniform and can be calibrated by the use of a pendulum. The movement of the pencil across the paper, corresponding to the strength of the blows, can be calibrated by measuring it against readings on the pressure gage.

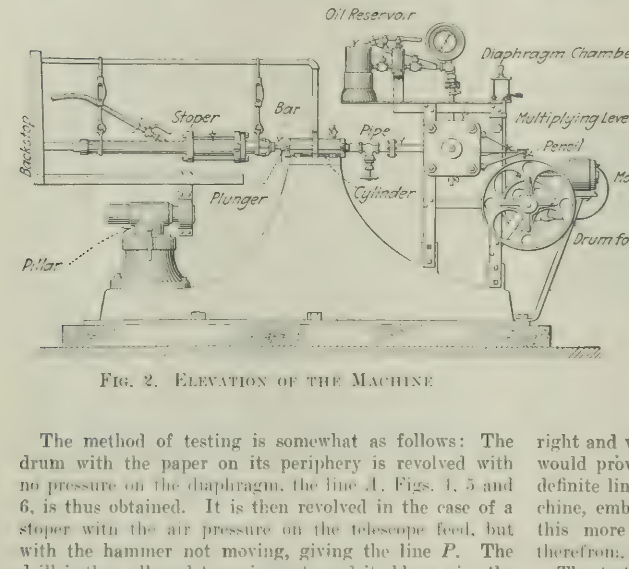

Fig. 2. Elevation of the Machine

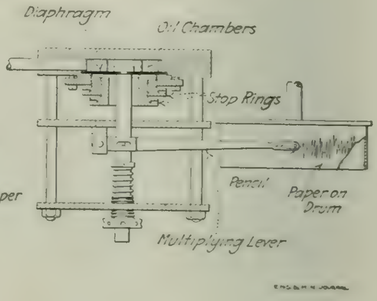

Fig. 3. Plan of Diaphragm, Recording Arm and Drum

The method of testing is somewhat as follows: The drum with the paper on its periphery is revolved with no pressure on the diaphragm, the line *A*, Figs. 4, 5 and 6, is thus obtained. It is then revolved in the case of a stoper with the air pressure on the telescope feed, but with the hammer not moving, giving the line *P*. The drill is then allowed to reciprocate and its blows give the irregular line shown, the impact of the hammer forming the line *BC* and the return of the diaphragm, the line *CD*.

Fig. 4 represents a test on a typical stoper in which the air pressure was 100 lb., the number of blows struck was 1284 per min., and the foot-pounds developed per blow calculated to be 50. This would show a little less than 2 hp. developed. In Fig. 5, obtained from a similar machine, there will be noted a secondary blow, the cause and effect of which are not yet determined. In this case the air pressure was 96 lb., the blows per min. 1260 and the foot-pounds per blow, 40. Fig. 6 is the graph obtained from a machine in poor shape. The air pressure in this case was 84 lb., the blows per min. 1272, and the foot pounds per blow, probably about 15. These two last mentioned machines drilling in hard rock under the same pressure 84 lb., made 0.105 ft. and 0.051 ft. per min., respectively, thus confirming the indications of the tester. It is evident that the tester fulfills much the same function as a steam-engine indicator in giving an energy graph, valuable, however, more for its indications of condition and adjustment than for the quantitative measurements. It differs from the steam-engine indicator in measuring output rather than input.

The development of the machine grew out of the necessity of preventing defective drills from going underground. At the North Star the machines are usually taken on a truck from the shop to the shaft collar, unloaded, and loaded on a cage, unloaded again at the shaft turn, loaded on a truck to go up the main raise, unloaded at a level station, loaded in a car and taken to the top or bottom of a stope, unloaded and carried to the working face. Evidently this is a process costing money. If the machine will not drill when set up, it means a definite loss to the company, augmented by the fact that the irritated miner will work less efficiently for the rest of the shift. It was found impossible to detect the defective machines in the shop. One which might sound all right and work well when set up and run against a block would prove quite useless underground. To get a more definite line on the conditions of the drills, a simple machine, embodying the principle described, was built and this more complete and convenient device developed therefrom.

The tester has served this purpose excellently, but it also lends itself to investigation along other lines. The effects of changes in pressure, lubricant, etc., can all be investigated in this way more easily and more exactly than by actual drilling tests. A test to ascertain the effect of a difference in pressures indicated that a drop of 32% caused a drop in the strength of the blow of 31%, but a drop in speed of only 12%. Underground tests showed that a drop in air pressure of 28% gave a decrease in drilling speed of 17% with sharp steel; a pressure drop of 22% gave a drilling-speed decrease of 16% with dull steel; a pressure drop of 28% in another case gave a drilling-speed drop of only 25%.

A test with different lubricants showed that a change from heavy lubricant to medium gave an increase in blows per minute from 1116 to 1212 and of foot-pounds per blow from 25 to 34, while a change to light oil again gave increases to 1224 and 38. This test, however, was made on a new machine and it may be that smaller differences would be found in the case of an old machine.

The statement is frequently made that excessive air consumption indicates that a drill is in bad condition. A large number of tests indicated that machines of a certain type had an average air consumption of 75 to 80 cu.ft. of free air per min. at 90 lb. pressure. A test of a machine of this type using 90 cu.ft. gave 1296 blows and 43 foot-pounds, high figures, which indicate that increased air consumption does not necessarily indicate poor condition. A further field of usefulness lies in testing out new equipment. Thus in one instance four new valves were obtained from the manufacturers and when tested in machines, one was found defective. Investigation showed a piece of steel-cutting clogging a port so as to throttle the air and reduce the strength of the blow 35 per cent.

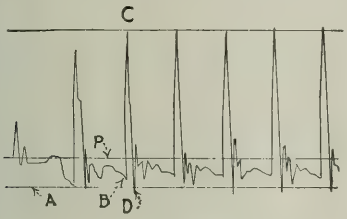

FIG. 4

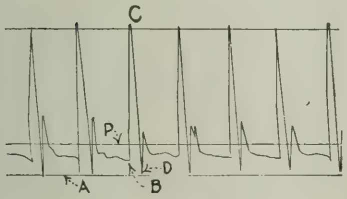

FIG. 5

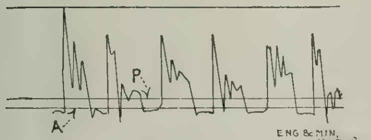

FIG. 6

TYPICAL CARDS OBTAINED WITH THE TESTER

It would seem as if one of the most extensive fields of application of the device would be in comparing drills of different makes. Many inferior types could be eliminated at once in a preliminary test on the machine and only the high-class drills reserved for further test in rock. The tester should receive a welcome both from mining companies and drill manufacturers. A mine of any size at all could well afford to install one. It is adapted to test both hammer and piston machines.

⁂

**A Simple Rule for Inflating Pneumatic Tires** was given recently by the service manager of one of the tire companies, according to "Engineering News," and is applicable to tires of all sizes. According to this rule the front tires should be inflated to a pressure in pounds equivalent to 17 or 18 times their cross-section in inches and the rear tires to 20 times their cross-section, thus 34x4-in. tires should have a pressure of about **70** lb. on the front wheels, and 80 lb. on the rear.

# Safety Rules—Belts, Pulleys and Shafts*

(1) Belt, rope and cable transmission shall be arranged, so far as possible, to be easily guarded.

(2) Pipe or angle railing placed 18 in. from the pulley or belt shall be provided where there is little danger of anyone's getting caught by the belt.

(3) Wire-mesh or perforated-plate casing shall be provided where the location of the belt is such that persons are liable to get caught between the belt and the pulley.

(4) Where the belt is located in such a position that, should it break, flying ends will strike persons passing by the belt, it should be inclosed by a suitable guard.

(5) The width of a belt should be allowed between two pulleys or a pulley and a hanger on shafting so as to prevent the belt from becoming wedged and possibly pulling down the line shafting.

(6) Belt splicing shall be made so as to eliminate ragged edges or projections which might catch employees' clothing. Endless belts are recommended, especially for high-speed machines.

(7) Belts should be inspected frequently and kept in a condition to avoid accidents. Tight belts should be avoided.

(8) Wherever it is necessary to shift belts a mechanical device should be provided.

(9) Where it is necessary to unship a belt, a hook or belt-perch should be provided to prevent the belt from resting on the shaft.

(10) Shafting not over 12 in. above floor should be covered.

(11) Shafting over 12 in. and not over 7 ft. above floor should be encased or railed off.

(12) Exposed ends of shafting shall be encased or otherwise guarded.

(13) Overhead shafting which must be oiled should be equipped with a walk for the oiler, if practicable.

(14) Electrically driven shafting should be provided with a safety switch, to be used when men are working on it. This switch should be placed at the top of the ladder or in some place where no one will tamper with it.

(15) Shaft couplings should be guarded where safety coupling is not used.

(16) To prevent gears or pulleys from working off the ends of shafting, shaft ends shall project at least the diameter of the shaft beyond the hub of the gear or pulley, so that the key can be locked in place.

(17) Hangers for shafting shall be particularly strong and well secured.

(17) All projecting keys in shafting when exposed so that a person might get caught thereon, shall be guarded or cut off.

(19) Wherever possible, cotter pins or spring washers should be provided to prevent nuts from working off the ends of bolts.

(20) Setscrews must be guarded, countersunk or placed in safety collar with flanges high enough so that the setscrew head will not project above the flange.

(21) Because of the dangers incident to hoisting material by means of line shafting, it is forbidden that any

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*From Inland Steel Co.'s book of rules.

hoisting be done in this manner. All hoisting shall be done either with hand tackle and block, or with regular hoisting machinery.

⁂

## Tramming System, Mount Royal Tunnel

The manner of handling the muck cars in the face of a typical heading of the Mount Royal tunnel, Montreal, is outlined in *Mine & Quarry,* July-August, 1913. After the blast, cars 1 and 2 of the illustration are pushed in by the men as they go to their positions, and are set on the two tracks as shown, 2 being a little bit back of 1 in order to give the muckers sufficient room to swing. Car No. 1 is loaded first. Before 2 is loaded, one of the two storage-battery locomotives which are used, has brought in cars 3 and 4, which it couples to car 1, runs back to the near switch, pushes up and couples to car 2. It then returns the empties 3 and 4 to the track from which 1 was taken, picks up 1 and 2, and proceeds with them to the shaft. Car 4 is pushed back to the switch and ahead again on the other track by a man called the car wrangler, so that 3 and 4 now occupy the positions in which 1 and 2 were first shown. The second locomotive, which has passed the first locomotive at a siding about midway between the face and the shaft, now comes in with two more empties and repeats the operation. By this system no time is lost by the muckers in waiting for cars. The spur track is changed frequently, so as to reduce the switching distance necessary.

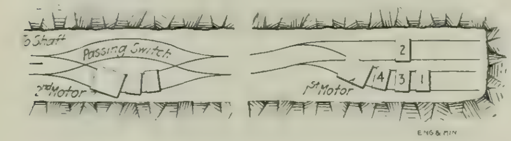


DIAGRAM OF METHOD OF HANDLING CARS

⁂

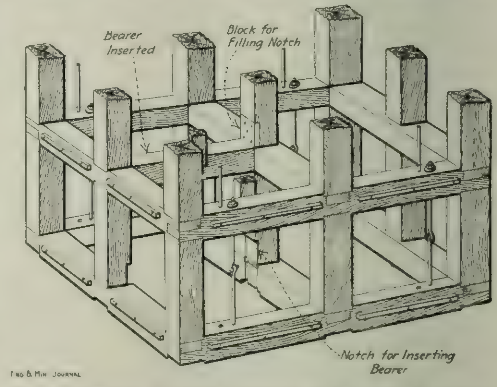
## The Dead Load of Hoisting

Extensive tests and measurements were made in various Butte shafts by Nordberg engineers, preliminary to the installation of new hoisting machinery. The figures obtained show the importance of dead loads in hoisting. From the descriptive article published in the A. I. M. E. Bulletin for September, it appears that the weight of the Speculator round rope was 4800 lb., while the flat ropes at the Diamond, High Ore and Mountain View shafts weighed 10,700 lb. each, these weights covering a depth of 1800 ft. The skips and cages in each case weighed 11,000 lb., and the normal load of ore was 10,000 lb., except at the High Ore, where it was 8000 lb. The ratio of dead load to useful load is, therefore, for the Speculator, 1.58; for the Diamond, 2.27; for the High Ore, 2.84; and for the Mountain View, 2.27. These are greater than in average hoisting practice, inasmuch as in Butte the cage is permanently attached to the skip, and for great depths flat ropes become exceedingly heavy. The magnitude of the dead loads is an important factor in the mechanical efficiency of hoisting operations, since it influences the friction and the dynamic energy that has to be supplied during acceleration and released during retardation. This dynamic energy is lost in the form of heat on the brake shoes ordinarily. The difference in the weight of the round and flat ropes is noteworthy. Ordinary figures do not give such a wide variation in the weights of the two types used to handle the same load. This additional weight of 2½ tons for a flat rope having the same live load is a strong count against this type. Their easy inspection where corrosion is rapid is the main argument in favor of flat ropes, although reels offer advantages from the point of view of lightness.

⁂

## Delayed Placing of Shaft Dividers

When sinking through soft or heavy ground in Butte, it is necessary to keep the last set close to the bottom of the shaft. In such case the muck fills almost to the timbers, and mucking becomes awkward (A. I. M. E. Bulletin, August, 1913). In such cases it is customary to omit one of the dividers in the bottom set. An area 2 in. deep is cut from the post just above the plate and when a new set is placed, the divider of the set above is pushed into this opening and hammered down into place. The 2-in. opening is then filled with a block. The method of doing this is shown in the accompanying illustration, which, it should be noted, however, is not the typical arrangement for a Butte shaft-set.



SET SHOWING DIVIDER OMITTED FOR LATER PLACING

In case a guide girt is used, which is really an auxiliary divider used to give support to the guide, this also can be omitted and put in from the side at the same time that the divider proper is inserted, being then wedged and allowed to become solid from the side weight of the shaft. In case a guide post is used and is framed into the divider with a mortise and tenon, the divider cannot be inserted in this manner. It is then framed with straight sides and pushed up from the bottom, being held in place by the posts of the set below. This method makes the framing cheaper and is sometimes used where the mortise and tenon guide post is not installed. It is, however, inferior to the first mentioned method. When the wall plates of a shaft have been pushed in so that the divider is hard to set, they can be spread with a small bar of 3-in. pipe with a screw end similar to that used for machines.

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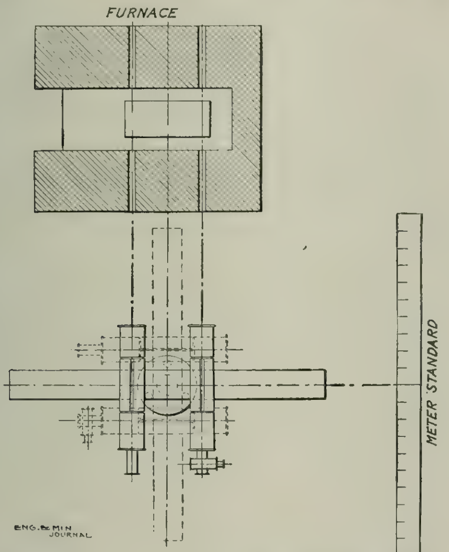
**The Murex Magnetic Process** (cf "Eng. and Min. Journ.," Dec. 7, 1912) has been in operation at Clausthal on the mixed ores of blende and galena for some time and the results are said to give satisfaction

# DETAILS OF METALLURGICAL PRACTICE

## Testing Firebrick for Use in Coke Ovens

A description of apparatus used by Baron Coppée for measuring the expansion of firebricks is given in the *Iron and Coal Trade Review*, Sept. 26, 1913.

The apparatus consists of a furnace for heating the bricks, a cathetometer for observing the expansion, and a standard meter scale for measuring the amount of the expansion, together with the necessary thermometers and pyrometers for taking the temperature readings. The cathetometer is of a horizontal type, composed of a metal bar mounted on a central pivot and carefully adjusted, so as to be capable of being rotated in a true horizontal plane. The bar carries two sighting telescopes, fitted with fixed vertical and horizontal cross-wires. One of the telescopes is fitted in addition with a movable vertical cross-wire, attached to a delicate micrometer screw. The telescopes can be moved along the bar in a horizontal direction and are fixed by clamps.



Arrangement of Apparatus for Testing Firebrick

The furnace is of suitable size to hold bricks up to 10 in. long. For temperatures up to 1000° or 1100° C. the furnace is heated by gas, but for higher temperatures than this a gasoline blow-pipe is brought into use. Two small openings are made in the side wall of the furnace at a distance apart which is slightly less than the length of a brick. The standard meter scale is of H section, made of "Invar" metal, divided into millimeters, and is exact to within 0.01 mm. Temperatures are measured by mercury thermometers and pyrometers of Le Châtelier, Féry and Wanner types.

By means of an ordinary saw and emery powder, cuts about 5 mm. in depth are made on the face of the brick, not less than 1 cm. from each end. A thick platinum wire is then fixed in each cut, so that the ends of the wires, which are finely pointed, project some 2 or 3 mm. above the end of the cut. The brick is placed in the furnace so that the points of the platinum wires are visible through the openings in the side wall of the furnace. The cathetometer is placed at a distance of about 1.5 m. from the brick, and its bar is adjusted so that the horizontal cross-wire of each telescope is on a level with the top surface of the brick. The telescopes are focussed on the platinum points and then adjusted so as to bring the platinum points exactly on to the fixed vertical cross-wires of each telescope. This fixes the distance between the platinum points, which distance has next to be read on the standard meter scale. For this purpose, the scale is placed at right angles to the cathetometer, and at a distance from it equal to the distance between the cathetometer and the brick. On turning the cathetometer through 90° degrees the cross-wires are brought on to the scale, and it remains to read the distance between them, which is done in the usual way in which a cathetometer with micrometer eyepiece is used.

The furnace is then heated up and similar readings are taken every 100° up to 1400° or 1500°. The complete results are plotted as a curve whose coördinates are the temperature and the distance between the platinum points, respectively.

Results are accurate to about one part in 22,000.

⁂

## Improving Arsenical Copper

In a paper before the Institute of Metals, at the Ghent meeting, F. Johnson records the results of an investigation of the properties of specially alloyed arsenical copper with a view to proving its suitability for use as locomotive stay-rods, wire for rivet manufacture, and any material required to have specially high malleability, ductility and toughness combined with tensile strength and resistance to reducing gases at high temperatures. An improvement in quality in these respects has been obtained by adding silicon and iron to the copper in various small proportions. When added to the copper in the form of a copper-silicon-iron alloy (of low melting point) complete deoxidation is effected, and, in addition is so thorough that perfectly sound ingots are obtained. In the absence of bismuth and other like impurities which cause red shortness in deoxidized copper, the ingots behave perfectly when rolled at a bright-red heat, even if silicon and iron are present together in considerable excess of the amount required for deoxidation. It is shown that silicon is a more efficient deoxidizer than iron, but that iron has a greater strengthening effect than silicon. Complete analyses of the rolled bars have been made, and it is noteworthy that the added elements confer greater toughness than is possessed by "tough-pitch" copper containing oxygen and a similar quantity of arsenic. Heat treatment of the experimental bars in a reducing atmosphere also proves their immense superiority over "tough-pitch" arsenical and nonarsenical bars. The experiments have been backed up by works' tests on a larger scale. Tensile tests at the temperature of high-pressure steam show that the specially alloyed bars are in no way inferior to "tough-pitch" copper of similar arsenic contents. The above mentioned improvements have not been gained at the expense of any of the properties considered to be essential in commercial "tough" copper for locomotive stay-rods. Certain physical characteristics of the experimental bars are revealed and differences in behavior explained by the aid of the microscope.

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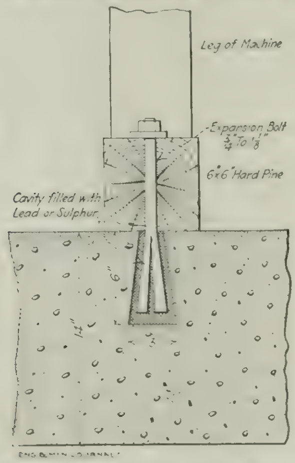
## Attaching Machinery to Concrete Floors

The problem of fastening machinery to concrete floors easily and economically is always of interest, says John S. Nicholl, in the *American Machinist,* Oct. 9, 1913, and the following method may prove of value.

The machines in question weighed about one ton each and were run at such a speed as to cause injury to the concrete unless all vibration were absorbed. No provision for attaching the machines was made in the original design.


Leg of Machine
Expansion Bolt $\frac{3}{4}''$ To $1\frac{1}{8}''$
6x6" Hard Pine
Cavity filled with Lead or Sulphur
ENG & MIN JOURNAL

Attaching Machinery to Concrete Floor

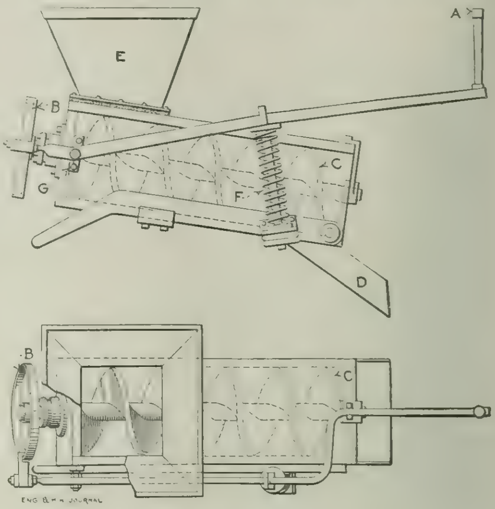
The owners therefore decided first of all to sink holes 6 in. deep and 3 in. wide, tapering at the top. This was done with an air drill.

Expansion bolts were then put into the cavities and were held in place by pouring in lead, the latter serving as a cushion. The machines were fastened to 6x6-in. hard pine beams, nuts with washers being used. In place of lead the manufacturers have used sulphur, but not with such good results. In cases where the vibration was excessive, $\frac{1}{4}$ in. sheets of rubber were placed under the beams with good results.

The owners report that the vibration of the machine has now been taken care of, all the machines operating satisfactorily on the concrete floors without any liability of damage.

## New Feeder for Stamp Mills

A feeder for stamp mills, which operates on a principle somewhat different from the usual one, has been designed by Thomas Sutton, of California, and patented under U. S. No. 1,047,589. Its operation is apparent after consideration of the accompanying drawing. The movement is imparted at *A* by the tappet and communicated by the lever, pivoted at *G* to the wheel *B*, which is grasped by a plain wrench grip. This allows free movement in one direction but carries the wheel with it in the other. Fixed to the shaft of the wheel is a spiral screw *C*, which moves with it, taking the ore from the hopper *E* and delivering it to the spout *D*, which leads into the mortar. A spring *F* returns the lever to the normal position after having been depressed by the tappet. The device is simple, has few parts to get out of order, and appears entirely practical.



Stamp-Mill Feeder

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## Galvanizing with the Aid of Mercury

A description by Consul General William Dawson of a German method of securing adherent deposits of zinc in galvanizing is given in "Mineral Resources of the United States for 1912."

After steeping in sulphuric acid the iron is placed in a solution of mercuric chloride and then heated, resulting in a decomposition of the mercuric chloride and precipitation of metallic mercury, which forms an amalgam of iron on the surface. The iron is then plunged into a zinc bath heated to 500°, where it remains three minutes.

Iron galvanized by this process usually shows strong adhesion of coating to metal. Microscopic investigation shows that the zinc penetrates into the pores of the iron, and in case a portion of the coating is worn or broken off iron does not rust, owing to the presence of sufficient zinc in the pores to prevent corrosion. The mercury is, of course, lost.

# THE ASSAYER AND CHEMIST

## Salting Assays by Salted Cupels

By Donald M. Liddell*

The following experiments were made to test the possibility of salting assays through cupels which had previously been salted, either intentionally or otherwise. Bone-ash cupels, 1 in. in diameter, were treated with silver-nitrate solution. After drying, the outside of the cupels gave no indication of the presence of silver salts, but inside the cupel depression, the surface invariably showed a deep purple color, indicating precipitation of insoluble silver salts by the bone ash. The first experiments were made using varying quantities of silver (as nitrate), first in 1 c.c. of solution, then in 2 c.c. With 1 c.c. about two-thirds of the cupel became gradually wet; with 2 c.c., the entire cupel. The cupels were then dried, and 20 grams of test lead cupeled in each one under usual commercial conditions.

To test whether different results would follow, if there were silver originally present in the buttons, that is, to see whether this silver would pick up any additional amounts from the cupel, the experiments were repeated, using 10 mg. of pure silver and 20 grams of lead. Check cupellation of 10 mg. pure silver with 20 grams lead in untreated cupels, gave beads weighing 9.95 mg. and 9.98 mg.

RESULTS WITH 1 C.C. OF SOLUTION

| | | | |
|---|---|---|---|
| Silver contained in solution | 40 mg. | 20 mg. | 10 mg. |
| Silver recovered by cupellation | 2.89 mg. | 2.49 mg. | 2.00 mg. |

RESULTS WITH 2 C.C. OF SOLUTION

| | | | |
|---|---|---|---|
| Silver contained in solution | 40 mg. | 20 mg. | 10 mg. |
| Silver recovered by cupellation | 2.50 mg. | 2.26 mg. | 1.82 mg. |

| | | | |
|---|---|---|---|
| 1 c.c. solution contained: Ag | 40 mg. | 20 mg. | 10 mg. |
| Weight of Ag beads from cupelling 20 grams of pure lead and 10 mg. pure silver in salted cupel | 12.85 mg | 12.46 mg. | 12.05 mg. |
| Deduct check obtained by cupelling 20 grams lead and 10 mg. Ag | 9.95 mg. | 9.95 mg. | 9.95 mg. |
| Gain | 2.90 mg. | 2.51 mg | 2.10 mg. |
| 2 c.c. solution containing: Ag | 40 mg. | 20 mg. | 10 mg. |
| Weight of Ag beads from cupelling 10 mg. pure Ag and 20 grams. Pb. in salted cupel | 12.51 mg. | lost | 11.80 mg. |
| Check—10 mg. pure Ag and 20 grams Pb. | 9.98 mg. | | 9.98 mg. |
| Gain | 2.53 mg. | ........ | 1.82 mg. |

All these results are of the same order and point to the conclusion that during cupellation, lead absorbs silver from cupels containing it, but only from the surfaces with which it comes into immediate contact. It is also apparent that most of the silver contained in the solutions used was precipitated in the upper part of the cupels at or near the surface and not carried throughout the body of the cupels by the solution. This was confirmed by treating a 1-in. cupel with 80 mg. of silver (as nitrate) in 2 c.c. of solution; the whole cupel was gradually wetted by the solution. On cutting the cupel in half horizontally, the lower portion, although it was well moistened by the liquid, contained no silver and the upper portion, consisting of the upper ½-in. section, contained all of the silver.

I thank Ledoux & Co., of New York, in whose laboratory the above experiments were made; and to acknowledge the suggestions of its staff as to variations of the original scheme.

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*Associate editor, "Engineering and Mining Journal."

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## Benzoic Acid as Standard Material

The extended use of benzoic acid as a calorimetric standard, and its value as an acidimetric standard, makes it appear desirable to call attention to the fact that the substance is slightly hygroscopic, according to an article by E. R. Weaver, of the Bureau of Standards, Washington, D. C., in the "Journal of the American Chemical Society," September, 1913. Mention of the subject has been made in the Journal, Aug. 17, 1912.

Definite data on this point were first obtained when comparing, by means of titration with a standard alkali, the samples *B* and *C* described below. The following samples were then examined: Sample *A* was especially prepared to be used as a standard for comparison by starting with the purest material obtainable commercially, and successively crystallizing from alcohol and from water, subliming in vacuo, again crystallizing from water and again subliming twice in vacuo over fused calcium chloride. The object of the double sublimation at the end was the removal of the last trace of water. Sample *B* was some of the material purified by Morey[1] and kept for more than a year in a glass-stoppered bottle. Sample *C* was a commercial product of good quality, but shown to contain a small amount of impurity by the ash left upon ignition.

The acidity of the samples having been determined, a portion of each was carefully fused and the acidity again determined. The average results follow, taking the average value obtained for *A*, as 100%.

| Sample | Number of Determinations | Average Per Cent. |
|---|---|---|
| A | 7 | 100.00 |
| A fused | 5 | 100.00 |
| B | 6 | 99.93 |
| B fused | 9 | 100.01 |
| C | 6 | 99.95 |
| C fused | 5 | 99.96 |

The results obtained with each sample were concordant. One series, the results obtained upon sample *A* before fusion, gave 100.01, 100.02, 99.98, 100.00, 100.00, 99.98, 99.99. This fairly represents the agreement between results from any one sample.

While these titrations indicated that sample *B* had taken up during the year about 0.07% of moisture, it seemed desirable to prove the presence of water in the sample in a more direct manner. This was done by dissolving a little of each of the samples in ethyl acetate, which was shown by a blank test, made in the same way as the final test, to be nearly anhydrous; shaking with calcuim carbide, and decanting the liquid into an ammoniacal solution of cuprous chloride. This test, which is being investigated as a general method for the detection of traces of water, depends upon the formation of acetylene, which dissolves in the organic solvent used, in this case ethyl acetate, and is precipitated upon adding to cuprous-chloride solution. The test was repeated several times, using ethyl acetate and other organic solvents, and showed clearly the presence of water in sample *B* and of a smaller amount in sample *C*. Several other old samples of benzoic acid showed the presence of a little water when subjected to the same test. That moisture is not taken up rapidly by the acid is shown by the fact that no change could be noted in sample *A*, after it had been freely exposed to the air of the room at intervals, during compression into pellets and handling in other ways. Numerous calorimetric tests on different samples made from time to time in the heat laboratories of the Bureau have shown no systematic differences exceeding 1 part in 2000, which could be attributed to moisture variations.

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[1] Journ. Am. Chem. Soc., Vol. 34, p. 1027.

Fortunately, in order to remove the absorbed moisture from benzoic acid, it is only necessary to fuse it; but this must be done with great care or else a change takes place with the formation of a brown, resinous substance. The fusion may be made in a loosely stoppered Erlenmeyer flask in an air bath. The fused mass may usually be broken up easily without breaking the flask. A temperature higher than 130° should be avoided.

No effort was made to learn the exact nature of the change, which takes place upon heating. It goes on quite rapidly when the temperature is raised to more than 150°. A portion of sample *A*, which had been heated to 150°-160° for half an hour, showed an acid value of only 99.93%, as compared with the standard. It has not been found practicable to sublime the acid without the formation of a little of the brown compound. A small amount of residue was left in the platinum dish after each of the sublimations carried out in the preparation of sample *A*, and as this residue is volatile only at a much higher temperature than that occurring during sublimation, and was found to be present in about as large quantity after the third sublimation as after the first, some of it must have been formed during sublimation. In the sublimation apparatus used for the preparation of standard benzoic acid on the large scale, a small amount of the acid condenses upon the inside of the glass cylinder supporting the electric hotplate. It remains here day after day at a temperature somewhat elevated, but lower than the melting point. Under this condition it gradually turns yellow, showing that the resinous compound is slowly formed at a temperature even below the melting point. When the acid is fused to remove moisture, it should, therefore, be kept at as low a temperature as possible and not allowed to remain any longer than is absolutely necessary. It should remain perfectly colorless after fusion. Any amount of decomposition which can be detected chemically imparts a distinct yellow color to the fused mass.

⁂

## Determination of Zinc in Ores

By means of the following method, zinc may be determined by Low's ferrocyanide process (*Journ. Ind. Eng. Chem.*, p. 302, 1913), no matter what impurities may be present. One gram of the ore is dissolved in aqua regia, treated with 1 gram of potassium chlorate, evaporated to dryness, the residue treated with 50 c.c. of water and 0.5 gram of potassium hydroxide, and then heated nearly to boiling for several minutes with 6 grams of ammonium carbonate, whereby iron, aluminum, manganese, lead and cadmium are precipitated. The precipitate is filtered off, washed with a hot 5% solution of ammonium carbonate, then dissolved in hydrochloric acid, with a little potassium nitrate, the solution neutralized with potassium hydroxide, and reprecipitated with ammonium carbonate, the precipitate being washed as before. The filtrates and washings contain copper and zinc. The copper is precipitated as sulphide, and the zinc determined by titration with ferrocyanide, using uranyl nitrate on a spot plate as indicator.

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## Melting Points of the "Iron Group"

Some recent determinations of the elements with atomic weights from 48 to 59 were reported by G. K. Burgess and R. G. Waltenburg to the Washington Academy of Science. These new values should be used rather than those in the JOURNAL of Aug. 17, 1912, p. 293.

The determinations were made mainly with the micropyrometer, the metals being melted in hydrogen, usually on platinum strips (manganese also on nickel strips, and titanium on iridium strips). In some cases the metals were melted in crucibles in an Arsem electric furnace, and the melting point determined by the method of optical heating and cooling curves (Tech. Paper 10, Bureau of Standards). The results are summarized in the following table:

| Metal | M.Pt. with Micropyrometer °C. | Purity of Metal % | Probable M.Pt. of Pure Metal °C. |
|---|---|---|---|
| Nickel | 1452*<br>1449† | 99.83, | 1452 ± 3 |
| Cobalt | 1477 ± 2<br>1478 ± 1‡ | 99.95, | 1478 ± 5 |
| Iron.. | 1533 ± 1§<br>1528† | 99.98 ± 0.01 | 1530 ± 5 |
| Manganese | 1255 | 97-98 | 1260 ± 20 |
| Chromium | 1520 | 98-99 | 1520 to >Fe |
| Vanadium | 1720 | 97-98 | 1720 ± 20 |
| Titanium | 1794 ± 12 | 99.9 + | 1795 ± 15 |

* Assumed value on platinum strip; observed value on iridium strip
† Crucible melts in Arsem furnace.
‡ Crucible melts in Arsem furnace; also on iridium strip with micropyrometer.
§ Five samples all agreeing to within 3°.

⁂

## New Reaction for Molybdenum

P. Melikoff, a Russian chemist, has proposed a reaction for molybdenum, which consists in the formation of ammonium permolybdate $(NH_4)_2MoO_4.H_2O_2$ (*Chem. Zeit.*, Aug. 9, 1913). In order to prove the presence of molybdenum in a substance, its solution is evaporated to dryness on the water bath; after cooling, a drop of strong ammonia and as much hydrogen peroxide are added to the residue. If molybdenum be present, a cherry-red to pinkish-yellow color, according to the amount of molybdenum, will instantaneously make its appearance. Komarowsky, another Russian chemist, has compared this reaction with the one produced by concentrated $H_2SO_4$ and finds it fully equal, if not superior, to the latter, since it never fails, which cannot be said of the sulphuric-acid reaction. By gently heating the ammonium permolybdate it is destroyed as such and the original substance regenerated. This is another advantage, as the quantity of substance used for qualitative test is not lost, but can be used quantitatively for the molybdenum determination, or for the qualitative test for any other element or radical, if only small quantities are at disposal. Komarowsky has determined the limit of sensitiveness to be at 0.006 mg. per liter.

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### MINING—GENERAL

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23,585—ACCIDENTS—Nonfatal Injuries in Bituminous mines. F. L. Hoffman. (Coal Age, Aug. 9, 1913; 4 pp.) 70c.

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23,593—CHUTE—Bulldozing Chute and Underswung Gate at Perseverance Mine, Alaska. G. J. Jackson. (Eng. and Min. Journ., Oct. 18, 1913; ¾ p., illus.)

23,594—COMPRESSED-AIR SYSTEM of the Anaconda Copper Mining Co., Butte, Mont., Bruno V. Nordberg. (Bull. A. I. M. E., Sept., 1913; 62¼ pp., illus.)

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23,619—TASMANIA—The Progress of the Mineral Industry of Tasmania for the Quarter Ending 31st March, 1913; W. H. Wallace. (John Vail, Govt. Printer, Hobart, Tasmania; 27 pp.)

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23,640—METALLOGRAPHIC TESTING. (U. S. Bureau of Standards, Circular No. 42, 1913; 16 pp.)

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## FUELS

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23,647—GASES—Entgasungsöfen und Mischgasbetrieb. Trautwein. (Feuerungstechnik, Aug. 15, 1913; 2 pp.) Gas-extracting ovens and the use of mixed gases. 40c.

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23,653—UTILIZATION OF COAL—The Proper Utilization of Coal, and Fuels Derived Therefrom. (Colliery Guardian, Sept. 19, 1913; 3⅜ pp.) Discussion by H. E. Armstrong, G. T. Beilby and others before the British Association. 40c.

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## MATERIALS OF CONSTRUCTION

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## Collection of the Income Tax

WASHINGTON CORRESPONDENCE.

The first important step toward the application of the income tax was taken by Secretary McAdoo on Saturday, Oct. 25, in the issuance of rules governing the application of the law and collection of the income tax from individuals. The mechanism now in force for the collection of the corporation tax was not changed and it is understood that that is to remain practically in operation as it is now. The new rules applicable to individuals are, however, of great importance in their bearing on corporations, including mining corporations, because they lay upon these corporations the duty of collecting the tax at the source, by deducting from the amounts they pay to individuals the proportion which is due to the Government.

The new rules are elaborate and detailed, including a great many forms. These will be freely sent to all mining corporations which have bonds outstanding. The main part of the regulations, apart from the forms includes the following points:

Under the Income Tax Law, enacted Oct. 3, 1913, a tax of 1%, designated in the law as the normal tax, shall be deducted at "the source," beginning Nov. 1, 1913, from all incomes accruing and payable to: (a) Every citizen of the United States, whether residing at home or abroad. (b) Every person residing in the United States, though not a citizen thereof, which may be derived from interest upon bonds and mortgages, or deeds of trust, or other similar obligations, including equipment-trust agreements and receivers' certificates of corporations, joint-stock companies or associations and insurance companies, although such interest does not amount to 3000 dollars, excepting only the interest upon the obligations of the United States or its possessions, or a State or any political subdivision thereof.

The term "debtor," as hereinafter used, shall be construed to cover all corporations, jont-stock companies, or associations and insurance companies.

For the purpose of collecting this tax on all coupons and registered interest, originating, or payable, in the United States the source shall be the debtor (or its paying agent in the United States) which shall deduct the tax when same is to be withheld, and no other bank, trust company, banking firm, or individual taking coupons for collection, or otherwise, shall withhold the tax thereon; provided that all such coupons, or orders for registered interest, are accompanied by certificates of ownership signed by the owners of the bonds from which the coupons were detached. These certificates shall be in the forms hereinafter prescribed and a separate certificate shall be made out by each owner of bonds for the coupons or interest orders for each separate issue of bonds or obligations of each debtor.

If, however, the coupons are not accompanied by certificates as prescribed above, the first bank, trust company, banking firm or individual or collecting agency receiving the coupons for collection or otherwise, shall deduct and withhold the tax and shall attach to such coupons its own certificate, giving the name and address of the owner of, or the persons presenting such coupons if the owner is not known, with a description of such coupons also setting forth the fact that they are withholding the tax upon them; whereupon the debtor shall not again withhold, the tax on said coupons, but in lieu thereof shall deliver to the Government the certificate of such bank, trust company, etc., which is withholding such tax money. Any corporation, collecting agency, or person first receiving from any interest coupons or orders for the collection of registered interest, and to whom the certificates above provided for are delivered, should require the persons tendering such coupons or orders for registered interest satisfactorily to establish their identity.

A debtor whose bonds may be registered both as to principal and interest, shall deduct the normal tax of 1% from the accruing interest on all bonds before sending out checks for said interest orders signed by the registered owners or before paying such interest orders signed by the registered holders of said bonds until there shall be filed with said debtor or its fiscal agent (and not later than 30 days prior to March 1) through whom said interest is customarily paid, the proper certificates claiming exemption from liability for said tax.

The debtor may appoint paying or fiscal agents to act for it in matters pertaining to the collection of this tax upon filing with the collector of internal revenue of its district a proper notice of the appointment of such agent or agents.

⁂

## Iron Blast Furnaces at Perth Amboy

In his testimony at the hearing of the Government's dissolution suit against the Steel Corporation on Oct. 22, Frank S. Witherbee, president of Witherbee, Sherman & Co., told something of the plans of that company respecting the projected blast-furnace plant near Perth Amboy, N. J.

Mr. Witherbee testified that only a small part of the Adirondack properties is now in operation and that his company has 9000 acres of idle ore lands in Cuba.

"We can supply the present demand from the Mineville, N. Y., district alone," he said.

He was asked about the two blast furnaces that Witherbee, Sherman & Co. contemplate building at Perth Amboy. He said they are to take care of the excess products of the mines in Cuba and the Adirondacks. He added that the company also expects to use some ore from the Lake Superior district.

"On the completion of the barge canal across the state of New York," said Mr. Witherbee, "it will be cheaper to deliver Lake Superior ore in New York than in Pittsburgh."

⁂

## Calamine at Leadville

The most important of the known deposits of calamine at Leadville are situated on the northern side of Carbonate hill and are in the Maid of Erin, Henriette, Clontarf, Brookland, Monte Cristo, Wolftone, Waterloo, Morning Star and Big Chief mines. The first six of these are under lease to, and are worked by, the Western Mining Co., a Guggenheim concern; and all the others are worked through the Wolftone shaft of the Western Mining Co. No important deposits of calamine of a marketable grade have been opened elsewhere in the district, although deposits of low-grade zinc carbonate, of more or less extent, are known to be widely distributed throughout the mineralized area.

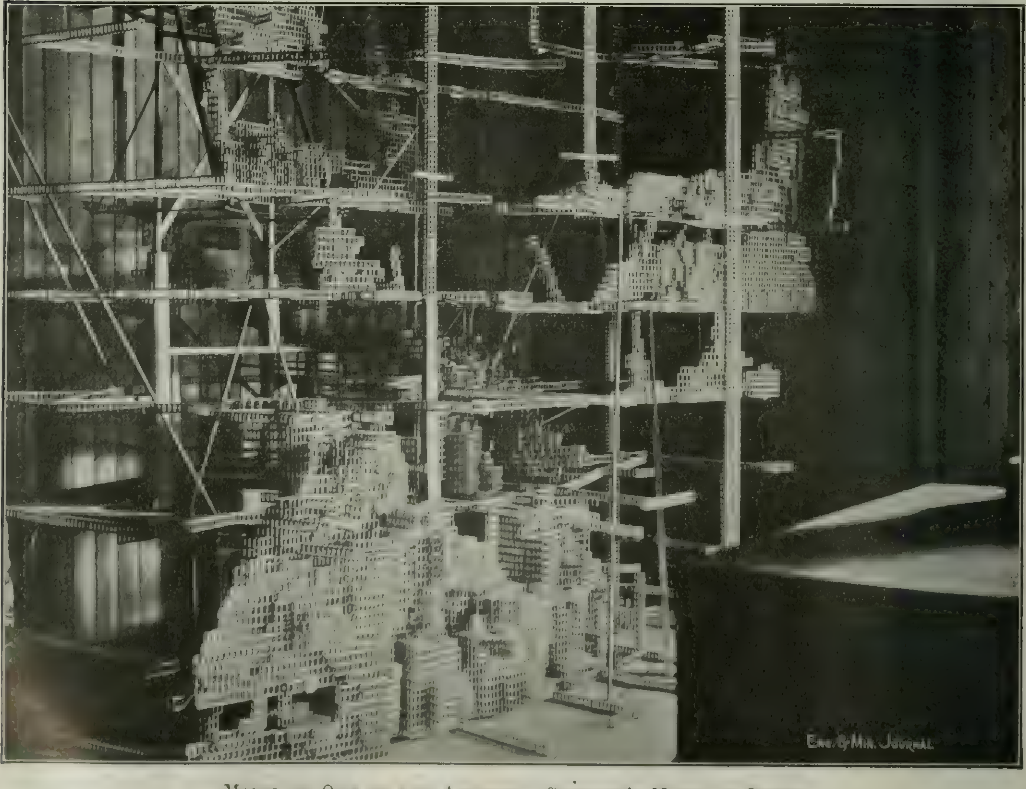
# PHOTOGRAPHS FROM THE FIELD

First Shipment from South Cuyuna Range

The ore was shipped from the Barrows mine, Oct. 2. On the Minnesota iron ranges it is customary to decorate initial shipments, as here shown, for the 120-mile trip to the docks.

Butte, Anaconda & Pacific Electric Train

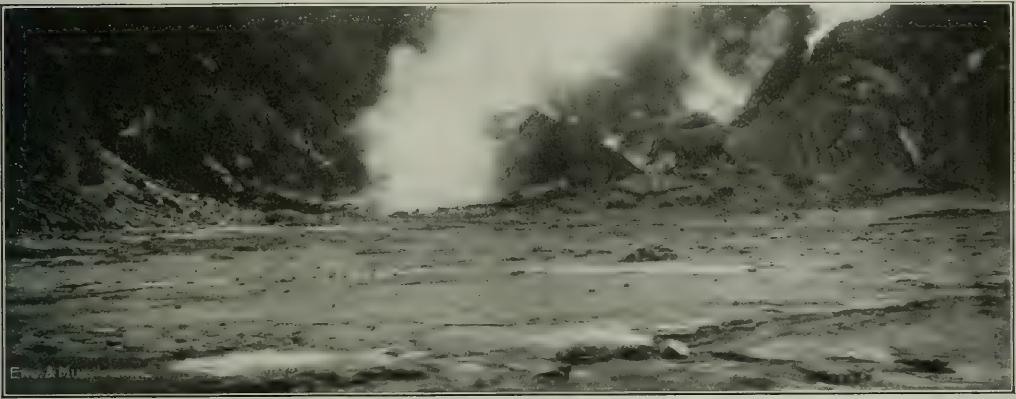
Electrification has been completed between Butte, Mont., and the Washoe Smelting Works, at Anaconda. The first regular trip was made Oct. 1.



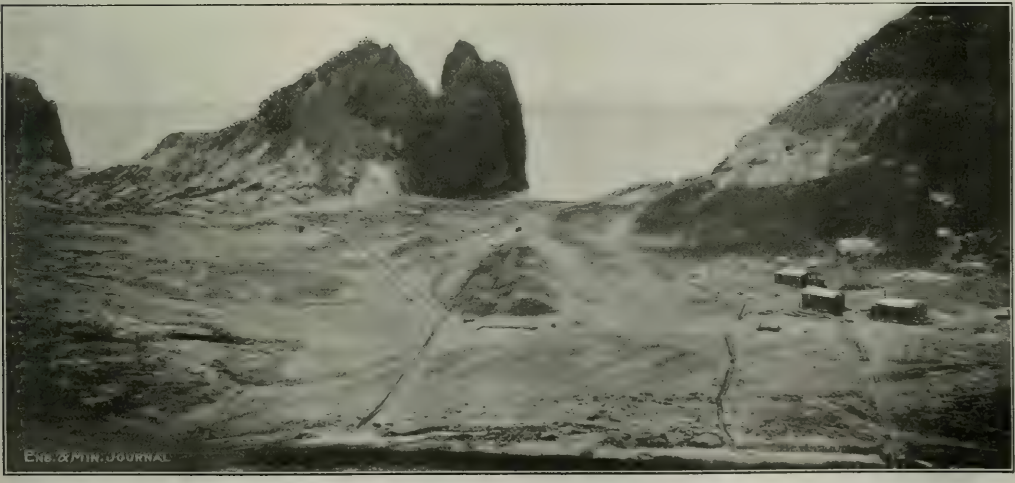
Model of One of the Anaconda Company's Mines at Butte

Every set of timber is shown in detail, made of little sticks of wood, cut to scale and glued in place. The builder worked two years on the model.

Smelting Works at East Helena, Montana
The building at the right with three chimneys is the baghouse



The White Island, New Zealand, "Sulphur" Lake
The hot spring across the lake, now drained, is one of the sources of sulphur.



Another View of the White Island Workings
Sulphur occurs on the bottom of the lake which has been drained and the nearly pure sulphur mined. The hot springs yield several tons hourly of sulphur, 94% pure. This unique volcanic "sulphur works" is described on the first page of this issue of the "Journal."

# The American Mining Congress

Special Editorial Correspondence

*SYNOPSIS—A report of the sixteenth annual American Mining Congress, held in Philadelphia during the week of Oct. 20.*

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The sixteenth annual session of the American Mining Congress began in Philadelphia, Oct. 20. A brief summary of the opening days of the congress was given in the last issue of the Journal. The meeting was called to order at 2 p.m. by F. H. Wigton, chairman of the local executive committee, and the chair was taken by Dr. D. W. Brunton, of Denver, president of the congress. Addresses of welcome were made on behalf of the mayor and corporate authorities of Philadelphia, and the governor of Pennsylvania. Appropriate responses were made by Doctor Brunton. The rest of the afternoon session was devoted to brief speeches by members of the different state delegations, who summed up in a few words the conditions of mining in their different states and the needs of the industry. Appeals were also made for the enactment of workmen's compensation laws as nearly uniform as possible in the different states and for the conservation of the coal deposits of the country.

### The President's Address

At the evening session, Dr. D. W. Brunton, president, delivered his annual address, which was devoted largely to the difficulties existing in securing title to valuable mineral deposits by the discoverer, and to the exactions which the prospector may meet before he can secure the reward of his labors. He referred at some length to the imperfections of the existing law and to the possibilities of litigation which deterred many miners from going on with their investigations of the mineral deposits. He referred also to the long discussion over the desirable amendments to the mining law made by various committees and technical societies in which the American Mining Congress had taken a prominent part. He also referred to the antagonism which had unfortunately arisen in California, Montana, Utah and other Western states between the farmers and the miners. Another point was the difference in the laws and regulations for the operations of mines in different states, another branch of this subject being the differences in safety provisions required and in the workmen's compensation laws.

The gradual absorption of the smelting industry by large corporations, which were able to dictate to the miners, was also considered. In conclusion, the work of the Bureau of Mines was referred to and approved, so far as it had gone, and an appeal was made for larger appropriations in order that the bureau may be able to extend its work. The crying need of the industry, however, is a thorough revision of the present mining laws.

### Mine Taxation

At the morning session on Tuesday, Oct. 21, after the appointment of committees and some other routine business had been disposed of, papers on the "Taxation of Mining Property," by R. V. Norris, of Wilkes-Barre, Dr. H. M. Chance, of Philadelphia, and D. L. Webb, of Denver, were read. These papers referred to the various systems of taxing mine property in existence in the different states and appealed for greater uniformity in the different systems of assessment. Levying taxes upon output, or upon operating profits was strongly objected to, and the difficulties attending the assessment of mining property, which is gradually decreasing in value as the coal or ores are removed, were mentioned as an important factor in the case. A more uniform system in the different states is considered one of the needs of the mining industry.

These papers were discussed at length by many members. The opening speeches were made by Prof. H. L. Smyth, of Cambridge, Mass., Harry N. Taylor, of Chicago, and T. H. O'Brien, of New Mexico, and many others joined in the discussion. The session concluded with papers on "Mine Accounting," by J. B. L. Hornblower, of Pittsburgh, and on "Uniform Requirements of Official Mine Reports," by S. A. Taylor, also of Pittsburgh. A short discussion followed these papers.

There was no session in the afternoon, a number of members joining in a steamboat excursion on the Delaware River to visit the docks and other public works on the river front of the city and also the League Island navy yard. Many of the members spent the afternoon in visiting the exhibition of mining machinery in Horticultural Hall, where there were many interesting features.

### The Evening Session

At the evening session, on Tuesday, papers were read on "Mine Rescue and Recovery Work," by Dr. Charles E. Munroe, of the Bureau of Mines, and on the "Use and Abuse of Explosives," by R. W. Gunnell, of Pottsville. These were discussed by J. W. Paul, George S. Rice, H. M. Wilson, B. N. Dunn and others. A short paper on "The Use of Concrete in Mining Operations" was presented by E. C. Sargent, and an elaborate paper on the "Coal Resources of Alaska," by Dr. W. R. Crane, of the Pennsylvania State College. Doctor Crane is a believer in the great extent of those resources, while fully realizing the many difficulties attending their development. He believed, however, that in time they would be of great importance to the country.

### The Wednesday Sessions

At the morning session, a report from the committee on Alaskan affairs was presented by F. Joslyn, of Fairbanks, Alaska, and a paper on "Public Lands," by Dr. James Douglas, was read, Doctor Douglas himself being unable to be present. An address on "Industrial Corporations and Scientific Research," by D. B. Rushmore, of Schenectady, N. Y., was also presented.

At the afternoon session, a report was presented and received by the committee on the Revision of the Mineral Land Laws. Dr. George Otis Smith, director of the U. S. Geological Survey, presented a paper on this subject, in which he presented at considerable length the various considerations affecting the tenures of mining properties on the public lands, and expressed a belief that the ultimate solution of the question would be found in a leasing system, and in the reservation by the Government when granting patents to surface or agricultural lands of all mineral deposits beneath the surface. The possessory title to the mineral should be retained by the Government, not for the purpose of asserting any theoretical right, but as a practical method of securing development under proper conditions. This would be of especial importance in relation to deposits of such public necessaries as coal, petroleum, phosphates and potash. This system would also discourage the locking up of mineral deposits for speculative purposes. He believes that in time such a system would prove to be of general benefit to the mining industry and would be generally favored by the people.

U. S. Senator John F. Shafroth, of Colorado, then made an address on "The Administration of Public Lands as Affecting the Mining Industry," which was rather an arraignment of the land system and its administration. Senator Shafroth is an energetic speaker and his address excited general attention.

The feature of the evening session was a paper on "Big Business in Its Relation to Industrial Prosperity with Particular Reference to Mining," by Prof. Charles R. Van Hise, of the University of Wisconsin. Doctor Van Hise referred at much length to the practical breakdown of competitive methods and small mines and to the many and great advantages to be secured by combination. He gave many instances of the different systems in different branches of mining, and advocated a system of combinations or large aggregations of capital and effort to be controlled by a national commission with powers analogous to those of the Interstate Commerce Commission. His plan, in short, was very similar to that suggested for the regulation of the iron and steel industries suggested by Judge Gary when he was before a congressional committee last year. Doctor Van Hise brought forward many instances and referred to the present condition of the bituminous coal trade as an illustration. His paper attracted much attention, but the time was too short for a long discussion.

### Radium Resources of the United States

A paper by Dr. Charles L. Parsons, of the Bureau of Mines, referred to the discoveries of carnotite in Colorado and to its mining by several parties who shipped their ores to Europe, especially France and Germany, where it is used in the manufacture of radium. It is believed that these deposits are the most important source of radium yet found, and their development has now been undertaken by a new association, the particulars of which are given in Doctor Parsons' paper as follows:

> In closing, I take pleasure in saying that I am authorized by the Director of the Bureau of Mines to announce that a coöperative agreement has been entered into with the newly organized National Radium Institute, whereby the Bureau obtains the opportunity of a scientific and technological study of the mining and concentrating of carnotite ores and of the most efficient methods of obtaining radium, vanadium, and uranium therefrom, with a view to increased efficiency of production and the prevention of waste.
>
> The National Radium Institute was recently incorporated with the following officers: Howard A. Kelly, of Baltimore, president; Curtis F. Burnam, of Baltimore, vice-president; Archibald Douglas, of New York, secretary and treasurer; James Douglas, of New York, and E. J. Maloney, of Wilmington, as additional directors.
>
> The institute has no connection with the mining of pitchblende, details of which recently appeared in the Denver papers. It has, however, obtained the right to mine 27 claims in the Paradox Valley region, among which are some of the best mines in this richest radium-bearing region of the world. Nearly 100 tons of high-grade carnotite have already been procured. Under the agreement with the Bureau of Mines, the technical operations of the mines and mill are to be guided by the scientific staff of the Bureau. Work will begin in an experimental plant to be erected in Colorado, using entirely new methods developed at the Denver office of the Bureau of Mines. Concentration experiments also will be conducted in the Paradox, probably at the Long Park claims, and if successful will be applied to reducing the wastes that now take place. Within a year at most, the mill operations should make results certain and the extraction of ore and production of radium will then be continued on a larger scale. The separation of uranium and vanadium will also be studied, a contract having already been signed for all of these byproducts that may be produced.
>
> The institute has been formed for the special purpose of procuring enough radium to conduct extensive experiments in radium therapy with special reference to the curing of cancer.

### The Thursday Sessions

The morning session on Thursday, Oct. 23, was opened by Dr. Charles E. Van Barneveld, of San Francisco, who presented the claims of the mining department of the Panama-Pacific Exposition.

The committee on Coal-Mining Legislation presented a brief report of progress, after which Edward W. Parker, of the U. S. Geological Survey, read a paper on "The Cost of Coal Production," presenting a careful analysis of the figures on this point as collected by the Census Bureau and showing the small margin of profit on which the business of bituminous coal mining has been and is conducted in this country. John W. Boileau, of Pittsburgh, made an address on "What Is the Matter with the Coal-Mining Industry?" in which he urged a greater degree of combination and coöperation in order to secure reasonable prices. A long discussion followed the reading of these papers, which was opened by A. J. Moorshead, president of the Madison Coal Co., of Illinois, who was followed by a number of other speakers. Mr. Moorshead referred at considerable length to the conditions under which mining is conducted in what are known as the competitive states—including western Pennsylvania, Ohio, Indiana and Illinois—and the difficulties under which the operators in some of those states labored from the existence of strict mining laws involving expensive improvements and precautions in working. He said that the operators in those states would have no objection to these laws, and would be perfectly willing to comply with their requirements, providing that similar laws existed in all the states; but the requirements varied so widely that it imposed an unjust burden in certain states and prevented them from securing business in competition with others. He advocated either uniform laws in all the states, or general federal regulation. His line of argument was approved by a number of the other speakers. General approval was also expressed of E. W. Parker's paper, and his conclusions were accepted as just and of great service to the industry.

In the afternoon, a special executive meeting of coal operators for general discussion and consideration of the mining situation, was held. This meeting was private and there were no reports of the proceedings. At the general session, a number of papers were read, and briefly discussed. These papers were as follows: "Gold Mining in Georgia," by W. H. Fluker, Thompson, Ga.; "Joint Meetings of Mining Organizations," by H. M. Wilson, Pittsburgh; "Federal Aid for Mining Schools," by Dr. Erasmus Haworth, Lawrence, Kan.; "The Federal Government and the Mining Industry," by Dr. Martin D. Foster, Chairman of the House Committee on Mines and Mining. Mr. Fluker's paper presented a hopeful view of the possibilities of gold mining in Georgia and believed that the best results would be obtained in the future as they had been in the past by what is known as the old Dahlonega method of mining.

### The Smoker

In the evening, nearly all the members and a number of guests attended the smoker and reception, provided by the reception committee. This was a very enjoyable affair, a very good program of entertainment being presented, followed by a supper. There was a general discussion of more or less personal nature with a renewal of many old acquaintances and the meeting of many new ones. The entertainment concluded at an early hour in the morning and was very much enjoyed by those present.

### The Friday Sessions

On Friday morning the committee on standardization of electrical equipment presented its report through George R. Wood, of Philadelphia. The committee on resolutions presented a preliminary report, which was put over until the afternoon session. The Committee on Ways and Means presented a report showing that the finances of the congress were in a backward condition and suggesting various means for paying off arrears and continuing its work. Among these was a proposition providing for the obtaining of a larger number of regular yearly subscriptions, and also for the publication by the secretary of a periodical which should contain reports of legal decisions and notes of legislation in Washington and the various states. The maintenance of an office at Washington was also suggested. This report was discussed at length from different points of view and was finally referred to the directors for further consideration.

Hon. William B. Wilson, Secretary of the Department of Labor at Washington, then made a very clear and interesting address on "Arbitration as a Factor in the Mining Industry." He dealt especially with coal-mine labor and the coal-mining industry, with which he was most familiar, and showed the advance that had been made through combinations and the discussion of questions by operators and miners, and dwelt on the many advantages which had been obtained by arbitration. Mr. Wilson did not believe in the possibility of compulsory arbitration, but he is a thorough believer in the advantages of arbitration in the settlement of disputed questions. His address was discussed by Messrs. Green, Connell, Watkins and others, and Mr. Wilson replied to the various points raised.

### The Closing Session

At the closing session in the afternoon, reports on workmen's compensation and accident-prevention work were presented and there was discussion in which John H. Jones and S. A. Taylor, of Pittsburgh, E. T. Bent, of Chicago, David Ross, of Springfield, Ill., and Thomas L. Lewis, of Bridgeport, Ohio, took the chief part. Dr. J. A. Holmes, director of the Bureau of Mines, who was unable to be present as he has only just reached San Francisco on his return from Alaska, sent a paper on "Some Problems in the Mining Industry," which was read.

The report of the Committee on Resolutions called out some discussion and there was some modification of its terms, but not of any material importance. The resolutions finally adopted may be summed up as follows:

(1) Approving of the work done so far by the Bureau of Mines and urging upon Congress not only the proper support of the bureau, but also the creation or the development of the bureau into a department of mines, the head of which shall be a member of the Cabinet.

(2) Pledging the congress in favor of the enactment of universal state laws providing protection for stockholders in mining enterprises and preventing dishonest operations of financiers.

(3) Requesting the committee of the congress on Mineral Land Law Revision to confer with, and, if possible, to enlist the support of the American Institute of Mining Engineers, the Mining & Metallurgical Society and all other kindred organizations in an effort to bring about a desirable amendment to these laws.

(4) Requesting the directors of the Geological Survey and the Bureau of Mines to coöperate with a committee of the congress on the endeavor to secure uniform legislation in the different states as to the time and form of making statistical reports.

(5) Favoring the passage by Congress of legislation providing for Federal assistance to the state mining schools.

(6) Providing for a special committee of the congress to investigate and recommend a uniform and equitable system of assessment and taxation of mining properties, and urging upon the different states the passage of laws to that affect.

(7) Urging upon Congress some provision for the construction of railroads and other measures to assist in the proper development of the mineral resources of Alaska.

(8) Requesting the Treasury Department to make proper regulations, instructing the collectors of internal revenue to proceed on a uniform system of allowances for depreciation in arriving at the net income of mining companies for taxation.

(9) Expressing sympathy with the relatives and friends of those who lost their lives in the explosion of the Dawson mine in New Mexico, and joining with the officials of the company in regretting that all their efforts toward safe operations of the mines had proved of no avail in preventing this regrettable accident.

(10) Urging some modification of the anti-trust law which will permit reasonable coöperation among coal operators which may result in securing a fair regulation of the industry and incidentally increasing the safety of mining and providing for the proper conservation of our natural resources.

(11) Tendering thanks to the local committee, the citizens of Philadelphia and others who aided in the entertainment and in the proceedings of the congress.

At the meeting of the incorporated members the following officers were chosen for the ensuing year: President, Carl Scholz; first vice-president, Hennen Jennings; second vice-president, M. S. Kemmerer; third vice-president, Harry A. Day; directors, W. J. Richards, M. S. Kemmerer and E. A. Montgomery.

During the continuance of the congress, and for two or three days before and after its sessions, the Bureau of Mines presented in the lecture room of Horticultural Hall a series of demonstrations and lectures in some cases illustrated by moving pictures. These were under the immediate charge of Charles Enzian, mining engineer of the bureau, and included the various forms of first-aid and rescue work, the mining of bituminous coal and iron ore, the manufacture of coke and the production of pig iron. These lectures were largely attended not only by members and attendants at the congress, but also by citizens of Philadelphia.

In one end of the hall, a sort of working model of a gold mine had been built which was visited by a large number of people.

### THE MACHINERY EXHIBIT

The greater part of Horticultural Hall, which is on Broad St., a short distance from the Bellevue-Stratford Hotel, where the meetings of the congress were held, was the exhibit of mining machinery and appliances. A very interesting exhibit comprising a wide range of objects was here collected. Coal-mining machinery rather predominated, as might be expected from the location of the meeting in an Eastern city, but there was much that was interesting to all classes of miners. Mining machines, mine locomotives, models of conveyors and other handling plants, pumps, car-loaders, miners' lamps and a great variety of other appliances were here collected and could be readily inspected.

The exhibits which at first sight attracted most attention, were, of course, those of the larger and heavier machinery. Prominent among these were a number of mine locomotives for electric driving, including those of the Baldwin Locomotive Works, the Vulcan Iron Works, and the Jeffrey Manufacturing Co., the latter showing a gathering locomotive with combined trolley and storage battery. A gasoline mine locomotive was shown by the Milwaukee Locomotive Co. Mine cars, mine wheels, and appliances were exhibited by several well known companies. Storage batteries for use on mine locomotives and for other purposes, were well presented by the different electric companies.

Interesting features were shown in a number of models and drawings of coal-handling plants, car hauls and dumping plants, some of them involving important new features. Driers and magnetic separators were also represented in the same way. Especially interesting in this class were the exhibits of the American Concentrator Co., the Bartlett & Snow Co., the Fairmont Mining & Machinery Co., the Link Belt Engineering Co., and several others.

Mining machines of various kinds were also well shown by different companies, including the Goodman Manufacturing Co., and the Jeffrey Manufacturing Co. The latter showed a novelty in the form of a coal-cutting machine especially designed for use in anthracite coal seams.

Pumps, of course, were not neglected and a number of mine pumps of various designs and for both steam and electrical drive were in evidence.

An interesting collection of miners' lamps was presented by various manufacturers. These included oil, naphtha, electric and acetylene lamps with safety machines for relighting and several magnetic fastening and unlocking machines. All the standard types were included, with several new and excellent patterns, intended especially to secure safety and convenience combined with the best service to the miner.

The display of instruments by various well known firms was a very interesting one, including mathematical and survey instruments, balances, assay and testing apparatus and many other kinds. Chemicals and chemical apparatus for mine use were also shown by a number of well known firms.

Mine-rescue apparatus was also shown, together with first-aid appliances for the injured. These were also to be seen at the demonstrations conducted by the Bureau of Mines.

The United States Steel Corporation and several of its subsidiaries had exhibits made by their Bureaus of Safety and Sanitation, these consisting largely of photographs, drawings and copies of rules intended to secure safety and to assist employees.

We regret that space forbids our giving a full list of the different firms and companies which contributed to this very interesting exhibit.

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## Oroville Dredging, Ltd., Oroville Dredging Co., Ltd., and Pato Mines, Ltd.

SAN FRANCISCO CORRESPONDENCE

Oroville Dredging, Ltd., operating in Oroville and Bear River fields of Feather River division in California, with capital stock of $3,500,000 all issued and outstanding, has for several years been the holding company for the Boston & Oroville Mining Co., Boston & California Dredging Co., Oroville Gold Dredging & Exploration Co., Continental Gold Dredging Co. and Bear River Mining Co. The assets of all the above named subsidiary companies were, in October, 1913, taken over by the holding company; the articles of incorporation of Oroville Dredging, Ltd., were filed with the Secretary of State at Sacramento, and the head office of the company removed from Boston, Mass., to Insurance Exchange building, San Francisco. The directorate of the company is composed of F. W. Baker, of London, president; W. P. Hammon, of San Francisco, vice-president; C. W. Gardner, R. K. Barrows, J. C. Osgood, F. C. Van Deinse. A. E. Boynton is secretary-treasurer.

The natural and expected result of this transaction will be the dissolution of the subsidiary companies. The important and interesting feature of the situation, which has quickly followed the merger, is that 90% of the stockholders of Oroville Dredging, Ltd., have exchanged their stock for stock of Oroville Dredging Co., Ltd., which is an English corporation. This English corporation, besides now holding the 90% of the stock of the American corporation, owns a majority of the stock of Pato Mines, Ltd., operating a 9-cu.ft. bucket-elevator all-steel dredge in Colombia, S. A., built by the Yuba Construction Co., of Marysville, California.

A further interesting and still more important fact in this connection is the extraordinary gold production of the Pato dredge. We are permitted to take the following statement from the directors' report and audited accounts of Oroville Dredging Co., Ltd., as presented by F. W. Baker, chairman of the company, to the shareholders' meeting in London on Oct. 4, 1913, and returns supplemental thereto.

STATEMENT SHOWING DREDGING RETURNS FROM PATO MINES JAN. 9, 1913, TO OCT. 14, 1913, INCLUSIVE

| | Cu.Yd. Washed | Estimated Value |
|---|---|---|
| For period from Jan. 9 to Sept. 2, 1913 | 576,050 | $101,258 |
| For week ended Sept. 9 | 18,600 | 13,650 |
| For week ended Sept. 16 | 14,550 | 7,350 |
| For week ended Sept. 23 | 14,650 | 10,150 |
| For week ended Sept. 30 | 22,100 | 18,700 |
| For week ended Oct. 7 | 23,500 | 21,900 |
| For week ended Oct. 14 | 22,500 | 18,200 |
| | 691,950 | $191,208 |

The total average value of the gravel dug in the nine months, as shown by the statement, was 27.6c. per cu.yd. The minimum weekly average was about 8c., while the maximum weekly averages ranged from 50c. to 93c. per cu.yd. These are extraordinary yardage values and greatly in excess of any dredged gravel yield in California for like continuous periods. In order to facilitate the transportation of materials for the construction of the dredge the company was unable to begin operations in tested ground and 427,000 cu.yd. of gravel was dug in going to the tested ground. This supposed barren ground yielded an average of 14.27c. per cu.yd. and for five weeks showed a maximum yield of from 31c. to 43.77c. per cu.yd. dug per week. The average cost of digging has been below 10c., probably 8c. per cu.yd., and this cost covers the delay and expense resulting from the overturning of the dredge in the early period of initial operation, besides other delays and extraordinary expenses. The company had in the beginning 310 acres of tested ground, and about 20,000 acres not tested, but a part of it now is being Keystone drilled.

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## Hand-Picking Iron Ore

By P. B. McDonald*

Hand picking of iron ore has never been attempted to any great extent in the Lake Superior region, although at the old hard-ore mines of the Marquette range there have been occasional trials. Rogers, Brown & Co. now propose to hand pick the yellow, limonite ore at their Portland and Ohio mines, at Michigamme, operated under the name of the Niagara Iron Mining Co. These mines are at present practically idle, never having been very profitable. The shipments in the past have run about 48% in iron, and it is expected to raise the grade by hand picking after crushing.

A crusher plant has been installed at the Ohio shaft to serve both mines. The crusher house is 70 ft. high and has concrete foundations. The sill timbers are coated with creosote. A double skipway leads up to a gyratory crusher of 800 tons daily capacity; the ore is dumped from the skips upon grizzlies, thence it falls to the crusher. The crushed ore passes to a wide endless belt where the hand picking will take place.

It may be found necessary to spray water on the crushed material to distinguish ore from rock; the fines will be let drop through a screen previous to going on the belt. The Portland mine is an openpit that was stripped of overburden two years ago. It is estimated that 250,000 tons of ore are exposed ready for mining and steam shoveling. Later the deeper portions of the orebody may be mined by underground methods. The Ohio mine is an underground mine adjoining the Portland, and has been filled with water for several years, although plenty of ore remains. The Portland ore will be drilled, blasted, loaded by steam shovel into railroad cars and hauled to the Ohio crushing plant for crushing and hand picking. The mines will be reopened as soon as demand for the ore warrants it.

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## John Coit Adams

John Coit Adams, superintendent of the Boston & Montana Mines Department, of the Anaconda Copper Mining Co., died at Butte, Oct. 24, after a long illness. He had for nearly 25 years been identified with the mining interests of Montana, and since 1900 had been a resident of Butte, where he was numbered among the city's representative citizens.

Mr. Adams was a native of Honolulu, Hawaiian Islands, and was born July 17, 1867. His father, Edward P. Adams, was born and reared in Maine, but when a young man went to the Hawaiian Islands, where he resided for a period of 30 years, during which time he was prominently identified with the business interests of that city, acting for a number of years as the American consul. He subsequently returned to the United States and passed his remaining days in Cambridge, Mass., where his death occurred. He married Miss Caroline Wright, who died in Honolulu.

John C. Adams passed his boyhood days in Honolulu until about the age of eight years, when he was sent to Castine, Maine, there completing his preparation for college. Entering Harvard University, he pursued a special course as a member of the class of 1887. After graduating he went to Portland, Ore., where he was located for about one year, and then went, in 1887, to Montana, which has ever since been the scene of his activities.

His first employment in that state was at the Hope mine, at Philipsburg, where he remained two years. Subsequently he was for a period of five years connected with the Bi-Metallic mine near Philipsburg. In 1901, he entered the employ of the Boston & Montana Co. as foreman of the Pennsylvania mine, and in 1904 was appointed general superintendent of the Boston & Montana mines, in which capacity he had ever since remained. Mr. Adams was one of the best known and most capable men in the mining world of Butte, where his business experiences have been of a broad and varied character, and his high position was earned solely through merit. During the famous underground fight between the Amalgamated and the Heinze companies, Mr. Adams had charge of the proceedings for his company, in which his skill and ultimate success are a matter of history in Butte.

In political matters he was a stalwart in the ranks of the Republican party, and while no aspirant for political honors he was one of the party's counselors and advisers in his section. In a fraternal way he was affiliated with the Benevolent and Protective Order of Elks, while socially he is a member of both the Silver Bow and University Clubs. He was a member of the American Institute of Mining Engineers.

At Butte, in March, 1898, Mr. Adams was married to Miss Ethlyn Caldwell, who was born and reared in Michigan, and two children were born to them: Nina, born in 1899, and Jaquelin, born in 1908.

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*Mining engineer, Gouverneur, N. Y.

# EDITORIALS

## What Is the Matter with the Mining Industry?

At the recent meeting of the American Mining Congress several speakers took up the question, "What is the matter with the mining industry?" That there is something the matter seems to be generally admitted. Of course, it is recognized that the tonnage of ore produced by the operating mines of the United States and the yield of iron, copper, lead and zinc is increasing all the time, while the production of gold and silver is, at least, being maintained. There is, however, undoubtedly a dullness in the buying and selling of mining property, an absence of interest in the development of prospects, and a decline in activity among the little mines of many parts of the Rocky Mountain region. Promoters have fallen upon hard times, the mining engineer unconnected with the large companies finds relatively little to do and more than one has abandoned his profession for work that affords better opportunities, while machinery manufacturers in several quarters, by no means all, experience a slowness of demand for their goods.

All of these are undeniable facts. As to the causes, however, there is no general agreement. The talk in the American Mining Congress did not display any exhaustive study of the causes. Rather was the theme the necessity of "doing something," which something appeared to be legislation in Washington. There was much flapdoodle about congressional ignorance of the magnitude of the mining industry, inattention to its needs, etc., but apart from a revision of the mining laws nothing specific was demanded of Congress. Now, a revision of the mining laws is highly important, but we do not suppose that any reasonable person imagines that the abolition of the law of the apex, etc., is going to work a revival of the mining industry. Nor has anybody suggested any serious pinching effect of any of our laws that Congress may relieve. In fact, the present situation in our mining industry appears to be the consequence of economic and international factors, some of which are as follows:

(1) The situation in Mexico. No argument is necessary to show that this has seriously reduced the market for mining supplies, the employment of mining engineers, and the return on capital invested there.

(2) The exhaustion of the easily discoverable, easily developed ore resources of the United States, which has greatly reduced the opportunities of the prospector and of the mining operator of small means. This is not a sudden change, but is one that has been progressive through many years. Ore discoveries were many and frequent in the '60s and '70s, fewer and less frequent in the '80s, and still more so in the '90s. Since 1891 the only new mining districts of magnitude have been Creede, Cripple Creek, Tonopah, Goldfield, Cobalt, Porcupine and the placer districts of Alaska; no great number for a period of 20 years.

At the present time there is a great scarcity of zinc ore and of new zinc mines. Anybody who has a zinc deposit of promise does not need to go begging for a customer. On the contrary, zinc-mining interests are hunting for zinc mines, but so far as anybody knows now they do not exist. In fact, the demand for good copper, lead and gold mines is no less keen. Unfortunately, it is not known where they are. We do not mean to imply that there are no more and that they will not be found, but probably they are for the most part deep-lying deposits whereof there is little or no surface indication, deposits that await deep and costly exploring before they will be found. The zinc mines at Mascot, Tenn., and the copper mines of Miami, Ariz., are two examples that immediately occur to us. Why is there not more prospecting for such mines? This brings us to what is perhaps the chief cause of dullness in mining, viz.:

(3) The state of the world's finances. Never since the crisis of 1907 has there been anything like a well sustained boom in business in the United States. After recovery from the slump in 1908 and 1909 there were fitful periods of activity and successful speculation, but nothing of long duration or of a character to produce a substantial overflow into speculation in mining. Less than ever has there been any tendency toward that in this year 1913 when the strain on the world's capital has once more resulted in financial disturbances and established feelings of caution. This has not interfered with the financing of sure things, or nearly sure things, or what are conceived to be such, like the Alaska-Gastineau gold mines and the Chuquicamata copper mines; but capital has been little disposed to take chances in prospecting, which inherently spells risk.

The chief reasons for the so called dullness in mining are of this order, we believe, and the troubles are not of a kind for which any remedy is to be found in Congress, or in legislation by any body. In the meanwhile the affairs of the producing mines are not dull or depressed, and they are employing more men and using more material than the average of recent years.

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## Colonel Gorgas at Johannesburg

Col. William C. Gorgas is going to Johannesburg to assist that municipality in combating a host of endemic and industrial diseases, as noted in our Johannesburg notes. Of the three colonels eminent in Panama Canal history, Gorgas is preëminent in the far-reaching effects of his work for humanity, world over. Since the Zacapa, Guatemala, outbreak of yellow fever, in 1906, that malady has become so rare in Central America as to cause it to be considered not endemic north of the Canal. Malarial cases in Panama have been reduced from 1200 cases per thousand of population in 1906 to 81 per thousand in 1912. The credit for these records belongs to Colonel Gorgas and his staff.

Time was when sea captains had to shanghai able-bodied seamen to man a ship bound for Aspinwall, so vicious was the reputation of that port's unsanitary state.

So they changed the name, then the first colonel acquired the Canal Zone and sent the second colonel to purge it of disease so that the third colonel and his men could build the big ditch. The result is that Aspinwall has long been forgotten; there is no fear of Colon and Panama; Ancon and Cristobal have the reputation of spas. All this is the result of Gorgas' work.

Although at an elevation of 6000 ft. above sea level, Johannesburg has been the center of one of the world's most renowned malarial districts. But of almost as evil reputation is the prevalence of pulmonary disease among the gold miners of the Rand. Miners' phthisis, silicosis, tuberculosis and other diseases of the respiratory organs, and ankylostomiasis cause such a large proportion of the mortality of Transvaal mine workers that the Chamber of Mines and the government some time ago determined to exhaust every means of reducing the pernicious effects that the country's principal industry produced on the workmen. The services of Sir Almroth Wright were enlisted and now Colonel Gorgas has been called upon. We hope he may make as brilliant a record at Johannesburg as he did at Panama, but we regret his going to South Africa. Guayaquil is not yet free from yellow fever and the West Coast still trembles in fear of bubonic plague, despite the rigid quarantines and disinfections. With the opening of the Canal that coast will be so near that we would like to feel it free from taint.

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## Iron Smelting in New York

We have upon numerous occasions in the past prophesied the establishment of iron-smelting furnaces on the shore of New York Harbor. Our prophecy now seems in a way to be borne out, inasmuch as several projects for the erection of such plants are said to be in consideration.

The removal of the duty on iron ore enables iron smelters on the Atlantic seaboard to draw upon the immense iron-ore resources of Sweden, Newfoundland, Cuba, Brazil and Chile without any handicap, while they may command moreover a supply from domestic deposits in the Adirondacks and in Texas. There are optimists who reckon that when the barge canal across the state of New York is completed it may be possible to fetch Lake Superior ores to New York at less cost than to Pittsburgh.

New York commands a coal supply by water from Norfolk, Va., and from Nova Scotia. If the coal be coked in byproduct ovens, as is done at Everett, Mass., there will be a ready market for all the gas that is produced. The slag from the blast furnaces will fill low-lying lands along the water front and convert them into building sites worth many thousand dollars per acre.

New York is already the greatest metallurgical center of the universe. Its liberation from tariff bonds will increase the magnitude of its smelting and refining industries, which will be enhanced, moreover, by the opening of the Panama canal. Copper, lead and nickel smelting are already done here. Iron smelting will soon be done and we venture the prophecy, furthermore, that some day we shall see a revival of zinc smelting, not on the basis of New Jersey and Pennsylvania ores, as in the past, but on the basis of imported ores.

## The Currency Bill

Congress has before it a bill which in any form will be of extraordinary effect upon the welfare of the nation. The bill is intended to remedy an archaic banking and currency system, to avert money panics, and to create the machinery for an expansion of trade.

The bill now before Congress has excited differences of opinion. The bankers appear to oppose it. So do the surviving exponents of populistic ideas. These parties do not, however, oppose it on the same grounds.

An economic question of this kind is capable of scientific study and developments. It is not, like the tariff question, enmeshed in the web of local interests. Why, then, should it not be referred to experienced men for such amendment as will make it as nearly right as human capacity permits? And why then should not everybody agree upon it?

To the average citizen, who confesses his own ignorance of the subject and his lack of feeling one way or another, it is incomprehensible that such a measure should be made a party question.

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## The 13th Census of Mines

The more we try to dig something useful out of the mining statistics of the 13th census, the more disgusted do we become. Nothing much of what anybody wants to know is to be found. When we think we have got something by analysis and deduction, we don't know whether the figures mean what we think they do. Even when we transcribe them directly we don't in many cases know with certainty what they mean.

There was never so bad a statistical fiasco as the 13th census; never a sadder waste of the public money. This apparently is recognized even in Washington, where the new director is making an effort to save something out of the wreck. There won't be much to save. His best policy will be to throw it up as a bad job and shape things for better work next time.

With respect to mines and mining we'll give the new director one brief piece of advice which will come nigh to excluding the trouble of the 13th census. It is this:

*Don't let any responsible officer connected with the 13th census have anything to do with the next one.*

In other words, dismiss them all—make a clean sweep. Green hands would be better than the present crew.

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If Congress would forget its desire to scotch the money-devil and should devote itself to some such simple job as improving the postal service there would be satisfaction in the cañons leading from Wall St.; and also in other parts of the country. The money-devil looms larger in the mountains of Tennessee and the swamps of Arkansas than he does in what are supposed to be his haunts.

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We imagine that many of our subscribers in Mexico are failing to receive their copies of the JOURNAL with regularity. We are reserving some spare copies of each number to enable them to complete their files when troubles are over. We should like to have subscribers notify us respecting this as early as possible.

## BY THE WAY

It is gossiped that the Department of Justice has exonerated the American Smelting & Refining Co. of any violation of the anti-trust law.

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According to the Geological Survey, there is a plant at Park City, Utah, "equipped for acid leaching and precipitation of the gold, silver, copper and lead on scrap metal, each metal precipitating from solution on the metal for which it has the greatest affinity." How would it strike you to revise our textbooks to read, "Copper has an affinity for iron and hence precipitates on it from its solutions"? Sounds as if the Survey was going back to the alchemists.

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The stock of Lake copper, which only a few months ago was disproportionately large, had been reduced to about 10,150,000 lb. on Oct. 1. Allowing for the stock of casting copper on that date, the electrolytic stock was only about 17,250,000 lb., a figure that reminds us of 1906. The Lake production in October had dwindled to 6,950,000 lb., mainly the output of the Calumet & Hecla company, which drew on its historic stock of "mineral" carried at its Buffalo works.

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The "constitutionalists" of Mexico have begun to strike their own silver coinage. An example that we have seen exhibits fairly good workmanship, considering the facilities available. It is said that ore-crushing rolls were used for producing the sheet silver out of which the coins were stamped. Raids on the mills furnish most of what is needed for this and for other things. Among the other things are the making of brass cannon. The mills and machine shops have been stripped of their brass and bronze parts for this purpose.

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Practically all of the mines of Parral are now closed except the Alvarado. A large party of Americans has recently come out of the country, under the leadership of Mr. Dufourcq, enduring much hardship on the way. During a part of the journey they were in company with the refugees from Mapimi, which place has been entirely abandoned by foreigners; the mines are filling with water at the rate of 2000 gal. per min. The condition of the refugees in many cases is pitiful. Most of them have lost all their belongings. Some have lost fortunes.

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Mexico has attempted a national election. Ask an American who has lived south of the Rio Grande what a free election will really mean. He will tell you that if the Mexican people, peons and all, voted as they wished, Montezuma would stand a fair chance of receiving a handsome popular majority. Here, by way of example, are the official results of the first primary held in Mexico, so far as is known, says the *Evening Post*. At a mining town in Sonora a visiting American and the resident engineer were talking of Mexican politics. The visitor was somewhat inclined to believe in the applicability of pure democracy to Mexico. The R. E. was skeptical, and more. "I'll call an election for this afternoon and show you," said he. And that afternoon the 500 miners came to the commissary plaza below the hacienda on the R. E.'s orders. He made a speech in grandiloquent Spanish. They loved their country. (No applause, and less understanding.) He wanted to know whom they wanted for el Presidente. He, the R. E., did not want to be elected—this to forestall a unanimous election. They must vote as they wished. They were to file by and speak their wishes. Come. After 15 minutes more the idea permeated the crowd. The miners walked by and mumbled their choice. The official tabulation showed 250 for Larita, the local bull-fighter, a scattering for Lola Mendez, and the balance for Juarez, the Indian president dead now these 40 years.

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Here is the same old story. "When the ore is treated by ordinary cyanide processes so much gold is lost at every stage that only a fraction of the total value is recovered, whereas by my process I have recovered from four-ton parcels of ore as much as 12 times the assay value, as indicated by ordinary fire tests, and never less than four times as much. Ore, assaying 4 dwt., gave from 16 dwt. upward when operating on Pine Creek ores." This from an Australian contemporary that ordinarily knows better

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The results of sanitary measures in minimizing the effect of malaria and other diseases in the Canal Zone are justly famous, and while the economic benefits of working under healthy conditions are well recognized, it is often supposed that the elaborate methods adopted on the Canal are too expensive for industries working on a smaller scale in remote situations and with limited capital. In the *Scientific American*, Sept. 15, 1913, Dr. J. H. Verloop outlines the results obtained in a successful attempt to decrease malarial sickness on the Guiana placer mine in Dutch Guiana. The methods adopted started on the principle that the mode of life would have to be radically altered. The large extent of surrounding swamp and drowned forest made chemical prophylaxis impossible, and the removal of quarters to a more favorable situation would have been too expensive. For that reason, only the immediate vicinity was kept clean. The houses were built to be light and airy and protected against mosquitoes with gauze in every possible way. The beds were covered with curtains of a special construction and the houses connected by passages also covered with gauze. Supper was taken early and recreation provided so that there was no temptation to leave the quarters in the evening. Special efforts were made to interest the staff in the observance of hygienic laws. Thus, in cases of ordinary sickness, the employees received a higher benefit wage than if stricken with malaria or other preventable diseases. There was also a premium paid for mosquitoes caught indoors. The result was that everbody watched results with interest and enthusiasm. The cost of surplus wages and salaries and of the gauze for the protection of the building was a low premium to pay for insurance against disease. While the overcoming of naturally careless habits necessitated the exercise of a great deal of will-power, the results were well worth the efforts. The health of the 12 to 18 Europeans was largely improved and malaria was no longer greatly dreaded. The company reaped the benefit of steady work under less disturbed conditions.

## PERSONALS

**J. R. Finlay** has just returned to New York, where he will remain about 10 days.

**D. de Vries**, a well known Dutch engineer, is making a tour through the United States to study our iron and steel plants.

**Frank E. Getts** recently engineer with the General Electric Co., has taken charge of the Chicago office of the Alberger Pump & Condenser Co., of New York.

**Alex. H. Smith** has been placed in charge of the Teck-Hughes mine, Kirkland Lake, Ont., in place of John Reddington, who resigned to attend to his other interests.

**Ralph Roseberry**, lately manager of the Amphitheatre Gold Mining Co., at Leadville, Colo., has accepted the managership of the Bessie Cora Co., and the McCulloch Mines Co., at Montezuma, Colorado.

**Charles M. Schwab**, president of the Bethlehem Steel Co., has returned from Europe, where he went to complete the transactions relating to the acquisition of the Tofo iron mines in Chile by the company.

**J. S. Frazier**, recently superintendent of blast furnaces at the Clairton works of the Carnegie Steel Co., has been appointed superintendent of furnaces for the Pittsburgh Steel Co., at its Monesson plant.

**John Fulton**, the eminent mining engineer and expert on coke, recently celebrated his 87th birthday, at his residence at Johnstown, Penn. Mr. Fulton has retired from active work, and is now writing his recollections. His many friends hope that his life will be prolonged for years.

**Thomas M. Kekich** has recently resigned his position as assistant superintendent of the Chicago plant of the Great Western Smelting & Refining Co., and has taken an engagement with the Spassky Copper Mines, Ltd., in Siberia. Mr. Kekich has been at different times with the Boston & Montana and the Anaconda mines in Butte, the Cerro de Pasco in Peru, and the Teziutlan Copper Co. in Mexico.

**W. J. Loring**, of the firm of Bewick, Moreing & Co., was a recent visitor to the properties under development by the California Exploration Co. at Plymonth, Amador County, Calif. Mr. Loring was once superintendent at the Plymouth Consolidated when it was one of the large producers of the Mother Lode region. He was also with the Utica at Angels and the Melones in the Angels Camp district in the early days.

## OBITUARY

**William Maughan** died at Blackhawk, Colo., Oct. 15, aged 59 years. He had been for many years engaged in the smelting industry at first in the old Golden works and for several years past in the Chamberlain Sampling works at Blackhawk.

**John S. Fackenthal** died at Easton, Penn., Oct. 22, aged 51 years. He was born and brought up in the neighborhood of Allentown, and had been nearly all his active life engaged in the iron industry. He had been with the Thomas Iron Co., at Hokendauqua, and had been superintendent of the blast furnaces at Glendon, Penn., and at Pequest, N. J. He was also for several years connected with the works of the Consolidated Lake Superior Co., at Sault Ste. Marie

**James Putnam Kimball** died at Cody, Wyo., Oct. 23, aged 77 years. He was born in Salem, Mass., and was educated at the Lawrence Scientific School of Cambridge, Mass., and also studied at the Universities of Berlin and Göttingen He was well known as a chemist and geologist, and had held professorships at the New York Agricultural School, and Cornell University. He was also for some time connected with the United States Mint

## SOCIETIES

**American Electro Chemical Society** The next meeting of the New York section will be a joint one with the New York section of the American Institute of Mining Engineers and will be held on the evening of Nov. 20 A large attendance is promised The subject for the evening is the metallurgy of zinc, and three papers will be read: "Progress in the Metallurgy of Zinc," by George C. Stone, metallurgist of the New Jersey Zinc Co.; "The Electric Smelting of Zinc Ores," by W. R. Ingalls; "The Electrolytic Refining of Zinc," by Victor Englehardt, chief engineer of the Siemens-Halske Co. Following these papers there will be a general discussion on the subject, several gentlemen familiar with the questions having promised to take part. It is expected that the discussion will be an interesting one, as there are many conflicting

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

SLIME-DEWATERING GRAVITY DEVICE. Ira F. Monell, Boulder, Colo. (U. S. No. 1,074,192; Sept 30, 1913.)

ELECTROMETALLURGICAL PROCESS OF REDUCING METALLIC OXIDES. Dorsey A. Lyon, Palo Alto, and Edwin R. Cox, Jr., Heroult, Calif. (U. S. No. 1,075,295; Oct. 7, 1913.)

METAL BRIQUETS—Composition of Matter for Making Briquets of Fragments of Metal. Charles G. Alton, Hartwell, Ohio. (U. S. No. 1,075,135; Oct. 7, 1913.)

ORE TREATMENT—Apparatus for the Treatment of Ores. George Mitchell, Los Angeles, Calif. (U. S. No. 1,074,282; Sept. 30, 1913.)

WHITE LEAD—Process of Producing White Lead. Edwin Euston, St. Louis, Mo. (U. S. No. 1,075,143; Oct. 7, 1913.)

LEACHING—Cyclic Process of Extracting Metals from Cupriferous Materials. Albert David, Brooklyn, N. Y., assignor to Midland Ores & Patents Co., New York, N. Y. (U. S. No. 1,075,093; Oct. 7, 1913.)

CYANIDING—Process of Preparing a Precious Metal-Dissolving Means. Hans Foersterling, Perth Amboy, N. J., assignor to the Roessler & Hasslacher Chemical Co., New York, N. Y. (U. S. No. 1,076,006; Oct. 14, 1913.)

HARDENING—Case-Hardening Material. Hugh Rodman, Edgewood, Penn., assignor to Rodman Chemical Co. (U. S. No. 1,076,235; Oct. 21, 1913.)

ALUMINUM ALLOY and Method of Producing the Same. William A. McAdams, Bay Shore, N. Y. (U. S. No. 1,076,137; Oct. 21, 1913.)

RADIOTHORIUM—Preparation of Radiothorium. Lise Meitner, Berlin, Germany, assignor to Dr. O. Knöfler & Co., Berlin-Plötzensee, Germany. (U. S. No. 1,076,141; Oct. 21, 1913.)

TIN—Apparatus for Preparing Tinned Sheet-Iron Boxes, Etc., for Detinning. Hans Goldschmidt, Essen-on-the-Ruhr, Germany, assignor, by mesne assignments, to Goldschmidt Detinning Co., Jersey City, N. J. (U. S. No. 1,075,781; Oct. 14, 1913.)

TITANIUM—Method of Raising the Alloying Qualification of Titanium. Hans Goldschmidt and Otto Weil, Essen-on-the-Ruhr, Germany, assignors to the firm of Th. Goldschmidt, Essen-on-the-Ruhr, Germany. (U. S. No. 1,075,782; Oct. 14, 1913.)

TUNGSTEN—Method of Rendering Insufficiently-Ductile Metals Ductile. Carl Trenzen, Cologne-Braunsfeld, Germany. (U. S. No. 1,074,993; Oct. 7, 1913.)

PYRITES—Tilting Furnace for Smelting Pyrites and Sulphur Ores. Emil Knudsen, Mühlbach, Austria. (U. S. No. 1,015,214; Oct. 7, 1913.)

DRILLS—Locking Chuck for Rock Drills, Etc. Sanford W. Brothers, Denver, Colo. (U. S. No. 1,075,325; Oct. 14, 1913.)

ROCK DRILL. Corwill Jackson, Madison, Wis., assignor to General Electric Co. (U. S. No. 1,075,424; Oct. 14, 1913.)

ROCK DRILLS—Valved Connection for Rock Drills. Sanford W. Brothers, Denver, Colo. (U. S. No. 1,075,324; Oct. 14, 1913.)

STEAM SHOVELS—Equalizing System for Steam Shovels and the Like. Svante Robert William Mattsson Bager, Milwaukee, Wis. (U. S. No. 1,075,081; Oct. 7, 1913.)

CRUSHING—Disk Pulverizer. Thomas W. Capen, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,075,192; Oct. 7, 1913.)

CRUSHING—Ore-Treating Machine. Mitts Quenner, Santa Ana, Sonora, Mexico, assignor, by mesne assignments, to Quenner Dry Crusher Co., Douglas, Ariz. (U. S. No. 1,076,061; Oct. 21, 1913.)

CRUSHING—Rock Breaker. Mitts Quenner, Nogales, Ariz., assignor to Quenner Dry Crusher Co., Douglas, Ariz. (U. S. No. 1,076,062; Oct. 21, 1913.)

CRUSHING—Rock Crusher. Thomas L. Smith, Milwaukee, Wis. (U. S. No. 1,075,507; Oct. 14, 1913.)

DRY CONCENTRATING APPARATUS. Arthur Audet, Los Angeles, Calif. (U. S. No. 1,075,959, Oct. 14, 1913.)

SEPARATOR—Ore Separator. Hiram J. Stewart and James S Tucker, Canton, Okla. (U. S No. 1,076,397; Oct. 21, 1913.)

CEMENT—Water-Resistant Cement and Process of Making Same. Carleton Ellis, Montclair, N J., assignor to New Jersey Testing Laboratories. (U. S. No. 1,076,028; Oct. 21, 1913.)

FIREBRICK—Process of Manufacturing Light Fire Brick. Masahide Hanabusa, Tokyo, Japan. (U. S. No. 1,074,618; Oct. 7, 1913.)

MELTING AND CASTING POT. Thomas C. Sheehan, Jersey City, N. J., assignor, by mesne assignments to Automatic Furnace Co., New York, N. Y. (U. S. No. 1,074,901; Oct. 7, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Oct. 22

**The Mineral Production of California** in 1912 is reported by the State Mining Bureau to be worth $91,472,385. The leading product in the list of 44 is petroleum, 89,689,250 bbl., valued at $41,868,344. Gold is second, valued at $19,713,478. The copper production was 34,169,997 lb., valued at $5,638,049; zinc, 4,331,391 lb.; silver, $799,584; quicksilver, 20,600 flasks; tungsten ore, 8042 tons; platinum, 603 oz.; lead, 1,370,067 pounds.

**The Farmers' and Smelters' Troubles** bid fair to be settled. The outlook for a satisfactory termination of the war of the farmers against the smelters in California and other copper-mining states is stated by Dr. J. A. Holmes, director of the U. S. Bureau of Mines, to be more favorable now than at any other time for several years. Doctor Holmes, returning from Alaska, made a third visit to Shasta County, Oct. 18, traveled over the "smoke" belt and conferred with a few farmers, representing the farmers' protective association—a baker's dozen out of about 300 farmers of whom the majority recognize that the miners and smelters and other industrial operators have some rights within Shasta County. The delegation, which was headed by George Baker, vice-president of the association, was unanimous in the declaration that the crops are still being damaged by fumes from the works at Kennett. They told of their losses, the same old story in the same old way; and that in face of the fact which was plain to Doctor Holmes that the farms of the county produced large crops this year, as they have for the past two or three years. The outlook for an early and satisfactory settlement of the complaints of the farmers is encouraged by the fact that only a small delegation representing the farmers' association are still complaining, and that the complainants are among the most prosperous farmers in the county.

### DENVER—Oct. 27

**The Golden Cycle** has not passed into the hands of British buyers, the president of the company says nothing of the kind has occurred and no one has an option on the property.

**A Radioscope,** or instrument for detecting the presence of radio-active elements in ores, has been invented by a Denver man and experiments are being made with the device by Ainsworth & Sons.

**A Battle Between Sheriffs and Strikers** was waged for more than 12 hr. in Berwin Cañon at Hastings and in the vicinity of the Colorado & Southern station at Ludlow, Oct. 26. Firing started at three in the morning and continued intermittently until nearly four in the afternoon. One mine guard was killed and, according to union men, one striker is missing. Armed strikers patrol the entire district in the vicinity of Ludlow, and communication with the camps of Cedar Hill, Tollerburg, Berwin, Hastings, Del Agua and Tobasco practically has been cut off. Governor Ammons ordered the mobilization of all the companies of the state militia after a long-distance conference with officials at Trinidad. In his messages to the companies throughout the state, the governor ordered them to be ready to move at an instant's notice. The troops assembled in their armories, and the Colorado & Southern Ry. got trains ready for the immediate movement of the soldiers.

### BUTTE—OCT. 22

**Bullion Purchases** by the U. S. Assay Office at Helena have been stopped by the director of the mint, owing to the fact that Congress failed to pass an appropriation for the maintenance of several western U. S. Assay Offices. The orders direct those in charge of the assay offices to cease purchasing bullion until such time as such appropriation is available. This will necessitate closing the office for an indeterminate period.

**In the Pilot Butte Injunction** suit brought by the Anaconda company against the Pilot Butte Mining Co. to prevent the latter from working a certain body of ore until its ownership shall be established under the apex law, the hearing which had been set for Oct. 20 under Judge Lynch has been continued to Mar. 2, 1914, by agreement of attorneys. In the meantime, by an agreement between the two companies, no mining will be done by either on the disputed ore.

**In the Northern Pacific Case,** in which the railroad denies the right of the State of Montana to assess the mineral rights of the former's holdings, which they are selling with the mineral rights reserved, the first round has been won by the state. The demurrer of the state to the complaint of the railroad company instituted to restrain the Park County assessor from assessing these mineral rights, was sustained by Judge Stack, of Livingston. Notice has been given that the case will be appealed to the supreme court, and perhaps to the United States supreme court.

### SALT LAKE CITY—Oct. 23

**The U. S. Assay Office** at Salt Lake has received notification from the treasury department directing it not to receive any more bullion for shipment to the mint or subtreasuries, as the appropriation made by Congress for the payment of shipping charges from Western assay offices has been exhausted.

**The Utah Power & Light Co.** is developing additional water power along the Bear River. Work has been in progress for some time in constructing canals, large pipe lines, power houses, etc., to utilize the flood waters of the Bear River, which for many years have gone to waste. In dry season the river is so low that a relatively small amount of power is available, and it is partly to conserve and equalize the power that the present work is being done. Two power plants, one at Grace 67 miles from Bear Lake, and the other at Wheelon, 180 miles down the river from Bear Lake, were purchased, when the Utah Power & Light Co. was organized. The power house at Grace is being altered so that twice the power can be generated as at the old plant. A dam 330 ft. wide, with reinforced concrete intake, is being built at Oneida, 34 miles below Grace, and will form a large reservoir. The power house is one-half a mile below the dam. Three and a half miles below Oneida is another large natural reservoir, with an outlet at the Narrows. Another dam with power house is to be built here. At Mink, three miles below, a dam to impound a large amount of storage water, together with a power plant, will be built. The power house at Wheelon will be enlarged, as soon as the work at Grace and Oneida has been completed. The system of power plants at Grace, Oneida, the Narrows and Mink will be so arranged that it will hardly be possible for an accident at any one or two of the plants to cause a shortage of electric power. Two steel-tower transmission lines are to be built from Grace to a substation six miles west of Salt Lake, and work on one of these lines is well under way. The line is to be 135 miles long. The power will be brought at high voltage to the substation, where it will be reduced, and distributed over the company's system, including power to be furnished to the Utah Copper at Bingham, the mills at Garfield, etc. A large amount of money is being spent on the work under way, and upward of 3000 men are employed at the various camps along the Bear River.

### CALUMET—Oct. 25

**Violation of the Strike Injunction** and constant rioting during the last week resulted in Judge O'Brien issuing a writ to the sheriff and deputies to bring before him all violators, and as a result 209 men were rounded up at the Allouez and Mohawk locations Friday morning and taken by special street cars to the courthouse at Houghton. A preliminary hearing was held and an adjournment taken until the following Friday, the men being released on their own recognizance. Mass picketing and small parades was the order of procedure at the various mines, and the men going to work were interfered with and several were badly beaten. In the village of Red Jacket, a clash between the strikers and deputies occurred; 13 men were arrested, and in the afternoon, when they were being arraigned before the justice of the peace, an attempt was made to take them from the deputies and a free-for-all fight ensued. A large number of men are coming into the district daily. A party coming in special coaches attached to the regular Chicago train on the Northwestern line, was stoned by strikers at the Hancock station and nearly all the windows in the train were broken. Last night, as another party was coming in, the train was fired upon. The train was under military guard, which returned the fire, but as far as is known at present, nobody was seriously injured. The railroads of the district have reported these occurences to the Federal officials and an investigation will be made. The Calumet & Hecla has erected quarters for the men coming in. Nine large buildings are completed, consisting of bunk houses, dining rooms and kitchens. The buildings are well constructed and furnished. A temporary hospital is being erected at the camp. This company has not experienced any difficulty in securing men, and in a short time, a full force of men will be at work. Preparations are being made to take care of men of the subsidiary companies in the same way. The Socialist element, particularly the Finns, who have been conspicuous in the agitation of the labor troubles, will in all probability, be refused further work in this district.

### HOUGHTON—Oct. 25

**That Labor Will Be Plentiful** in the Copper Country by the end of the year is a prevalent belief. Men are coming into the district on every train and the men who come from other mining districts and these that have been secured from employment agencies, including harvest hands and city laborers, are sticking to their jobs. Even the inexperienced workmen who took jobs as trammers in the Calumet & Hecla like the work and are satisfied with the wages and with the conditions under which they work. As far as experienced miners are concerned, there is no difficulty at all in securing plenty of them to work, for the iron mines are making their usual winter layoff in the Michigan and Minnesota ranges and these men are glad to get placed in the copper mines. Then, again the miners who left early in the strike and went to Butte and to other western camps, are coming back just as soon as they can make arrangements to do so, finding that while wages are higher in the other camps the living conditions are not as good and the cost of living is proportionately high. The Finnish socialist is the most to be pitied in the local situation. He is the most easily led of all the workmen. He was the easiest mark for the paid agitator. Now he finds himself without a job, his funds about exhausted, no chance to get a place to work even if he wants it, either in the mines here or in the iron mines, for the iron mines have had quite as much antipathy toward the Finn socialist as the copper mines now have. Hundreds of these Finns reside on farms which they lease from the mining companies at nominal rentals, mostly to men who have worked for the companies in the past. Most of these farmers have been taking an active part in the strike parades and helping the strikers in various ways. When they walk up to the captain's office to get their leases renewed on Jan. 1, 1914, the situation will present an aspect that they are not now enjoying in contemplation. The Superior is the first local mine to get back to normal production. It is now shipping 500 tons of rock per day. This, in view of the fact that the mine is right in the center of the worst disturbances of the entire strike, is a particularly good record.

### TREADWELL, ALASKA—Oct. 15

**A New Route,** states a Dawson dispatch, has been made from Dawson to the International boundary line within 20 miles of Chisana. The first post will be at Donjek, the second at Snag and the third at the boundary.

**A Good Trail to Shushanna** or Chisana has been found, states George C. Hazelet, who has been in charge of the party locating the new trail from McCarthy on the Copper River Ry. to the Chisana by way of the Nizina and Chisana glaciers. This trail is over the glaciers. The route has been thoroughly staked and a short and safe route to the goldfields is now available over this trail.

**Alaska Juneau Reserves,** states President F. W. Bradley, of the Alaska-Juneau Gold Mining Co., are 254,150,000 tons of ore in sight which will pay a profit of $1 per ton. There will be required a working force of 1500 men. The company claims to be able to treat the ore for 80c. per ton, or 60c. per ton less than it is costing the Treadwell. The first of the four stamp mills will be in running order before the first of the year.

**The Midas Copper Mine** negotiations for the transfer of the mine on Solomon Gulch near Valdez were completed Oct. 1 and the property now belongs to the Granby Consolidated Mining, Smelting & Power Co. The deal was for cash, the price paid for the property being $123,000. This group was bonded in 1903 by the Hadley smelter men, but owing to a suit pending for ownership of the property, the Hadley men dropped the bond.

**Fire at the Treadwell Mine** broke out at 3 a.m., Oct. 11, totally destroying the shafthouse, causing a loss of $40,000. There were a number of narrow escapes during the fire. The last three men had just stepped from the cage when the cable burned off. The cage dropped 4 ft. when the new safety device caught and held. The skip fell to the bottom of the shaft. The firemen battled for an hour before the flames were under control, using 11 streams of water. The hoist adjoining the shafthouse was not damaged. The management announced that the building would not be replaced.

**A Coal Reserve** in the Bering River field is recommended by Dr. J. O. Downey, disbursing officer of the U. S. Navy, who for more than a year has been studying the Bering River coal fields. He will recommend that the Navy Department ask the Government to create a coal reserve in that field for the exclusive use of the Navy.

### CORDOVA—Oct. 14

**Latest News from Shushanna,** according to a letter from an engineer who recently arrived in Alaska, is as follows: I have met three men who have returned from the Chisana diggings, one of whom just reached Cordova today, having made from Chisana to the Copper River Ry. in four days. Reports, as usual in stampedes, are rather conflicting, but from all I can gather the camp is not likely to compare with Dawson, Nome or Fairbanks as a gold producer. The field is 3800 ft. above sea level, the formations slate and porphyry, and the creeks have formed cañons which widen in places and the flats are covered with gravel about two feet in depth. There is no moss or vegetation to contend with. The latest arrival from there, a man named Erickson, says no mining is being done at present and that work was shut down a month before it was necessary because of weather conditions. He maintains that sluicing could have been carried on all through September, and that mining ceased for some reason at the end of August. He panned some of the best claims and only got 5c. per pan, though he says he knows of much better pans being obtained. On the bench claims, wherever location work had been done he tested the gravel, but could get no colors; but he says none of the cuts reached bedrock so his pannings only went to show the surface bench gravels were barren of gold. In his opinion the camp is not likely to prove suitable for dredges as on a number of the creeks he saw large boulders. There are about 250 people in the camp at present, making preparations to stay for the winter. Erickson says the new comers as a rule do not trouble to test the creeks to any extent, but make haste to secure a lot and get up a log cabin. They are in there for the winter and are preparing to make the best of it until next season, when the camp's possibilities will be definitely known. Owing to changes in the Alaskan mining laws which allow prospectors to stake for friends, legally, only if they hold power of attorney and have recorded the same, there has been some confusion and jumping of claims. Next season is likely to be a good one for the lawyers in and around the Chisana district. A story is already going the rounds of the holder of a placer claim who wanted to utilize it for a townsite. He wanted a legal opinion as to the matter from a member of the legal fraternity in the camp, who first of all demanded $100. Having received this amount he told the claim holder to go ahead with his townsite. The claim owner called on a well known "judge" with his application and was told it would have to be typewritten. This the "judge" proceeded to do after collecting a fee of $10 from the would-be townsite owner. A young man whose mother lives in Juneau was going into the Chisana over the glacier by way of Scolai Pass and was taken ill, as the result of using some canned stuff. He was met on the glacier by a doctor who was coming out to Cordova and the doctor stopped for a short time and dosed the young man with five pills. The pills were evidently efficacious as the young fellow proceeded on his way. When the doctor reached Cordova he sent a collect message to the mother asking for $100 for medical services to the son, and what is more, received it. The son figures those pills were too high at $20 each and is going to ask for a rebate of about $90. Erickson says that it is pitiful to see the horses that have been taken in over the trail. Many of them have died and others are crippled and dying. A prospector going in from Cordova with a dog team has had some difficulty in getting a team together. He picked up three dogs at Juneau at a cost of $40 but at Douglas and Skagway was unable to get any, although he had impressed the night watchman on the boat into his service and the latter was keeping his eyes open for stray canines when in port. However, anyone owning a good sleigh dog around an Alaskan port at this season of the year knows his value well enough to keep track of him as a rule, though we did hear of one or two mysterious disappearances. Good dogs, well trained and not too old are worth about $50 each. [It will be noticed that our correspondent speaks of the Chisana, not of the Shushanna county. Although we have always referred to it as Shushanna, it now appears that Chisana is preferable.—Editor.]

# THE MINING NEWS

## ALASKA

A LARGE DREDGE is to be brought from the Iditarod over the ice this winter to the ground owned by Riley & Marston in the Innoko country, and will be ready for operation early next spring.

GLACIER CREEK GOLD MINING CO. (Porcupine)—A successful season has been completed preparing for the installation of a hydraulic-elevator plant to be placed in operation next year. The work this season has been mainly cutting flume lumber, swamping and grading the right-of-ways for flumes and pipe line.

NOS. 3 AND 4 BELOW, DOME CREEK (Dome)—These placer claims have been purchased by Streeten Dockham from Frank Lawson and George Friend. Both claims were formerly big producers and are of interest as being the only ones on the second tier, right limit of Dome Creek that were not involved in the extensive litigation of a few years ago.

U. S. SMELTING, REFINING & MINING CO.—This company has closed options on the Dora, Wagner and Boston Group of claims and the Lemon Creek water right at Juneau. The company will take steps immediately to purchase the Ebner mine as a part of a scheme to work the low-grade gold ores in these properties. D. D. Muir, who is now at the Ebner with Angus Mackay, will be retained in charge of operations.

SPALDING & BRUMBAUGH (Dome)—On this lease on the Wild Rose and Soo claims, owned by the Reliance Mining Co., the mill of three stamps weighing about 250 lb. each has been rebuilt and is being operated with water from the mine. The larger mill on Dome Creek, 2000 ft. from the mine, was run 12 days in August, producing amalgam worth $1000. It is idle at present, but will be started again as soon as sufficient development work renders more ore available than the smaller mill can crush. A change house has been built near the mouth of the shaft. A 50-ton ore bin, equipped with a 7x10-in. Blake crusher is being built at the mine. A new mess house is to be erected as soon as the ore bin is completed. Underground development work is showing up good ore especially in the east ends of the 50-ft. and 100-ft. levels.

VALDEZ CREEK PLACERS—During the season a 1¼-mile ditch of 2500 miner inches capacity was built, 2800 ft. of pipe was laid, a penstock was completed, a by-wash ditch with a length of nearly one mile was dug, a flume was put in and hydraulicking operations were started Aug. 1 on the Tammany claim. In proving the bedrock from 1907 to 1911 more than $160,000 was taken out. Forbes Rickard in 1911 estimated the entire bank would run 94c. per cu.yd. This year hydraulic operations on the face of this bank, cutting the bank back 125 ft., showed in the cleanup an average of $1.50 per cu.yd. where the old workings had previously cleaned the bedrock; 28 hr. piping into the flume averaged about $100 per hr. It is contemplated sending in 6000 ft. of pipe of 36-in. intake with necessary equipment and installing it not later than July 1, 1914, working under a head of 300 ft. This should increase the plant from 1000 to 6000 yd. daily capacity. Bonds for the equipment and work laid out for next season have been underwritten.

## ARIZONA

### Cochise County

COPPER QUEEN (Bisbee)—It is rumored that the roasting experiments referred to on p. 651, of the "Journal" for Oct. 4, 1913, have given over 80% of water-soluble copper. This was on a porphyry carrying about 2% of copper.

### Gila County

INSPIRATION CONSOLIDATED (Miami)—The Miami Industrial Council issued a statement, Oct. 28, to effect that the American Bridge Co., doing steel work on Inspiration concentrator was unfair, paying low wages and warning labor to remain away from plant. American Bridge Co. claims to be paying union scale.

ARIZONA COMMERCIAL (Globe)—A small flow of water was encountered about the middle of October, but thus far no trouble has been experienced from it. The third crosscut showed the vein to be 50 ft. wide, carrying ore throughout, although portions of it will have to be hand sorted. The extraction drift is being driven parallel with the vein 25 ft. from it.

SOUTH LIVE OAK (Miami)—The bond on the company's ground expired Oct. 15, and circulars have been issued to the stockholders, stating the assets of the company. The initial cost of the large churn drill used by the company was $6780, with added cost of equipment, freight, etc., bringing the total up to $12,000. The cost of drilling was $3.78 per ft. The drill was left on the last hole and the casing has not been pulled. Mining men of the district say that the ground had already been proved worthless by other drilling.

MIAMI COPPER (Miami)—Plans have been formulated and actual development started for extraction of the Captain orebody. The sinking of the Captain shaft has been completed to the 420 or main tramming level, and a sump has been cut. On the 420 level 1894 ft. have been completed to date. A number of raises have been started from this level to develop the ground. The first sub-level to be opened up will be the 270 and the work on this will begin at the Captain shaft. Diamond drilling has been discontinued for the present. The daily output is averaging 3000 tons of ore, a rate that will be maintained for the present. The additions to the crushing plant are virtually completed.

### Greenlee County

TWIN PEAKS (Clifton)—The erection of a 25-ton mill has been begun. Later a cyanide plant will be added. When the mill is in operation, ores from the New Strike claim, which have been shipped to the Shannon smelting works, will be treated in the Twin Peaks mill.

### Maricopa County

RELIEF (Phoenix)—The cyanide plant is in continuous operation.

### Mohave County

PIONEER (Oatman District)—Ore 8 ft. wide, assaying $30 per ton, has been opened on the 200-ft. level. A mill is to be erected.

HOT TAMALE (Chloride)—The new development tunnel has been driven 400 ft. with excellent results. A large shoot of ore is being opened and work will soon be started on another tunnel lower down. On the Brighter Days tunnel, owned by the same group, some new drifts are being made below old shoots.

### Pima County

CLIPPER (Wooley)—Work has been resumed on the Clipper shaft, which is to be sunk an additional hundred feet and then drifts will be driven on the vein.

KELVIN-SULTANA (Kelvin)—Massive chalcocite has been opened in the east drift on the No. 2 vein at the 300-ft. level. The west drift on the same vein and level has passed into the granite where high-grade carbonates and silicates were encountered. Work on the aerial tramway across the Gila River has been begun.

### Yavapai County

CONSOLIDATED ARIZONA (Humboldt)—A contract has been made with the Mineral Separation Co. to install a 250-ton flotation plant in connection with the concentrator.

## ARKANSAS

### Boone County

GEORGIA CRACKER (Zinc)—This mine is being operated by J. W. Sneller.

### Marion County

FRISCO (Yellville)—Ore is being shipped regularly.

STAR KILN (Yellville)—William A. Lancaster, of New York, is operating this mine.

### Pike County

KIMBERLITE DIAMOND MINING & WASHING CO. (Murfreesboro)—The charter was recently revoked by the secretary of state, but the company has temporarily turned over its holdings to three trustees and has resumed operations. The company has taken its case to the supreme court on the grounds that the act by which the charter was revoked is unconstitutional.

## CALIFORNIA

### Amador County

GRITO (Volcano)—Preparations are being made for development of this gravel mine, which is believed to be on the same channel from which good pay is being taken in the Grillo.

### Butte County

A TIN PROSPECT at Goat Flat is reported to yield ore carrying a fair percentage of cassiterite.

THE NEW CONCRETE DAM AT MAGALIA on Feather River, under construction by P. B. Steifer Mining Co., is expected to be completed by the end of October.

WATER FOR DREDGING is again available in the Oroville and Honcut fields. The Gardella dredge at Honcut is in operation. The Berry Creek mine also is reported to have sufficient water to resume. There is less demand for water for irrigation.

MAMMOTH CHANNEL GOLD MINING CO. (Marysville)—It is reported that plans were presented at the annual meeting for the organization of a new company to proceed with the development of the mine at Magalia. A drain tunnel is said to be a part of the scheme, which will cheapen the cost of working the gravel.

### Eldorado County

THE CABLE EQUIPMENT of the Eureka slate quarry on American River at Slatington is reported to have been destroyed by the recent forest fires. The cable tram is three miles long and cost about $50,000 to build eight years ago.

CARPENDAR—A civil suit and a criminal charge have grown out of the disagreements between W. P. Carpendar and son, the owners, and Arthur S Lyon over possession of the surface holdings. The Carpendars have secured legal possession. Recently Lyon was charged with threatening the life of Bert Carpendar.

### Humboldt County

HORSE MOUNTAIN (Eureka)—This copper property, which is being developed, is reported to have passed under a purchase option to a corporation represented by R. B. Harper, of San José, who made an examination of the mine last month. The development done under the direction of David Wilson is said to have disclosed a large amount of copper ores; the cost has been paid by sales of stock.

### Inyo County

INYO CERRO GORDO MINING & POWER CO. (San Josē)—The state water commission has granted the application for taking water from Lone Pine Creek in Inyo County. The company is successor to the Four Metals Mining Co., which had partly developed the power plant.

### Kern County

CONSOLIDATED MINES CO. (Randsburg)—The unwatering of the Wedge is contemplated. This mine has yielded high-grade ore in the Rodgers stope.

YELLOW ASTER (Randsburg)—A dividend of $5000 was declared on Sept. 25. This makes a total of $45,000 for the year, and a total of $1,166,789 since incorporation. The poles for the power line from the substation to Old Wells and to the mine are in place. The equipment of the mills and the pumping plant with electric motors will now proceed.

### Modoc County

YELLOW JACKET (Highgrade)—A carload of high-grade ore was recently shipped. A second shipment will be made soon.

MODOC (Highgrade)—Ore of high grade is reported to have been disclosed in the 50-ft. level. Drifting on the 100- and 200-ft. levels is in progress.

BIDWELL DISCOVERY (Highgrade)—It is reported that development will be resumed on this property, which was the first to yield high-grade ore in the early life of the district.

### Mono County

STANDARD CONSOLIDATED (Bodie)—The office management has been reduced from five to one man, and the miners reduced to 10. It is reported that a deal is under consideration for taking over of the electric-power plant on Green Creek by another corporation, said to be operating at Aurora, Nev. The plant was installed by the Standard 15 years ago.

## COLORADO

### Boulder County

THE INCREASED DEMAND FOR TUNGSTEN has created renewed activity among the mines and mills of the Nederland district. The Primos mill, which was shut down a few weeks ago, has been started again and a large force of men has been put to work in the mines. The Wolf Tongue Co. is installing on the Travarton ranch a big compressor plant which will supply air for the drills of 11 different mines owned by the company in the immediate vicinity. The compressors will be driven by electric power furnished by the Colorado Power Co. The Boulder Tungsten Production Co. has a large force of men at work getting out ore for its mill, and the Colorado Tungsten Co. mill has also been started again. The Caribou mines which were sold to a Holland company in 1873 for $3,000,000 and are credited with an early day production of $10,000,000, are being reopened by an English company under the management of Henry P. Lowe, of Central City. The entire Caribou Hill is said to have been secured and 50 men are at work. While the mines are being unwatered and put in shape the mill at Nederland will treat dump ore.

### Clear Creek County

HOOSAC—It is reported that the mill will be placed in operation in the near future.

BLACK EAGLE—Development has been resumed by lessees McDonald & Welsch. The lower level will be advanced 200 feet.

TERRIBLE-DUNDERBERG (Georgetown)—The ownership of this group of mines, on Brown Mountain, above Silver Plume, has been transferred to the Terrible-Dunderberg Mining & Power Co., which was recently incorporated with capital of $250,000. It is announced that at a meeting of the stockholders, to be held Nov. 1, the capital is to be increased to $500,000, represented by 100,000 shares of a par value of $5. The company has planned an extensive campaign of development, including the sinking of the main shaft several hundred feet and the driving of the 11th, 12th, 13th and 14th levels. It is reported that the new organization has ample funds to carry out its plans. B. C. Catron, Jr., has been appointed resident manager, with offices at Georgetown, Colo.

### Gunnison County

GOLD CUP DREDGING CO.—The dredge and power plant has been completed and was put in operation last week.

### Lake County

BABY SHAFT (Leadville)—A 22-hp. electric hoist has been installed at this mine, in California Gulch.

NEW MONARCH (Leadville)—A vein has been opened on the fourth level by lessees of the Cleveland shaft, from which they have shipped two cars that netted $900 per car and they have two more carloads ready. The returns are for gold, silver, copper and lead.

### San Juan Region

SMUGGLER UNION VS. LIBERTY BELL—This suit, in which the plaintiff company claimed damages for willful trespass and for the willful extraction of ore from its ground was finally determined in favor of the Smuggler-Union. In June last year, a verdict in favor of the plaintiffs in the sum of $403,000 was rendered. The circuit court of appeals last March in St. Louis confirmed the judgment, and lately the supreme court of the United States, on a writ of certiorari, denied a review or any further hearing. The judgment, therefore, as rendered stands and amounts, with added interest, to about $448,000.

### Summit County

RELIANCE GOLD DREDGING CO. (Breckenridge)—The cleanup for September is said to have been about $10,000.

DUNKIN (Breckenridge)—The lessees who made such an extraordinary strike of nuggets of gold this summer, are now said to have cleaned up $20,000 from that one pocket.

### Teller County

PORTLAND (Victor)—It is reported that a vein of ore has been opened at a depth of 1350 ft., which is 5 ft. wide, and assays run from $4 to $2000 per ton. A dividend was paid, Oct. 20, at 2c. per share, making a total of $9,397,080 paid to stockholders.

STRATTON'S ESTATE (Cripple Creek)—The properties are now being worked by 30 sets of lessees, not including sublessees, and the production is about 2000 tons per month of ore of a good average grade. Profits thus derived will result in the payment of the regular annual dividend.

GOLDEN CYCLE (Goldfield)—Charles Butters has brought suit against the company charging that the company is using three processes invented by Butters without permission or profit to him. He asks that a perpetual injunction be issued against the company and that it pay the statutory amount of three times the damage suffered by the knowing use of the patent of another.

## IDAHO

### Coeur d'Alene District

BLACK HORSE (Murray)—This mine, which is noted for its financial troubles, was sold at sheriff's sale for $5800. It has been in a receiver's hands for some time.

OREGON-WASHINGTON R.R. & NAVIGATION CO., it is rumored, is preparing to enter Sunset district; a route from Cañon Creek across the divide into Nine Mile has been investigated.

ALICE (Mullan)—The leasing company operating this mine is shipping four cars of ore monthly. A crew of 20 men is working between the 400 and 600 levels. The grade of the ore is good.

SILVER CLIFF (Lookout)—The company has experienced great difficulty in finding the vein in the lower tunnel. It has been decided to work through the winter and supplies will be hurried in.

HYPOTHEEK (Kingston)—The water shortage has been relieved and the mill is now running two shifts. The ore is coming from the stope on the 700-ft. level. The property will be operated throughout the winter and will ship three tons of concentrates monthly.

BEAR TOP (Murray)—A leasing company is operating this mine which is in the hands of a receiver. The work will be done between the No. 2 and No. 3 tunnels where a block of ground 200 ft. long and 250 ft. high has not been stoped. The compressor has been put in operation and as soon as the mill has been repaired shipping will commence. The lease is on a royalty basis.

RAY-JEFFERSON (Nine Mile)—The ore encountered in the tunnel has widened from a streak to 8 ft., 18 in. of which is shiping ore which will assay 65% lead. The tunnel is in 800 ft. at a depth of 350 ft. A new tunnel will be started 400 ft. lower. Plans are being considered to install a compressor at once and to erect a mill if the lower tunnel strikes ore.

## MICHIGAN

### Iron

PICKANDS, MATHER & CO. (Marquette)—Work on a new coal dock is soon to be started at Marquette, and the dock will be ready for use next spring. The dock and unloading machinery will cost $100,000, and will be modern in every respect. The piers of one of the old Duluth, South Shore & Atlantic ore docks, which are under lease, will be used for the foundation. The coal will be carried by a belt conveyor to the present storage plant. The old dock has outlived its usefulness. Most of the soft coal that is brought to the port is for the mines of the Marquette range.

BARRON (Humboldt)—The Breitung interests have discontinued mining ore at the Barron mine, throwing about 200 men out of work. Most of the known ore on the property has been removed, but a crew of about 25 men will be employed underground in searching for new orebodies, which are believed to exist. The Barron is the only Humboldt property which has worked for a number of years, and it will not be long before the village will be practically deserted. At present there is not a mine working in Humboldt, Champion or Michigamme, although it is believed that the Imperial at the last named place will resume work shortly.

## MINNESOTA

### Cuyuna Range

BRAINERD ALMOST HAD A HOLIDAY a couple of weeks ago. No new Cuyuna property entered the shipping lists, but Leslie Bush, of the Philadelphia Athletics came home.

TONNAGE ESTIMATES of the Cuyuna range outputs by accredited authorities show that shipments in 1913 will be between 850,000 to 900,000 tons, made up as follows: Kennedy, 280,000; Armour No. 1, 160,000; Armour No. 2, 200,000; Pennington, 100,000; Thompson, 40,000; Barrows, 12,000; Cuyuna-Mille Lacs, 75,000; and Cuyuna-Duluth, 15,000.

AVAILABLE CUYUNA ORES, according to testimony of Carl Zapfe in the Steel Corporation dissolution suit in New York Oct. 2, amounted to 400,000,000 tons of ore in addition to the properties now being operated. Of this amount, 50,000,000 tons is manganiferous ore. Mr. Zapfe is geologist in charge of the Northern Pacific interests on the Cuyuna range, which company controls the bulk of the tonnage on the South Range of the Cuyuna district and several properties on the North range.

CUYUNA-DULUTH IRON CO. (Ironton)—This company is hoisting 150 tons daily, some of which is going to stockpile and some to Ashland, Wis., via all rail. 75 men now employed.

BARROWS (Barrows)—About 200 tons per day is being hoisted, all of which is being shipped. This will continue until 10,000 tons have been shipped, when product will be put in stockpile.

THOMPSON (Crosby)—Day and night shifts now working. About 300,000 cu.yd. of stripping removed to date of a total of 800,000 cu.yd. When completed the pit will have a depth of 70 ft. No water troubles so far, and the usual ideal Cuyuna range overburden is being encountered.

### Mesabi Range

OLIVER IRON MINING CO. (Buhl)—A new underground property is being opened on Section 16, adjoining the Woodbridge, at Buhl. When well opened up this will be one of the largest underground mines on the range.

UNION (Virginia)—This mine, controlled by the Oliver Iron Mining Co., has discontinued shipments for the season, throwing 50 men out of work. The Roberts-Kingston Contracting Co. is stripping the property.

DULUTH, MISSABE & NORTHERN ORE DOCK (Duluth)—About 250 men now employed on construction work at new No. 5 dock; concrete cribwork about completed, except for 500 ft. of outer end of dock. Erection of the steel supports has begun, and sufficient steel is on hand to keep the full force at work all winter. The dock will be completed prior to opening of navigation next season.

OLIVER IRON MINING CO. (Virginia)—Drills being operated by this company on the Higgins No. 2 are proving up some fine ore. Some of the drills are working where the orebody is being traced west across the "forty," while the remainder are working on extensions of the Mesabi mountain. The ore has been known to exist in both places for several years, and the drilling now being done is merely to prove the extent of the deposits.

SULLIVAN (Virginia)—The Oliver Iron Mining Co. is doing development work on the Sullivan property, a short distance northeast of Virginia, and adjoining the Larkin. New buildings were recently erected and a shaft is now being sunk. The orebody is known to be comparatively small, but large enough for mining at a profit. While nothing official has been given out it is believed that it is the intention of the company to start mining this winter, as the shaft will be down within a short time.

## MONTANA

### Butte District

EAST BUTTE (Butte)—The management has decided hereafter to issue monthly instead of quarterly reports of output.

RAINBOW (Butte)—This company which owns 110 acres of ground adjoining the Butte & Superior holdings on the east, has sunk a shaft on the property to the depth of 750 ft. and will continue to sink to an indefinite distance. A crosscut was driven on the 600-ft. level for development purposes but no ore was discovered.

GAMBRINUS (Butte)—The shaft in the western residential section of Butte has reached a depth of 200 ft. and drifting is being done on that level. A new hoist capable of sinking to a depth of 1500 ft. has been ordered. As soon as it is installed sinking will be continued to the 1200-ft. level before further drifting is undertaken.

BUTTE & LONDON (Butte)—The Rainbow Lode Development Co. controlled by Duluth men is preparing to sink the shaft from its present depth of 1100 ft. to the 1600-ft. level, and there to crosscut to the north and south endlines of the claim. By the terms of the contract the Rainbow will receive 51% of the stock of the Butte & London company for doing the work. An electric hoist and equipment have been ordered which are now en route, and as soon as received the shaft will be unwatered and work commenced.

BULLWHACKER (Butte)—There has been trouble at this property with the pumps and other machinery, which interrupted operations. The management announces that everything has been finally adjusted and that operations are proceeding under normal conditions. During the time the property was in the hands of lessees the ore was taken out through tunnel, but now it has been decided to reopen the shaft, which has not been used for seven years. The shaft is 400 ft. deep. It is intended to sink the shaft down several hundred feet. With the leaching plant in operation the Bullwhacker expects to bring about a large saving as compared with the leasers who averaged $500 a month with the ore treated at the Washoe works.

## NEVADA

### Clark County

SINGER (Goodsprings)—The new 50-ton mill has been in operation, and shipments of lead concentrate to Salt Lake smelters have already begun. The plant uses the Stebbins dry concentrator in order to make a separation of lead and zinc minerals from limestone gangue. From a head averaging 17% lead, it is claimed that a concentrate is taken off averaging 60%, with an extraction in excess of 80%. The plant is owned by the Howard Mines Co.

### Humboldt County

CHARLESTON NATIONAL (National)—The shaft is now down 300 ft. Sinking will be continued.

ROCHESTER HILLS MINING CO. (Rochester)—A dividend of 10c., it is stated, will be paid before the first of the year. The shaft is 250 ft. deep, and drifting is in progress; 50 tons of ore per day is being shipped. A consolidation of the Rochester Mines Co., Nenzel Crown Point, Weaver, and others, it is stated, will be effected, and that a mill for the treatment of the low-grade ores will be built.

### Lyon County

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Oct. 16, 1913, were as follows: From Mason Valley mine, 2338 tons; from Nevada-Douglas, 1024 tons; from other mines, 1030 tons; total 4392, or a daily average of 625 tons. During the same week five cars of matte were shipped.

NEVADA-DOUGLAS (Ludwig)—Recent development in the Ludwig has exposed ore on the eighth level. In the Casting Copper the 100- and 200-ft. levels are entirely in ore. This shoot has been crosscut and is 42 ft. wide. On Douglas Hill shipping ore is being blocked out on the sublevel, as well as a large tonnage of low-grade ore. The leaching plant, it is stated, will be built at Ludwig near the mine instead of at Hudson, as first stated.

### Mineral County

LUCKY BOY (Hawthorne)—This mine will be reopened in the near future. In the meantime the driving of the tunnel will be continued.

FERMINA SARRIAS GROUP (Luning)—This group of 53 claims, belonging to Señora Fermina Sarrias, has been sold, through A. G. James, of Fallon, for $65,000, a cash payment of $4000 having been made. The roads are now being repaired and development will commence in the near future. Two sets of lessees are now at work and other leases will be granted.

YERINGTON MOUNTAIN (Yerington)—The shaft is now 530 ft. deep and crosscutting on the 500-ft. level is in progress. On the 300-ft. level and in the Beach tunnel ore is being stoped and regular shipments are being made. Ore of good grade is being developed in the Lavigne and Azurite tunnels. The shaft will be sunk to the 750-ft. level, and a tunnel 3500 ft. in length, cutting the vein at a depth of 1200 ft., will be driven.

### Nye County

PRODUCTION OF TONOPAH MINES in September was as follows: Tonopah-Belmont, 13,000; Tonopah Mining, 13,150; Tonopah Extension, 4847; Montana-Tonopah, 4496; West End, 3948; North Star, 1757; MacNamara, 2387; Jim Butler, 1426; Merger, 2309; Halifax, 225; Midway, 200; total, 47,745; total gross value, $937,720. The production for September shows a falling off of 5437 tons and $108,880 in value due solely to the mills being closed on Labor Day and from 2 to 2½ days after an account of lack of water and interruption in electric-power service.

### Washoe County

A DISCOVERY OF GOLD-SILVER ORE has been made near Jumbo, on the west slope of Mount Davidson. The ore closely resembles that of the Comstock Lode.

### White Pine County

STEPTOE VALLEY (McGill)—Two men were burned to death and four others received minor injuries when an explosion occurred in the smokestack Oct. 21. The men were lining the interior of a new stack. A gasoline torch exploded. A. A. Ellis and a Greek laborer were on a platform in the stack 25 ft. from the ground and were burned to death. Although the other men were within the stack, they escaped with slight injuries.

## NEW MEXICO

### Colfax County

AN EXPLOSION at the No. 2 Stag Cañon colliery of Phelps, Dodge & Co., at Dawson, Oct. 22, occurred when 288 men were underground, 27 men were rescued, and 261 are dead or missing. The superintendent was killed by falling roof just after the explosion while on his way out of the mine. Two rescuers lost their lives.

### Socorro County

ERNESTINE MINING CO. (Mogollon)—Some time ago a contract was let for crushing the ore, with the result that the daily treatment has increased from 100 to 160 tons a day.

MAUD MINING CO. (Mogollon)—The drifts being driven from 500-ft. level in new shaft are in excellent milling ore. A steam compressor plant was recently placed in commission.

OAKS (Socorro)—The Winze in "B" tunnel of the East End tunnel group has reached a depth of 20 ft. The vein, of a good grade of sulphide ore, averages 3 ft. width at bottom.

TREASURE MINING & REDUCTION CO. (Mogollon)—The mine crew has been increased after a thorough overhauling of the electric hoist, compressor and other equipment. Machine drills are now employed underground. Power is furnished by the company's hydro-electric plant on Whitewater Creek.

SOCORRO MINING & MILLING CO. (Mogollon)—About a year ago the company started milling the old ore dump accumulated during the bonanza days of the property in the late '90s. It has yielded something like 10,000 tons to date of $10 ore, at a cost of but a few cents per ton to put into mill. A considerable portion of the dump remains to be treated. A large daily tonnage is regularly coming from mine.

## NORTH CAROLINA

### Montgomery County

COGGINS (Eldorado)—A strike of unusually rich, free-gold ore, 8 ft. wide, of silicified slate carrying quartz in seams and stringers, has just been made in a west crosscut at the 250-ft. level at this mine seven miles from Whitney, in Stanly County. Samples across the 8-ft. width of ore show $202 per ton, largely free gold. The ore carries but 4 or 5% pyrite, with much of the ore showing visible coarse and fine gold disseminated throughout the gangue. This property was purchased last May by North Carolina men, who have since been developing and sinking the main shaft from the 200-ft. level to reach a depth of 500 ft.; the present depth being about 280 ft., and installing a 20-stamp mill with Wilfley tables, which will be completed ready for operation in November. This property is about 20 miles northwest from the Iola mine at Candor in Montgomery County, the South's principal producer of gold in 1912 and 1913. Samples at the 100- and 200-ft. levels gave $7.50 average value for an average width of 20 ft. of ore.

## NORTH DAKOTA

### Ward County

PLANT FOR BRIQUETTING LIGNITE at Minot, North Dakota's first commercial briquetting plant, is about to begin operations, all machinery having arrived and much of it already being in place. The plant, which is laid out after plans by Dean E. J. Babcock, of the North Dakota School of Mines at Grand Forks, is being watched by Eastern owners of North Dakota lignite properties, as heretofore the disintegration of the lignite has prevented its shipment and hence its general use. The success of the plan would mean much to North Dakota, as Pennsylvania and Wyoming coals are now shipped into the state.

## OREGON

### Baker County

POWDER RIVER DREDGE—This dredge will work all winter. The management has operated the plant daily for the last few years and with good success. The production ranges from $10,000 to $48,000 per month.

### Crook County

THE OREGON TRUNK R.R. will take ore cars into the cattle country of Crook County to bring out an accumulated deposit of gold quartz sent into Redmond by teams, a distance of 30 miles, from the placer mines along the Ochoco River.

### Josephine County

ALMEDA CONSOLIDATED (Galice)—Receiver Burley has closed down the smelting plant after operating it since Aug. 21, the date of the receivership. He has come to the conclusion that it is impossible to operate the works with any margin of profit, as it is only by the strictest economy that it can be made to pay more than the running expenses. Burley has left Superintendent John Ross and a crew of men at the mine to make tests by which the selection of the concentrators required will be made. Since operating the mine the receiver, like Mr. Ross, is of the opinion that 30% of the ore is smelting and 70% concentrating ore. Since Aug. 21 the smelting plant has made $14,000 worth of matte, but it was only by the strictest economy that it showed a small margin of profit. The item of hauling had been reduced something over 70% by the use of an automobile truck, which hauled matte to the railway station at Merlin, a distance of 17 miles.

## SOUTH DAKOTA

### Lawrence County

SILVER GROUP—Local men are arranging to start a systematic course of development on this property, consisting of 135 acres adjoining the Wasp No. 2 and Bismarck on the south.

WELLS FARGO (Terry)—This property, owned by the Golden Reward company, is being operated under lease, by Norman & Bates. Steady shipments of mill ore and occasional lots of smelting grade are going forward.

HEIDELBERG—Now that the new road to this property has been completed, shipments to the Golden Reward mill will commence. There is considerable ore on the dumps, and mine work is yielding a satisfactory tonnage.

TITANIC—Since the installation of a new air compressor and steam hoist, progress at this property has been augmented. The principal work is being confined to the Combination shaft, where sinking is in progress below the 100-ft. level. On the 100-ft. level exploratory lateral work is under way.

## UTAH

### Beaver County

SOUTH UTAH MINES & SMELTERS (Newhouse)—During September there were produced 249,323 lb. copper, this being the largest output since May, 1912. Operations were suspended in September, 1912, owing to a strike, and work was not resumed until April of this year. Between Apr. 1 and Oct. 1 the production was 1,151,476 lb. copper.

### Juab County

TINTIC SHIPMENTS FOR THE WEEK ended Oct. 10 were 128 cars.

EAGLE & BLUE BELL (Eureka)—The fourth quarterly dividend of 5c. was declared Oct. 20, and totals $45,000, payable Nov. 1.

### Piute County

WEDGE (Marysvale)—This property in the Horse Heaven country of the Marysvale district has recently made a shipment of rich gold ore. This came from a 2-ft. vein about 60 ft. from the surface. The Wedge has produced chunks and boulders of specimen ore running especially high in gold.

### Salt Lake County

UTAH METAL (Bingham)—The difficulties over the water question with the Middle Cañon Irrigation Co. have been settled by the Utah Metal agreeing to pay for the privilege of taking water from the springs above the tunnel, and supplying the irrigation company with an equivalent amount of water from the tunnel.

### Summit County

PARK CITY SHIPMENTS for the week ended Oct. 17 amounted to 3,012,230 pounds.

### Tooele County

CONSOLIDATED MERCUR (Mercur)—The last of the mine and mill equipment has been sent to Salt Lake City, leaving little of value at the property.

### Utah County

NEBO HIGHLAND (Nebo Mining District)—A car of ore from this property is on the market, and other shipments are expected to follow. The ore carries lead, zinc and silver, and is of good grade. Development will be carried on throughout the winter.

## WASHINGTON

### Ferry County

BEN HUR LEASING CO. (Republic)—During August the company shipped to the Trail, British Columbia, smelting plant ore valued at about $21,000. In September the company sunk the Ben Hur shaft from the 500 to the 600-ft. level, [illegible] a considerable quantity of ore and mined and stored [illegible] 1500 tons, ready for shipment. On Oct. 12, 1910, the leasing company leased the Ben Hur mine from the Ben Hur Mining & Milling Co. for a term of five years. The lessees have sunk the shaft to the 600-ft. level and will have it completed and timbered to the 700-ft. level by Nov. 1. Thereafter the 600 will be made the main working level until it can be ascertained how the oreshoots pitch below it. To that end a crosscut is being driven 120 ft. eastward toward the vein, which will be explored immediately. From a station on the 400-ft. level a crosscut has reached the vein and a drift has been driven 135 ft. north and another 40 ft. south. From the south end a raise has been carried up to the 300-ft. level. On the 300 the vein has been exploited by driving about 500 ft. north and 90 ft. south, and from a point 300 ft. north of the shaft a raise has been put through to the 200-ft. level in good shipping ore, and 1500 tons have been broken assaying $15 per ton. The leasing company has shipped about $200,000 worth of ore, netting about $100,000, which sum has been expended on development and the purchase and instalment of new machinery.

## CANADA

### British Columbia

GRANBY CONSOLIDATED (Grand Forks)—This company has taken over the Midas mine at Valdez, Copper Queen on Texada Island, and Mamie mine, on Prince of Wales Island, in Alaska. Bonds have also been taken on local properties.

DALY REDUCTION CO. (Hedley)—This company intended to install a 1500-hp. hydro-electric plant on the Similkameen River, but so far, owing to conflictions, has been unable to get the necessary rights from the government. Everything at the property is running along about as last year, with a slightly increased tonnage, and about the same surplus and dividends.

LUCKY JIM (Kaslo)—A stockholders' meeting, to be held at Victoria, has been called Nov. 13, for the purpose of reorganizing and refinancing the company. Two plans have been made for the owners to consider. One is to reincorporate under the provincial laws and levy an assessment of 5c. per share, to be called at the rate of 1c. per month. The other is to issue bonds. Pressing liabilities of the company are now placed at $83,250. G. Weaver Loper, who financed the corporation originally, is said to be a creditor to the extent of a further $73,000, but this amount the officers say does not come due until the mine is paying 1% per month to the shareholders. The mine cannot be operated profitably without a concentrator, they state, which will cost $150,000. The question of raising this amount additional will be put up at the meeting.

### Ontario

BELLELEN (South Lorrain)—This mine has been closed down owing to financial difficulties.

LUCKY CROSS (Swastika)—Operations on this property have been resumed. An electrical power plant will be installed, taking electricity from either the White or the Raven Rivers. A 30-day run will be made to test the best plan of cyaniding the ore.

PORCUPINE MIRACLE (Langmuir Township)—This company is building a 60-ton mill comprising crushing, ball mill and straight amalgamation equipment. A cyanide plant will be put in later. The company has a large quantity of milling ore claimed to average over $11 per ton.

## MEXICO

### Sonora

SILVER KING (Nacozari)—John G. George, the owner of this mine, has given a bond and lease to J. V. Fryer, who has also secured a lease on the adjoining property. This is one of the old producers in the district and has been worked by the highgraders since it was closed down last year.

WASHINGTON (Uepac)—Development work is being pushed by F. O. Bostwick, manager of the mine and large bodies of ore are being blocked out. Owing to the unsettled conditions of the country no ore is being shipped, but when things are again normal the mine will be in shape for steady shipments.

LA REINA (Esqueda)—Work is being started preparatory to building a small mill. The ore is a sulphide of iron and lead, with quartz containing gold. It is intended to concentrate the ore, after it passes over plates which will get a large portion of the gold. The lead-iron concentrates will be shipped to El Paso.

SANTA ROSA (Cabullona)—Mr. England, who has secured a lease on all James Kirks properties in the district, has become associated with H. F. Brown and others, of Douglas, Ariz., and they are now mining some of the high-grade ore which contains 20% copper. The Santa Rosa is 15 miles southeast of Douglas and six miles east of Cabullona on the Nacozari R.R.

SAN SABA (Cabullona)—Carisie & Vinnie, who are the owners of this property, have recently incorporated both in Mexico and the United States, and have again started to work both in the shaft and on the new crosscut tunnel, which will cut the shaft at the 100-ft. level. The ore can then be taken through this crosscut to the road, saving the expense of hoisting it up the shaft and packing it down the hill again to the wagons.

## PERU

### Piura

LONDON & PACIFIC PETROLEUM CO., LTD. (Negritos)—It is reported that the Standard Oil Co. has acquired control of the Negritos oil fields. Standard Oil has also a controlling interest in the West Coast Fuel Co., a distributing concern, which has heretofore handled the greater portion of the output of the Lobitos oil fields. The Lobitos fields proper now yield 80,000 tons annually, the chief market being in Peru, Chile and California. The Talara and Negritos fields operated by the London & Pacific Petroleum Co. and which have now come under the dominion of Standard Oil, produce 100,000 tons annually. They lie about 10 miles along the coast to the northwest of Paita, the port of the Department of Piura. Negritos is the center of boring operations and Talara, an excellent harbor connected with it by 16 miles of narrow-gage railway, is the location of the refinery and shipping wharves. Besides the oil from the wells scattered about Negritos on the ocean side of the property, operations are also carried on at La Brea, 35 miles inland.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Oct. 29

The little excitement in copper last week seems to have passed over for the present, and the market is quieter. Other metals are also inclined to be quiet, with few changes.

### Copper, Tin, Lead and Zinc

**Copper**—The promise of an increasing volume of business at the close of our last week failed to be borne out. American buyers did not come into the market and orders from Europe dwindled. There was an early show of strength, during which close to the asked price of 16⅞c., delivered, 30 days, was realized on some small business. At the same time sales in Europe as high as £78¼, equivalent to about 16.93c., were reported. These were on orders filled out of stock in Europe, representing the necessities of some buyers who had to have immediate copper, and were relatively small in volume. Business for shipment from this side was taken at lower prices right along.

The failure of any important American orders to materialize, coupled with authentic news of relaxation in the brass trade in Connecticut and elsewhere, the mills being reported as running on reduced time, produced a distinct weakening in the attitude of several sellers. Some considerable business was accepted from domestic consumers on Oct. 27, at 16.65@16.70c., delivered, 30 days, while some orders for shipment to Europe were taken at prices that netted scarcely 16.45c. Subsequently there were offers by first hands to sell at 16⅝, delivered 30 days, and at 16.65c. c.i.f. Europe. The largest producers have, however, stood firmly by their asked price of 16⅞c., delivered, usual terms. A significant feature of the week has been offers to deliver copper from seaboard refineries to inland points that ordinarily are noncompetitive.

The situation in Lake copper remains about as last reported. Barring some small quantities the only important supply is in the hands of one producer. This is understood to have been booking to its customers at 17¼c. The price for Lake copper is wholly out of tune with the general market, but special conditions exist, as is well known.

There seems to be still a supply of casting copper on hand which does not find ready buyers.

Speaking generally, there is exhibited some fear that consumption is falling off, both in Europe and in America, and particularly in the brass and sheet trades. This is thought to explain the apathy of buyers in the face of the continued strong statistical position. Reports respecting business in rods and wire are mixed. The electrical business, without doubt, continues excellent, both here and abroad.

At the close the market is very dull. We quote Lake copper at 16¾@17¼c.; and electrolytic in cakes, wirebars or ingots at 16.45@16.50. Casting copper is quoted nominally at 16@16¼c. as an average for the week.

The London standard market closed on Thursday, Oct. 23, at £74 for spot and £73 7s. 6d. for three months. Spot advanced 10s. the next day and further 10s. on Monday, when it was quoted £75 for spot, while the three months quotation remained at £73 10s. The backwardation emphasizes the scarcity of spot material, and the three months quotation the skeptical attitude of speculators regarding the further course of the market. On Wednesday, Oct. 29, spot closed at £74 5s. and three months at £73 7s. 6d. per ton.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Exports of copper from New York for the week were 6815 long tons. Our special correspondent gives the exports from Baltimore for the week at 2790 tons.

**Tin**—The firmer tone of the market, to which we alluded in our last report as becoming manifest the middle of last week, brought out considerable inquiry on the part of consumers for forward delivery of the metal. As, however, sellers had withdrawn their previous low offers and even raised their quotations above the London parity, no business resulted. Since then the market relapsed into dullness, only to become active on Oct. 28 inst. at the expense of values. The close is steady at £183 15s. for spot and the same for three months.

**Lead**—At the lower figures which have recently been established more business has been done, and the market is slightly firmer at 4.35c. New York and 4.20c. St. Louis.

At London Spanish lead is £20 7s. 6d. and English £1 higher.

**Spelter**—Consumers having permitted their stocks to run down and the price of the metal having gone off considerably of late, a good inquiry made its appearance during the past week and a fair volume of business was transacted at somewhat higher prices. At the close the market is firmer at 5.20@5.25c. St. Louis and 5.35@5.40c. New York.

The foreign market is quoted at £20 10s. for good ordinaries and specials 7s. 6d. higher.

The base price of sheet zinc in carload lots is now $7.50 per 100 lb. f.o.b. cars Peru, Ill., less 8% discount.

DAILY PRICES OF METALS

NEW YORK

| Oct. | Sterling Exchange | Silver | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 23 | 4.8525 | 60¼ | *16¾<br>@17¼ | 16.60<br>@16.70 | 40½ | 4.35 | 4.20 | 5.30<br>@5.35 | 5.15<br>@5.20 |
| 24 | 4.8525 | 60¼ | *16¾<br>@17¼ | 16.60<br>@16.70 | 40½ | 4.35 | 4.20 | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 25 | 4.8510 | 60 | *16¾<br>@17¼ | 16.55<br>@16.60 | 40½ | 4.35 | 4.20 | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 27 | 4.8510 | 60¼ | *16¾<br>@17¼ | 16.45<br>@16.55 | 40⅜ | 4.35 | 4.20 | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 28 | 4.8515 | 59¾ | *16¾<br>@17¼ | 16.45<br>@16.50 | 40 | 4.35 | 4.20 | 5.35<br>@5.40 | 5.20<br>@5.25 |
| 29 | 4.8545 | 59½ | *16¾<br>@17¼ | 16.45<br>@16.50 | 40 | 4.35 | 4.20 | 5.35<br>@5.40 | 5.20<br>@5.25 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Oct. | Silver | Copper | | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spot | | | | | | | | | |
| | | £ per Ton | Cts. per Lb. | 3 Mos | Best Sel'td | Spot | 3 Mos | £ per Ton | Cts per Lb. | £ per Ton | Cts. per Lb. |
| 23 | 27 13/16 | 74 | 16.08 | 73⅜ | 80 | 184¼ | 185¼ | 20¼ | 4.40 | 20½ | 4.45 |
| 24 | 27¾ | 74½ | 16.19 | 73¼ | 79½ | 184¾ | 185⅜ | 20¼ | 4.40 | 20½ | 4.45 |
| 25 | 27¾ | | | | | | | | | | .. |
| 27 | 27 13/16 | 75 | 16.29 | 73½ | 80½ | 184 | 184½ | 20⅜ | 4.43 | 20⅝ | 4.48 |
| 28 | 27⅝ | 74¾ | 16.24 | 73¼ | 80 | 182½ | 183½ | 20 7/16 | 4.45 | 20⅝ | 4.48 |
| 29 | 27½ | 74¼ | 16.13 | 73⅜ | 80 | 183¾ | 183¾ | 20⅜ | 4.43 | 20½ | 4.45 |

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately. Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

**Imports and Exports in Great Britain** of metals other than iron and steel are reported as follows for the eight months ended Aug. 31, in long tons, except quicksilver, which is in pounds

| Metals | Imports 1912 | Imports 1913 | Exports 1912 | Exports 1913 |
|---|---|---|---|---|
| Copper | 86,824 | 91,499 | 37,148 | 46,411 |
| Tin | 27,658 | 30,275 | 30,476 | 29,527 |
| Lead | 138,651 | 136,704 | 35,799 | 40,924 |
| Zinc | 100,176 | 100,686 | 6,222 | 6,573 |
| Quicksilver, lb. | 3,338,867 | 3,151,442 | 1,472,163 | 1,552,431 |
| Minor metals | 5,038 | 6,008 | 17,497 | 18,452 |
| Ores, etc.: | | | | |
| Tin ore and concentrates | 19,690 | 23,638 | ..... | ..... |
| Pyrites | 595,047 | 552,422 | ..... | ..... |

Copper includes metal contents of ores, mátte, etc. Exports include reëxports of foreign material.

## Other Metals

**Aluminum**—The market is dull for spot metal, and prices are lower, 19½c. per lb. being quoted for No. 1 ingots, New York. The London market has declined rather sharply, the latest quotation received being £81 per long ton—equal to 17.6c. per lb.—for ingots.

**Antimony**—Business has been very good and considerable buying is reported both for current supplies and for stock. Prices are a little higher. Cookson's is quoted at 7.60@7.70c. per lb.; Hallett's 7¼@7⅜c.; while 6½@6¾c. per lb. is paid for Chinese, Hungarian, and other outside brands.

**Quicksilver**—Business is somewhat better than it has been recently, and prices are generally steady. The New York quotation is $38.50 per flask of 75 lb. with 56@57c. per lb. for retail lots. San Francisco price is $38.50 per flask, with special terms for export business. The London price is £7 5s. per flask, with £7 quoted from second hands.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

**Nickel**—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders.

Exports from Baltimore for the past week included 330 lb. selenium.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London was unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was less demand for Egypt and India, but Germany is still looking for gold.

**Iridium**—Demand is fair and prices steady. Dealers ask $83@85 per oz., New York.

**Platinum**—The market is firmer and there seems to be less metal offering at lower prices. Quotations are still $44@45 per oz. for refined platinum. Hard metal is steady, $49@52 per oz. being asked. The foreign market is reported firmer than it has been lately.

**Silver**—Owing to over-speculation in India, coupled with reports from the northwest of India of the rather unfavorable Monsoon, causing uncertainty in regard to further requirements of the India Government, silver has had a reaction and the market even at the decline does not yet look settled.

Shipments of silver from London to the East, Jan. 1 to Oct. 16, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £8,591,500 | £8,145,000 | D. £ 446,500 |
| China | 993,500 | 702,000 | D. 291,500 |
| Total | £9,585,000 | £8,847,000 | D. £ 738,000 |

The stocks of silver in London are estimated at £1,800,000, which is £750,000 less than at the corresponding date in 1912. Stocks at Bombay are £435,000, a decrease of £1,375,000. On the other hand stocks at Shanghai are reported to be £6,235,000, or £2,935,000 more than last year

**Gold and Silver Movement in the United States** nine months ended Sept. 30.

| | Gold 1912 | Gold 1913 | Silver 1912 | Silver 1913 |
|---|---|---|---|---|
| Exports | $43,728,274 | $74,079,279 | $52,347,946 | $49,022,237 |
| Imports | 38,789,793 | 46,199,608 | 36,301,752 | 27,430,312 |
| Excess exp. | $4,938,481 | $27,879,671 | $16,046,194 | $21,591,925 |

Merchandise exports for the nine months this year were valued at $1,733,367,608; imports, $1,325,868,152; excess of exports, $407,499,456. Adding the gold and silver gives $456,971,052 as the total export balance.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Oct. 25

The base price paid this week for 60% zinc ore was $42 per ton. The base price paid for 80% lead ore was $55 per ton.

SHIPMENTS WEEK ENDED OCT. 25

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,173,390 | 175,330 | 1,024,960 |
| Year to date | 121,048,420 | 5,652,670 | 48,289,800 |

Shipped during week to separating plants, 2,689,850 lb. zinc ore.

### JOPLIN, MO.—Oct. 25

The high price of zinc blende is $45, the base per ton of 60% zinc ranging from $40@42 for choice grades. Toward the week-end medium grades were forced to a level of the best by keen competition and heavy purchases were made mostly for future delivery. Calamine continues unaffected by the declining blende market and is quoted strong at $21@23 per ton of 40% zinc. The average of all grades of zinc is $40.04 per ton. Lead ore is unchanged at $52 per ton of 80% metal content. The average of all grades of lead is $51.22 per ton.

SHIPMENTS WEEK ENDED OCT. 25

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Total sales this week | 10,118,510 | 950,890 | 1,541,420 | $261,045 |
| Total sales 10 months | 469,009,400 | 34,567,040 | 77,380,920 | $12,780,584 |

Blende value, the week, $209,465; 10 months, $11,171,591.
Calamine value, the week, $12,100; 10 months, $445,644.
Lead value, the week, $39,480; 10 months, $2,063,419.

# IRON TRADE REVIEW

### NEW YORK—Oct. 29

The steel situation has lost more ground in the past week than in any week since the recession in activity began. Production of steel has undergone a considerable decrease, being estimated this week at 80% of capacity, against 85% so recently as last week, and 90% at the beginning of tne month. The prediction is now freely made that within 30 days the mills will be running at about 65% of capacity.

The tariff is not the governing influence in the steel trade, a conclusion forced by the fact that prices show at least as great a declining tendency in the great inland market centering in Chicago as they do along the seaboard.

Mills in the Pittsburgh district have not greatly reduced their operations, but in the Chicago district and the South there has been considerable reduction, making the average of the country lower compared even with last week, and further curtailment is practically certain, as new orders are averaging only between one-half and two-thirds of capacity.

**The United States Steel Corporation** reports for the quarter ended Sept. 30 net earnings, after payment of ordinary repairs, renewals and subsidiary company charges, as follows:
HOBART

| | 1912 | 1913 |
|---|---|---|
| July | $9,322,142 | $12,936,658 |
| August | 10,583,377 | 12,657,430 |
| September | 10,157,993 | 12,856,312 |
| Quarter | $30,063,512 | $38,450,400 |
| Depreciation and sinking funds sub. cos. | .... | $7,130,960 |
| Interest and sinking funds | .... | 7,311,962 |
| Total charges | | $14,442,922 |
| Surplus for the quarter | ...... | $24,007,478 |
| Dividends, 1¾% on preferred and 1¼% on common | ...... | 12,658,700 |
| Undivided surplus | ...... | $11,348,778 |

### PITTSBURGH—Oct. 28

Pittsburgh iron and steel men just returned from the semi-annual meeting of the American Iron & Steel Institute, held in Chicago last week, bring reports that the sentiment of leading manufacturers who gathered in Chicago was less cheerful than was expected. The interchange of views seemed to depress rather than encourage. It may be taken as the concensus of opinion that the trade has entered upon a depression of which the severest part, in the matter of prices and tonnage production, is yet to be experienced, and which will last not less than three or four months as a minimum.

Slight shading of a week or more ago in merchant steel bars had developed into general shading of $1 a ton, making the market quotable at 1.35c., while shapes have lost $1 a ton and are quotable at 1.35c., plates being 1.30c. These quotations represent the average market, there being occasional concessions beyond.

The National Tube Co. in a list dated Oct. 27 has reduced prices on standard steel pipe by $1 to $3 a ton. Black and galvanized sheets are easier, while unfinished steel has undergone a somewhat more marked decline. The Pittsburgh market is now $8 a ton lower than that of early in the year, when there was a virtual famine in unfinished steel.

**Pig Iron**—Several sales of foundry have been made on the basis of $13.75, Valley, and on light transactions bessemer has declined 25c. Basic is offered at $13.75, with no sales. We quote: Bessemer, $15.50; basic, $13.75; foundry, $13.75; forge, $13.50; malleable, $14, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—English ferromanganese is well held at the former quotation of $50, Baltimore, with $2.16 freight to Pittsburgh, for prompt or forward, but buying is light and is confined to prompt. German ferromanganese is offered in limited tonnages at $49.50, Baltimore, but it is represented that the price is fixed without reference to the English price.

**Steel**—The market for billets and sheet bars continues to be made by mills adjusting contract prices with their customers, to avoid their going elsewhere, and not by outright sales in the market, of which there are practically none. On this basis we quote billets at $21 and sheet bars at $22, f.o.b. maker's mill, Pittsburgh or Youngstown, noting that lower prices might possibly be done. Rods are about $26, Pittsburgh.

### IRON ORE

The movement of iron ore from the Lake Superior region has been delayed by stormy and unusually cold weather. From now on the movement of ore will begin to decrease. There has been some congestion at Lake Erie ports, with consequent delay in unloading.

### COKE

The group of Connellsville coke operators who were maintaining the quotation of $2.50 for furnace coke have abandoned the effort and will meet the market. They have already sold 10,000 tons to an eastern steel interest at $1.90 for November shipment. The furnace-coke market is quotable at $2@2.15 for prompt or contract with possiblities of shading.

**Coal tonnage of Pennsylvania R.R.** lines east of Pittsburgh and Erie nine months ended Sept. 30, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 7,387,837 | 7,665,020 | I. 277,183 |
| Bituminous | 34,114,059 | 37,774,323 | I.3,660,264 |
| Coke | 9,671,343 | 10,859,413 | I.1,188,070 |
| Total | 51,173,239 | 56,298,756 | I.5,125,517 |

The total increase this year was 10%. The largest proportional gain was in coke.

**Foreign Fuel Trade of Germany** nine months ended Sept. 30, in metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Coal | 22,473,309 | 6,364,395 | Exp. 16,108,914 |
| Brown coal | 40,415 | 4,717,163 | Imp. 4,676,748 |
| Coke | 4,502,886 | 409,956 | Exp. 4,092,930 |
| Briquettes | 2,137,740 | 95,146 | Exp. 2,042,594 |
| Total | 29,154,350 | 11,586,660 | Exp. 17,567,690 |

Of the briquettes exported in the nine months 554,573 tons were made from brown coal, or lignite. Exports included 15,239 tons of coke to the United States.

## CHEMICALS

### NEW YORK—Oct. 29

The general markets are rather quiet and business is not especially active.

**Arsenic**—The market is still very quiet. Supplies are plentiful. Prices are nominally unchanged at about $3 per 100 lb. for white arsenic.

**Copper Sulphate**—The market is steady and fairly active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is still dull and unsettled. Prices are unchanged at 2.25c. per lb. for October, 2.30c. for November and December and 2.35c. for January-May delivery.

### PETROLEUM

Exports of mineral oils from the United States in September were 190,330,214 gal. For the nine months ended Sept. 30 the total exports were 1,377,144,587 gal. in 1912, and 1,504,779,483 gal. in 1913; an increase of 127,634,896 gal., or 9.3%, this year.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | May | June | July | August | September |
|---|---|---|---|---|---|
| Alaska shipments | 1,771,508 | 2,203,191 | 2,705,136 | 1,847,785 | 2,261,216 |
| Anaconda | 25,600,000 | 21,500,000 | 22,100,000 | 22,500,000 | 22,600,000 |
| Arizona, Ltd. | 3,200,000 | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 |
| Copper Queen | 8,301,605 | 7,477,936 | 8,369,607 | 8,252,404 | .......... |
| Calumet & Ariz. | 4,300,000 | 4,000,000 | 3,800,000 | 4,500,000 | 4,000,000 |
| Chino | 3,883,611 | 3,682,706 | 4,831,185 | 6,050,867 | 4,308,296 |
| Detroit | 2,001,633 | 1,750,601 | 1,549,224 | 2,187,223 | .......... |
| East Butte | 1,268,595 | 1,055,646 | 1,060,257 | 1,162,007 | 1,233,018 |
| Giroux | 839,317 | 598,240 | 584,546 | 524,953 | 198,178 |
| Mason Valley | 1,186,560 | 1,097,014 | 908,892 | 867,060 | .......... |
| Miami | 1,943,900 | 2,612,000 | .......... | .......... | .......... |
| Mammoth | 1,700,000 | 1,750,000 | 1,800,000 | 1,750,000 | 1,750,000 |
| Nevada Con. | 5,933,275 | 6,344,863 | 5,403,919 | 5,989,973 | 4,441,671 |
| Ohio | 650,071 | 537,400 | 601,700 | 689,000 | 685,900 |
| Old Dominion | 2,749,000 | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 |
| Ray | 4,384,400 | 4,392,612 | 4,097,000 | 4,269,519 | 4,336,434 |
| Shannon | 1,080,000 | 924,000 | 880,000 | 1,248,000 | 1,232,000 |
| South Utah | 200,000 | 185,000 | 140,000 | 223,498 | 241,843 |
| Tennessee | §1,037,115 | 1,379,220 | 1,247,804 | 1,101,019 | 1,309,950 |
| United Verde* | 3,000,000 | 2,900,000 | 3,000,000 | 3,000,000 | .......... |
| Utah Copper Co. | 10,003,227 | 11,637,949 | 9,849,043 | 10,302,251 | 11,462,905 |
| Lake Superior* | 18,705,000 | 16,500,000 | 17,500,000 | 9,700,000 | 6,950,008 |
| Non-rep. mines* | 6,300,000 | 6,000,000 | 6,200,000 | 6,200,000 | .......... |
| Total prod. | 109,824,500 | 104,051,138 | 101,758,167 | 96,769,606 | .......... |
| Imports, bars, etc. | 22,205,942 | 18,255,267 | 29,029,990 | 22,474,471 | .......... |
| Total blister | 132,030,442 | 122,306,405 | 130,788,157 | 119,244,077 | .......... |
| Imp. ore & matte | 10,528,562 | 7,497,002 | 8,527,046 | 9,171,351 | .......... |
| Total Amer. | 142,559,004 | 129,803,407 | 139,315,203 | 128,415,428 | .......... |
| Miami† | .......... | .......... | 2,890,000 | 3,097,500 | 2,688,000 |
| Shattuck-Arizona | 1,026,170 | 1,059,625 | 1,019,388 | 1,001,634 | 1,163,237 |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,076 | 634,238 | 618,379 | .......... | .......... |
| Granby | 1,782,570 | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,424,800 | 1,984,640 | 2,240,720 | 2,264,640 | 2,369,920 |
| Cananea | 2,272,000 | 2,908,000 | 3,328,000 | 3,186,000 | 3,148,000 |
| Moctezuma | 2,695,881 | 3,438,793 | 2,693,006 | 3,542,047 | .......... |
| Other Foreign: | | | | | |
| Braden, Chile | 1,150,000 | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 |
| Cape Cop., S. Af. | 387,520 | 414,400 | .......... | .......... | .......... |
| Kyshtim, Russia | 1,490,000 | 1,000,000 | 2,500,000 | 1,585,000 | .......... |
| Spassky, Russia | 721,280 | 835,520 | 660,800 | 1,048,320 | .......... |
| Exports from | | | | | |
| Chile | 3,584,000 | 5,824,000 | 9,856,000 | 8,736,000 | 5,600,000 |
| Australia | 7,840,000 | 7,616,000 | 10,304,000 | 7,720,000 | 6,944,000 |
| Arrivals–Europe‡ | 13,661,760 | 5,277,440 | 11,728,640 | 14,624,960 | 9,661,120 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| IX, '12 | 140,089,819 | 63,460,810 | 60,264,796 | 46,701,374 | 113,568,000 | 160,269,374 |
| X. | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI. | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII. | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | .......... | .......... | .......... |
| I. 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV. | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V. | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI. | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX. | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X. | .......... | .......... | .......... | 29,793,094 | 53,625,600 | 83,418,694 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Alameda, Ida | Oct. 21 | Nov. 20 | 0.0015 |
| Big Elk, Ida | Oct. 13 | Nov. 5 | 0.001 |
| Carlin-Nevada, Nev. | Oct. 25 | Nov. 11 | 0.001 |
| Cedar Extension, Utah | Oct. 30 | Nov. 17 | 0.005 |
| Central Eureka, Calif | Oct. 13 | Nov. 14 | 0.05 |
| Comet, Ida | Oct. 20 | Nov. 20 | 0.0005 |
| Cop Mountain, Ida (postpo'd) | Sept. 6 | Nov. 4 | 0.002 |
| Copper King, Ida (postpon'd) | Sept. 14 | Nov. 14 | 0.01 |
| Crown Point, Nev | Oct. 20 | Nov. 12 | 0.10 |
| Demijohn Cons., Utah | Oct. 17 | Nov. 4 | 0.0025 |
| Dennemora, Ida | Oct. 20 | Nov. 20 | 0.0025 |
| Emerald, Utah | Oct. 15 | Nov. 8 | 0.005 |
| Euresa, Utah | Oct. 21 | Nov. 11 | 0.001 |
| Hamburg-American | July 22 | Nov. 9 | 0.0075 |
| Hypotheek, Ida | Oct. 9 | Nov. 4 | 0.004 |
| Lewis & Clark, Ida | Oct. 15 | Nov. 18 | 0.0075 |
| Los Josephine, Utah | Oct. 17 | Nov. 6 | 0.002 |
| Lower Mammoth, Utah | Oct. 17 | Nov. 7 | 0.01 |
| Mont. Pittsburgh Ex., Calif. | Oct. 13 | Nov. 8 | 0.01 |
| Reindeer, Ida | Oct. 20 | Nov. 7 | 0.003 |
| Revenue Cons., Utah | Oct. 29 | Nov. 19 | 0.005 |
| Spider, Utah | Oct. 23 | Nov. 15 | 0.0025 |
| Sunset, Ida | Oct. 18 | Nov. 12 | 0.002 |
| Tar Baby, Utah | Sept. 29 | Nov. 3 | 0.0025 |
| Utah United, Utah | Oct. 1 | Oct. 30 | 0.01 |
| Western Star, Ida | Oct. 23 | Nov. 8 | 0.002 |
| Wisconsin, Ida | Oct. 9 | Nov. 10 | 0.002 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53.340 | 63.471 | ... | 24.594 | 29.299 | ... |
| November | 55.719 | 62.792 | ..... | 25.649 | 29.012 | ... |
| December | 54.905 | 63.365 | ... | 25.349 | 29.320 | |
| Year | 53.304 | 60.835 | | 24.592 | 28.042 | |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | 16.328 | 17.698 | 16.799 | 78.762 | 73.125 |
| October | 17.314 | ... | 17.661 | ..... | 76.389 | ... |
| November | 17.326 | ... | 17.617 | .... | 76.890 | . |
| December | 17.376 | | 17.600 | | 75.516 | |
| Year | 16.341 | | 16.560 | | 72.942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.140 |
| March | 42.577 | 46.832 | 192.619 | 213.615 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | 42.410 | 223.762 | 193.074 |
| October | 50.077 | . . | 228.353 | ... |
| November | 49.891 | . | 227.619 | . .. |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | 4.698 | 4.924 | 4.579 | 22.292 | 20.648 |
| October | 5.071 | ...... | 4.894 | .... | 20.630 | .... |
| November | 4.615 | ...... | 4.463 | ..... | 18.193 | .. |
| December | 4.303 | ...... | 4.152 | ..... | 18.069 | . |
| Year | 4.471 | ...... | 4.360 | .. | 17.929 | |

New York and St. Louis cents per pound London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7.426 | ..... | 7.276 | ...... | 27.543 | . |
| November | 7.371 | ...... | 7.221 | ...... | 26.804 | . . . |
| December | 7.162 | ..... | 7.081 | ...... | 26.494 | . |
| Year | 6.943 | ...... | 6.799 | ... | 26.421 | |

New York and St. Louis, cents per pound London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.65 | 16.03 | 15.04 | 15.63 | 14.93 |
| October | 17.90 | ...... | 17.18 | ...... | 17.22 | |
| November | 18.07 | ..... | 17.09 | ..... | 18.00 | . |
| December | 18.15 | . . | 17.45 | ..... | 18.73 | . |
| Year | $16.01 | | $14.93 | ...... | $15.28 | .... |

## STOCK QUOTATIONS

| COLO. SPRINGS Oct. 28 | |
|---|---|
| Name of Comp. | Bid |
| Acacia | .02½ |
| Cripple Cr'k Con. | .01½ |
| C. K. & N. | .09 |
| Doctor Jack Pot | .06 |
| Elkton Con | .53 |
| El Paso | 2.95 |
| Findlay | .02 |
| Gold Dollar | .08 |
| Gold Sovereign | .02½ |
| Isabella | .09½ |
| Jack Pot | .05 |
| Jennie Sample | .05 |
| Jerry Johnson | .03½ |
| Lexington | ‡ .005 |
| Moon Anchor | ‡ .006 |
| Old Gold | .01½ |
| Mary McKinney | .54 |
| Pharmacist | .01½ |
| Portland | .97 |
| Vindicator | .84 |

| SALT LAKE Oct. 28 | |
|---|---|
| Name of Comp. | Bid |
| Beck Tunnel | .04½ |
| Black Jack | .07 |
| Cedar Talisman | .00½ |
| Colorado Mining | .10 |
| Columbus Con. | ‡ .01 |
| Crown Point | .00½ |
| Daly-Judge | 5.00 |
| Grand Central | .52 |
| Iron Blossom | 1.07½ |
| Little Bell | ‡ .10 |
| Lower Mammoth | .00½ |
| Mason Valley | 4.00 |
| May Day | .05½ |
| Nevada Hills | .60 |
| New York | .02½ |
| Prince Con | .29 |
| Silver King Coal'n | 3.82½ |
| Sioux Con. | .01 |
| Uncle Sam | .02 |
| Yankee | .08½ |

### TORONTO Oct. 27

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .07½ | Foley O'Brien | .15 |
| Coniagas | 6.90 | Hollinger | 17.00 |
| T. & Hudson Bay | 70.00 | Imperial | ‡ .02 |
| Timiskaming | .15 | Jupiter | ‡ .10 |
| Wettlaufer-Lor | .07 | Pearl Lake | ‡ .11 |
| Apex | ‡ .01 | Porcu. Gold | .08 |
| Big Dome | 19.75 | Preston E. D. | .01 |
| Crown Chartered | ‡ .00½ | Rea | ‡ .12 |
| Dobie | ‡ .10 | Swastika | ‡ .02 |
| Dome Exten | .07 | West Dome | ‡ .08 |

### SAN FRANCISCO Oct. 28

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| **Comstock Stocks** | | **Misc. Nev. & Cal.** | |
| Alta | .08 | Belmont | 7.70 |
| Belcher | .25 | Jim Butler | .62 |
| Best & Belcher | .04 | MacNamara | .10 |
| Caledonia | 1.85 | Midway | .38 |
| Challenge Con. | .09 | Mont.-Tonopah | 1.07½ |
| Chollar | 1.03 | North Star | .36 |
| Confidence | .30 | West End Con. | 1.42½ |
| Con. Virginia | .13 | Atlanta | .12 |
| Crown Point | .28 | Booth | .02 |
| Gould & Curry | .03 | C.O.D. Con. | .04 |
| Hale & Norcross | .06 | Comb. Frac | .03 |
| Mexican | 1.20 | Jumbo Extension | .09 |
| Occidental | .70 | Pitts.-Silver Peak | .40 |
| Ophir | .19 | Round Mountain | .39 |
| Overman | .30 | Sandstorm Kendall | .07 |
| Potosi | .03 | Silver Pick | .03 |
| Savage | .13 | Argonaut | 3.00 |
| Sierra Nevada | .08 | Bunker Hill | 1.50 |
| Union Con. | .11 | Central Eureka | .15 |
| Yellow Jacket | .31 | So. Eureka | 2.00 |

| N. Y. EXCH. Oct. 28 | |
|---|---|
| Name of Comp. | Clg. |
| Amalgamated | 74¾ |
| Am. Agri. Chem | 44 |
| Am.Sm.&Ref.,com. | 64 |
| Am. Sm. & Ref., pf. | 100 |
| Am. Sm. Sec., pf. B | 81¾ |
| Anaconda | 36 |
| Batopilas Min | 1 |
| Bethlehem Steel,pf. | 71½ |
| Chino | 40¼ |
| Federal M. & S., pf. | 38 |
| Great Nor.,ore.,ctf. | 33½ |
| Guggen. Exp. | 45½ |
| Homestake | 106½ |
| Inspiration Con. | 15¼ |
| Miami Copper | 22½ |
| Nat'l Lead, com | 44¼ |
| National Lead, pf. | 102½ |
| Nev. Consol. | 15¾ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 90½ |
| Quicksilver, pf. | 3 |
| Ray Con. | 18¾ |
| Republic I&S,com. | 20 |
| Republic I&S, pf. | 81¼ |
| SlossSheffi'd,com. | 29 |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper | 28¾ |
| Utah Copper | 53 |
| U. S. Steel, com. | 57¼ |
| U. S. Steel, pf | 107 |
| Va.Car.Chem.,pf. | 95 |

| N. Y. CURB Oct. 28 | |
|---|---|
| Name of Comp. | Clg. |
| Ariz. Belmont | 12½ |
| Barnes King | 1¼ |
| Beaver Con | .34 |
| Big Four | .19 |
| Braden Copper | 7 |
| B. C. Copper | 2½ |
| Buffalo Mines | 2 |
| Can. G. & S. | .19 |
| Caribou | .59 |
| Con. Ariz. Sm | $\frac{3}{16}$ |
| Coppermines Cons. | 3 |
| Davis-Daly | 1¼ |
| Diam'field-Daisy | .02 |
| Ely Con | .06 |
| Florence | .23 |
| Gold Hill Con | .18 |
| Goldfield Con. | 1$\frac{7}{16}$ |
| Greene Cananea | 30 |
| Greenwater | .05½ |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 3$\frac{13}{16}$ |
| Keystone | ‡1¼ |
| La Rose | 1¼ |
| McKinley-Dar-Sa | 1$\frac{3}{16}$ |
| Min. Co. of A. new | 2¼ |
| Nipissing Mines | 8¼ |
| Ohio Copper | $\frac{7}{16}$ |
| Pacific Sm. & M. | ‡¼ |
| Puebla S. & R. | 3 |
| South Utah M&S | .25 |
| Stand'd Oil of N.J | 377 |
| Stewart | 1¼ |
| Tonopah | 4¼ |
| Tonopah Ex | 1¾ |
| Tonopah Merger | .60 |
| Tri-Bullion | ¼ |
| Tularosa | $\frac{11}{16}$ |
| Union Mines | .04 |
| United Cop., pfd. | 3 |
| Yukon Gold | 2 |

| LONDON Oct. 20 | |
|---|---|
| Name of Comp. | Clg. |
| Camp Bird | £0 18s 0d |
| El Oro | 0 14 6 |
| Esperanza | 0 18 9 |
| Mexico Mines | 5 15 0 |
| Oroville | 0 6 6 |
| Santa Gert'dis | 0 18 9 |
| Stratton's | 0 1 6 |
| Tomboy | 1 6 3 |

| BOSTON EXCH Oct. 28 | |
|---|---|
| Name of Comp. | Clg. |
| Adventure | 1½ |
| Ahmeek | 280 |
| Alaska Gold M. | 22¾ |
| Algomah | 1½ |
| Allouez | 34 |
| Am. Zinc | 18 |
| Ariz. Com., ctfs. | 5½ |
| Bonanza | .30 |
| Boston & Corbin | .60 |
| Butte & Balak | 4½ |
| Calumet & Ariz. | 64 |
| Calumet & Hecla | 420 |
| Centennial | 13½ |
| Cliff | 1¼ |
| Copper Range | 36¾ |
| Daly West | 2 |
| East Butte | 11½ |
| Franklin | 3 |
| Granby | 72 |
| Hancock | 15 |
| Hedley Gold | 29½ |
| Helvetia | 25 |
| Indiana | 3¾ |
| Island Cr'k, com | 46¾ |
| Island Cr'k, pfd. | 83½ |
| Isle Royale | 18 |
| Keweenaw | 1½ |
| Lake | 8 |
| La Salle | 3½ |
| Mass. | 2 |
| Michigan | ‡1¼ |
| Mohawk | 41 |
| New Arcadian | 1½ |
| New Idria Quick. | 2¾ |
| North Butte | 24¾ |
| North Lake | 1 |
| Ojibway | .50 |
| Old Dominion | 50 |
| Osceola | 77½ |
| Quincy | 58 |
| Shannon | 6¼ |
| Shattuck-Ariz. | 28 |
| Superior | 23 |
| Superior & Bost. | 2¾ |
| Tamarack | 27 |
| Trinity | 4¾ |
| Tuolumne | .90 |
| U. S. Smelting | 38 |
| U. S. Smelt'g, pf. | 47 |
| Utah Apex | 2 |
| Utah Con. | 9¾ |
| Victoria | 1¼ |
| Winona | 1¾ |
| Wolverine | 43 |
| Wyandot | .50 |

| BOSTON CURB Oct. 28 | |
|---|---|
| Name of Comp. | Bid |
| Bingham Mines | 5¼ |
| Boston Ely | .47 |
| Butte&Lon'nDev. | .30 |
| Cactus | .02 |
| Calaveras | 1$\frac{1}{16}$ |
| Chief Cons. | 1$\frac{5}{16}$ |
| Corbin | .66 |
| Cortez | .20 |
| Crown Reserve | 1$\frac{11}{16}$ |
| Eagle & Blue Bell | .98 |
| First Nat. Cop. | 2¼ |
| Houghton Copper | 3½ |
| Majestic | .27 |
| Mexican Metals | .46 |
| Moneta Pore | ‡ .07 |
| Nevada-Douglas | 1$\frac{11}{16}$ |
| New Baltic | .50 |
| Oneco | .80 |
| Raven Copper | .08½ |
| Rhode Island Coal | .01 |
| Smokey Dev | .75 |
| So. Lake | 3¾ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | .25 |
| Trethewey | .30 |
| United Verde Ext | .50 |

‡Last Quotation

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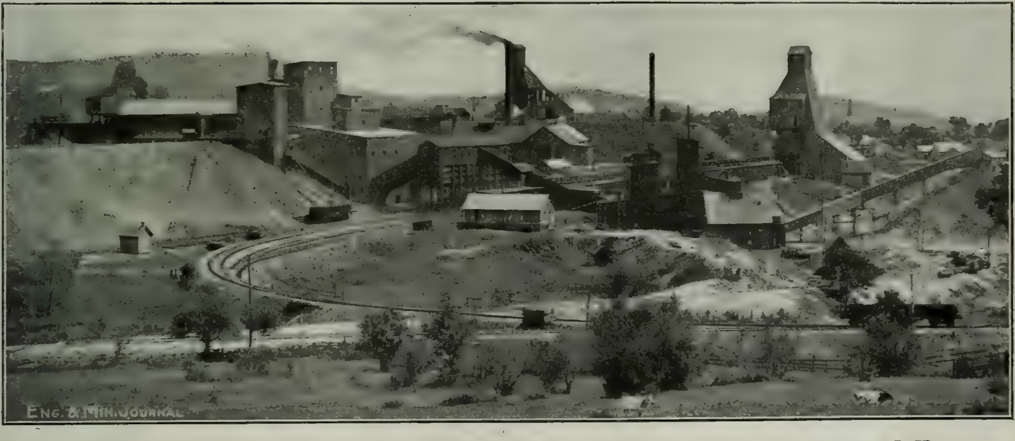
# The Magnetite Mines Near Port Henry, N. Y.

By L. O. Kellogg

*SYNOPSIS—A review of late developments and the present situation in the properties of Witherbee, Sherman & Co., Inc., the Port Henry Iron Ore Co., and the Cheever Iron Ore Co. Witherbee-Sherman, the leading company, has excellent surface equipment and is still planning improvements. Present production and future life of the companies are great.*

⁂



JOKER, BONANZA AND CLONAN SHAFT HOUSES, WITHERBEE, SHERMAN & CO., MINEVILLE, N. Y.

Port Henry is somewhat of a mining center for the eastern Adirondacks. One of the furnaces of the Northern Iron Co. is situated here and three of the operating magnetite mining companies are within a few miles of the town. At Mineville, about six miles west, the Witherbee, Sherman & Co., Inc., and the Port Henry Iron Ore Co., are working, and about two miles north is the property of the Cheever Iron Ore Company.

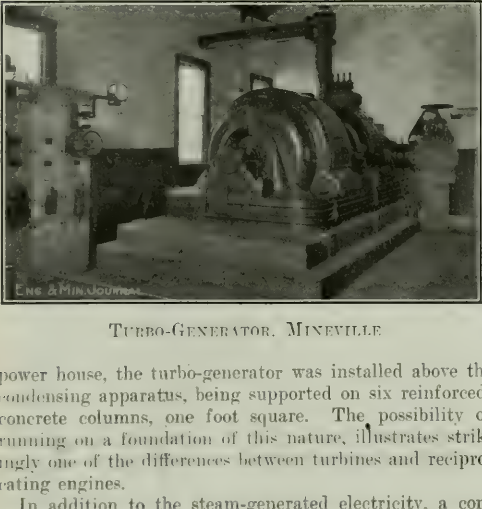
### Importance of Witherbee, Sherman & Co.

The Witherbee-Sherman company, in a way, dominates the iron-mining industry of the Adirondacks. Beside the great property at Mineville, it owns many other deposits in the region, and around Arnold Hill especially, it is exploring and developing some extremely large orebodies. It also owns nearly half of the Cheever company, the control of which is held by Bethlehem Steel. The Witherbee-Sherman Mineville property has been often described. An exhaustive account by J. H. Granbery appeared in the JOURNAL, May 12, 1906, *et seq.*: the power plant on Lake Champlain was described by Guy C. Stoltz and Samuel Shapira, in the JOURNAL, Sept. 9 and 16, 1911: the generation and use of the electric power was covered by John Liston in the *General Electric Review*, February, 1912: details of practice are described by Mr. Stoltz in the JOURNAL, Oct. 26, 1912, and at other times. An excellent general conception of the nature of the deposits and the methods of work can be obtained by reading these articles. New developments, on which little has been written, include the two new concentrators, or separators, to use the local term, additional work on the Barton Hill deposits, new developments in the Old Beds, and many projected changes in the hoisting arrangements.

No attempt will be made here to describe the two new separators, Nos. 3 and 4, as it is intended to publish complete descriptions later. The magnetic concentration of iron ore probably reaches about its highest development in these plants. In No. 4, especially, remarkably good work is done. This mill handles all of the Barton Hill ore, and nothing else and the grade of this material is low at present, a little better than 30%, so that the ratio of concentration is often 2⅓: 1.

### Generation of Power

Electric power is extensively used both on the surface and underground in all the mines. Much of this energy is converted to the compressed-air form and used thus. Practically no steam is used direct, although most of the electric power is steam generated. The latest and best of the steam power plants is that at Port Henry, on the lake shore, where a 6600-volt current is generated by one 800-kw. and one 1500-kw. vertical Curtis-General Electric turbo-generator. This plant is modern, efficient and excellently designed and constructed. Coal is unloaded direct from the Delaware & Hudson cars and the long pull up the hill to Mineville is saved. Furthermore, Lake Champlain furnishes an inexhaustible supply of cool condensing water, the lack of which has seriously interfered at times with operations in the Mineville steam plant. This latter plant, although older, is above the average of mine power plants. It consisted originally of a 750-kw. generator driven by a corliss engine. This engine is now run noncondensing, and the exhaust steam used in a 750-kw. horizontal mixed-pressure turbo-generator. The boiler plant was increased only 53%, to obtain this increased power capacity of 100%. To avoid enlarging the power house, the turbo-generator was installed above the condensing apparatus, being supported on six reinforced-concrete columns, one foot square. The possibility of running on a foundation of this nature, illustrates strikingly one of the differences between turbines and reciprocating engines.



Turbo-Generator, Mineville

In addition to the steam-generated electricity, a considerable amount of power is purchased from a hydro-electric company, its entire output being taken. This company has two plants, one rated at 375 kw. on the Black River, at Kingdom, and one of 300-kw. on the Bouquet River, at Wadhams Mills. Current from these various sources is brought to Mineville, transformed and distributed as required. A certain amount of power is also sold to the Cheever Iron Ore Co., which taps the transmission line from the Port Henry station.

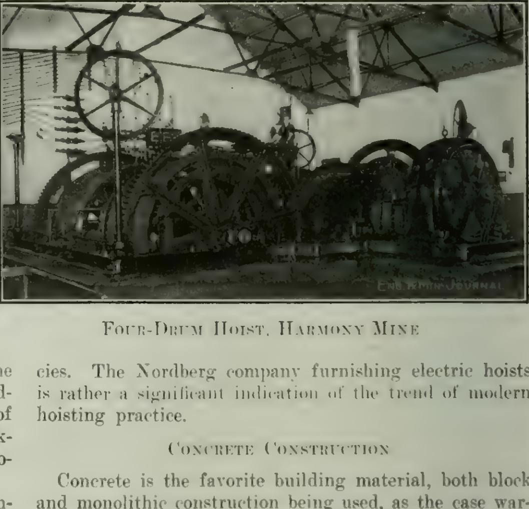
### Large Compressor Plant

The compressor installation is rather elaborate. Five of the machines are in a building between "A" and "B" Harmony shafts, which also shelters the hoist serving these shafts. Of these compressors, one, the latest, is a large Nordberg constant-capacity machine with all valves of the corliss type, direct-connected to a 400-hp. synchronous motor. Two other compressors of 2500 cu.ft. capacity, one Nordberg and one Ingersoll-Rand, are belt driven by 400-hp. synchronous motors. Two smaller Ingersoll-Rand machines of 1250 cu.ft. capacity are belt-driven by 200-hp. induction motors. Another similar Ingersoll-Rand machine at the Joker power house feeds into the compressed-air system.

The compressor installation was designed with a good deal of care. A great part of the Mineville load consists of induction motors, as in the mills and on the hoists. These motors, with the fluctuating nature of their work, had a serious effect on the power factor which was as low as 65%. It was, therefore, decided to drive the large compressors by synchronous motors, which, with their leading current, compensate for the lag of the induction motors and raise the power factor to 90%.

### Electric Hoists

Electric hoists are used exclusively, and four new ones of 300 hp. have been ordered from the Nordberg company for use in various places on the surface and underground. This is of rather unusual interest, as the Nordberg hoists and compressors heretofore have been chiefly noted for their elaborate valve design and high efficiencies. The Nordberg company furnishing electric hoists is rather a significant indication of the trend of modern hoisting practice.



Four-Drum Hoist, Harmony Mine

### Concrete Construction

Concrete is the favorite building material, both block and monolithic construction being used, as the case warrants. The new separators, the office building, the Port Henry power house and numerous houses and tenements are examples of its use. The tenements, so called, are large houses to be used as licensed boarding and rooming houses for the men. They are unusually good looking and well built. The tailing from the separators is ideal material, both for sand and aggregate, a product up to 2 in. in diameter, being made on the cobbing machines.

### Underground Work

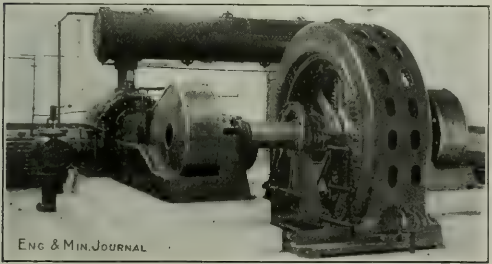
The underground work of the Witherbee-Sherman company has been described in the articles previously mentioned. The methods of mining depend largely on the nature of the orebodies, which are alike only in being usually inclined at a low angle. In the upper of the "Old Beds," now mined out, a back stoping method was in use. The system now followed in most of the mines is a bench or underhand stoping method. Two-man piston drills are used, mounted on tripods. The introduction of one-man Leyner machines is contemplated. At the

Barton Hill mine, the ore bed has a fairly uniform hanging wall, but a foot wall that rolls both parallel to the dip and parallel to the strike. This makes an exceedingly difficult situation to meet. The ore is handled on inclines to the tunnel level. From the incline, levels are led off at about 50-ft. intervals; a certain amount of ore is left on the foot wall to form a bluff or bank at the incline, so as to facilitate dumping into the skips; away from the incline the ore is mined clean except for pillars left to support the roof. The "level" is not a drift so much as a stope in which the top is kept in advance of the bottom so as to form benches. A track from the loading station in the incline is kept up to the face.

Electric Hoist Control

### Task and Bonus Systems

The mucking is done under a task system, 12 cars being considered a shift's work for a man; this amounts to 18 tons, more or less, depending on the grade of the ore. The length of tram is short and the cars are low; the bottom, however, makes shoveling difficult. It is intended to introduce a bonus system before long for both mucking and drilling under which an additional payment will be made for each car, or each foot of hole over a fixed minimum. In order to obtain sufficient data to grade the payments intelligently, the company has introduced a prize system; first, second and third prizes of \$5, \$3 and \$1, respectively, are offered to the machinemen for the highest average footage drilled in each mine. About the best shift's work so far has been a little over 40 feet.

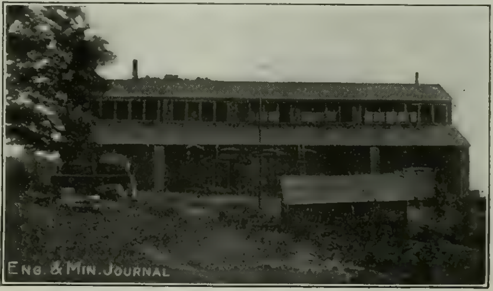


400-Hp. Induction Motor and Compressor

### Developments and Plans at Old Beds

The Old Beds are mined at present through the Joker and the Bonanza shafts. The upper of these beds consists of a long flat-dipping pod with cross-sectional dimensions approximately equal, overlying the relatively thin lower bed. It was at one time supposed that these "upper" and "lower" beds were one[1], the result of folding in the gneiss. Later exploration and mining revealed the fact that they are distinct beds. The property line between the Witherbee-Sherman and the Port Henry companies crosses diagonally through the upper portion of the beds. The Port Henry company is mining the upper portion which it owns, and the activities of Witherbee-Sherman are confined to the bottom portions where the lower Old Bed is being mined and preparations made to extract some new deposits disclosed by drill holes. The exact relation of these new deposits, which are two or three in number, is not known; they may be extensions or faulted portions of either one of the Old Beds or may be distinct deposits.

The Bonanza shaft is vertical until it strikes the ore of the upper bed. Here it turns and follows the ore for some distance down the dip. It then turns to the vertical again and descends to the lower bed. The Bonanza shaft will soon be practically abandoned. The Joker shaft is inclined at 78° for 1000 ft., to the lower bed. It is equipped with the best hoist in the camp, of Wellman-Seaver-Morgan make, with two 10-ft. drums, each clutched to the shaft, and with compressed-air brakes; it is driven by a 500-hp. General Electric motor. The control of the hoist is had through a contactor, providing for seven-point acceleration and equipped with current limit and overload relays. The Joker will continue to be the main hoisting shaft for the Old Beds. Hoisting will be conducted on the stage system. Three of the new Nordberg hoists will be installed underground to operate on three slopes or inclines, by means of which the remaining ore in the lower bed will be extracted and the new discoveries explored and mined. The skips on these slopes will dump into pockets either at the Joker shaft itself or connected with it by crosscuts in which electric tramming will be installed.



Cheever Compressor House and Substation

The Harmony ore is hoisted through two shafts "A" and "B" by means of a four-drum hoist in the same power house with the compressors, the hoisting ropes running over turn sheaves. The present management is not responsible for this hoist and intends to change it soon. It is, therefore, permissible to say that it is about as bad as one often sees and it is to be hoped it is unique. A 300-hp. induction motor is geared to drive a shaft to which are permanently geared two parallel shafts, a double reduction being thus effected. Clutched to each of the parallel shafts are two drums, one pair for "A" mine shaft and one for "B." When the motor runs, as it does most of the time, the drum shafts revolve and always at the same speed as regards each other. The motion of the drums themselves depends on their being clutched in, and from one to four drums may be moving at one time. If more than one drum is hoisting at the same time, they must move at the same speed. No attempt is made to hoist in balance, in fact the ropes are not arranged to permit this. Lowering is done with the drum unclutched and must be done under the brake alone. Three engineers on a platform in the middle of the hoist manipulate the motor control, the brakes and the clutches. With four drums moving, their work looks to the bystander somewhat exciting. The hoist has all the attributes of a man-killer. It is stated, however, that its use has been entirely free of accidents. This is the fault of Witherbee, Sherman & Co., Inc., not of the hoist.

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[1] J. H. Granbery, "Eng. and Min. Journ.," May 12, 1906.

### CHANGES IN "A" SHAFT

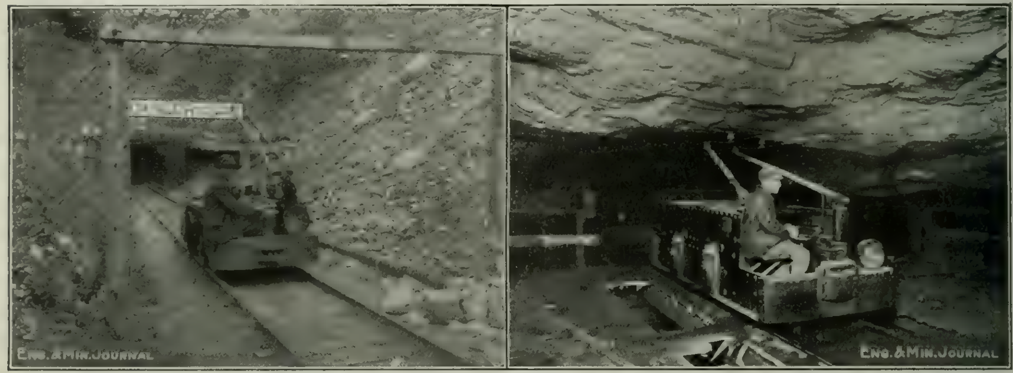
A new hoisting system is planned for "A" shaft, which will entail cutting off the two "A" drums from operation and the use of the hoist for "B" shaft only. Both "A" and "B" shafts are vertical for about 300 ft., where they turn and follow the ore as inclines. Beginning with the incline portion, the two tracks of "A" shaft split and diverge, one going on one side of a dike, one on the other. These split tracks are not only irregular in dip, as they follow the foot wall, but also meander considerably laterally, giving a corkscrew resultant. They are a constant source of accident and delay from derailed skips. It is planned to straighten and double track the inclined portion on the west side of the dike, hoist with two drums not in balance, however, dump to a 100-ton bin and deepen the vertical portion of the shaft so as to load from this bin. This rearrangement will necessitate the use of the fourth of the new Nordberg hoists mentioned. One [illegible] 5-ton skip will be operated in the vertical portion of the shaft, the other drum of the surface hoist being used for a man cage. The inclined track east of the dike will be used for handling men with a single-drum hoist. The incline portion of "B" shaft does not split and no changes are contemplated there.

### BARTON HILL DEVELOPMENT

At Barton Hill there is one main adit through which the ore is trammed to the bins of No. 4 separator. A good many old workings existed in this deposit chiefly above the tunnel level. A great deal of ore remains, however, above the tunnel level and its existence has been proved for 2000 ft. below the level measured on the dip. Two inclines below the tunnel and two inclines or raises above will deliver ore to wooden bins on the level where the electrically drawn ore cars will be filled. The inclines below are known as the South Pit and Intermediate; those above, the Orchard Vein and the North Pit. The work above the level involves considerable straightening and rearrangement of tracks.

At present the company is mining a little less than 3000 tons per day. This is not up to mill capacity, as neither No. 3 nor the old plants are run both night and day, and also a large amount of Port Henry company ore is handled at one of the old plants. Of this amount, about 1000 tons of 30 to 35% ore comes from the Barton Hill tunnel, about 900 tons of 45 to 48% ore from the "A" and "B" Harmony shafts and about 1000 tons of 55% ore from the Old Beds through the Joker and Bonanza shafts. To this must be added about 50 tons of 40% ore from the Smith mine. Practically all of this ore is concentrated, although at the Joker shaft some lump waste is sorted out.

But for strike troubles, this would have been a banner year for Witherbee-Sherman. As it is, the production for the last six months of the year will be not far from 500,000 tons. Of this year's shipments, a large part has been to Nova Scotia by water, the route being through Lake Champlain and the St. Lawrence, involving a transfer to ships.



ELECTRIC HAULAGE IN NEW YORK IRON MINES

Witherbee, Sherman & Co. Cheever Iron Ore Co.

### COSTS

A simple, but detailed cost-keeping system is in use, the power consumption receiving special attention. Power-generating costs for a typical month ran as follows: At Port Henry plant, 0.85c. per kw.-hr.; at Mineville plant, 0.927c.; power purchased, 0.6121c.; average, 0.806c. The kilowatt-hour consumption for this month was 1,148,300 and during the month 63,551 tons of ore were mined and 59,639 tons of concentrate shipped. This rather close correspondence is due to the fact that the Port Henry ore milled almost compensated for the tailing discarded.

The number of man-shifts per day will run from 1100 to 1150, of which 800 to 850 are underground. The tonnage broken per underground man is about 5½ at the Harmony and the Old Beds, and 4½ at Barton Hill. The lower figure in the latter case is due to the fact that the ore there is lower grade and so lighter, and also to the fact that work in this mine is more recent and the highest efficiency has not been obtained.

### THE PORT HENRY IRON ORE CO.

Next neighbor to the Witherbee-Sherman company is the Port Henry Iron Ore Co., working the upper part of the Old Beds, as stated before. The operations of this company are about equivalent in extent to any one of the three Witherbee-Sherman mines, with a production of about 800 tons per day. There are thus four mines in the camp, all within a circle of about one mile in diameter, which can produce about 1000 tons a day each and with a probable future production covering a good many years. The importance of Mineville is thus indicated.

OLD OPENINGS, PORT HENRY OPENPIT

Joker and Bonanza shafts in distance.

The Port Henry production is of high grade: about half of the hoisted material is shipped as crude lump ore, the rest is treated by Witherbee-Sherman. Some hand sorting is practiced for the purpose of eliminating lump waste.

The plant of the Port Henry company, while rather complete at one time, is not uptodate except at the Clonan shaft. Hoisting at present is carried on through the 21 and Clonan shafts. The 21 shaft is a daylight shaft in a way, the upper part for several hundred feet lying on the foot wall of the great openpit. The Clonan shaft is vertical. Descriptions of the sinking and equipment of this shaft by Guy C. Stoltz can be found in the JOURNAL, Jan. 11, 1908, and July 23, 1910. The headframe is a substantial steel structure, the hoist is a Sullivan double-drum corliss and compressed air is furnished by two Sullivan corliss, tandem-compound, two-stage, steam-actuated machines. The Port Henry also plans some improvements for the future. A 750-kw. turbo-generator will be installed to furnish power for underground electric pumping, and for electric hoists at some of the slopes in the old openpit.

PORT HENRY CO.'S OPENPIT

### THE CHEEVER COMPANY

The Cheever Iron Ore Co. has been for several years successfully operating an old magnetite property, situated near the lake and a few miles north of Port Henry. A full account of the property by Guy C. Stoltz was published in the JOURNAL, Oct. 21, 1911. Peculiarly difficult mining problems are here encountered. The ore outcrops at an angle of about 45°, but flattens rapidly at a comparatively shallow depth and remains approximtely horizontal. The bottom of the flat deposit is a miniature, buried mountain range, the foot wall rolling in both directions. As a consequence, while the ore is hoisted through two shafts, using a single drum for each shaft, there are 14 drums in use underground, consisting of 10 air-actuated single-drum hoists, one double-drum electric and two single-drum electric. The air engines especially are small and light to facilitate moving about and resetting as workings are advanced and new ridges and valleys have to be traversed, The underground handling system has been most cleverly worked out.

### HOISTING

There are three shafts equipped with headframes and houses, the Witherbee, the Tunnel and the Weldon, but of these, only the Weldon, at the southerly end of the outcrop, and the Witherbee, on the northerly part, are operated. A small power house set back of the Weldon, covers a two-drum electric hoist, one drum serving the Weldon and one the Witherbee. Each of the ropes has to be taken around two turn sheaves and the Witherbee rope is also conducted over a series of pulley stands. There is a pinch in the formation, making a barren zone between the Weldon and the Witherbee workings. When the property was reopened, mining tributary to the Weldon shaft soon exhausted that lens and it was found necessary to open up the Witherbee lens in a hurry. At present, all mining is conducted in the Witherbee lens. The four underground hoists collect the mined ore eventually into a skip pocket at the Witherbee shaft. From this pocket some of the ore is hoisted to the Witherbee ore bin and some electrically trammed in 8-ton trains to the Weldon shaft, and thence hoisted. The electric locomotive uses all three phases of the alternating current with two trolleys.

### SURFACE EQUIPMENT

The ore from the Weldon surface bin is trammed on a trestle to the near-by separator by a Hunt automatic railway, which often works satisfactorily. The ore from the Witherbee also is lowered on a trestle, but with an electric hoist. The hoisted skip in the Witherbee headframe is handled over a turntable, which dumps it into either the ore or the waste bin.

The separator uses Ball-Norton magnetic machines, as is general throughout this region. Some changes in its design increased its capacity to 500 tons per day. To supply this tonnage, the mine is worked only on day shift. The concentrate from the mill is lowered to a bin built beside the Delaware & Hudson tracks on the lake shore. Lowering was formerly done in stages with gravity planes. An electric hoist has now been installed and the tramway rebuilt on a single track. Accumulated tailing was used for filling and one cut was made so that the grade is more nearly uniform, the handling of the concentrate thus is cheaper, much labor being eliminated. The length of the tramway is about a half mile and the drop about 400 ft. Electric power furnished by the Witherbee-Sherman Port Henry station is used exclusively, part of the supply being converted to compressed air in the substation shown. Two compressors are used, one Ingersoll-Rand belt driven by a synchronous motor and one Chicago Pneumatic Tool Co. direct-connected to an induction motor.

For the information presented here, acknowledgment is especially made to H. Comstock, of the Witherbee-Sherman company, J. R. Sullivan, of the Port Henry company and Arthur E. Hodgkins, of the Cheever company.

CHEEVER SEPARATOR, LOADING BIN AT LOWER LEFT

WELDON, WITHERBEE, AND TUNNEL SHAFTS

## Metallic Beryllium

Two German investigators recently made some experiments on the reduction of metallic beryllium (*Elec. Rev.*, Oct. 18, 1913). The metal was obtained by the electrolysis of a fused mixture of the pure fluorides of beryllium and sodium. The product was purified from adherent oxides by centrifuging the fine powder in a mixture of ethylene bromide and alcohol. It was then compressed into cylinders and fused. The metal, after melting, had a specific gravity of 1.842, melted at 1280° C., and did not volatilize at 1900°. It does not tarnish readily, and the authors say that its apparent inertness is, like that of aluminum, due to a film of oxide. It will be noticed that beryllium is much lighter than aluminum.

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**For Refractory Lining of Fireboxes,** the only satisfactory materials available for use on a large scale, are fireclay brick, silica brick and bauxite brick. Both magnesia and chromite brick spall too freely when subjected to a cold draft ("Proc. Engineers Soc. of West. Penn.," July, 1913). Because the former is highly basic, and the latter neutral, they have been tried along the clinker line, and while they were successful in reducing the adherence of slag, they were not sufficiently durable to be economical.

# The Byron Oil Field of Wyoming

By A. P. Rogers*

A rather interesting but small oil field occurs in northern Wyoming close to the Montana line. It is interesting principally on account of the high grade of the oil, which has a paraffin base and contains nearly 30% of gasoline and 40% of kerosene. It is known as the Byron oil field, and is situated upon the Garland anticline, seven miles west of Cowley, Wyo., and a similar distance east of Garland, upon the Cody branch of the Chicago, Burlington & Quincy Railroad.

The rocks of this section of Wyoming, and extending into southern Montana, belong to the Cretaceous period. Through the Bighorn Basin, east of the National Park, the country has been folded into a series of small anticlines on the western slope of the large anticline of the Bighorn Mountains. It is in these isolated minor folds that the oil and gas deposits have been found. The Garland anticline extends from Polecat Creek southeasterly to the Shoshone River, a distance of about seven miles, having the form of a slightly elongated dome, with an elliptical plan, the major axis of which extends in a northwest-southeast direction. The sides and ends are gently inclined.

The crest of this anticline is in the black carbonaceous shales near the base of the Colorado formation. Capping these shales, the heavy sandstones appear, but over the area where drilling operations have been conducted, they have disappeared. Directly across the southern end of the anticline, the Shoshone River has cut a wide path, leaving a bluff 75 ft. high on the northern side of the river.

Two companies are now operating in this field, and they control practically all the desirable ground. About 30 wells have been drilled, but many of them were so poorly done with unsuitable rigs that they are of little value as a guide to the exact limits of the productive area. Few exact records have been kept of the holes drilled, so that the underground conditions can be judged only from the accounts of those who happened to be present at the time the work was done. Most of the drilling has been confined to the low river-bottom land on the southern end of the anticline. Several thin sands were penetrated until a depth of 600 ft. was reached, where sand 40 ft. in thickness was encountered, containing commercial quantities of oil under sufficient gas pressure to force it to the surface without pumps. From one well during the past year an output has been maintained which supplies the refinery at Cowley with 165 bbl. per day, the capacity of that plant.

The area from which a steady output of oil has been obtained is limited, but about one-half to three-quarters of a mile to the north of these wells and upon the higher ground, two gas wells were sunk, 1670 and 1675 ft. deep, respectively, close to the crest of the anticline. They passed through a sand at 1200 ft. from which a small amount of oil was obtained, and then one of them ran into a heavily charged gas sand at 1675 ft., which blew the tools out of the wells. A 10-in. casing was used at the surface, and the gas is said to be under a 655-lb. pressure; but now it has been capped and the gas is used only for illuminating and heating purposes in the neighborhood. The sand from which this gas comes is probably the Cloverly formation. Whether it contains much oil has not been determined, but the indications are not favorable. Five wells upon a 10-acre tract of land in the river-bottom have encountered oil in the 600-ft. sand. One of them has been shot and produces all the oil now being disposed of. The other four wells are capped and have become clogged with paraffin.

The oil has a paraffin base and a gravity of 42 on the Baumé scale. It is pumped seven miles to a small refinery on the railroad at Cowley. The refined gasoline, having a gravity of nearly 60, and the kerosene are sold to the Continental Oil Co. for distribution. The refinery owners plan to increase their capacity in anticipation of an increased yield from the oil wells as soon as they have been cleaned out and put in proper condition.

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*Mining engineer, 60 Broadway, New York.

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# The Lake Superior Iron-Ore Outlook for 1914

Special Correspondence

The figures of this season's ore movement from the Lake Superior iron regions, showing a tonnage considerably in excess of that shipped at the corresponding date last year, indicates that it is not a question of the shipments of 1913 reaching 50,000,000 tons, but by how much that vast production will be exceeded. On the Marquette range, big inroads have been made in most of the stockpiles and there is now ample room to store the ore that will be hoisted during the winter. In particular, the Cleveland-Cliffs Iron Co. had been shipping heavily late in August and early in September from the Cliffs Shafts mine at Ishpeming.

The railroad companies are prepared to move an immense tonnage, one even materially surpassing that now being moved. There are bigger and better docks on the Lake now than ever before and the number of cars and locomotives especially provided for the ore traffic has never been greater. Heavier trains are being hauled. While there are exceptions, the mines in general are employing large forces. On the older ranges, many first-class miners thrown out of work on account of the strike in the Michigan copper country, have been given places. There is practically not an idle man in the region.

## Increase in Railway Facilities in 1914

With its extension from Crystal Falls in commission in 1914, the Chicago, Milwaukee & St. Paul will become an important factor in the transportation of ore from the Iron River district of the Menominee range next season. The grading has been completed and the work of laying the rails will soon be finished. The assembling yards will be one mile east of the village of Stambaugh. There will be 16 tracks, each one-half mile long. The yards will be capable of holding 600 cars. Adjacent to the tracks will be an eight-stall roundhouse, water-tank, coal-sheds and other buildings. The district has waited many years for the coming of a second railroad and the arrival of the first train will be appropriately celebrated. The Chicago & Northwestern heretofore has been the only line extending to the field.

The McGreevy Steel Co., of Duluth, is preparing to open up the Sheridan mine, which is within the Iron River village limits. This property is already well developed and needs only a good plant of machinery to put it on the shipping list soon after it is unwatered. The machinery has been ordered. The McGreevy company is operating several properties in the district. A new plant of machinery will be installed this month at the Purcell tract, in Section 14, 43-36, adjoining the Forbes mine of the Jones & Laughlin company. The plant will consist of two 150-hp. boilers, a 10-machine air-compressor, already on the ground, and a hoist. Shipping from this property has been in progress for several months. The ore is coming from the 220-ft. level.

### Mesabi Shipments to Date

Since the first find was made on the Mesabi along about 1890, that biggest of all the Lake Superior ranges has shipped more than 300,000,000 tons of ore. Since that year approximately 210,000,000 cu.yd. of stripping have been removed and 140,000,000 cu.yd. of ore has been taken out. The deepest mine on the range is the Leonidas property of the U. S. Steel Corporation's Adams-Spruce group at Eveleth. The Leonidas also is known as the "model mine" of the Mesabi. It is an extension of the Adams westward. The shaft is 460 ft. deep, a shallow depth compared with the 2500 ft. reached on the Gogebic and the 2100 ft. attained on the Marquette range, but these great Mesabi orebodies are horizontal, instead of standing on edge, and they have great lateral proportions. The timbering of the stations, main-drifts and crosscuts at the Leonidas consists of steel I-beams. The lagging is of slabs of concrete, and the roof is of reinforced concrete. The pumping station at the bottom of the shaft is a mammoth affair, lined with steel and concrete.

The deepest openpit on the Mesabi is at the Steel Corporation's Norman property at Virginia. It is 350 ft. deep, and all shovel work in it has been abandoned. The Genoa, another of the Steel Corporation's big pits, is getting too deep for shovel mining and most of the ore is now being milled. The biggest mine on the range, as well as the largest iron property in the world, is the Steel Corporation's Hull-Rust pit at Hibbing. The pit is several miles in length, and wide in proportion, and there are many million tons of ore still to be taken from it. The wettest ore mined on the Mesabi is that procured at the Brunt property of M. A. Hanna & Co. The Brunt ore carries 18% moisture, which is reduced to 6% by four driers. Two of the driers can dry 40 tons each per hour and the other two can dry 20 tons each per hour, a total capacity of 120 tons per hour.

The Soo Line, which is extending its Cuyuna system to the town of Manganese and the Iron Mountain mine, expected to finish the grading of that stretch of road late in September or early in October. The rails will be laid at once. Much activity in that region is looked for when train service is established. At the Iron Mountain mine, a crew of 25 men is sinking a three-compartment shaft. The deposit lies at a depth of less than one hundred feet. The ore is said to be manganese of high grade. It is expected the mine will ship this autumn. The Duluth-Brainerd Mining Co. is sinking a shaft on Section 32, 47-29. John T. Jones and associates are sinking a shaft on the Harker-Hammel property, a short distance northeast of Manganese. The Cuyuna-Mille Lacs and Cuyuna-Duluth mines have increased forces and are increasing production. At the Adams property at Oreland drifting is now in progress and it is expected that shipments will begin soon.

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## Heavy Industrial Locomotive

A heavy industrial locomotive has been built for use on the 36-in. gage industrial railway system at the steel works of the Tennessee Coal, Iron & Railroad Co., at Ensley, Ala., says *Engineering News*. It is a tank engine of the 0:6:0 class, with large tanks alongside the boiler and with a coal bunker on one side of the cab so that the cab is open at the rear. The wheels are placed close together, with a wheelbase of only 9 ft. to enable the engine to operate on sharp curves. The connecting-rods drive the rear axle, and the Walschaerts valve-gear is used to operate the slide valves. A steam brake is applied to all the wheels. The locomotive was designed for heavy and severe service, and is believed by the builders to have the heaviest load per square foot of track for an engine of this class, with its short wheelbase. The engine was built by the H. K. Porter Co., of Pittsburgh, Penn., and its leading dimensions are as follows:

| | |
|---|---|
| Type of engine | 0:6:0 (tank) |
| Gage of track | 3 ft. 0 in. |
| Service | Yard work at steel plant |
| Wheels (6) diameter | 3 ft. 10 in. |
| Wheelbase | 9 ft. 0 in. |
| Weight in working order | 147,000 lb. |
| Weight per sq.ft. of track | 5,445 lb. |
| Cylinders | 19x24 in. |
| Boiler pressure | 200 lb. |
| Length over bumpers | 27 ft. 8 in. |
| Width over all | 8 ft. 10 in. |
| Height, rail to top of smokestack | 13 ft. 0 in. |
| Water in tanks | 2000 gal. |
| Coal in bunker | 1200 lb. |
| Tractive force | 32,000 lb. |

The reason for using such a heavy locomotive for the yard work at Ensley was that two of the smaller engines (97,000 lb. on driving wheels) were required to handle a heat from the openhearth furnaces to the mills, and at times this was accomplished with difficulty and attended by more or less delay. The new engine handles these loads without any difficulty and has reduced the repairs to the equipment to a minimum. The sharpest curves are of 96 ft. radius, and the maximum grade is 1%. The engine will haul 615 tons gross, or 26 loaded mold cars, with 1500-lb. drawhead pull, developing 39,000 lb. tractive power on level track.

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## Nickel Brasses

A brass containing a certain percentage of nickel in addition to copper and zinc is similar in mechanical properties to an ordinary brass of higher copper content than would be the case if the nickel were replaced by another metal, according to L. Guillet, *Rev. Met.*, p. 1130, 1913. Other things being equal, the addition of a small percentage of nickel makes a brass easier to work cold. An improvement in the mechanical properties of brasses is effected by the presence of up to 10% of nickel.

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## Mine Rescue Car Itinerary

IRONWOOD CAR NO. 6

| Arrive | Leave | Station |
|---|---|---|
| Nov 10 | Nov 15 | Ely, Minn. |
| Nov 17 | Nov 22 | Aurora, Minn. |
| Nov 24 | Dec 6 | Gilbert, Minn. |
| Dec 8 | Dec 20 | Eveleth, Minn. |

# Lead, Zinc and Copper Smelting in America

*SYNOPSIS—A record of observations on current American metallurgical practice, and of comparison of American methods with European.*

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Conditions, both general and in regard to mining and metallurgy, differ so radically in the two hemispheres that not only the evolution of metallurgy itself, but also the requirements which are made on the other side in solving certain problems, are unlike our own practice. The metallurgical industry of America is hardly 50 years old and is only in the beginning of its evolution as compared with European mining and metallurgy. In the Eastern United States, general conditions, such as the density of population and the wage conditions connected therewith, the existence of large chemical and mechanical industries which come into play as purveyors and consumers of the metallurgical industry, remind me greatly of Europe. Generally speaking, wages as well as the cost of living are essentially higher and the price of coal is lower than with us. At Pittsburgh, for instance, iron works are able to obtain a good coal at from 75c. to $1 per ton and can, therefore, easily make their own coke for about $2, while the workman is earning from $3 to $4 per shift.

## American Practice on Greater Scale

Again, while in Europe, our metallurgical works are based, for the most part, on the exploitation of ore deposits of comparatively small extent, and while we are dependent for our ore supplies on far-away countries, America has to deal with gigantic ore deposits to which equally large mine and reduction plants correspond. At the head of American mining and metallurgical enterprises are companies with enormous funds, fine organizations and an admirable spirit of enterprise at their command. That smaller enterprises may be harassed and injured by these mammoth companies is obvious.

On the other hand, it must be conceded that many a mine or reduction works could not be operated or conducted with financial success without the large resources of those big companies. Moreover, I have gained the impression that even the most powerful companies have to acknowledge the right of existence of their smaller competitors in order to avoid coming in conflict with the anti-trust laws.

Leaving out the Eastern part of the United States the reduction works are situated far away from chemical centers of consumption. The consequence is that in working ores and byproducts, certain essential constituents cannot receive such treatment as we are wont to give them in Europe; for example, a utilization of the huge quantities of sulphur in the ores cannot be thought of in many cases, although the volume of sulphurous-acid gases discharged into the air is in places enormous. In my travels I have gone through works in which, for instance, as much sulphur passed into the air in the form of sulphur dioxide as would easily have produced 1000 tons of sulphur trioxide per day.

However, the escape of such a large quantity of sulphurous-acid gases cannot be helped unless the operation of mine and reduction works were stopped entirely. But, since the mining interests in those districts are paramount, they have the first right to a free development and existence. If once the mines are exhausted the ground will, in all probability, be made available for farming or like purposes. It is self-evident that in those places provisions should be made to protect not only the employees, but also the inhabitants from damages by acid gases.

In the reduction works where there is a possibility of profitably disposing of sulphuric acid—as, for instance, at Ducktown, Tenn.—the latter is saved and finds a market. These works produce daily about 550 tons of 60° Bé. sulphuric acid, which is used for the preparation of super-phosphate with such economical success that the said works are reported to make their copper indirectly cheaper than any other. What I have said about the frequent non-utilization of sulphur holds equally good for other material, as low-grade arsenic and zinc ores, etc., which cannot stand heavy freight expenses.

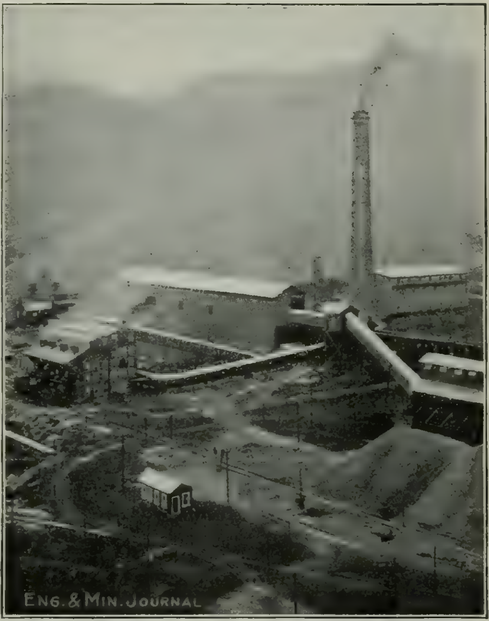

Fig. 1. Typical American Smelting Plant

Note bag houses and stack.

## Waste of Coking Byproducts Indefensible

While nothing can be said against the frequent and justifiable non-utilization of sulphur and other materials, there obtains in other branches, for instance, in coke manufacture, a great waste by non-recovery and non-utilization of byproducts. During the excursion of the members of the Eighth International Congress of Applied Chemistry on the Monongahela River, near Pittsburgh, the conductor of the party called their attention to the fact that the steamer has just passed a battery of 2500 beehive coke ovens. It is well known that in these ovens

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Note—Abstract by O. H. Hahn, of F. Heberlein's "Eine Exkursion auf nordamerikanische-mexikanische Blei-, Zink- und Kupferhütten," in "Metall und Erz," 1913, p. 717.

not only all of the gasifiable constituents of the coal are lost, but also a portion of the carbon. Modern coking ovens are, however, rapidly coming into use in the United States, principally those of Otto, Koppers and Solvay. I have often wondered why the large copper- and lead-smelting works which treat thousands of tons of ore per day and consequently must consume 200 tons of coke and upward, have not gone to work and erected coking plants of their own in connection with their works. Even if benzol and ammonia should not be saved, the application of gas and tar for generating steam would tend to cheaper working. While many reduction works are situated in the same locality as the mines, the smelting plants, which subsist entirely, or at least partially on purchased ores, are nearly always situated at junctions of several railway systems. The reason for this is the easier delivery of all materials and that the reduction works will be enabled to secure cheaper freight rates from competing railroads (not owned by the government). For longer distances these railroad companies make cheaper rates than for short ones. Thus it is possible for a smeltery in Missouri to compete with one in Colorado in the purchase of ores in Montana, at least as far as freight rates are concerned.

It is surprising to Europeans to notice that the inland waterways are so little used in the movement of large shipments of ore and coal; in part, this is owing to the irregular and poor conditions of river navigation even on the largest rivers like the Mississippi, Ohio and Missouri, partially also to the tactics of the powerful railroad companies, whose interests are opposed to cheap river freights. In the use of transportation by water, we Europeans are undoubtedly far ahead of the Americans.

The quantities of ore treated at American lead and copper works are disproportionately larger than those at our European works. The smallest lead-smelting plant which came under my notice treats much more ore than the largest European works that I know of. The mastery of such huge quantities of material has forced American metallurgists to pay as much attention to the movement of materials as to the metallurgical part of their work. For this reason the most perfect contrivances for the cheap movement, loading, crushing and conveyance of smelting material have been devised. There are, for instance, gondola railroad cars, having a loading capacity of 50 tons. The upper part is made of steel plate and nearly all of them are provided with an automatic bottom discharge. For the internal transportation of freight, generally electric locomotives, large overhead traveling cranes, belt conveyors and similar appliances are used. In this regard we could learn something from the Americans.

### TREATMENT OF LIQUID PRODUCTS

Liquid materials, as slag, matte, molten lead and liquid copper are moved in vessels of larger or smaller size after the fashion of ladles and slag pots in iron works by locomotives or traveling cranes at great speed. The ladles for copper are, of course, adapted to the capacity of the converters and sometimes hold as much as 30 tons, slag pots usually carrying from 5 to 10 tons. At one works we saw one of 30 tons capacity. The staff of the works thought this too large, however. The slag pots are ordinarily emptied by tapping through a slag hole, which is about 15 cm. above the lowest point of the pot. The shells with any matte that may have settled at the bottom are returned to the furnace while the liquid slag is poured over the dumps. In some places slag, as well as matte, is granulated in water and washed in a flume to its destination.

The liquid lead of the blast furnaces is run periodically from the automatic tap into lead pots, mounted on wheels, and from these poured into a large collecting pot for the removal of the scum. For the transfer of liquid lead from one pot to another or to the softening furnace, centrifugal pumps made of iron are frequently used. These are suspended in the lead pot and actuated by electric motors. Such a pump can raise 5 tons of lead per minute, 10 ft. high. In most of the works air-compressor plants may be found, and pipelines with compressed air are conducted through all the buildings in order to be ready for use for any purpose that might offer itself. For instance, hammers for breaking up material are driven by compressed air, and air lifts for raising small loads such as lead and copper bars into cars or refining furnaces are connected with these pipe lines. In high buildings even the workmen are lifted to the high levels by machinery.

### NOVEL WORKS ELEVATOR

In a concentrating and sampling mill in Colorado, which disposes of about 1000 tons of ore per day, an elevator similar to a bucket elevator runs through all four stories of the building at a lively gait. It consists of a stout vertical canvas belt to which handles and steps are fastened. Otherwise the belt is, like that of a bucket elevator, in constant motion, and the workman who wishes to descend from an upper to a lower story, for instance, quickly seizes the first handle that comes in sight, at the same time placing one foot on the step under it, drawing the other after him and disappears instantaneously in an opening of the floor.[1]

As the source of power in metallurgical establishments, etc., the reciprocating engine is almost exclusively used. While we in Germany and also in other parts of Europe have replaced the older types of engines by modern aggregates, especially by large units of steam turbines, I found in the more remote reduction works a good many steam engines of older construction and of small size.

As blowing engines, Green blowers coupled directly to upright engines were preferably used. In many works special attention is paid to the blast consumption of the different furnaces. At the works of the Cia. Minera de Peñoles, Mapimi, records have been kept for many years of the quantity of blast consumed per ton of ore. By constant comparisons not only deficiencies in the blast pipe and losses in the tuyeres have been detected and remedied, but, in the course of time, essential savings in the cost of blast per ton of ore have been effected through this means. In my opinion this practice ought to be emulated by us in Europe.

A peculiar feature of works located at high altitudes in the Rocky Mountains, due to the climate, is the so called thawing houses. These are long sheds in which from 8 to 10 railroad cars loaded with frozen ore may be housed in winter time. These thawing houses have mostly double walls, and if possible a double roof, and are heated by steam or by a direct coal fire conducted through a long and centrally located flue. In other places small coke stoves are placed in the railroad cars containing frozen ore, and the ore is thawed out through them. It is obvious that the storehouses are also arranged with heating appliances. In American smelting works the sampling arrangements play an important part. On account of the huge quantity of ores and smelting materials which are delivered every day, the sampling is mostly done by machinery; but where small and widely varying lots are received, hand sampling is still in vogue.

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[1] An elevator of this description is still in operation at the Mansion House Chambers, London, Eng.

A mechanical-sampling plant connects directly with an unloading contrivance, which passes all large lumps through a common large-sized rock breaker, which, in its turn, is in connection with quartering machines like the Vezin or the Snyder sampler. Smaller rock breakers, rolls and sample grinders pulverize and reduce the samples gradually to the size required for the final sample. A model plant in its details is the Golden Cycle mill, in Cripple Creek, near Colorado Springs.

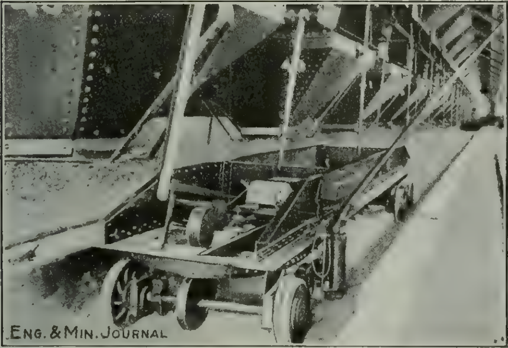

FIG. 2. CHARGING CAR AND ORE-STORAGE BINS, TOOELE, UTAH

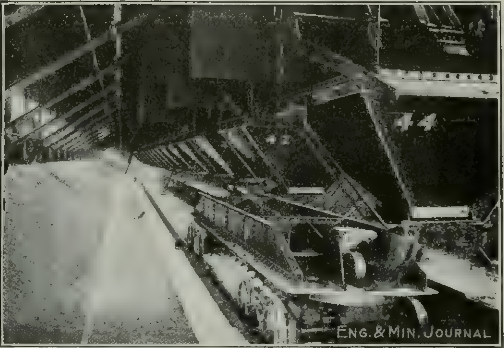

FIG. 3. CHARGING CAR RECEIVING AND WEIGHING CHARGE

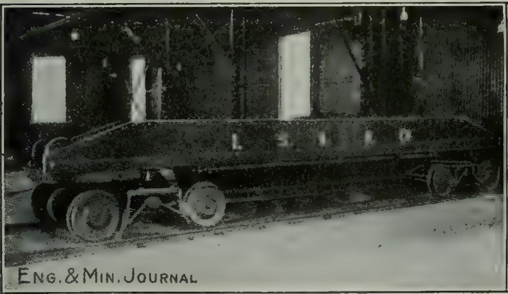

FIG. 4. CHARGING CAR READY TO DISCHARGE INTO FURNACE

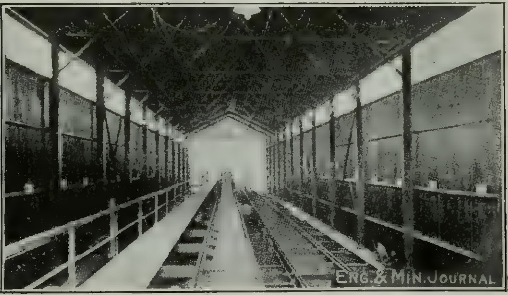

FIG. 5. MESSITER RECLAIMING SYSTEM

### LABORATORY EQUIPMENT

As regards the modern metallurgical laboratories these are in part arranged finely and handily. Everywhere the electric current is employed at a large scale, for instance, for ignition and incineration, for preparing and keeping distilled water hot, for heating sand baths, drying ovens, etc. What is principally aimed at is to have laboratories with furnaces producing the least possible amount of dust and to save in human labor wherever there is a chance. In this connection, I might remark that the determination of lead in ore as well as in slag is made almost exclusively in the wet way by volumetric analysis, while that of silver is made in the dry way by scorification and cupellation. Copper is determined either by volumetric analysis or electrolytically.

### FURNACE CHARGING

In making up a smelting mixture of the different ores, an addition of barren fluxes is avoided as much as possible. The preparation of a proper and uniform smelting mixture is, therefore, of greater importance in American works than it with us. In many cases it is not difficult, as a good many works receive large quantities of homogeneous ores. In works, however, which rely entirely on custom ores and where the delivery is irregular, the preparation of a smelting mixture is not so easy a matter. In order to be able to maintain uniformity in such a plant, it is advisable to keep in hand a good supply of well mixed ore lots. In one of the newest plants, the Tooele lead-copper smeltery, the different ores and fluxes are stored separately in a large number of bins made out of iron plate, which are located in one continuous row (Fig. 2). Under the discharge of each hopper a sheet-iron box is loosely suspended, which is connected with an automatic scale. The exact quantity of ore or flux desired is emptied into these boxes from the different bins. An electric charging car is now run under the boxes which are filled with ore and a man empties the contents of each along the whole length of the long, narrow charging car (Fig. 3). After having thus obtained a good mixture of all component parts in the proper proportion the car is now run on the charge floor of the roasters or over the mouths of the blast furnaces, as the case may be (Fig. 4).

The doors closing the tops of the furnaces are now opened by the car man by means of a lever and the contents of the car are dumped into the furnace. The doors of the furnace close themselves again and the car is run back. In this manner two men per shift suffice to handle the whole smelting material of a furnace of 250 tons capacity per day. The arrangement just described is, of course, only applicable to a plant built in terraces. In all the works located on level ground, the smelting material is conveyed to the blast furnaces almost entirely on inclined planes. At various works the Messiter system is used for making a homogeneous smelting charge. Large level areas are so arranged that belt conveyors with movable discharge trolleys will cover the whole surface of the area uniformly with material. At the large works of Douglas, Ariz., the different ores and flumes are deposited in large, long ditches, which are about 6 m. wide by 4 m. deep. The several materials loaded on railroad cars are run along one side of the ditch, dumped into it and there to form even layers or strata. A track on the bottom of the ditch carries a steam shovel, by which the smelting material is transferred to large-sized dumping cars set up at the other side of the ditch. These cars are run over the furnace tops and by tilting them the charge is dumped into the furnace without any further use of shovels.

In regard to the roasting appliances used in the reduction of lead, copper and zinc ores, the following may be said: The historic Freiberg long-hearth furnaces have disappeared almost entirely. I found them only in two works in Mexico and Colorado, and even there they are doomed to oblivion. The same is the case with the Brückner cylinders at one time so widely used. They have been superseded, particularly in works where lead ores, complex ores and matte are treated by the Huntington-Heberlein circular furnaces and in connection therewith the Huntington-Heberlein converters.

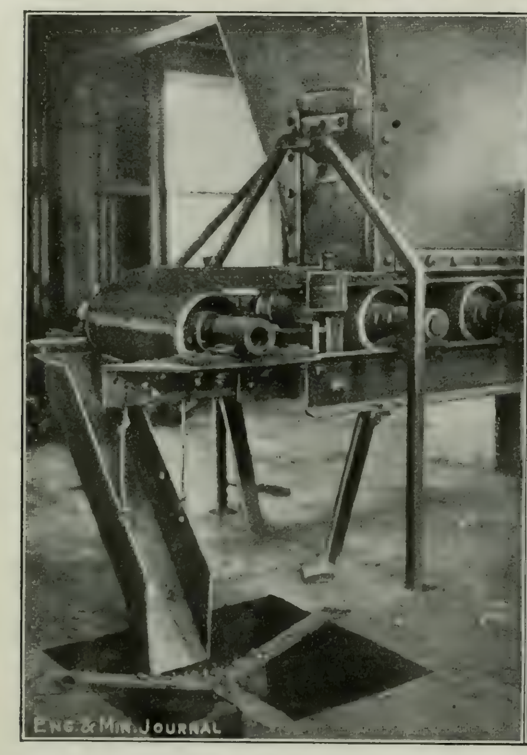

FIG. 6. DISCHARGE FROM DWIGHT-LLOYD ROASTER

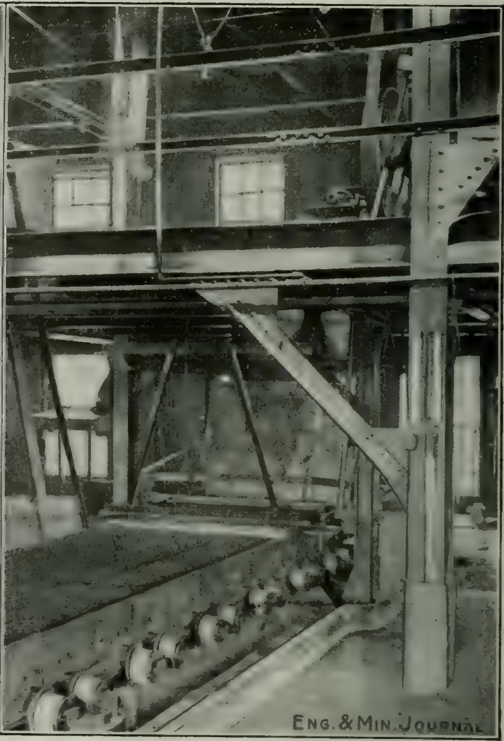

FIG. 7. DWIGHT-LLOYD STRAIGHT-LINE ROASTER

In one lead smeltery of the Missouri district, the pure lead ores with dolomitic gangue produced there were formerly roasted by the Savelsberg process. The roasting plant on the Huntington-Heberlein principles, as operated in the United States, differs in construction from those used in Europe and Australia. While we usually have our blowing apparatus standing on a high level, from which the roasted chunk is removed by tilting the apparatus, the so called H.-H. converters in the United States are mostly sunk in the floor. The converters which hold from 10 to 12 tons of material to be roasted are covered by a dome, from which a tube or flue is run off sideways to the main stack. In emptying these converters, a traveling crane is used, which lifts off the dome, brings the converter to a dumping area and tips it over in the air.

The larger lumps of the block dumped are drawn into rock breakers and crushed to head size. The empty converter is conveyed by the traveling crane in front of an H.-H. rotating furnace and the bottom screen covered there with about 1 ton of hot preroasted ore, after which 3 tons of moistened, cold, raw ore with up to 20% S and 10 to 15% of Pb are added and the converter is brought back to its blowing place. After turning on the blast, roasting proceeds, and later more raw ore is added as it is needed. The generation of heat in the H.-H. converter is greater than in the Dwight-Lloyd apparatus.

It is, therefore, possible to roast to a finish and sinter material with a lower sulphur content. If the generation of heat by excessive quantities of sulphur should be too great, the excess of sulphur may be removed, either by better preroasting or reduced by a larger addition of ores devoid of sulphur, spent pyrites, limestone, etc. In this manner even hard fusing ores and products may be sintered in the H.-H. converter. In roasting the pure lead ores of the Missouri district, it would be in conformity with European and Australian practice to add silica-, iron- and lime-bearing ores or fluxes during the preliminary roasting in order to cut down the work of the blast-furnace to a mere reduction of the lead and silver and a remelting of the slagged compounds.

The Americans, however, are not inclined to expose the lead ores to two roasting operations, viz., the preliminary roasting in the H.-H. rotating furnace and the blowing in the converter or the Dwight apparatus, but prefer to blow these ores, without any fluxes except some silica, in their green state. Hence, the fluxes of lime and iron have to be added in the blast furnace. The roasting expenses at American reduction works are, therefore, cheaper, but qualitatively the work is poorer than ours. During the last few years at a number of smelting works, the Dwight-Lloyd continuous apparatus are coming into use (Figs. 6 and 7). For self-burning ores, that is, pyrites, Herreshoff, Wedge and Klepetko furnaces are employed almost exclusively.

*(To be concluded)*

## Recovery of Tar by the Cava Process

In a paper read before the Iron and Steel Institute in September, 1913, Mons. Gevers-Orban, of Liège, points out that if a metallurgist makes his own coke, in the proportion of one ton for each ton of pig iron, he will also produce 100 lb. of tar, which is worth about 1s. 8d. This tar has commonly been handled only by regular tar refineries, costing to erect about £1 per ton of annual output; the Cava process, operated at the Bonne-Fortune collieries, Montegnée, having a capacity of 6000 tons per year, on the other hand, cost only £2400 to install, and occupies a building having an area of only 39 sq.m. The advantages of the Cava process are: (1) The operation is continuous, in the discharge of pitch and of volatile oils. (2) Distillation is aided by evaporation due to air currents, which increase the efficiency of the furnace. (3) The oxidizing effect of the air current increases the binding qualities of the pitch product.

In connection with iron metallurgy, the products of a tar distillery are of value in several ways: (1) The coke-oven tar is readily converted into binder suitable for compounding converter linings. (2) The volatile oils are excellent fuel for reheating, annealing and hardening furnaces. (3) The pitch is a cheap and excellent binder for ore-dust briquettes.

## Mount Lyell

The report of the Mount Lyell Mining & Railway Co., Mount Lyell, Tasmania, for the half-year ended Sept. 30, 1912, shows that 157,296 dry tons of metal-bearing ores were treated. The total blast-furnace charge amounts to 166,190 tons, as shown in the following table:

BLAST-FURNACE CHARGE FOR HALF-YEAR ENDED SEPT. 30, 1912

| Material | Dry weight tons | Copper % | Assay value Silver, oz. | Gold oz. |
|---|---|---|---|---|
| Company's ore... | 157,167 | 2.45 | 1.58 | 0.026 |
| Purchased ore....... | 46 | .... | . | .. |
| Metal-bearing flux... | 83 | 1.62 | 0.27 | Tr. |
| Flue dust......... | 3,393 | 4.28 | 2.74 | 0.055 |
| First matte........... | 498 | 29.91 | 19.89 | 0.371 |
| Converter slags.... | 4,469 | .... | .... | .... |
| Converter linings... | 534 | .. | .... | ..... |
| Total.... | 166,190 | | | |

Of the 157,167 tons of company's ore, 96,936 tons came from the opencut and underground workings of the Mount Lyell mine and 60,231 tons from underground works of the North Mount Lyell mine. The converter treated 7545 tons of matte averaging 45.95% Cu, 31,33 oz. Ag, and 0.61 oz. Au; producing 3161 tons of blister copper containing 3124 tons of copper, 213,285 oz. of silver and 4316 oz. of gold. The net profits for the half-year amounted to $518,801 after crediting $78,608 for revenue received from railroad traffic and $2804 for interest receipts. The costs were as follows:

MOUNT LYELL—COSTS PER TON OF ORE

| Item | Per ton ore |
|---|---|
| Mining charges.......... | $2.32 |
| Overburden account for openpit mining and development charges on ore won... | 0.11 |
| Smelting expenses.......... | 2.09 |
| Converting expense.......... | 0.27 |
| Railway traffic expense, maintenance, etc... | 0.42 |
| Freight and charges on copper. | 0.60 |
| Local and London offices, directors' fees, exchange and bank charges, insurance, etc. | 0.27 |
| Mine prospecting..... | 0.18 |
| Taxes on dividends and income | 0.18 |
| Depreciation....... | 0.30 |
| Total.......... | $6.74 |

At the Mount Lyell mine 48.6c. per ton is charged on ore raised from openpits to cover the expense of stripping overburden. On ore secured from underground workings a charge of 8c. per ton is made to cover development expense. As stated in the table given, 166,190 tons of charge were treated in the blast furnaces, based upon this tonnage the smelting cost was about $2.02 per ton of charge treated. The cost of converting or bessemerizing, not included in the smelting charge, was about $5.64 per ton of matte treated. Net income from railroad and interest receipts amounted to about 9.5c. per ton of ore treated and has not been deducted from the costs as given. The ore reserves were reported to contain 3,444,944 tons of ore, 2,361,182 tons were credited to the Mount Lyell mine and 1,083,752 tons to North Mount Lyell mine. This ore is considered available for extraction. The company purchased the Mount Lyell Comstock Copper Co.'s property and upon closing down the North Mount Lyell mine on account of fire necessary steps were undertaken to make the Comstock ore available for extraction. Work was also started on Lyell Tharsis orebody by opencut. Dividends have amounted to $13,445,549 to date of Sept. 30, 1912.

## The Mysore Shaft Accident

Our readers will probably remember that a disastrous accident occurred in the Edgar shaft of the Mysore mine, on the Kolar field, recently, whereby 42 persons traveling in a cage were killed. The following is the preliminary report on the accident by Dr. Smeeth, chief inspector of mines, (*Min. Journ.*, Oct. 11, 1913):

About 7 a.m. on Aug. 21, the south cage in Edgar's shaft fell from 100 ft. below the surface to the bottom of the shaft, a distance of 2600 ft. The cage has two compartments, one above the other, in each of which 25 men are permitted to travel. At the time of the accident there was altogether 42 persons in the cage—viz., six Italians, two Eurasians, and 34 natives, all of whom must have been killed instantaneously when the cage reached the bottom of the shaft. When the cage fell away, at 100 ft. from the surface, it was on the downward trip, and traveling at some 1200 to 1300 ft. per minute.

Edgar's shaft is a vertical circular shaft which was completed and equipped about two years ago. The cages run up and down on steel guides without safety catches. There are two cages, one of which ascends as the other descends, each cage being suspended by a flat steel rope passing over a pulley at the top of the head-gear and led from thence into the engine room, where it is coiled around a flat drum some 16 ft. in diameter. Each reel is mounted on the main engine shaft, but is not rigidly fixed to the latter. While winding is going on, the reel is secured to the main shaft by means of a clutch, which in the present engine is in the form of a steel band, lined with wood, acting on a drum—very like a band brake. One end of this steel band is attached to a fixture on the shaft, through an adjusting link for taking up wear and regulating the tension of the clutch band. The accident was due to the snapping of this link, which released the clutch and left the reel, on which the winding rope is coiled, free to revolve on the shaft and therefore disconnected from the engine. The link which snapped is in the form of a bolt 3⅜ in. in diameter, made of mild steel and appears to be amply strong enough. When I inspected the engine the day after the accident, the broken pieces of the link were still in position, and the fractures were perfectly clean and fresh. There was no appearance of any flaw, but it is impossible to say whether any molecular alteration may have been set up without further examination.

Each reel is provided with a powerful post brake which is capable of controlling the rotation of the reel, whether the latter is clutched to the shaft or not under ordinary working conditions. These brakes appear to have been in perfect working order, and are in constant use every day. At the moment when the link snapped and the south reel became unclutched from the main engine shaft, the south cage with 42 men was 100 ft. below the surface, and the north cage with 21 men in it was 100 ft. above the bottom of the shaft, the former descending and the latter ascending. The engine-driver, J. Jenkins, heard the snap of the link, and, without being able to recognize what had happened, he immediately cut off steam and applied the two brakes, which are worked by two small engines. The promptness of this action is shown by the fact that the north cage was brought to rest 150 ft. above the bottom of the shaft, so that it traveled only 50 ft. after the snap took place. In other words, after the snap was heard the engine-driver cut off steam, applied the brakes, and brought the north cage to rest within a space of a few seconds, and the cage with its burden of 21 men remained suspended in the shaft for three hours or so until it was ascertained that it was safe to lower again to the bottom. In this case the weight of the cage, rope, etc., helped the brake to overcome the momentum of the moving masses.

In the case of the south cage, which was descending, the whole work devolved upon the brake, which failed to bring the reel and the cage to a standstill. The friction of the brake-blocks on the brake drum of the reel was so great [illegible]t the wooden brake-blocks were charred and the engine [illegible] filled with smoke in a few seconds. The engine-driver [illegible] to his post, though he could do nothing further, while [illegible] revolved in a cloud of smoke, and after the cage had [illegible] bottom the rope continued to pay out until some [illegible] coils were unwound and finally the plates and bolts [illegible] the rope to the drum of the reel were torn off [illegible]red through the roof of the engine house.

[illegible] is in the charge of Mr. Kendall, one of the [illegible]eers, and is subject to regular daily inspection. So far [illegible] can see there is nothing whatever wrong with the [illegible] the clutches or anything else, and the sudden fail[illegible] adjusting link is one of those unforeseen contingencies which it is not possible to account for at present. On the other hand, this accident must raise questions as to the mechanical soundness of the particular type of clutch employed and as to the efficiency of the types of brake now employed on large winding engines with heavy loads and working at great depths. The question of brakes has already been the subject of protracted discussion in various parts of the world, and is by no means finally settled. I have followed the discussion from time to time, but have no wish to intrude my own opinions upon such a technical specialty. The fact remains that the brake failed to bring the descending cage to rest under conditions which are by no means so arduous as those which might obtain in many cases, where quick winding of heavy loads has to be undertaken, and that accidents affords a definite and terrible object lesson which requires the fullest investigation. The question of the type of clutch and of the nature of the fracture of the link also requires further consideration.

As soon as the necessary details are available I propose to obtain a fuller discussion of the particular conditions of this accident both by the engineers on the Kolar field and by outside authorities on this particular subject. In the meantime, work will be resumed as usual, but the adjusting links on both clutches will be replaced and constructed of slightly larger section, if possible.

As regards safety catches for holding up the cage in case the rope breaks, permission has been given to work the cages without safety catches, as there was no safety catch known which was regarded as reliable and effective and free from grave objections. The practice of working such cages without safety catches is the usual one followed in other mining centers after exhaustive inquiry and experiment. In the present case it may be noted that the rope did not break, and was probably under considerable tension all the time the cage was descending the shaft, and that consequently no automatic safety catch would have been of the slightest use in averting the catastrophe. The accident is a most unusual one, and a repetition of it need not be anticipated.

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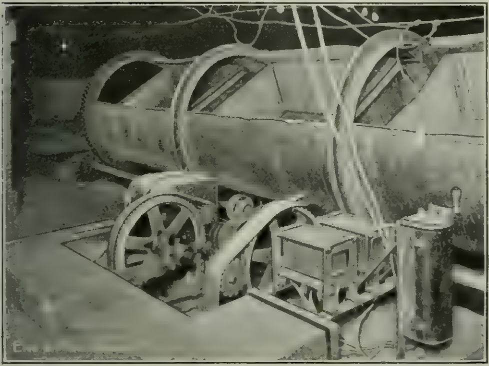
## Solution of Gases in Metals

At the recent meeting of the British Association for the advancement of Science, Dr. A. Holt read a paper on "The Solution of Gases in Metals," dealing chiefly with experiments by Dr. J. H. Andrew and himself concerning the occlusion of hydrogen by palladium (*Engineering*, Oct. 10, 1913). His former experiments, he stated, had shown that there was a change in the occlusion at about 100° C., and that absorption by the surface and diffusion into the interior, taking place at different temperatures, had to be distinguished. The subject was still obscure. They had heated palladium foil, palladium black (obtained by igniting the palladium ammonium chloride) and a button of fused palladium in an electric furnace, consisting of a porcelain tube, jacketed outside with copper, *in vacuo*, in hydrogen and in air, and had examined the heating and cooling curves taken with the aid of thermo-couples of platinum and platinum-iridium. The results confirmed the assumption that palladium was dimorphic, and that the transition of the one phase into the other was extremely slow. Under certain conditions, in the cold, the surface layer rapidly occluded much gas with considerable evolution of heat. An amorphous surface layer seemed to be wanted for this reaction, for under other conditions the metal appeared almost passive as regards gas absorption. Above 100° C., however, hydrogen was always occluded, but in small quantities and with the evolution of a constant amount of heat; above 150° C., the two forms, the amorphous and the crystalline, had the same affinity for hydrogen.

Dr. Rosenhain remarked that on his amorphous cement hypothesis, a worked or a rapidly cooled metal should have a greater absorptive power than a slowly cooled metal, and the same relation should hold for fine grains and coarse grains.

# DETAILS OF PRACTICAL MINING

## Motor-Driven Three-Car Tipple



Motor-Driven Three-Car Tipple

The accompanying photograph represents an underground tipple installed at the Joker shaft of Witherbee, Sherman & Co., Inc., Mineville, N. Y. The motor driving the tipple is a 20-hp. machine, operating under 220 volts. A quadruple reduction of speed between the motor and the tipple is effected by a train of gearing on three countershafts. The tipple handles at one time three of the regular motor-hauled underground tram cars.

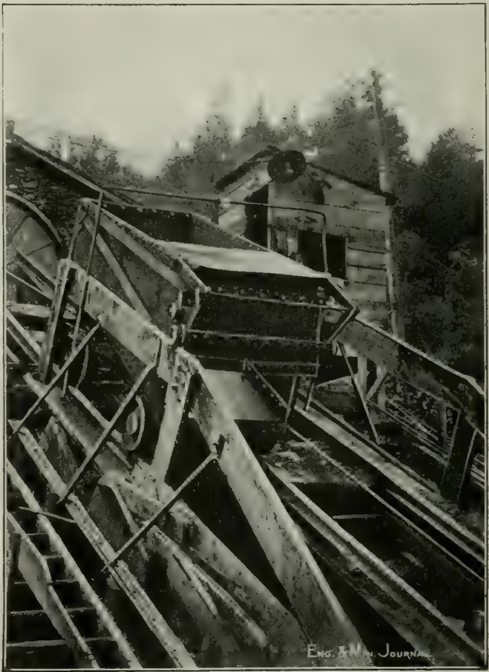
## Preservation of Wood Pipe

The many advantages of wood pipe for water transportation are somewhat offset by its liability to rapid decay. It has been demonstrated, says *Engineering and Contracting,* Oct. 15, 1913, that the durability of wooden pipe depends entirely upon its continuous and perfect saturation with water and it follows that the pipe should be thin enough to insure penetration of the water through its pores at a more rapid rate than the loss of water by evaporation from its surface. The porosity of timber differs to such an extent that a proper thickness of shell of a red cedar pipe, for example, is too great a thickness for Washington fir. Obviously a thickness that is proper for a pressure of 40 lb. per sq.in. is too great for a pressure of 10 lb. per square inch.

Not until comparatively recently, however, have engineers begun to consider the external conditions that affect the life of wooden pipe. Enough instances of long life of wooden pipe buried in clay are on record to establish the fact that clay is an admirable preservative. The reasons for this are probably two-fold: (1) Clay holds moisture and thus insures continuous and thorough saturation of the wood at the surface of the pipe; and (2) moist clay is not a good culture bed for the growth of fungus that causes rot. In view of the preservative quality of clay, would it not be good engineering to incase wooden pipe with clay several inches thick? Where the clay is within comparatively easy reach, and particularly where the trench is in soil that is either very porous or contains much vegetable humus, it would seem that a clay jacket around wooden pipe would prove economical. A concrete jacket might serve a similar purpose, but ordinarily at a greater cost than clay.

## Rear-Dumping Skip-Car

By L. O. Kellogg

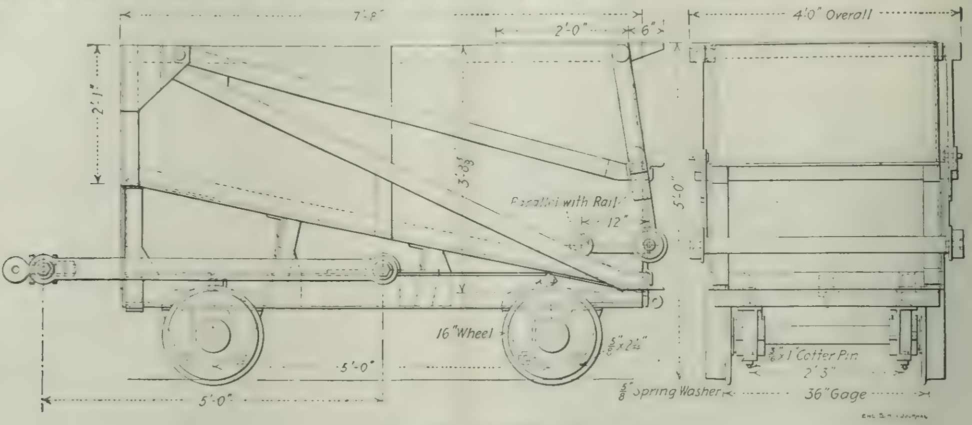


Car in Process of Dumping

At the Sterling mine, in Orange County, N. Y., the flat-dipping shaft and the limited room between the collar and the hoist make the employment of a special type of skip necessary. This is shown in the accompanying illustrations. It is really a car with an automatic door on the bottom end. The door is shown closed in the drawing and open in the photograph. Opening is effected by tripping, two small wheels coming into contact with a railing erected beside the track at the dumping point. The smaller wheel first comes in contact and unlocks the toggle joint. Then the larger wheel forces the lower half of the door to slide up outside the fixed upper half.

As the car descends again, the door is allowed to drop and is locked with the toggle mechanism. There is a double track with a tripping railing on each side and the tripping device on the cars is put on both sides, so that the cars can be used on either track.

The car body is built with its bottom higher toward the upper end. By this means sufficient slope is given to the bottom to discharge all the contents. The car, as used, hoists four tons of magnetite. It was built by the Kilbourne & Jacobs Manufacturing Co., of Columbus, Ohio, to fit the peculiar conditions existing, and is a unique type.



Rear-Dumping Skip Car

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## Square-Set Framing at Butte

In the earlier operations in Butte, Mont., timber was abundant for mining purposes, and it was common practice to use sawed lumber for the stope square-setting, the framing on this being relatively simple. There were, nevertheless, various methods employed for framing these square sets. In Fig. 1 is shown the framing used in the High Ore mine ("Timbering in the Butte Mines," A. I. M. E. Bull., August, 1913); the post has a long and relatively slender horn, subject to breakage under heavy side pressure, and to crushing with heavy top pressure. The opposite extreme is shown in Fig. 2, the framing used at the Syndicate group. In this case the horn of the post is only 1 in. high, which gives a small shoulder for the cap and girt. Furthermore, the framing is unnecessarily complicated, and consequently expensive. In Fig. 3 the method for the Anaconda group is exhibited. It is probably in general the best method for sawed timber, being cheap, simple, and designed to obtain the full strength of the timbers in all directions. The horns on the posts, being 6 in. square by 2 in., are strong, and at the same time give a good shoulder for the cap and the girt. The caps butt end to end. The girts in this figure are unnecessarily large, inasmuch as they lie parallel with the strike of the deposits and consequently take less weight than the caps, which are subject to the crushing force of the hanging wall. The framing shown in Figs. 4 and 5 is similar to this, except that the girts are 1 in. less in [illegible] thickness, and so require no framing at all, although leaving the set just as strong. One case shows the dimensions for 10-in. caps and posts, and the other for 12-in. Using the 10-in. timber the sets are made 5 ft. from center to center, either cap-way or girt-way, and 7 ft. 6 in. center to center in height.

As the timber about Butte available for sawing became scarcer, it was found necessary, in order to utilize the remaining forests, to adopt round timbers underground. Even before this, round timber had been used by the Gagnon mine. The method of framing employed here is that shown in Fig. 6. The posts and caps have horns 5 in. square by 2½ in., and the cap has a shoulder taken off the bottom 5 in. from the center to allow it to fit snugly on top of the post, while on the top, also 5 in. from the center, a slab is taken off for its full length, in order that a stope floor may be easily laid. The girt is framed as shown, being usually less than 10 in. in diameter. The sets are 8 ft. 3 in. from center to center in height, and are 5 ft. center to center in the two other dimensions. The framing used on the levels, shown in Figs. 7 and 8, is similar, except that the posts are given a batter of 6 in., furnishing additional resistance against side pressure.

A combination of round and square timber has been used at the Steward mine for a number of years. The caps are of square timber; the girts and posts are round. The dimensions and method of framing are shown in Fig. 9, while Figs. 10 and 11 exhibit the relations of the level timbering and the stope set. The horn on the post is 1½ in. deep on the bottom, and 3½ in. on the top, it being supposed easier to stand a post with a short horn when erecting the set. This necessitates that the horn of the cap be out of center; this does not weaken the cap, but the timbers, being unsymmetrical, are a little slower to handle. The sets are 7 ft. center to center in height, 5 ft. 2 in. center to center along the cap, and 4 ft. 10 in. center to center along the girt. The drift posts are framed on the top only, and are given a heavy batter, which has proved satisfactory. Fig. 10 also shows the method of putting in the sheeting on which the waste is filled. The height of this above the drift cap allows room for repairs when necessary. The material used for this is usually small round timber or large round timber sawed in half.

When round timber began to be more generally

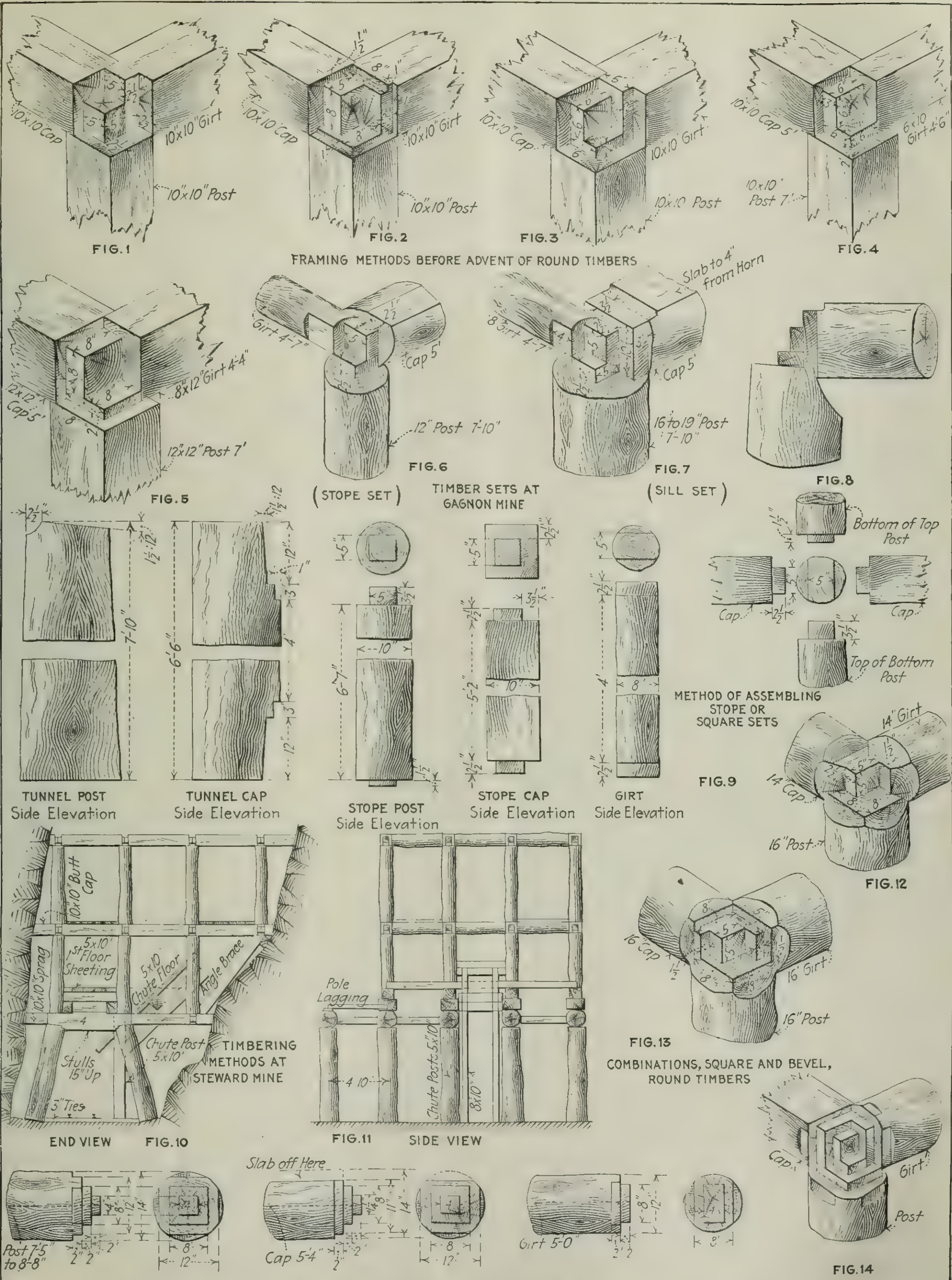

FIG. 15 – STEP DOWN TIMBER FRAMING

**METHODS OF FRAMING AND ASSEMBLING SQUARE AND ROUND TIMBERS IN BUTTE MINES**

ENG. & MIN. JOURNAL

adopted, the first framing, done in machines, is that shown in Fig. 12, the post having a flat top, 8 in. square, with no horn, and with a miter cut to the outside of the timber. The caps and girts both had horns, as shown. While this style was used for some time, it was found difficult to set the timbers and to block them so that the sets would satisfactorily resist pressure, and the concussion of blasting. The first improvement was that shown in Fig. 13, a combination of the square and the beveled type. As can be seen, the framing of these caps is complicated, there being a 1½-in. shoulder at the base of the horn, from which the miter begins. The sets measure in height 7 ft. 5 in., and 5 ft. 10 in. either cap-way or girt-way, in these latter two cases. A still further improvement is that shown in Figs. 14 and 15, the step-down type, the large 12-in. horn on the post being used when the post is large enough. The cap is slabbed off on the top in order to enable a level floor to be laid. In this style, the size of the set was also changed, it being made 7 ft. 9 in. in height and 5 ft. 4 in. in each of the other dimensions; being thus smaller along the caps and girts, it is stronger, and the common length of lagging used, 16 ft., will cut into three pieces to fit the sets and leave no waste.

It is probably the best method of framing round timbers where the size varies, the full strength of each member of the set being obtained regardless of the size of the timber. If the timber were all the same diameter, a simpler method could be used, somewhat similar to that shown in Figs. 3 and 4 for square timber. On the main levels, specially selected timber is used, varying from 12 to 18 in. in diameter for posts and caps. There is no difference in the method of framing except that the posts are framed on one end only. It is the intention ultimately to apply this method in all of the mines of the Anaconda Copper Mining Company.

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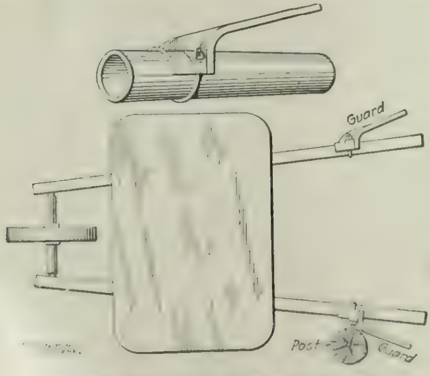
## Wheelbarrow Knuckle Guard

The dangers of septicemia is always present around mines and treatment plants. Any abrasion of the skin is, therefore, to be avoided. The accompanying illustration, taken from the Inland Steel Co.'s "Safety Bulletin," is designed to prevent one frequent source of abrasion, namely, knuckles skinned while wheeling a barrow. The device is simple, cheap and effective.



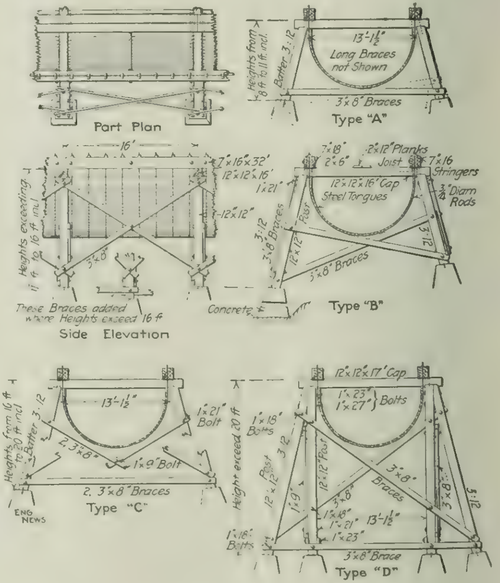
WHEELBARROW KNUCKLE GUARD

## Wooden Stave Semicircular Flume

A wooden-stave flume of semicircular section is used in the Puntledge River power development at Vancouver, B. C. The power will be developed for the Canadian Collieries (Dunsmuir), Ltd., of Victoria, which owns and operates a group of coal mines near Union Bay, Vancouver Island.

The wooden flume, states *Engineering News,* is built of staves laid on steel suspension rods carried by and between side girders laid on bents placed 16 ft. center to center.

The flume is approximately semicircular in shape, 12 ft. wide and 7 ft. deep. The staves are of 3x6-in. lumber dressed to $2\frac{9}{16}$x$5\frac{7}{16}$ in. The suspension rods are ¾ in. in diameter, are spaced 24 in. on centers, and are adjustable over each girder by screw ends with nuts over specially designed washers. The girders are built up of double fir timbers, 8x16 in., with space between, fixed by separators, for passing the suspension rods through. The flume bents are built on concrete piers except across a swamp where the girders are carried directly on piles driven to solid bottom. This design, which is shown in the accompanying illustration, was found to be economical and well adapted to rapid erection.



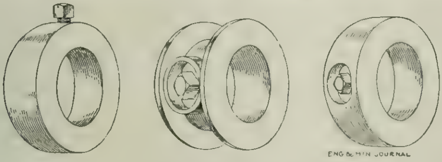
DESIGNS OF BENTS FOR WOOD-STAVE FLUME

Wood was used for flume and supporting structures because of the general adaptability of the material to the local requirements. The design is such that any part of the support can be renewed without interrupting the operation of the plant. The flume itself, except for staves near the flow line, is under practically the same conditions as submerged wood and therefore of indefinite life. No trouble is expected in the maintenance of the flume proper, since a large part of it can be replaced without shutting down entirely.

# DETAILS OF METALLURGICAL PRACTICE

## Guarding Setscrews

The accompanying sketches from a Safety Bulletin of the Inland Steel Co. show an unguarded setscrew and two methods of protection. A setscrew would not seem likely to cause a fatal accident, but the case is given of a manager who, in opposing his safety inspector's protest against an unguarded setscrew that was revolving nearby, gesticulated too wildly, had his coat sleeve caught by the very setscrew and was whirled to death. Furthermore, a setscrew on a rapidly rotating shaft in an exposed place is in excellent position to cause cuts and abrasions, which are often serious and always liable to cause death by infection.



Unsafe and Safe Setscrews

⁂

## Oil-Storage and Distribution House

The illuminants, lubricants and gasoline of the Chateaugay Ore & Iron Co. are handled through one central station. This is a cast-concrete building, shown in partial section in Fig. 1. It measures 16x32 ft. outside, and has an arched roof, also cast of concrete. The lower portion or basement of the building is 4 ft. 3 in. high, and contains a series of tanks for the oils. The working floor of the building is flush with a platform, which is of suitable height to receive unloaded material from the railway cars. The barrels of oil are stored on the platform and are emptied as may be necessary through connections in the floor of the building into the tanks mentioned. The most interesting feature of the building is the method of drawing the oils from the tanks and of measuring them at the same time. For this purpose, there are used the S. F. Bowser self-measuring pumps, similar to those frequently seen in garages. There are 16 of these devices, which are illustrated in Fig. 2. Each pump consists of a handle, geared to a vertical rack, which operates the pump plunger. One stroke of the plunger in either direction can be set to deliver 1 pt., 1 qt., 2 qt., or 1 gal. of oil. There is an attachment for counting the number of strokes, and thus the exact quantity issued at any one time is measured accurately and automatically. A rather large series of oils is thus handled, including air-drill oil, signal oil for the railroad, dynamo oil, gasoline, kerosene, black oil, engine oil, cylinder oil, compressor oil, etc. Greases and solid materials are issued by weight or by the piece. Thus, "Sunshine" is broken up into chunks about as big as a man's fist, of suitable size for carrying in the pocket. The whole installation is well designed, compact and convenient.

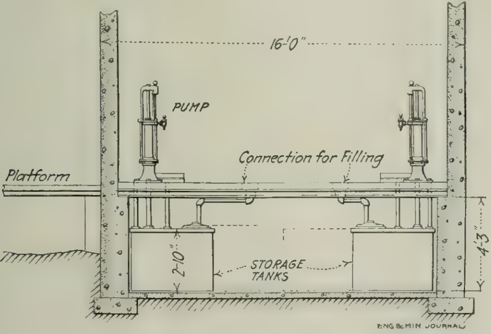


Fig. 1. Arrangement of Pumps and Tanks

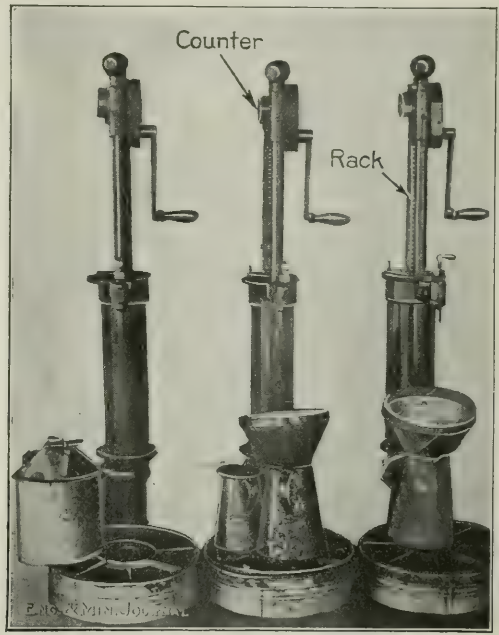


Fig. 2. Self-Measuring Oil Pump

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## Mills Combination Steel Furnace

A successful run of a new type of steel furnace at Frederick, Md., is reported by the *Frederick Post.* A high grade of steel is said to have been produced from low-grade material consisting of pig iron and scrap. The furnace, which is called the Mills combination, was installed by E. Cooper Mills & Co., for the Morris Iron & Steel Works. It is said to embody the best features of the openhearth, the side-blow converter, and the electric process.

In operation, the best results are believed to be obtained by first using the cheaper side-blow to do the roughing work and finishing the run with the openhearth or electric process, as desired.

⁂

## The Finn Elevator Bucket

With the object of devising an elevator bucket which will permit easy renewal of rapidly worn sections, and which will be a general improvement over those usually found in commission, O. B. Finn, of Colorado Springs, Colo., has invented one and patented it under U. S. pat. No. [illegible].

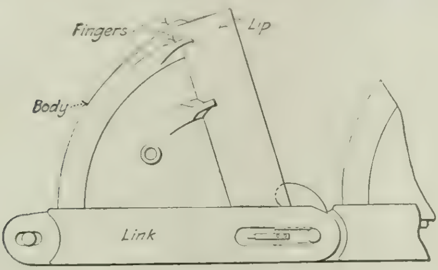


FIG. 1

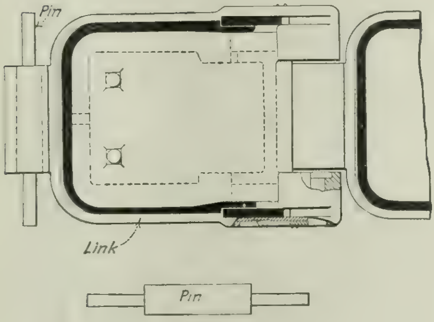


FIG. 2

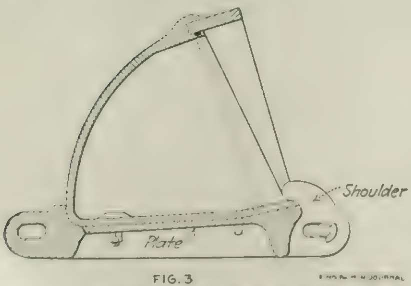


FIG. 3

Finn Elevator Bucket

In the construction of this bucket, a link of U-shape, shown in side view in Fig. 1, and in plan in Fig. 2, is used as a base. At the lower end of this link is a projection, integral with it, having an oval hole bored through lengthwise. This projection fits into the open end of the next link, as shown in Fig. 2, and is held by the pin, which has an oval body, to fit the hole in the link end, and round ends.

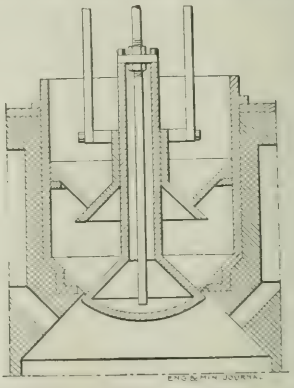
The body of the bucket seats on a plate which is part of the link. At its outer rim it has cast fingers which serve to receive and hold a removable lip. This lip is tightened in its position by fastening the bolts which hold the bucket-body to the link-plate. The bottom of the bucket body, at its front end, seats on the angular inturned edges of the lip, its front end being held in place by lugs formed on the link ends. A cross-bar connects the link sides at the open end to strengthen it.

The buckets are arranged to fit together with an easily moving joint, as shown in the drawings, the uniting of one bucket with another acting to force the pivot pin into its place and hold it there. These buckets find their principal use in dredging operations in gold-bearing gravels.

⁂

## A Trapped Charging Bell

The charging bell shown in the accompanying illustration is one used in the electric iron-smelting furnace of Dorsey A. Lyon and Edwin R. Cox at Heroult, Calif., in order to have the furnace trapped at all times. Both the purpose, construction and method of operation are completely shown by the cut. It seems to be one of those metallurgical ideas capable of a wide application.



Double Charging Bell

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## A Refractory Furnace Lining

For certain purposes a furnace lining of a refractory nature may be made from asbestos and water-glass, says the *Brass World*. It is useful for patching or plugging cracks as it does not crumble as readily as other similar compositions made from clay.

The material is made of the following:

| | |
|---|---|
| Fine asbestos | 40 lb. |
| Water-glass | 60 lb. |

The water-glass is the same as silicate of soda and occurs in commerce as a jelly-like mass which is soluble in water. The asbestos and water-glass are mixed with enough water to make the whole pasty so that it can be worked.

# COMPANY REPORTS

## Broken Hill Proprietary Co.

According to reports and statements of the Broken Hill Proprietary Co., Barrier Ranges silver field, New South Wales, for half-year ended Nov. 30, 1912, the company apparently made a net profit of $752,828 for the period. The gross income from mine products was $5,377,716, and working expenses for mines and plants, exclusive of depreciation and office charges, $4,437,412, leaving a working profit of $940,304. Depreciation, offices, directors' fees, taxes and general expenses amounted to $224,798. Income from interest, rents and investments was $37,322, leaving a balance of $187,476 to be deducted from working profit as reported. Dividends during the period amounted to $699,840. The crude-ore output was 120,839 tons. The lead-concentration plant treated 117,767 tons of crude ore, producing 24,355 tons of lead concentrates, assaying 58.29% lead and 27.18 oz. silver per ton.

In the zinc concentration plant 88,361 tons of dump tailings were reground, producing 3057 tons of lead concentrates assaying 52.18% lead and 27.48 oz. of silver per ton. The present stock of these tailings is about 1,150,000 tons. In slimes the joint production from both sections amounted to 28,676 tons, assaying 19.29% zinc, 13.88% lead and 16.4 oz. silver per ton. The smeltery treated in all 95,092 tons of ores and concentrates and 5513 tons of flue dust and refinery drosses. The production of bullion was 50,302 tons, which was a record production. The refinery treated 45,730 tons of bullion resulting in 2,059,197 oz. of silver, 872 oz. of gold, 43,578 tons of soft lead and 362 tons of antimonial lead. In the spelter plant 5012 tons of zinc concentrates and slimes were treated by the roasters, the distillation plant produced 1367 tons of spelter and 212 tons of blue powder. During 1912 the company sold 83,982 tons of lead as follows: To Europe, 46,512 tons; to India, China and Japan, 27,504 tons; to Australia and New Zealand, 9966 tons. The report claims 2,000,000 tons of ore available in the Broken Hill mine.

⁂

## Colorado Mining Co.

The Colorado Mining Co., of the Philippine Islands, made a profit of 315,776.20 pesos in 1912. Ore milled amounted to 33,169 tons, of which 31,417 tons came from the mine and 1752 tons from dumps. The mill treated an average of 113.2 tons per day of actual working time. The metal content of the ore consists of gold with a small percentage of silver. The average head value at the mill was $11.53 per ton and tailings averaged $1.17 per ton U. S. currency; the extraction was 89.84%. The following costs are reported, and apparently represent the total expenditure during the year: Development, 0.602 pesos per ton; stoping, 4.295; milling, 5.577; general and marketing, 0.532; total operating expense, 11.006 pesos. In addition to this expenditure the following amounts were expended: Mining property, 0.186 per ton; mine equipment, 0.006; mill plant, 0.662; estate, 0.577; transporting equipment, 0.377; total, including operating expenditure, 12.814 pesos per ton of ore or about $6.40 per ton. This is the first producing year for the company, and it is stated that the general conditions of the property have been improved in many respects, a suitable staff house containing living quarters for American and European employees has been constructed, and separate houses for the superintendent and a number of married American employees have also been built. A complete line of supplies for mine and mill was reported on hand. The development work consisted of 2182 ft. of drifts, etc., 575 ft. of which were timbered. Of the ore mined, 45% came from the first level and 55% from the second level. The ore from the first level averaged $13.16 per ton and the second level, $10.50 per ton. It is estimated that the ore reserves as now blocked out contain 217,215 tons of ore, averaging $10.77 per ton or a gross value of 2,388,885 pesos. A dividend of 100,000 pesos was paid on Dec. 4, 1912, on 100,000 shares, par value, 10 pesos each.

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## Mount Morgan Gold Mining Co.

The annual report of the Mount Morgan Gold Mining Co., Mount Morgan, Queensland, for the year ended May 31, 1913, shows that 312,068 tons of ore were treated during the year, including ore from the Many Peaks mine; 9280 tons of fine copper and 126,082 oz. of gold were produced from this ore. The total revenue from all sources amounted to $5,540,539. Total expenditure was $3,591,044, which includes $606,266, payments to Queensland Government; $1,938,873 for wages and contracts, and $1,045,945 for other expenditures. The profit for the year was $1,949,495. At the Mount Morgan mine 2.72 tons of ore were broken per miner and shoveler per shift; 1.32 tons broken and delivered per shift per underground employee. The average earnings per contract miner per shift were $4.40; and per contract shoveler, $3.15 per shift. The cost of breaking ore and moving from face of stopes to chutes, including explosives, was $1.25 per ton. Of the 224,385 tons of ore hoisted from the Mount Morgan mine 575 tons came from and above the 450-ft. level; 21,187 tons from 512,-ft. level, 23,594 tons from 574-ft. level, 87,032 tons from 650-ft. level, 35,107 tons from 750-ft. level, 56,610 tons from 850-ft. level and 280 tons from and above the 1050-ft. level.

Designs were prepared for installing conveyor belts in the opencuts, to deliver mullock to the passes leading into the mine and also other conveyor belts underground for carrying the mullock through such places where hand trucking is now employed. The development work at this mine consisted of 186 ft. of drifting; 49 ft. of recessing, 399 ft. of sinking and 25 ft. of raising.

At the Many Peaks mine 2.19 long tons of ore were secured per miner per shift and 1.47 per shift per man employed underground. During the year, 1078 ft. of driving and 412 ft. of sinking were performed. The net ore reserves as reported by the company at the end of the year consisted of 1,365,000 tons of high-grade and 1,982,000 tons of medium-grade ore. The following table shows the material handled and the results at the smelting works:

| | Tons | Copper obtained | Copper % | Gold oz obtained | Gold dwt. per ton |
|---|---|---|---|---|---|
| Copper ore | 203,777 | 6,958.15 | 3.41 | 96,851.60 | 9.50 |
| Gold ore | 19,895 | 529.71 | 2.66 | 18,831.38 | 18.93 |
| Many Peaks | 88,396 | 1,346.02 | 1.52 | 658.20 | 0.15 |
| Purchased | 353 | 40.14 | 11.37 | 95.60 | 5.11 |
| Miscellaneous | 9,677 | 406.18 | 4.19 | 2,051.09 | 4.24 |
| Total | 322,098 | 9,280.20 | 2.88 | 118,487.87 | 7.36 |

In addition to the gold shown in the table 7591.19 oz. were produced from Mundic works cleanup. The fluxes and fuels used in smelting were as follows: Limestone, 72,874 tons; ironstone, 1573 tons; and coke, 43,472 tons.

An addition to the power plant was started during the year. The boiler house will consist of large-sized units automatically fired with coal. The engine room will have the following machines: 2 turboblowers, each capable of delivering 40,000 cu.ft. of air per min. to the blast furnaces at a pressure of 5 lb. per sq.in.; one mixed pressure turboblower, capable of delivering 10,000 cu.ft. of air per min. to the converters at a pressure of 14 lb. per sq.in.; three reciprocating air compressors, delivering air to the mine and for general purposes at a pressure of 90 lb. per sq.in.; three turbo-alternator rotary-converter sets of a combined capacity of 4000 kw. The existing blower room will be used in case of emergency.

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## Broken Hill South Silver

The report of the Broken Hill South Silver Mining Co., Broken Hill, New South Wales, for half-year ended Dec. 31, 1912 shows that two dividends, amounting to $826,200, were paid, and the year ended with net liquid assets amounting to $1,111,627. Apparently the profit for the period was $1,130,000 after allowing for depreciation and other expenses. The ore reserves were estimated to contain 3,250,000 tons of ore, and the slimes accumulated now amount to 300,000 tons. During the period covered by the report 182,000 tons of tailings were delivered to the Amalgamated Zinc, Ltd., and the Zinc Corporation, Ltd. The mine produced 178,547 tons of crude ore averaging by assay 13.7% Pb, 6.4 oz. Ag, and 13.8% Zn. Of the ore mined, 0.8% came from the 1170-ft. level, 29.6% from the 1070-ft. and 42.8% from the 970-ft. level, the remainder coming from between this level and the 125-ft. level.

Of the ore broken 96.5% came from contract stopes and 0.5% from miners in stopes on wages, the remaining 3% came from development work. All but 0.5% of this ore was handled from the stopes to shaft plats by contract; 58,571 cu.yd. of tailings and ashes were distributed in the stopes on contract for filling. The cost of purchase, handling on surface and distributing in depleted stopes was 97.3c. per cu.yd. of filling, or 31c. per ton of crude ore extracted. This compares with a cost of $1.23 per cu.yd. of filling and 35c. per ton of ore extracted during the first half of 1912. Practically the whole underground force is now on contract. The average earnings were as follows for an 8-hr. shift: Miners development, $4.54; miners stoping, $4.20; ore trammers, $3.43; waste trammers, $3.16 per shift.

Of the 1027 employees engaged for underground work 804 were in daily attendance. The average extraction of crude ore was reported at 6867 tons per week, which indicates approximately 8.55 tons of ore per week per man underground. On the surface 390 men were on the roll, while the daily attendance was 362, or about one man for every 19 tons of ore mined and treated. The general average for all men on surface and underground was about 6 tons of ore per week per man. The development work performed amounted to 5182 ft., of which 1154 ft. were underground diamond drilling. The concentrating plant treated 180,080 tons of crude ore, from which 27,238 tons of concentrates containing 18,755 tons of lead, 617,679 oz. of silver, 1695 tons of zinc was made. The recovery was 76% of the lead contents, 53.8% of silver and 6.8% of zinc contents.

The working cost, not including depreciation, office expenses, directors' fees, etc., was $4.68 per ton, made up of $2.93 per ton of ore for mining, 31c. for filling stopes, 58c. for development and 86c. for concentration. This was equivalent to $30.96 per ton of concentrates. According to a statement of water consumption 183 gal. of water were consumed per ton of crude ore concentrated.

⁂

## Arizona Copper Co.

The statement of the Arizona Copper Co., Clifton, Ariz., for half-year period ended Mar. 31, 1913, shows a production of 18,566,000 lb. of bessemer copper. The profit from operations, stores, rents, etc., amounted to $1,032,814.51. From this, other expenses amounting to $138,465.87 was deducted, leaving a profit of $894,348.64 from American operations. This expense was made up of: Expenses of administration at Clifton, after deducting interest received, $19,724.96; public subscriptions in Arizona, $807.22; taxes in Arizona, $97,815.78; office expenses in Edinburgh, after deducting transfer fees, $20,117.91. Revenue from holdings in other companies was $176,788.19. There were interest and income tax expenses amounting to $57,875.15 to be deducted from gross income, leaving a net earning of $1,013,261.68 for the period. A dividend of $59,610.57 was paid on "A" preference shares and preference stock, leaving a surplus for the half-year of $953,651.11. A dividend on common stock of $551,000 was declared, payable July 26. Expenses not charged to revenue amounted to $1,122,106, of this $1,085,720 was expended on the new smeltery and extensions to No. 6 concentrator. The remaining work on the smeltery consisted of making connections between the various departments, such as conveyor systems, dust flues, pipe connections, etc. The extension to the concentrator will increase its capacity to 3000 tons a day.

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## The Batopilas Company in 1912

A preliminary report gives data, partly estimated, on the operations of the mine in 1912. The production was 702,000 pesos, with sundry profits of 25,000 pesos. Mining, milling, administration, maintenance and taxes amounted to 516,951 pesos. Bond charges were 43,980 pesos for interest and 3665 pesos for accrued premiums. The remaining estimated profit was 162,404 pesos.

# Investigation of Copper Enrichment

By L. C. Graton*

*SYNOPSIS—The secondary-enrichment investigation is a scientific study under the joint auspices of many important American copper companies, the Harvard mining school, and the Geophysical Laboratory of the Carnegie Institution of Washington. Its aim is to augment and systematize the knowledge of the process of downward sulphide enrichment of copper deposits, which has to a greater or less extent affected deposits from which a large part of this country's copper output is derived. The plan contemplates two years of intensive study in the mining camps and in the laboratories, followed by a report embodying results achieved.*

⁂

Among the many noteworthy American contributions to the science of ore deposits in recent years, one of the greatest scientific and commercial importance, as pointed out by Professor Kemp[1], was the recognition that many rich ores of copper, especially the black sulphide, chalcocite, which give way in depth to leaner sulphide material, were the result of a natural process of concentration or enrichment by which much of the copper from an overlying but now impverished region had been added, in this "zone of enrichment," to that already present in the original or primary ore represented by the underlying leaner sulphides.

## Secondary Sulphide Enrichment an Appealing Theory

This hypothesis of secondary-sulphide enrichment, gradually taking shape in the minds of several observers, assumed tangible and positive form when, about 1900, the papers of S. F. Emmons, Weed, and Van Hise gave definite expression to and adduced the support of much evidence to the ideas that had theretofore been hardly more than vague though significant and fruitful conjectures. Accepted almost immediately and universally, this hypothesis became one of the most helpful instruments to those engaged in the study of ore deposits or in the finding and development of ore. It was readily and generally accepted because of its evident consistence with and explanation of many facts of observation and because of its easy comprehension, since it is one of the very few processes of ore deposition believed to take place under such conditions of temperature and pressure as can readily be duplicated artificially.

It was markedly helpful not only because it frequently elucidated the puzzling question of extreme changes in the distribution of values, but also because it applied to so many deposits of commercial prominence. A quantitative idea of the importance of the process of secondary enrichment may be gained from the fact that in the United States alone, which now supplies considerably more than half the world's copper, about three-quarters of the output is from deposits that have been more or less affected by it.

## Theory Applied in Modified Form to Other Metals

Hardly had this hypothesis of secondary enrichment been definitely announced for copper than it was applied in more or less modified form to other metals, especially silver. The strong hold which this idea of later sulphide deposition from descending solutions has taken upon the minds of American geologists and mining engineers may be indicated by the fact that in the last 13 years some two score articles have appeared in American literature treating of this subject primarily, in addition to numerous monographs and reports in which it is dealt with in greater or less detail in connection with other subjects.

The process is unquestionably most effective in the case of copper, and the varied mineralogy and comparative abundance of that metal combine to aid our understanding of it. In view of the common exhibition of the process, and of the great amount of attention that has been given to it, it might be expected that our knowledge of secondary enrichment would be fairly complete. Many of the basal conditions governing its operation are indeed now so well understand that mining undertakings in which the process is invloved are directed much more intelligently than before.

A survey of the literature of secondary enrichment, however, leaves one with feelings of uncertainty and disappointment, for he finds in regard to many important features of the process an appalling lack of unanimity of record and opinion. One at first assumes that various observers have described phenomena that actually differ; but from the frequent occurrence of ambiguity and of implied or actual contradictions, even within single contributions, it is necessary to conclude that as yet many matters relating to secondary enrichment have not been carefully and fully thought out and that personal opinion and viewpoint are largely involved in the writings upon the subject.

## Authorities Not in Complete Accord

Thus aware that "authorities disagree," we are left uncertain whether secondary sulphide enrichment is a definite, well characterized process, or whether it is a process that inherently is variable, acting in some cases in one fashion and differently in others—whether the variations noted in the literature are real, and if so, due to differences in local influences, or whether the variations arise solely or mainly from the fact that the descriptions have been written by different observers. In the majority of general writings upon this subject, the ratio of speculation and generalization to solid fact proves disappointingly large while on the other hand in many papers describing specific occurrences the statements seem to have been made with so little regard to the systematic conceptions of the process that they cannot be interpreted intelligently or safely employed.

The relation of secondary enrichment to the water level may be cited as one of the points upon which it is well-nigh impossible to secure from the literature either concordant testimony or adequate and reasonable explanation of the wide variations described, yet surely few sub-

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Note—This statement of the nature and scope of this investigation is presented in consequence of numerous inquiries that have been made regarding it.

*Professor of mining geology, Harvard University.

[1] Kemp, J. F., "Secondary Enrichment in Ore Deposits of Copper," "Econ. Geol.," Vol. 1, p. 11, 1905.

jects connected with secondary enrichment are of such importance.

In means of distinguishing the products of enrichment from the initial constituents of the ore, we are plainly deficient. We have little to answer to the important question why enrichment is pronounced in one deposit and perhaps absent in another seemingly as favorably conditioned. How far have we progressed during these several years in our actual knowledge of the chemistry of the process, either analytical or synthetically? Equations have been written in plenty, but many of them are rather guesses as to what may reasonably take place, stated in a plausible form, involving a small number of molecules, than the results of thorough quantitative investigation. These and other perplexities make it hardly possible to deny that our knowledge of secondary enrichment is markedly incomplete.

### Scattered Observations Insufficient Evidence

Some four years ago, I attempted the preparation of an article on secondary enrichment of copper. After long effort to reconcile the literature with itself and with my own brief observations in most of the important copper camps of the country, it appeared that satisfactory treatment of this subject could not depend on scattered observations of various students, but must rest on widespread study of occurrences directed especially toward this single problem, and accomplished as nearly as possible through one pair of eyes, so that such unknown quantities as personality, experience and viewpoint would be reduced to a minimum and a constant. Professor Irving[1] has recently stated the case with much force in his plea for the special-problem type of geological investigation:

> . . . . At present we progress in our study of this subject (secondary enrichment) by each man adding here and there a little of what he has observed in the few localities which he has had opportunity to study, and increase in our knowledge is very slow. If some . . . . geologist were sent out to study this problem of secondary enrichment, now in Alaska, now in the tropics, now in a dry country and now in one of heavy rainfall, now in deposits of one metal, now in those of another, a vast array of clearly correlated geological observations could be gathered from which generalizations of incalculable value might be deduced, and deduced in a comparatively short time.

As opportunity arose, efforts were made toward consummating such a plan. The commercial importance of the problem, fortunately, made it possible to secure funds for the study and more important still, to enlist the coöperation of practically all the important American copper companies that mine ores affected to a greater or less extent by secondary enrichment.

### Concerted Attack on Problems

Since this plan was conceived, there have appeared, in addition to numerous articles bearing upon the subject, systematic expositions of secondary enrichment by Dr. F. L. Ransome,[2] Prof. C. F. Tolman, Jr.,[3] and just now the elaborate and thoughtful treatise by Prof. W. H. Emmons.[4] The great value of these contributions is plainly evident. They appear to be, however, so far as field study is concerned, rather the accumulation of ideas gained more or less incidentally to the pursuit of more comprehensive objects than the results of deliberate attack upon this particular problem in the mines. Although these writings may anticipate some of the results to be expected from this detailed study, it is not to be doubted that independent corroboration of the conclusions they contain will be worth while, and it is to be hoped that, with concerted detailed examination of many occurrences, with the marked advantages afforded by the recently developed methods of opaque mineral examination, and with the assistance of thorough chemical study, conclusions may be reached concerning some of the questions now unsettled and additional matters of interest be uncovered, with the possibility that some existing views may have to be modified or abandoned. It is believed, therefore, that these recent treatises, as well as such suggestive papers as that by Winchell[5], and the earlier articles by Kemp, S. F. Emmons, Weed and others, while of great help in this study, do not lessen, but rather emphasize the need of systematizing and unifying our knowledge of secondary sulphide enrichment, and of adding to it wherever possible.

### Questions Must Be Answered after Careful Study

In outlining the attack upon this problem, it has been felt that fact must be all-important, and the more or less unconscious bias due to preconceived notions must be eliminated so far as possible. The other extreme of headlong attack through the complete elimination of hypothesis or systematic outline would, if anything, be worse. In the hope of striking a happy mean a syllabus has been prepared which consists entirely of questions, the answers to which it is hoped can be gained during the study. These questions, arranged under systematic headings, are intended to cover all the ideas that have as yet been expressed regarding secondary enrichment of copper ores; they consttute an impersonal, impartial screen with which to sift out all the pertinent facts, regardless of the conclusions that may result.

The geological part of the investigation is being conducted under the auspices of the Harvard mining school, where preparatory investigations have been carried on during the last three years, and where ample laboratory facilities are provided for the study. With the idea of unifying methods and conceptions, the geological staff has been made as small as is consistent with covering the wide field in a reasonable and effective period. On the other hand, the training and experience represented are believed to be sufficiently varied to avoid falling into ruts. The staff consists of Augustus Locke, Alan M. Bateman, Joseph Murdoch and Edward H. Perry, besides myself while C. T. Brodrick will study several European and Asiatic occurrences.

For the solution of the chemical side of the problem it was happily possible to engage the interest of the geophysical laboratory of the Carnegie Institution of Washington, where recent chemical researches of much geological significance on the sulphides of iron, zinc, and mercury afford preparation and foundation for this study of the copper sulphides. This chemical work is under the direction of E. T. Allen, assisted by J. L. Crenshaw, E. G. Zies and Eugen Posnjak, chemists, and H. E. Merwin, petrologist. Closest coöperation between the geological and the chemical staffs is to be practiced so that each may profit by the findings of the other.

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[1] Irving, J. D., "Special Problems and Their Study in Economic Geology," "Econ. Geol.," Vol. 5, p. 676, 1910.

[2] "Criteria of Downward Sulphide Enrichment," "Econ. Geol.," Vol. 5, p. 205, 1910.

[3] "Secondary Sulphide Enrichment of Ores," "Min. and Sci. Press," Vol. 106, pp. 38, 141, 178, 1913.

[4] "The Enrichment of Sulphide Ores." U. S. Geol. Surv., "Bull. 529," 1913.

[5] Winchell, H. V., "Prospecting in the North." "Mining Magazine," Vol. 3, No. 6, pp. 436-438, 1910.

### Two Years to be Devoted to Study

The plans provide for a two years' study of this problem, during which time the mines of the following companies that are coöperating in this movement will be examined:

| DISTRICT | COMPANY |
|---|---|
| Alaska | |
| Copper River Dist. | Kennecott Mines Co. |
| Montana | |
| Butte | Anaconda Copper Mining Co., East Butte Copper Mining Co., North Butte Mining Co. |
| Utah | |
| Bingham | Utah Consolidated Mining Co., Utah Copper Co., |
| Tintic | Centennial-Eureka Mining Co. |
| Nevada | |
| Ely | Consolidated Copper Mines Co., Nevada Consolidated Copper Co. |
| Arizona | |
| Ajo | Cornelia Mine |
| Ray | Ray Consolidated Copper Co. |
| Miami | Inspiration Consolidated Copper Co., Miami Copper Co. |
| Globe | Old Dominion Copper Mining & Smelting Co., United Globe Mines |
| Patagonia | R.R.R. Mine |
| Bisbee | Calumet & Arizona Mining Co., Copper Queen Consolidated Mining Co. |
| Gleeson | Leonard Copper Co. |
| Morenci | Arizona Copper Co., Ltd., Detroit Copper Mining Co., Shannon Copper Co. |
| New Mexico | |
| Santa Rita | Chino Copper Co. |
| Leopold | Burro Mountain Copper Co. |
| Tennessee | |
| Ducktown | Tennessee Copper Co. |
| Mexico | |
| Cananea | Cananea Consolidated Copper Co. |
| Nacozari | Moctezuma Copper Co. |

It would be absurd to assume that a small field staff could in two years independently secure the main features of the geology of these districts that bear significantly upon the problem. The descriptions already exists ing of many of these camps, especially the monographic reports of the U. S. Geological Survey, will be of much assistance, particularly in regard to the more general features of the geology. It is plain, however, that the main fund of information assembled must be that gained by the geologists and engineers of the several companies who have studied the orebodies in detail day after day and year after year, who know the conditions that existed in workings now abandoned or inaccessible, and whose intimate acquaintance with the deposits will enable them to indicate the places and features of importance in connection with enrichment. The regular field staff of the investigation, then, will act as a collecting corps, seeing the occurrences that the local workers point out, recording the facts they have gathered, and finally assembling the entire data systematically so as to bring out the points of similarity and contrast. The local geologists and engineers, so far as they permit and desire, are thus virtually to be partners in the study, sharing credit and responsibility in the results.

To supervise generally the investigation and especially to foster the spirit of coöperation between the investigating staff and the copper companies, the following gentlemen have consented to act as an advisory board for the investigation: J. Parke Channing, James Douglas, D. C. Jackling, L. D. Ricketts, B. B. Thayer, Pope Yeatman.

The secondary-enrichment investigation was formally started on January first of this year with the beginning of chemical work by the geophysical laboratory in Washington. Geological field work was begun on June 15, with a preliminary examination of the Butte deposits. The study at Bingham has just been completed, and the field staff will gradually work southward, commencing in the Arizona camps at Ray. It is a pleasure to record with appreciation the satisfaction and encouragement given the members of the field party by the earnest and helpful coöperation and the personal courtesies extended by officials of the mines thus far visited. At the close of the study the combined results will be assembled and published as a comprehensive report on the secondary enrichment of copper deposits, together with such information as may have gained regarding the behavior of other elements under the conditions of enrichment.

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## Chronology of Mining for October

*Oct. 1*—Butte, Anaconda & Pacific Ry. began operating regularly with electric power.—John C. Branner inaugurated president of Stanford University.

*Oct. 2*—First ore from South Cuyuna range, Minnesota, shipped from Barrows mine.—Hearings resumed in suit of Government against U. S. Steel Corporation.—Rudolf Weniger, assistant superintendent of mines for the Cia. Minera de Peñoles, killed near Mapimi, Mexico; mines and reduction works subsequently closed down and foreigners left the region.

*Oct. 5*—Nome, Alaska, almost totally destroyed by storm.—Commonwealth mill at Pearce, Ariz., commenced operations.

*Oct. 10*—Washoe smelting works resumed operations after two weeks' general cleanup.

*Oct. 14*—Colliery explosion near Cardiff, Wales; 417 men killed.—Colliery explosion in south of France.

*Oct. 17*—Strike of miners at Rio Tinto, Spain, closed the mines.

*Oct. 20*—American Mining Congress at Philadelphia.

*Oct. 21*—Lake Superior striking copper miners began attempts to wreck trains bringing in strikebreakers.

*Oct. 22*—Colliery explosion at Dawson, N. M.; 261 men killed.

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## Bauxite Brick

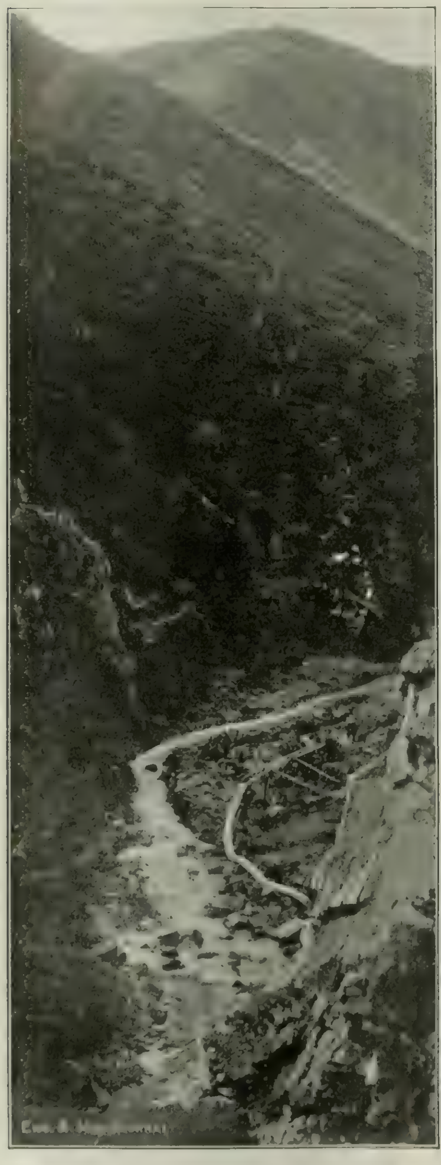
According to Kenneth Seaver, in a paper published in the "Proceedings Engineers' Society of Western Pennsylvania," July, 1913, the crude bauxite utilized for brick making is exceedingly variable in composition, and great care must be exercised in its selection, in order to maintain uniformity of product. The principal sources of domestic supply are Arkansas, Georgia, Alabama and Tennessee, in the order named, and the range of composition is about as follows: $Fe_2O_3$, 3 to 6; $Al_2O_3$, 55 to 60; $SiO_2$, 4 to 7; $TiO_2$, 2 to 2.75; water of crystallization, 30; moisture, 1.50 per cent.

The crude material must be thoroughly calcined at high temperature to expel all water of crystallization; suitable bonding clays are then added, and the brick burned at the highest temperature of the kilns. The early difficulties in the use of bauxite brick occurred partly through unsuitable bonding materials, partly to insufficient calcination of the crude material, and partly to incomplete burning in the kiln. A high-grade brick should contain about 56% $Al_2O_3$, a representative analysis being as follows: $SiO_2$, 38.38%; $Al_2O_3$, 56.77; $Fe_2O_3$, 2.95; CaO, none; MgO, 1.09; alkalies, 0.88%. Brick containing a still higher percentage of alumina can be made, if desired. The name bauxite brick is very loosely applied, and some specimens contain as little as 43 to 51%. A properly made brick is strong and tough, but has a tendency to spall if suddenly cooled or heated.

# PHOTOGRAPHS FROM THE FIELD

McCarthy, on the Copper River & Northwestern Ry.

Crossing the Nizina River



Hamshaw Operations On Bonanza Creek

No. 1 Above Discovery Little Eldorado Creek

The Shushanna or Chisana Discovery Was An Important Event in Alaska in 1913

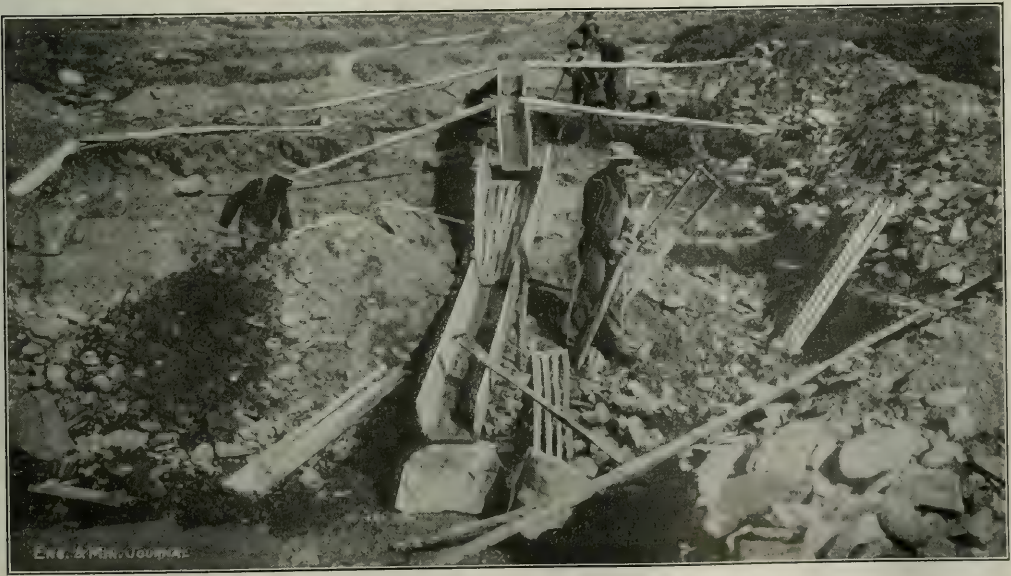
William James and Andy Taylor discovered gold in Eldorado Creek early this year and in the crude sluice shown on the opposite page made a good cleanup late in the season. The discovery was made 100 miles northwest of McCarthy on the Copper River & Northwestern Ry. It is reported that 12 men have lost their lives in attempting to cross the Nizina in the [illegible] to the new diggings.

A Typical Mining Town in Yukon Territory

Deposit of Volcanic Ash on the Yukon

Junction of Eldorado with Snow Gulch

James' Camp on Eldorado Creek



James Discovery on Eldorado and Sluice in Which $40,000 Was Recovered

# Metal Mines Production in California, in 1912

The gold, silver, copper, lead and zinc production in California in 1912, as reported by the U. S. Geological Survey, aggregated $26,383,946, an increase of $1,209,269 over 1911. The gain was due chiefly to the increased yield from deep gold mines, increased value of copper and silver and increased production of zinc. The greatest gain was in the advance in the commercial value of copper. The quantity of copper produced was less than in 1911. The mine production of gold is placed at $19,713,478, a decrease of $25,430 from 1911. The production of silver was 1,300,136 fine ounces, an increase of 29,691 oz.; copper, 33,451,672 lb., a decrease of 2,864,464 lb.; lead, 1,144,731 lb., a decrease of 253,380 lb.; zinc, 4,345,591 lb., an increase of 1,538,556 pounds.

The leading gold-producing counties in the year and the values produced by each were: Amador, $2,796,194; Luba, $2,753,408; Butte, $2,346,229; Nevada, $2,081,958; Sacramento, $1,712,587; Tuolumne, $1,113,291.

There were 1041 metal-mining properties reported productive in 1912, of which 532 were deep mines and 509 placers of various kinds. This shows a total decrease of 140 producing mines in 1912. There were 470 deep gold mines, 12 silver, 24 copper, 25 silver-lead-zinc and one zinc. Of the placer producers, 141 were hydraulic mines, 65 dredges, 146 drift and 157 surface or sluicing mines. There were 64 less deep and 76 less placers producing in 1912 than in 1911. The deep mines of California produced 2,641,497 tons of ore in 1912, a decrease of 155,764 tons. Of this output 2,225,429 tons were siliceous ore, 408,622 tons copper ore, 974 tons lead ore and 6472 tons zinc ore. The siliceous-ore output decreased 70,918 tons, the copper ore decreased 85,659 tons, the lead ore decreased 1034 tons and the zinc ore increased 1847 tons.

The total average value from all ore sold or treated in California in 1912 was $6.71 a ton, against $5.49 a ton in 1911 and $6.71 a ton in 1910. At gold and silver mills in California in 1912 the tonnage milled was 2,077,300 tons, yielding $10,371,347 in gold and 307,306 oz. of silver, valued at $188,993, or an average value in gold and silver of $5.08 a ton, compared with $4.64 in 1911 and $5.25 in 1910. Of this average value $4.17 was recovered as bullion in batteries and on plates in mills.

The smelting ores, 456,735 tons, produced all the copper and zinc, and practically all the lead, as well as 955,067 fine ounces of silver valued at $587,366, and $592,532 in gold. There were also treated 107,462 tons of old tailings, yielding $103,936 in gold, an average of 96c. a ton, and $1298 in silver, an average of 1c. a ton.

The placers of California in 1912 yielded $8,645,663 in gold and 35,652 oz. of silver, valued at $21,926, a decrease of $339,895 from the placer output of 1911. The hydraulic mines showed an increase of gold output of $14,196, the dredges a decrease of $236,506, the drift mines a decrease of $91,908, and the surface placers a decrease of $26,646 in gold. The placers produced 13.86% of the total gold yield of the state and the deep mines 56.14%. The dredges produced 37.68% of the entire output of gold in the state in 1912 and 85.93% of the placer gold.

The total gold-dredge output of California from 1899, when only $206,302 was produced, has been $55,415,191, including the $7,429,951 obtained from this source in 1912.

# The Federal Mining & Smelting Meeting

The New York *Times* gives the following account of the recent meeting of the Federal Mining & Smelting Co., which was of interest from the standpoint of the human factor:

> The meeting was enlivened by the presence of Sidney Norman, who has a suit pending for the cancellation of the contract by which its output goes to the American Smelting & Refining Co.; ex-State Senator A. M. Strode, of Mullan, Idaho, who described himself as "an old sagebrusher," and a number of small stockholders who occasionally interrupted the vigorous declamations of these two to say plaintively that all they wanted to know was why they hadn't received any dividends for several years.
>
> Mr. Strode said that Mr. Norman's suit "had no charms" for him, and it was local conditions out in Idaho that he wanted changed, so that Francis H. Brownell, of Seattle, chairman of the board, who was the only representative of the management present except Frank Sweeny, the secretary, had three distinct elements of opposition to deal with. Mr. Brownell proved fully equal to the task, stood the heckling for three hours, and answered every question with apparent candor and good temper except that he would not go into matters that were involved in the company's defense to the Norman suit.
>
> The protagonist in what Mr. Brownell jocularly called "the bear fight" was Mr. Strode, who had submitted in advance 14 questions that he wanted answered by the directors. During the discussion, which was good-natured throughout, it developed that Mr. Strode had failed of reëlection last year, and that he had been charged with owning four saloons in Mullan, which, it seems, is a crime in Idaho. The law prohibits the ownership of more than one by the same man. Mr. Strode denied that he had any interest in even one saloon, and said he didn't want to be reëlected, as in order to be he would have had to make two or three concessions to the Federal Mining people, which he was unwilling to do.
>
> The town of Mullan, whose unexpurgated population estimate is 1800, is apparently as well equipped with hotels as with saloons, as during the discussion of the boarding houses and stores maintained by the United Stores Co. Mr. Sweeny declared there were 15 hotels where the miners could board if they didn't like the boarding houses. Forgetting local pride, Mr. Strode contested this and Mr. Sweeny agreed to furnish him with a list of the "hotels."
>
> The local conditions that Mr. Strode wanted straightened out concerned the practice of the company of deducting from payment to the miners money they owed to the United Stores Co. for board or supplies, the company's part ownership in a losing newspaper, the inclusion of ore from the newly acquired Greenhill-Cleveland mine under the contract with the American Smelting & Refining Co., and a variety of minor matters, on some of which he was satisfied by Mr. Brownell's explanations.
>
> Mr. Brownell said that money for the United Stores Co. was deducted only when orders were given by the men, and that there was no pressure on them to do business with the United. He denied that men had been discharged for trading elsewhere, and said that no executive officer of the Federal company had any interest in the United.
>
> "Frank Sweeny here owns 10 shares in the stores company, according to its books," retorted Mr. Strode.
>
> Mr. Sweeny didn't know whether he owned the shares or not.
>
> "If the books show it, I own it," he said, and Mr. Brownell added that in any case Mr. Sweeny was connected merely with the New York office.
>
> "The fact is," pursued Mr. Strode, "that man after man has been discharged because he left the United boarding house."
>
> "That is not true," said Mr. Brownell.
>
> "If you have no interest in the stores company," asked Mr. Norman, "why do you deduct their bills from the wages?"
>
> "We will do that for anybody that gets an order from the men," replied Mr. Brownell. "In the early days the mines in the Coeur d'Alene found great difficulty in obtaining accommodations for the men in the way of boarding houses and stores, and every mine had to provide them. The mines for-

merly owned an interest in the stores, which was abolished when the Federal was started. The company has to see that there are proper accommodations or it can't get the men. It also has to see that the men get credit, so that they can get the equipment needed to go to work. It is thus necessary for the company to protect the boarding houses and the stores, and that is the only relation that now exists between the Federal and the United."

"What difference does all this make to us"? inquired a bored stockholder. "We are not interested in the troubles of the miners, if they have any. They can take care of themselves. What about our dividends"?

"If a new store was started," went on Mr. Strode, "would you guarantee to give it the same treatment, and if a man was discharged for patronizing it to investigate the matter"?

"Certainly," replied Mr. Brownell, and Mr. Strode insisted on shaking hands on this promise.

"That's all I came to get," he declared when this solemnity had been performed. "I'm ready to go home."

"I would like to have something develop," mildly remarked W. P. Fisher, "to benefit the other stockholders."

"The management," said Mr. Brownell, "has been perplexed to know why Mr. Norman brought his suit. He was not one of the old stockholders, but bought a small interest last summer. We don't understand what brought him, knowing the conditions, into the company."

"That's what we'd all like to know," said Mr. Fisher.

"I didn't buy knowing the conditions," replied Mr. Norman, "and as to being a small stockholder, I own 40 times as much stock as you do, Mr. Brownell, or Secretary Sweeny or any of nine other directors. I own twice as much as all the directors put together. And I own mine, and it is not stamped across the face 'dividends payable to the American Smelters Securities Co.,' as yours is."

"That's right," said Mr. Brownell, with a smile.

"I also represent 100 other stockholders," added Mr. Norman.

"The management," said Mr. Brownell, "has not felt satisfied of Mr. Norman's disinterestedness. The facts will all be brought out at the trial of his suit, but meanwhile, I don't care to make any statement except that the present management found this contract in existence, and it is a legal contract. If it is unfair the directors have no power to change it.

"I would like to know," he said, clapping Mr. Norman on the back and putting his arm around him, "who our friend Norman represents. He is not representing Mr. Norman. I understand that he has collected $20,000 or $30,000 from stockholders for the purposes of his suit."

"That is absolutely untrue," said Mr. Norman. "Your informant is a liar."

"You don't represent any ulterior interest"? queried Mr. Fisher.

"Absolutely not," said Mr. Norman. "Mr. Brownell thinks I am working for the International Smelting & Refining Co., but if he will get this contract properly revised I will sign up on behalf of myself and the other 100 stockholders I represent to continue it for the 17 years it still has to run."

"I represent 10 stockholders, and I'll join in that," said Mr. Strode.

Mr. Brownell never finished reading Mr. Strode's 14 questions, but the general discussion seemed to have covered all the ground necessary, and everybody was willing to adjourn.

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# Huge Capper to Be Used on Burning Oil Well

By L. M. Edholm*

Finding it impossible to put out the oil-well fire of the Kern Trading & Oil Co., by steam, as is done in most cases, the officials are now planning a huge capper to be installed 25 ft. in the earth, or if this fails, to collapse the big pipe by dynamite.

Since the coming in of this well it has been at no time less than 100 ft. across, which makes it almost impossible to ascertain just where the center of the fire is. So the capper method is to be tried by digging a tunnel into the side of the mountain to the pipe. This method was used in a previous fire among the oil wells to stop the oil flow after a fire had been extinguished. Steam, however, will be at hand in case of need when the capper is installed.

⁂

# Goldfield Consolidated

Report of Goldfield Consolidated for September, 1913, shows a total production of 27,979 tons. From this material $177,875 was realized.

Development cost $4.53 per ft. and 2985 ft. were accomplished.

| | Per Ton of Ore Handled | | |
|---|---|---|---|
| Mining: | Mining | Milling and Transportation | Total |
| Stoping | 2.79 | | .. |
| Development | 0.48 | | 3.27 |
| Shipping expense | 0.20 | . | 0.20 |
| Dump moving | 0.12 | .. | 0.12 |
| Transportation | | 0.09 | 0.09 |
| Milling | | 1.87 | 1.87 |
| Marketing | | 0.07 | 0.07 |
| General expense | 0.28 | 0.05 | 0.33 |
| Bullion tax | 0.21 | .. | 0.21 |
| Construction | .... | | .. |
| Flood damage | 0.12 | 0.02 | 0.14 |
| Total costs | 4.20 | 2.10 | 6.30 |
| Miscellaneous earnings | 0.08 | 0.04 | 0.12 |
| Net costs | 4.12 | 2.06 | 6.18 |

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# Asbestos-Protected Steel

A new construction material, asbestos-covered steel, is described in the Asbestos Protected Metal Co.'s Bull. No. 16. The Duckback brand, for exterior use, is composed of a steel sheet, of U. S. Standard gage, 18, 20, 22, 24 or 26, coated on both sides, with one or two layers of asphalt, applied hot, on which is compressed a layer of long-fiber asbestos, in gray or terra cotta colors. The sheets are either flat, corrugated or beaded, and are attached to the roof structure in the same manner as black or galvanized plates. Their weights range from 125 to 225 lbs. per 100 sq.ft. The price of 22-gage metal is $11.50 per 100 pounds. The asbestos will take and hold paint, if desired, but this is not necessary for the preservation of the material, one of its recommendations being that the cost of maintenance is practically eliminated. The material has been proved under the most severe use, as roofing and siding for acid factories, steel plants, coal-mine installations, and fertilizer factories near the seacoast. About 400,000 sq.ft. of this material were recently used in covering a modern zinc-smelting works.

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# Condoriaco Cyanide Plant

The mill and cyanide plant of the Sociedad Beneficiadora de Condoriaco, Ltd., have recently been sold to Mark R. Lamb. The intention when the plant was built was to treat an 80,000-ton dump of $10. gold-silver ore, but no start has been made on it, as sufficient custom ore has been offered to keep the mill busy. The plant is at Condoriaco, 30 miles from the nearest railway, in a district which has a record of large production. It is being increased in capacity, and modern luxuries, such as Dorr apparatus and vacuum filter, are to be added.

This is the first operating cyanide plant in Chile, and the only one now operating, though two small ones for Las Vacas and Taltal will be running this month. The Vacas plant will treat gold ore and the Taltal is for silver. The first is owned by a Chilean company and is under Chilean management, while the second is under an American cyanider.

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*4624 Figueroa St., Los Angeles, Calif.

# CORRESPONDENCE AND DISCUSSION

## Dewatering Huntington Mill Feed

In an article entitled "Huntington Mills and Their Operation," published in the JOURNAL of Aug. 2, Mr. Rice recommends dewatering the feed to a Huntington mill if it is used to regrind table or jig tailings in concentrating practice. It is possible that at the Silver King mill, by adopting this scheme, the cost of maintenance of Huntington mills has been reduced, but if a fine discharge screen, say, 30 to 40 mesh, is used, a fair amount of water is needed inside the mill to prevent the screens from blinding. I have tried time and again to use less water in the feed, because it not only would reduce the wear on the mill, but also because a finer and more uniform grinding would result. But after a short time the screens would blind to such an extent, that the mill choked, and spilled the pulp over the sides, unless a man was employed all the time cleaning the screens with a steel-wire brush.

As far as the ordinary cast-iron shoe for truing up the ring die is concerned, I can easily understand that it finds little favor with mill men. I use only shoes of hard cast steel with good results. By regularly using the grinding shoe in every mill twice a week for eight hours, the dies are preserved in good condition. I was once obliged to use shoes of softer material, but it only resulted in a rapid wear of the shoe, and the ring die remained just as uneven as it had been.

M. G. F. SÖHNLEIN.

Machacamarca, Bolivia, Sept. 8, 1913.

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## New York's Mining Law

I have read with interest the editorial in the JOURNAL of Sept. 20, discussing the proposed new mining laws for New York State, and agree with you that the matter is being hurried along too much. Such, also, is the sentiment of local mining men with whom I have talked. The point that New York's mineral industry is more important than is commonly supposed is well taken, and I would emphasize the fact that New York and New Jersey combined, with an area of 55,000 square miles, make annually an output of mineral products exceeding in tonnage and value that of California with an area of 155,000 square miles. Furthermore, New York's mineral industries are of a much more varied nature than those of the ordinary western state, including well established businesses in salt, gypsum, talc, graphite, iron ore, petroleum, etc.

On account of the miscellaneous character of New York's mineral products, it is difficult to standardize a mining code which shall suit all conditions fairly, although, as pointed out in the editorial, New York has had for a long time a general law governing mining conditions. Since it is now proposed to enact a new code for the safeguarding of employees in mines and quarries, it does not, on the face of it, look well to have an industrial board composed of four gentlemen and a lady, no one of whom is known ever to have been in a mine.

P. B. McDONALD.

Gouverneur, N. Y., Sept. 22, 1913.

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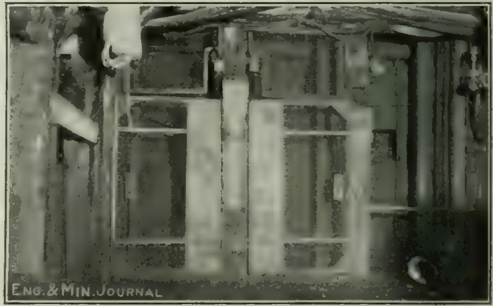
## Speculator Shaft Accident

The criticism of the care taken of the hoisting shaft at the Speculator mine, in the JOURNAL of Oct. 11, 1913, under "By the Way," is unjust to the men who have charge of this work. A second thought will show that the system in vogue of not cleaning the shaft timbers is the common-sense and safest way.

In hoisting with skips loading direct from large ore pockets, even with the most approved ore chutes with air-operated gates, some pieces of ore will drop down the shaft. Again at times the skips may be overloaded and ore drop off the skip in its ascent up the shaft. This being a recognized possibility, it is much better to have the shaft timbers well covered with fine ore, which naturally takes the angle of repose and gives no chance for pieces large enough to do any damage to lodge on the timbers. The danger is not from rocks lodging on timbers that are covered with ore, but from rocks lodging on new timbers that may have been put in in repairing the shaft and which have not had time to be covered with fine ore. The fine ore on the timbers is packed hard by the continual pounding of ore falling in the shaft and not only protects the timbers from wear but is considered much safer than having a ledge a foot wide all around the shaft every five feet for a distance of 2800 ft., on which large pieces of ore would accumulate and be a continual menace to men in the shaft.



2600 LEVEL, SPECULATOR SHAFT, BUTTE, MONT.

An examination of the shaft by the shaft men after the accident in question did not reveal any place on the shaft timbers where a rock could have lodged. The rock which caused the accident was a fresh piece of ore, which was probably pushed into the shaft from one of the upper levels where the station dumpers were cleaning the landings, which is done when each shift goes on. This, however, is merely a supposition.

At the Speculator mine of the North Butte Mining Co., the shaft is carefully inspected every day by men receiving shaft-bosses' wages, one pair of men to each compartment of the shaft.

Inclosed you will find a photograph of the 2600 station, showing the wire doors in front of the two hoisting compartments. As the third compartment is lagged off from the others, it is not considered necessary to protect it in the same way as no ore is hoisted through it.

N. H. Emmons.

Butte, Mont., Oct. 24, 1913.

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## The Use of Bucket Crossheads

An editorial was published in the Journal of Oct. 11, regarding the use of bucket crossheads. It is true that in a great many mines, especially in Colorado, it is deemed bad practice to use the crosshead in connection with a bucket in a vertical shaft. I think, however, that if a safety crosshead were used, this prejudice would be overcome.

The majority of the crossheads that are used at the present time are entirely inadequate, and are a menace to the miners who come in contact with them. A few years ago, Thomas Bryant, who, at the time, was in charge of a property in Montana, had a sad experience with the old type of crosshead, caused by its sticking in the shaft, allowing the bucket to be lowered away from the crosshead for quite a distance. After the bucket had left the crosshead, the crosshead came loose and fell down the shaft, killing Bryant's brother, as well as another miner who was on the bucket at the time.

To avoid the repetition of such occurrence, he devised a crosshead which has since been installed in some of the largest mines in the West, among which are the Original Consolidated Mining Co., at Butte, the Giroux mines, at Ely, the East Butte Copper Mining Co., at Butte, the Corbin Alta Mining Co., at Corbin, and others.

The Bryant safety crosshead was described in the Journal of April 15, 1911, and in the "Handbook of Mining Details," p. 280.

This crosshead is so built that there is eliminated any chance for accident by the falling of the crosshead upon the bucket. The cable is always free to move independently of the crosshead, and if the crosshead should get caught, no delay is occasioned, as the bucket can be lowered as far as desired, and when raised again, the crosshead will be automatically released. This crosshead is especially adapted for use in the shaft sinking, where it is necessary to lower the bucket below the end of the guides, as stops can be placed at the ends of the guides which will operate the safety mechanism on the crosshead, thereby securely holding it in place.

The mining inspector for the State of Montana, William Walsh, in his annual report to the governor of the State of Montana, for the year 1909, had the following to say as to the merits of the Bryant crosshead.

> Hoisting apparatus in mines, such as crossheads, skips and cages, have always been recognized as having an inherent element of danger, and many efforts have been put forth to provide various means of safety. Readers will doubtless recall the many accidents which have happened in the state and the number of lives lost by crossheads being used in shafts without any means of safety. Thomas Bryant, of Butte, has invented what is known as the safety crosshead, which has been tested and proved a success in every particular. The first distinctive feature of this combination is the safety catch, which grapples the guides and prevents the crosshead from falling away. Another feature is a safety beneath which grapples the bucket in the event the rope should break, everything working in uniformity, holding the crosshead and bucket safely in the shaft, thus eliminating all danger. In shaft sinking and operating in small mines, where buckets are in use 300 ft. and deeper, the miners of this state should see that a law be enacted so as to compel their use in all shallow mines and in shaft sinking. The state must realize that when the miners are underground they have rights of person which it is obliged to protect, and it should give due regard to the safe-guarding of the lives and persons of mine employees.

Mr. Walsh's statements are corroborated by William B. Orem, deputy mining inspector for the State of Montana, who, in his annual report for the year 1909, wrote in regard to these crossheads as follows:

> The crosshead invented by Mr. Bryant is a great improvement over the common crosshead used in this camp for years, being the cause of several accidents by hanging up when the miners were riding on the bucket, not noticing it, then coming loose, falling and catching them. The one invented by Mr. Bryant does away with the danger of hanging up, and in the case of the rope breaking it holds not only the crosshead, but the bucket as well. It also gives the same freedom to the bucket at the bottom of the shaft as was had by the ordinary crosshead, by releasing the bucket at the hang-up and permitting it to go to the bottom of the shaft. This crosshead is constructed on the lines of a skeleton cage, with safety dogs on it, bonnet and deck for men to ride on. The safety dogs are operated from the bottom by a hollow pipe which allows the rope to pass through. I do not consider the common crosshead safe and recommend the new safety crosshead to any operators using crossheads for sinking.

I hope these remarks will bring forth further discussion of this subject.

W. J. Roberts.

New York, N. Y., Oct 17.

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## Origin of Chalcocite

Apropos of the article, "Origin of the Butte Chalcocite," in the Journal of Sept. 6, regarding the character and genesis of the Butte chalcocite, which the author describes as a primary mineral, I consider it not inopportune here to state that precisely similar occurrences are to be found in other parts of the United States. As an example, in the Lee shaft of the Ruby Copper Co., in Santa Rita Mountains, about 10 miles north of Patagonia in Santa Cruz County, Arizona, there is an occurence of massive chalcocite which cannot be other than primary. Although this body of ore occurs at a depth of 360 ft., the shaft is practically dry, regardless of the fact that on the Hosey property to the north and the Happy Jack to the south, there are shafts in both cases filled to the collar with water, and the further fact that both of these properties are on higher ground than the Lee. In the vicinity of the Lee, the sheet of porphyry which covered the district in the late Tertiary has been almost completely worn away, leaving exposed a thick series of metamorphosed sediments. Immediately below these comes a thick deposit of fine-grained, black, sedimentary rock, no doubt formed by the compression of the accumulated, fine-grained sediment which settled farthest out from the mouth of a river which emptied here from the north in Paleozoic time. This rock is fine grained, black and crystalline, and contains scattered particles of chalcopyrite. It showed no evidence, whatever, of crushing or shearing in any part, so there was no chance for the descent of re-enriching solutions from above. The ore is high grade, much of it yielding upon assay as high as 27% copper and 100 oz. silver per ton. Here and there throughout the deposits, kidneys or globular masses of high-grade chalcocite mixed with bornite occur, the entire mass surrounded by a thick skin of almost insoluble gouge.

The character of the deposit had been a good deal of a puzzle to the manager, C. A. Pearce, who had frequently discussed it with me. Finally, after a careful examination of the deposit, we failed utterly to find any evidence tending to show that any surface enrichment had taken place.

In my opinion, the orebodies here have displaced quartzite dikes which were intruded through the old land surface long before these lava flows occured. While Mr. Pearce does not as yet fully concur in this view, he admits that the evidence so far is strongly in favor of it, and if such should turn out to be the case, the future of this property at least is assured.

A. P. MacCallum.

Benson, Ariz., Sept. 28, 1913.

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## A New Field in British Columbia

Owing to the closure of the field for mining investment in Mexico, it might interest Journal readers to hear something about an important district in a temperate climate which has remained a "sealed book" up to the present, through lack of railroad communication, but which will be accessible in 1914 by the completion of a line that will bring it within 250 miles of large custom smelters. I refer to the East Kootenay district of British Columbia near the source of the Columbia River.

Those who have spent their lives mining in the Rocky Mountains and the Mexican Sierras will understand the mineralization in the ranges that bound this valley, when I refer to it as the great lead-silver zone on the western side of the Rockies, which continues through the United States and Mexico to the interior of Guatemala and Honduras.

Where railroad connections have lowered the transportation charges in Southeast Kootenay, large mines have been opened, and by naming a few, such as the St. Eugene, North Star, and Sullivan, in Canada, with the Cœur d'Alene district in the United States, that follow this lead-silver zone, the possibilities of the hundreds of prospects along this new railroad can be regarded most favorably.

The various surface workings, where assessment work has been done, invariably show high-grade ores, the average silver content being 1 oz. per unit of lead; but with the exception of one mine which was developed several years ago when railroad rumors were rife, no real mining has been done. About 2000 tons were shipped from it under great difficulties and expense, but the mine, which is said to have in sight over $2,000,000 in high-grade carbonate ore, has been closed down for the reasons mentioned.

One great advantage of this region is the fact that since the Canadian mining boom of the '90s, its mineral deposits have not been advertised, so that bogus companies have not given it a bad reputation, and the old-timers who have held on to their favorite claims for a dozen years or more, are only too ready to take a share in the development of their property.

Some may be mistaken in their opinion of their holdings, but their readiness to show a stranger over other properties in which they hold absolutely no interest, is a sign of the good old-time frankness which is becoming so scarce in the better-known camps.

The geological structure consists of pre-Cambrian and Cambrian schists, quartzites, dolomites and slates, with granitic or porphyritic intrusions as the main cause of the fissure veins and contact deposits. The ore occurs as massive galena in schists and slates, and as galena and cerrussite in siderite gangue when in limestone, the latter ore affording an excellent flux for any smeltery that might be built in the district.

Further to the west, deposits of copper and zinc ores are more prevalent, but owing to difficulty of access, they may be classed as unworkable for the present. Along the same zone veins of quartz and arsenical pyrites with fair gold contents are also found, but the transportation problem also applies to them.

A few more points in favor of this new district should not be omitted, these being the abundant lumber supply and water power in the vicinity of the mines. Also the slight snowfall in this valley, owing to its situation in the dry belt, compares favorably with the winter conditions nearer the coast.

As I own no property in British Columbia and am only here to take a rest from the present mining difficulties in Mexico, this is not intended to boost any particular mine; but a little information may not be amiss to a number of old acquaintances in Mexico, who, like myself, may be seeking "pastures new."

Plomoso.

Invermere, B. C., Oct., 1, 1913.

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## Why a Copper Country Miner Left Butte

In answer to William Lakeland's article in the Journal of Sept. 13, 1913, "What the Union has Done for Butte," the following incident is worthy of consideration.

A Cornish miner of Calumet left the copper country two days after the strike started and went direct to Butte. He had heard so much about higher wages and good times in the great Montana mining district, that he determined to make that town his home. His wife and family went with him.

This man and his family will reside in Calumet in the future. They returned a few weeks ago. The wife explained that while they were in Butte they lived in a three-room apartment, in a basement. The rent for this unsatisfactory excuse for a house was $11.75 per month. While they resided in Calumet they lived in a comfortable company cottage of five rooms. The monthly rental was $5, less than half the amount paid for the three basement rooms in Butte. The house similar to the one they rented in Calumet for $5 per month might have been secured in Butte for $20, not less than that.

This same Cornishman explained that the price of coal was $18.50 per ton in Butte and slab wood cost $8.50 per cord. Pillsbury's flour sold in the copper country of Michigan for $2.70 per sack is sold for $3.75 in Butte. These are a few of the items, mentioned by this disillusioned Calumet miner. He made many other comparisons of a similar nature.

Homer A. Guck.

Houghton, Mich., Sept. 20, 1913.

# EDITORIALS

## The Secondary Enrichment Investigation

The article by Prof. Graton, Chief of the Secondary Enrichment Investigation, which appears elsewhere in this issue, is of particular interest, both as an authoritative statement of the organization and purposes of this important commission, and also for its disclosure of the trend of thought of leading economic geologists in a matter that is of superlative consequence in the mining industry. It is quite unnecessary for us to repeat anything that Professor Graton has said in his article. It is left for us, however, to say some things from which Professor Graton has refrained, out of his modesty; and also to express our high appreciation of the public spirit which has led the important copper producers of America to unite and render possible this important scientific research.

The Secondary Enrichment Investigation is a scientific study conducted under the joint auspices of American copper companies, the Harvard Mining School, and the Geophysical Laboratory of the Carnegie Institution as Washington. Its headquarters are in the Geological Museum at Cambridge, Mass. The advisory board comprises J. Parke Channing, James Douglas, D. C. Jackling, L. D. Ricketts, B. B. Thayer, and Pope Yeatman, whose names are a sufficient exhibition of the part that the copper companies are playing in the matter. They represent the leading copper producers of America, outside of the Lake Superior region. These companies for some years back have been promoting the development of their affairs, and incidentally of the industry as a whole, by exchanging information respecting their technical work, all former foolish ideas of rivalry, jealousy, and secretiveness, long ago having been abandoned.

The new spirit has perhaps come in with the advent of the younger generation of leaders, though, of course, the honor of being the leading exponent, the prophet of this policy, will forever be accorded to Dr. Douglas. Heretofore, however, such exchange of information has been informal. The Secondary Enrichment Investigation is the first important coöperative effort among the mining companies. It is not only important on that account, but also on account of its own intrinsic character. It is perhaps the most important geologic undertaking in progress otherwise than under state or governmental direction. Many persons will no doubt say that it is more important than any of the official work that is going on.

The composition of the investigating staff of the Secondary Enrichment Investigation affords ample ability to handle all sides of the problem with which it is engaged, Professor Graton, the chief, was formerly a member of the staff of the U. S. Geological Survey, and is now Secretary of the Copper Producers' Association, and professor of mining geology in Harvard University. His scientific work, of distinctly original character, has given him a high position among mining geologists. His assistants, Dr. Augustus Locke, Dr. A. M. Bateman, and Messrs. Joseph Murdock, E. H. Perry, and C. T. Brodrick, are all mining geologists of extensive experience in the field, each of them having been engaged in important work, generally in behalf of well known mining companies. Of the chemical and petrological staff, Dr. Allen is the chief chemist of the Geophysical Laboratory at Wasington, and Drs. Crenshaw, Zies, Posnjak, and Merwin are members of the staff at that organization.

Professor Graton, in his article, has fully outlined the plans and scope of the investigation. Without doubt, mining engineers and mining operators everywhere will generously afford assistance and coöperation. The scientific results of the investigation will surely be of great value to everybody. Perhaps after all, however, the most important thing about the present investigation is the precedent that it will constitute, which may lead to other joint researches of equally essential nature.

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## The Hydrometallurgy of Copper

The New York Section of the Mining and Metallurgical Society of America had a noteworthy meeting on Oct. 23, at which the subject of discussion was the hydrometallurgy of copper. This subject is one of the great metallurgical problems of the day, perhaps the greatest. The meeting was attended by many distinguished metallurgists, including a number of those who are doing the most important experimental work in copper leaching, and there was never a technical meeting with more lively, more interesting and more illuminating discussion.

Nobody attempted to summarize the discussion or to draw any conclusions, but there were some points which stood out prominently in all the talk. These were, we think, the general use of sulphuric acid as the leaching agent, the ability to obtain a remarkably high percentage of the copper in solution in the case of a rather wide variety of ores (including the porphyry ore of Miami, Ariz., the low-grade ore of Bisbee, Ariz., the Anaconda slime, the Braden concentrates, and the bronchantite of Chuquicamata) with a relatively small consumption of acid, while in the case of the Chuquicamata ore there is a steady gain of acid. Other striking points were the generality of the idea of precipitating the copper from the solution by electrolysis, using insoluble anodes, of course; the feeling that the difficulties connected with that old proposal have now been thoroughly mastered; and the contemplated introduction into the hydrometallurgy of copper of modern constructional methods, better and more economical than anything ever known before in this art. The 10,000-ton leaching vats at Chuquicamata will make everything else look infantile and trifling.

There is going to be a new hydrometallurgy of copper, and it is going to be very soon. We say this with perfect confidence, inasmuch as the Braden plant is nearly completed, while it will not be very long before the Chuquicamata works are a going concern. In both these cases the preliminary experimental work has been of such a character and has been done in such a way that there does not remain much doubt respecting the working of the new processes upon a large scale. We shall be clearer, perhaps, if we say that the experimental work has been done on a large scale, but the commercial work is to be done upon a gigantic scale.

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## The Future of Lake Copper

The derangement of the copper market caused by the restriction of the supply of Lake copper has already led to noteworthy changes in market conditions. This is well known inasmuch as they exist. There are likely to be, moreover, effects lasting after the strike is over and the Lake production has regained its normal proportions. What these will be cannot perhaps be fully prophesied. We may only have ideas.

The existing change is an increased disparity between the prices of Lake and electrolytic copper. Up to last summer the normal differential was about 0.25c. per lb. At present it may be almost anything within reasonable bounds. Even the price for Lake copper may go up while the price for electrolytic goes down. This results from there being a natural competitive market in electrolytic copper, while in Lake there is a corner, a perfectly innocent, unpremeditated corner, to be sure, but nevertheless a corner.

But why should there be a corner in such a commodity, why should anybody be willing to pay a corner price, why should not consumers turn to electrolytic copper which they can obtain in any quantity desired? Simply because many users of copper are conservative, employ it for delicate purposes, are unwilling to take any chances in experimenting and prefer to pay whatever may be asked for the particular brand of copper that they know and want.

This is not generally the case. For many purposes electrolytic and Lake copper may be used indifferently. The premium on Lake copper has not necessarily reflected superiority. On the contrary electrolytic is purer and of higher electrical conductivity, the advantage of Lake being only in greater toughness. Many users of Lake copper have lately had to resort to electrolytic inasmuch as they could not get anything else. Some of them having had to learn its excellence out of necessity will, no doubt, continue to use it.

The determining factor will probably be the labor cost in the manufacturing process. In the making of wares like cartridge cases, in which the labor cost forms a high percentage, the manufacturer will be likely to adhere to the special brand of copper which his artisans know how to work. An advance of even 1c. per lb. in the premium for that special brand of copper affects the cost of the finished goods but slightly, while if a lot were spoiled in manufacture, and, of course, the metal is always blamed for factory misadventures, the loss might be large. On the other hand, conditions are quite different in the manufacture of copper sheets, wherein the labor cost is relatively low and the metal cost high. In such cases the newly discovered needlessness of paying any premium may be an advantage worth keeping.

Just how this will be settled when the full supply of Lake copper comes again into the market we shall have to wait to see. Shall we see a reestablishment of the old premium? Or shall we see a premium only on fancy brands of Lake copper and all the rest of the nonarsenical brands selling simply on a level with electrolytic?

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## A Quarter Century on the Rand

During the recent strike, much was made by the labor leaders of the enormous dividends paid by the gold-mining companies, and the alleged inadequate share of the gold coin which accrued to the workers. It should not be difficult to convince the responsible section of the labor party, as well as thinking working men, that such an appraisement of the position is entirely erroneous. The figures both of the Mines Department and the Chamber of Mines are convincingly against such a contention. The Rand has proved no exception to the rule of precious-metal mining—that the miner and the artisan gets by far the largest proportion of the gold actually produced. Since 1887 to the end of last year, just a quarter of a century, the Rand has produced £347,054,851 worth of gold, while the dividends paid to shareholders over the same period have aggregated £88,159,489. In other words, the amounts received by the shareholders represent 25.7% of the value of the gold. The balance was absorbed in working expenditure.

It is somewhat remarkable that the dividends last year and the sums paid to the technical and clerical staffs and the actual wage earners were practically identical in amount, being respectively £7,960,394 and £7,865,000. Each represents about 21% of the gold production. The high remuneration of labor is proved by the actual statistics of wages paid; in December last 11,037 miners and underground laborers, all white men, of course, received 20s. 3d. per shift, and 9332 surface men 16s. 10d. per shift. Excluding the staff, the average amount paid for the year was £316.

While the seriousness of the scourge of miners' phthisis is admitted, it may be pointed out that 45% of the working force are surface workers and therefore free of the dangers which beset the underground worker. The most numerous class is the fitter, of whom 807 in December last, earned 20s. 3d. per shift; 680 winding-engine drivers made about 21s. 10d. per shift, and 250 mill and compressor drivers, from 18s. 6d. to 19s. 6d. Over 500 carpenters earned 20s. per shift, and 260 boiler makers 20s. 2d. Men working in metallurgical plants, many of whom have undergone technical training, did not do so well from a financial point of view, amalgamators receiving about 18s. 6d. a shift, and cyaniders, a couple of shillings less. Both in respect of pay and congenial work, the heavy labor being done by natives, the surface worker on the Rand may rightly be considered the aristocrat of the labor world.

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Judging from references in several publications, the idea appears to have become prevalent that the Mining and Metallurgical Society of America has expressed itself with respect to recommendations for a revision of the Federal mining laws. This is not the case. The mining law committee of the society has made a report and that report has been discussed by the New York section of the society, favorably in part and adversely in part. Neither the council of the society nor the society as a whole has yet taken any action, the committee's report being merely that it is before the society for discussion.

## BY THE WAY

A story is told of a "hill billy," who came from a swamp district of southeastern Missouri, to work in the lead mines. He was put to help on the carpenter gang. After starting to work one of the carpenters gave him a rule and told him to measure a piece of timber. Upon completing the job he announced the result as, "One length of the rule, one joint and about this much over," designating one finger length.

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Mutations among mines are not uncommon. Many that began as producers of one kind of ore have in the course of time turned into another kind. The Highland Boy mine of Bingham, Utah, is a recent and striking example. It began as a gold mine, in which class it was of no great account. Then it became a rich and profitable copper mine, its performance as such making it famous. It is no longer much good as a copper mine, but lately it has become a first-class lead mine.

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Some men succeed because when they have the opportunity to tackle a job that at first appears too big for them, they brace up and get away with it. Ernest Le Duc, president of the Mesabi-Cuyuna Iron Land Co., tells of one he knew when he was logging superintendent for the Merrill & Ring Co. at Split Rock, on the north shore of Lake Superior. One day he picked out one of the dependable men in his crew to proceed to Duluth, about 35 miles, following the lake shore, to count the Merrill & Ring logs that he might find on the beach. Le Duc did not know it, but the man that he selected could count only to 10. This man arrived at the Duluth office of the company and told E. H. Eddy, to whom he had been instructed to report, that he was prepared to state the number of Merrill & Ring logs on the beach between Duluth and Split Rock, and thereupon he began unloading pebbles from his pockets. Eddy was amazed, and then indignant, until informed that each of the pebbles represented 10 logs.

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There have been many odd packages sent through the new parcel-post system, but perhaps the most unusual to date is 400 lb. of ore sent by John B. Donahue, of Seattle, Wash. Mr. Donahue is a prospector and is working a claim about 13 miles from Lake Cushman. Not being satisfied with a report of $4 to $6 gold per ton, he corresponded with the University of Washington, at Seattle, in regard to a test on his ore. The University required 400 lb. for this test and Mr. Donahue undertook to ship by freight and found the charges were:

| | |
|---|---|
| Lake Cushman to Hoodsport | $3.50 |
| Wharfage charge at Hoodsport | 0.40 |
| Freight by boat to Seattle | 3.50 |
| Wharfage charge at Seattle | 0.40 |
| Drayage from boat to University | 3.00 |
| Total | $10.80 |

Mr. Donahue objected to such a charge and made the remark that he might as well send it by parcel post, and a friend bet with him that he could do so and save money. He inquired and found the parcel-post charges $1.24 per 100 lb., making a total of $4.96. The parcel post got the job, Mr. Donahue saved $5.84. The only ones to have any objection were the postal carriers in Seattle.

# October Mining Dividends

Dividends for October of United States mining companies making public reports amounted to $8,159,716 paid by 39 companies; iron, metallurgical and allied holding companies paid $4,667,163; while Canadian, Mexican and Central American companies paid $2,163,393.

Ahmeek suffered another cut in dividend, having come down from $7 paid six months ago, to $5 paid three months ago, and now to $3. Osceola has also reduced its dividends a second time by 50c. All the Michigan companies have now shown the effect of the strike, except Champion, which paid its ninth $1 dividend during the year. The Dunkin and Lost Packer mines both paid their initial dividends.

| United States Mining Companies | Situation | Per Share | Total |
|---|---|---|---|
| Ahmeek, c. | Mich. | 3.00 | 150,000 |
| Anaconda, c. | Mont. | 0.75 | 3,249,375 |
| Arizona, prf., A | Ariz. | ... | 5,769 |
| Bunker Hill Con. g. | Calif. | 0.05 | 10,000 |
| Bunker Hill & Sullivan, l.s. | Ida. | 0.20 | 65,400 |
| Butte-Alex. Scott, c. | Mont. | 0.50 | 37,000 |
| Champion, c. | Mich. | 1.00 | 100,000 |
| Colo., Gold Dredging, g. | Colo. | 0.25 | 25,000 |
| Copper Range Con., c. | Mich. | 0.50 | 196,846 |
| Daly-Judge, | Utah | 0.15 | 45,000 |
| Dunkin | Colo | 0.05 | 10,000 |
| Fremont, g. | Calif. | 0.02 | 4,000 |
| Frontier, z. | Wisc. | 2.00 | 2,500 |
| Goldfield Con., g. | Nev. | 0.40 | 1,423,659 |
| Golden Cycle, g. | Colo. | 0.03 | 45,000 |
| Hecla, l.s. | Ida. | 0.02 | 20,000 |
| Homestake, g. | S. D. | 0.65 | 163,254 |
| Iron Blossom, s.l.g. | Utah | 0.10 | 100,000 |
| Lost Packer, c. | Ida. | 0.25 | 37,500 |
| Mary McKinney, g. | Colo. | 0.02 | 26,185 |
| North Butte, c. | Mont. | 0.50 | 205,000 |
| Old Dominion M. & S., c. | Ariz. | 1.25 | 202,500 |
| Osceola, c. | Mich. | 2.00 | 192,300 |
| Snowstorm, c. | Ida. | 0.00½ | 22,493 |
| Stewart, s.l. | Ida. | 0.12½ | 154,783 |
| Shattuck Arizona, c. | Ariz. | 0.50 | 175,000 |
| Tom Reed, g. | Ariz. | 0.06 | 54,573 |
| Tonopah-Belmont, g.s. | Nev. | 0.25 | 375,000 |
| Tonopah Extension, g.s. | Nev. | 0.05 | 47,179 |
| Tonopah Mining, g.s. | Nev. | 0.25 | 250,000 |
| Utah Con., c. | Utah | 0.50 | 150,000 |
| United Globe, c. | Ariz. | 7.50 | 172,500 |
| United Verde, c. | Ariz. | 0.75 | 225,000 |
| Vindicator, g. | Colo. | 0.03 | 45,000 |
| Wasp No. 2, g. | S. D. | 0.01 | 5,000 |
| Yellow Aster, g. | Calif. | 0.05 | 5,000 |
| Yellow Pine, z.l.s. | Nev. | 0.01 | 9,500 |
| Yosemite, g. | Calif. | 0.10 | 2,400 |

| Iron, Industrial and Holding Companies | Situation | Per Share | Total |
|---|---|---|---|
| Amer. Agr. Chem., com. | U. S. | 1.00 | 183,309 |
| Amer. Agr. Chem., pfd. | U. S. | 1.50 | 408,172 |
| Amer. Sm. Sec., pfd., A. | U. S. | 1.50 | 255,000 |
| Amer. Sm. Sec., pfd. B. | Mex. | 1.25 | 375,000 |
| Bethlehem Steel, pfd. | U. S. | 1.25 | 186,350 |
| Cambria Iron | U. S. | 2.00 | 169,360 |
| Guggenheim Exploration | U. S., Mex. | 0.75 | 623,799 |
| General Chemical, pfd. | U. S. | 1.50 | 150,000 |
| Harbison-Walker, pfd. | U. S. | 1.50 | 144,000 |
| La Belle Iron | Ohio | 0.50 | 49,577 |
| National Carbon | U. S. | 1.50 | 82,500 |
| Old Dominion of Me., c. | Me. | 1.25 | 366,691 |
| Pennsylvania Salt | Penn. | 3.00 | 150,000 |
| Republic Iron & Steel | U. S. | 1.75 | 357,296 |
| Sloss-Sheffield Steel & Iron. | U. S. | 1.75 | 117,250 |
| U. S. Sm. Ref. & Min. com. | U. S., Mex. | 0.75 | 263,329 |
| U. S. Sm. Ref. & Min., pfd. | U. S., Mex. | 0.87½ | 425,530 |
| Virginia-Carolina Chem., pfd. | U. S. | 2.00 | 360,000 |

| Canadian, Mexican and Central American Companies | Situation | Per Share | Total |
|---|---|---|---|
| Buffalo, s. | Ont. | 0.20 | 200,000 |
| Canadian Goldfields, g. | B. C. | 0.0015 | 60,000 |
| Chontalphan, g.s.l.z. | Mex. | 0.50 | 3,500 |
| Crown Reserve, s. | Ont. | 0.02 | 35,376 |
| Con. Min. & Sm. Co. of Can. | B. C. | 2.00 | 106,104 |
| Dominion Steel Corp. | Canada | 1.00 | 345,896 |
| El Favor, g. | Mex. | 0.01 | 35,000 |
| Hollinger, g. | Ont. | 0.15 | 90,000 |
| La Rose, Con., s. | Ont. | 0.25 | 374,656 |
| Lucky Tiger Combination, g. | Mex. | 0.05 | 35,767 |
| McKinley-Darragh-Savage, s. | Ont. | 0.10 | 134,861 |
| Nipissing, s. | Ont. | 0.37½ | 450,000 |
| Nova Scotia Steel & Coal, com. | N. S. | 1.50 | 90,000 |
| Nova Scotia Steel & Coal, pfd. | N. S. | 2.00 | 20,600 |
| San Rafael, g.s. | Mex. | 0.50 | 1,200 |
| Seneca-Superior, s. | Ont. | 0.12½ | 59,604 |
| Standard, s.l. | B. C. | 0.02½ | 50,000 |
| Wettlaufer-Lorrain, s. | Ont. | 0.05 | 70,829 |

Dividends for the first 10 months of the year amount to $62,175,610 for United States mining companies; $91,880,823 for iron, industrial and holding companies; and $18,817,816 for other North American mining companies.

## PERSONALS

Frederick P. Burrall has returned to New York after a trip of several months in Alaska and Yukon Territory.

F. C. Alsdorf, mining engineer, has opened an office in the Merchants' Exchange Bldg., San Francisco, California.

Stanly A. Easton and J. F. McCarthy are members of the commission appointed by the Governor of Idaho to draft a workingmen's compensation act for that state.

E. J. Carlyle has returned from professional work in Argentina and is spending a holiday in the United States. He recently passed through New York on his way to Montana.

Dr. M. G. Christie, associate professor Imperial College of Science, London, England, is making an investigation of the byproduct coke industry in the United States, representing the Otto interests.

E. W. Westervelt, formerly with the engineering department of the Ray Consolidated Copper Co., has accepted a position in the engineering department of the Braden Copper Co., Rancagua, Chile.

George T. Fonda has been appointed as head of the department of welfare and safety of the Bethlehem Steel Co., South Bethlehem, Penn., with the title of safety engineer. He is a graduate of Stevens Institute.

E. B. Wilkinson, formerly blast-furnace superintendent of the Carbon Iron & Steel Co., Parryville, Penn., later with Ladd & Baker, of Philadelphia, is now superintendent of the Midland blast furnace of the Pittsburgh Crucible Steel Co., Midland, Penn.

Henry N. Thomson has resigned his position as superintendent of the Tooele plant of the International Smelting & Refining Co., at Tooele, Utah. William Wraith has assumed the combined duties of manager and superintendent, and will be assisted by O. M. Ruchs, formerly head chemist at the plant.

Frederick H. N. Gerwig, formerly superintendent of Carrie Furnace, of the Carnegie Steel Co., but for six years past superintendent of furnaces for the Pittsburgh Steel Co., at Monesson, Penn., has returned to the Carnegie Steel Co., as assistant to the general superintendent of the Edgar Thomson works.

James T. Newton, of Georgia, has been recommended to the President for appointment as assistant commissioner of patents. Secretary Lane, after a conference with Commissioner Ewing, recommended Mr. Newton for his recognized administrative ability and thorough training in patent work. Mr. Newton is 52 years of age, and during the 22 years of his continuous service in the Patent Office, had held successively the positions of assistant examiner, law clerk, chief clerk and principal examiner, having been in the latter grade since March, 1895. He is a Georgian by birth, and a Democrat in politics.

H. P. Barry, for a number of years general superintendent of the great Waihi gold mine, in New Zealand, retired from active work, Nov. 1, chiefly on account of the long illness and recent death of his wife. E. G. Banks, who for nearly 20 years has been associated with the Waihi company as head metallurgist, will succeed Mr. Barry as general superintendent. Mr. Garvin, the company's chief engineer, will assume the position of assistant superintendent, and Mr. Williams, who retired some time ago, has accepted the position of consulting engineer. He will visit the mine monthly, or as occasion arises. James Gilmour continues as mine superintendent. He, also, has been connected with the Waihi mine almost since its inception. He is thoroughly conversant with the mine and works.

Dr. Willett G. Miller, provincial geologist of Ontario, was tendered a complimentary banquet at the Toronto Club, on the evening of Nov. 1, and presented with his portrait in oils, by a number of the leading mining men in Canada in recognition of his services in connection with the development of the mining industry. The chair was taken by G. G. S. Lindsey, of Toronto, and the speakers included Hon. Frank Cochrane, Canadian Minister of Railways; Hon. W. H. Hearst, Ontario Minister of Lands, Forests and Mines; Dean Galbraith, Toronto University; Prof. Goodwin, Queen's University, Kingston; Theodore Denis, Superintendent of Mines, Quebec; R. W. Brock, Director, Canadian Geological Survey; Thomas W. Gibson, Deputy Minister of Mines for Ontario; and H. Mortimer Lamb, Secretary Canadian Mining Institute.

## OBITUARY

Robert M. Mein died at Oakland, Calif., Oct. 26. Death resulted from the effects of cold, contracted during a trip into Alaska several months ago. Mr. Mein was a graduate of the University of California School of Mines. Shortly after graduation he was employed as a mining engineer in South Africa. He later became an owner of mines in South Africa and in Alaska and Nevada. He was born in Nevada City, Calif., and was 38 years old. He was a brother of William Wallace Mein, mining engineer, of New York, who went to Oakland to attend the funeral.

Franklin J. King died at Montague, Calif., Sept. 14. He was 87 years old, born in Wheeling, W. Va. In 1846 he enlisted at St. Louis in the First Battalion Missouri Artillery and participated in the Mexican war, under General Kearny. He went to California in 1849, mined in Eldorado County, engaged in merchandise in Sacramento, mined in Shasta and Siskiyou counties, and again engaged in merchandizing in Yreka and followed that business for 40 years. He was married to Miss M. L. Moore, of Champlain, N. Y., in 1856. His wife, three sons and one daughter survive him.

Frank P. Swindler, a resident of Salt Lake City, died at Los Angeles, Oct. 13, from cardiac asthma, due to inhalation of stonedust while operating a dry crushing mill years ago. The dust in his lungs had given him much trouble during the past few years, although few of his friends were aware of his condition. He was a native of Pennsylvania, and before going to Utah was identified with mining at Leadville. He was a well known mining engineer in the West, having held positions as general manager of the De La Mar property in Nevada, in behalf of the Bamberger interests, general manager of the Ohio Copper Co., at Bingham, manager of the Opex Company, at Tintic, and had examined and reported on many properties. He is survived by his wife and three children, the eldest residing in Pittsburgh, and the two younger with their mother in Salt Lake City.

## SOCIETIES

**Minnesota School of Mines**—A new mining and metallurgical laboratory is to be erected for this school at Minneapolis.

**Mining and Metallurgical Society of America**—A meeting of the New York section will be held at 8 p.m., on Tuesday, Nov. 18, at the Engineers' Club, New York, preceded by the usual informal dinner at 6:30 p.m. The subject for discussion will be the flotation process.

**Michigan College of Mines**—Professor C. M. Carson is the new head of the department of chemistry, succeeding the late Professor George A. Koenig, who had been head of the department since 1892. Professor Carson comes from the University of New Brunswick, where he has been professor of chemistry and dean of Applied Science. He received his training at the University of Toronto and the University of Chicago, taking his degree of Doctor of Philosophy from the latter institution. Professor Albert J. Houle of the department of mining has returned from his year's leave of absence, spent in mining and smelting in Arizona.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

MUFFLE FURNACE. Willis W. Case, Jr., Denver, Colo. (U. S. No. 1,076,346, Oct. 21, 1913.)

REGENERATIVE FURNACES—Improvements in Furnaces of the Reversible Regenerative Type. A. Reynolds, London, Eng. (Brit. No. 12,991 of 1912.)

REGENERATOR for Metallurgical Furnaces. Theodore Ladolph Holle, St. Louis, Mo. (U. S. No. 1,076,426; Oct. 21, 1913.)

ROASTING—Agitating Device for Roasting Furnaces or the Like. Maurice van Marcke de Lummen, Cologne, Germany. (U. S. No. 1,076,297, Oct. 21, 1913.)

SINTERING—Improvements in or Relating to the Sintering of Metallurgical and Similar Products. J. Savelsberg, Papenburg, Germany. (Brit. No. 24,565 of 1912.)

SLAG—Manufacturing Slag Products. Carl Heinrich Schol, Allendorf, Germany. (U. S. No. 1,076,657, Oct. 21, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Oct. 29

**Smeltery-Fume Investigation** has been undertaken by the state commission appointed by the governor in accordance with an act passed by the last session of the legislature. The commission, composed of Dr. W. F. Snow, secretary of the state board of health, Dr. A. J. Cook, horticultural commissioner, and Dr. Charles Keane, state veterinarian, have gone to Shasta County to begin the investigation. The act of the legislature appropriated $5000 for the investigation and provided that the commission should report to the governor upon the damage done to animal life and vegetation by the waste products and gases from smelting works in the state. It is proposed to visit other districts and counties where such plants are in operation The chief smelting outside of Shasta County at present is at the Selby works, at Vallejo, and the Campo Seco plant, in Calaveras County.

**Dredging in Upper American River** field in California is making positive advancement, although two dredges have been dismantled recently and only one new dredge has been installed. Another will go into commission before the end of the year, which will make three active dredges operating on the river bars in Placer and Eldorado Counties. The Cache Rock dredge which operated between Rocky Chucky cañon and Forest Hill finished working out its ground about the end of September, and the machinery has been removed. The Beaver Gold Dredging Co. dredge working between Loomis and Roseville has also completed its ground, and the machinery goes to the new hull of the Poverty Bar dredge under construction at Butcher Ranch. The Gaylord Mining Co. dredge at Whisky Bar, near Rattlesnake bridge, has been improved, a new bucket line installed, and a fair grade of gravel is being dug. The Pacific Gold Dredging Co. dredge above Auburn, recently put in commission, is making fine progress in yardage and the gold recovery is good.

### BUTTE—Oct. 29

**Electric-Power Rates** in Montana, it is charged by the Public Service Commission, are excessive and unreasonable, and a hearing has been ordered on the subject, to be held in the near future. With the exception of the Helena Light & Railway Co., the rates of which are now under advisement by the commission, every electric-light company transacting business in Montana is made a defendant in this action of the board, and is given 20 days in which to submit for consideration schedules of rates in lieu of those now in effect. This hearing, the most important since the commission was established, was ordered upon the initial motion of the commission and was introduced because of the large and growing number of consumers directly affected. The companies cited to appear before the commission are the Montana Power Co. and its subsidiaries, the Northern Idaho & Montana Power Co., and the Missoula Light & Power Co.

**Barnes King Has Made a Fine Showing** this year. It has taken over the North Moccasin at a cost of $150,000, and by monthly installments from money earned by operating the North Moccasin it has earned sufficient to pay off the entire indebtedness with the exception of $14,000, which will be paid out of the revenue from the ore treated this month. The net bullion returns for September amounted to $37,499, and the mining and milling expenses amounted to $18,739. During the last month many improvements were made and additions put in with a view of increasing the capacity of the plant. A new double-drum electric hoist and an electric-driven compressor of 540-cu.ft. capacity have been installed at the Santiago shaft. During the last month the company paid $100,000 for the Piegan-Gloster property on which it had an option, and early this month five additional claims adjoining the Piegan-Gloster were purchased at a cost of $7200. It was considered advisable to secure those additional claims as they adjoined the Piegan-Gloster ground, and there was fear that some time after the Piegan-Gloster ground had been thoroughly developed others might come in and secure the adjoining ground and thus give the company some trouble. Those who are familiar with the region say that the Barnes-King directors got a bargain in the additional claims at the price stated. The Piegan-Gloster consists of about 200 acres, about 900 ft. along the strike of the Piegan-Gloster vein. Some fine ore has been opened up and development is going on with excellent results. Arrangements are about completed for the installing of an electric plant, and just as soon as it is completed mining operations will be started on a large scale.

### DENVER—Nov. 1

**The Strike Situation** in the southern coal field has continued with more shooting and killing and other acts of violence, and on Oct. 28, Governor Ammons, after having utterly failed in conference to get the operators or strike leaders to agree to any peace measures, declared martial law and ordered state troops to the affected districts with orders to disarm everyone on both sides, and to enforce obedience to the laws and constitution of the state; 1107 militiamen were ordered out and 775 responded to the call. The strike leaders appear to be in favor of the coming of the soldiers providing they disarm both sides. The governor orders all saloons closed, permits all old miners of the district to go to work and affords them protection, but will not allow the importation of strikebreakers. Two men were killed during the shooting, Oct. 27, and several were wounded; a bridge was dynamited and there were other acts of violence. It is thought that had troops been sent at the outset of the strike, many lives would have been saved, as well as an immense amount of money and much suffering. The first and second regiments of the Colorado national guard arrived at Trinidad the night of Oct. 28. Next morning the mine buildings at Aguilar were burned by armed strikers. Snow was a foot deep in the strike district and the tent colonies suffered greatly. On the night of Oct. 30, the situation was critical as advices were to the effect that 1200 strikers, fully equipped with the best high-powered repeating rifles, were arrayed against about 325 mine guards and the troops, and that an attack on Berwind, Tobasco and Hastings was being planned by the miners. At the auditorium in Denver, on the night of Oct. 30, a mass meeting was held on the coal strike under the joint auspices of the Colorado Federation of Labor and the Denver Trades & Labor Assembly, at which about 4000 people were present and were addressed by White and Hayes, president and vice-president of the United Mine Workers, the burden of their talk being that the miners have no redress when their statutory rights are violated, because "the operators own the courts as well as mines," and they put all the responsibility for the outcome of the present struggle on the governor of the state. Up to the afternoon of Oct. 31, no further fighting was recorded, and the general opinion in the district was, that the strikers would give up their arms peaceably.

### CALUMET—Nov. 1

**Strikers Applying for Work** will be given back their former places and no discrimination will be made as to nationality or federation affiliation, but the companies will use their own discretion in taking men back to work who have been connected with any of the strike violences. This statement was issued by the mine managements through the Copper Country Commercial Club. They also state, that an eight-hour day for underground work will be established on or before Jan. 1, 1914. As a result of this statement a number of men are applying for work, turning in their union cards, particularly among the Finns. A strong movement among the non-socialistic element of this nationality is working toward the men returning to work. Calumet & Hecla has practically as many men employed as it did before the strike was called and rock shipments of over 7000 tons daily are being made to the mills. Preparations are being made to resume hoisting at the Wolverine during the coming week. Allouez and Centennial are increasing production daily as well as the Kearsarge branches of the Osceola. Outside men continued coming into the district during the week, but there were no serious disorders. The hearings of the men arraigned under the injunction ruling was started before Judge O'Brien, but was adjourned after arguments of the attorneys and a decision to proceed with the cases by means of affidavits.

### TOWER—Oct. 31

**The Vermilion Range** has acquired the reputation of being an expensive district to explore. The reason for this is easily explained. When the blanket formation at moderate depth on the Mesabi range was discovered and it was found that it could be cheaply explored by churn drills, the diamond drilling, and development of ore at a depth of several hundred feet on the Vermilion looked expensive. But the Vermilion has its charms for the explorer for iron ore, for once a mine is located there it is sure to be a valuable one. Dame Fortune may flirt for a long time with the seeker of iron on the Vermilion, but once she relinquishes the secret of the hidden wealth she is generous, for the deposits are large and the ore may be depended upon to be of excellent quality. Men who know the history of the Vermilion pretty well are free in their acknowledgment of great service that was done by Thomas Bardon, of Ashland, in the early days. One of them speaking of the early history of the Vermilion said: "Tom Bardon had the money and the sand. I remember that at one time his associates in the old Pioneer Mining Co. threatened to get out an injunction against Bardon to prevent him from spending any more money sinking the Pioneer shaft. There was a period in the history of the range when Mr. Bardon did much to tide over financial stress and keep things going. He has since been successful in copper, as well as iron, as witness the Shattuck mine in Bisbee, Ariz., and he is entitled to large credit generally as a mining man." It may take more time and cost more to develop a mine on the Vermilion range than on some others, but the prospective reward is easily commensurate with the amount at stake.

### HIBBING—Oct. 30

**The Draining of the Lake Embarrass Field** on the Mesabi in order to permit the mining of the great bodies of ore known to exist there is again reported. The reported plan this time is to shift the course of the Embarrass River so that its waters will flow into the St. Louis or Partridge Rivers. There are many millions of tons of high-grade ore at and under Lake Embarrass, but because of quicksand and water the mining of much of it at present is practically impossible. The Steel Corporation, the Hill interests, Pickands, Mather & Co., and other concerns are interested in the region.

### BRAINERD—Oct. 30

**The Openpit System of Mining** is growing in favor on the Cuyuna range. Three properties will mine by steam shovel next season. These are the Pennington of the Tod-Stambaugh Co., of Cleveland, the Thompson of the Inland Steel Co. and the property of the Pittsburgh Steel Ore Co. The creation of other pits is contemplated. The Cuyuna-Mille Lacs mine is shipping steadily, there being an eager demand for its manganiferous product. A centrifugal pump of 2000 gal. capacity has lately been installed at the property. The Iron Mountain Mining Co. shipped early in October; so did the Cuyler Adams interests, operating the Adams property. M. A. Hanna & Co.'s Barrows mine is accumulating a large stockpile. Properties in course of development are the Duluth-Brainerd and the Brainerd-Cuyuna, the latter within the city limits at Brainerd. The Cuyuna-Duluth mine is shipping, as is the Ironton. Engineers representing the Great Northern Power company have been in the Cuyuna country lately and it is surmised that an 80-mile extension of that corporation's pole lines from Duluth is in contemplation. The district is served with electricity at present by the Cuyuna Range Power Co. At Grand Rapids, on the western Mesabi, practically the entire town turned out to witness the launching of the "John B.," the Interstate Mining Co.'s big dredge, in the Mississippi river. The "John B" is to be used in the experiment of removing overburden by suction dredging, a method never before attempted in mining work in the Lake Superior country. The lands the Interstate company, a subsidiary of the Jones & Laughlin company of Pittsburgh, has under option in the Grand Rapids district formerly were held by the U. S. Steel Corporation, having been relinquished by the latter at the time of the Stanley investigation. The existence of ore was proved by the Steel Corporation. Work now in progress is designed to verify the disclosures made by former drillings

**The Value of Manganese** in iron ore is a subject under discussion on the Cuyuna range now, between fee owners and leaseholders. The question raised pertains to the comparative value of the iron and manganese content of the ore, with reference to the royalty to be paid thereon. As most of the leases of necessity must be made before the actual value of the manganese content can be determined, the result has been a diversity of endeavors to obtain commensurate returns for the ore, from the fee owners' standpoint, and to safeguard the operator as well. It has been held that ore containing less than 2% manganese should not entitle the ore to a premium. Others maintain that 15% manganese should be the free limit. Practically all leases now drawn up contain the manganese clause. Sometimes this provides that if the manganese content be found to exceed the iron content, then the royalty shall be a fixed percentage of the value of such ore at lower Lake ports. Just why the operator is made to pay the fee owner a percentage on the hauling charge of this ore, is not clear. In case of increase of freight rates, the operator would have to bear a double burden. Again, some leases provide for royalty payment on basis of value of the ore at the mine. A confusing element arises when the ore goes into stockpile. As on all other ranges, the Cuyuna leases provide that royalties need not be paid on ores until they are actually shipped from the property. This works very well on the "per ton" basis, with only the iron content to consider, but it is difficult to adjust the percentage royalties on the widely varying manganese content. A separate analysis of each carload when actually shipped seems the logical solution. Finally, comes the concentrating clause, which permits the ore to be concentrated either on or off the leased property, as the case may be. No concentrating plant is now in operation, but several are planned. Concentrating is usually done for two purposes; to reduce freight costs and to remove undesirable constituents. The leaseholder whose lease provides that he pay 10% of the value of his manganiferous ore at Lake Erie ports, as royalty, and who then desires to concentrate his material before shipping, has a mathematical problem confronting him. The peculiar conditions existing on the Cuyuna range would certainly seem to call for extremely careful wording of leases.

### CORDOVA—Oct. 12

**The Klondike Production** of gold totals approximately $175,000,000. These figures are made up from Canadian royalty returns, American consular export records of earlier days and other sources. Of this grand total no less than $150,000,000 has come from the territory lying within a radius of 50 miles of Dawson. The most notable of producing creeks have been Bonanza, Eldorado, Hunker, Dominion, Gold Run, Sulphur, Quartz, Last Chance and their tributaries, and hills and benches along the creeks. The chief output today is coming from Bonanza, Eldorado and Hunker Creeks and the Klondike River, where 12 large modern dredges are operating, and from the benches of Eldorado, Bonanza and Hunker, where many hydraulic plants are at work. The total yearly gold shipments from Dawson and nearby creeks, including those made by the pioneers who worked on the Stewart, Forty Mile and other creeks before the strike of the Klondike, are as follows: 1885-1886, $100,000; 1887, $70,000; 1888, $40,000; 1889, $115,000; 1890, $175,000; 1891, $40,000; 1892, $87,500; 1893, $176,000; 1894, $125,000; 1895, $250,000; 1896, $300,000; 1897, $2,500,000; 1898, $10,000,000; 1899, $16,000,000; 1900, $22,275,000; 1901, $18,000,000; 1902, $14,500,000; 1903, $12,250,000; 1904, $9,413,074; 1905, $7,162,438; 1906, $5,258,874; 1907, $2,896,173; 1908, $3,282,684; 1909, $3,960,000; 1910, $4,550,000; 1911, $4,634,000; 1912, $5,018,000; 1913 (eight months), $5,000,000; supplementary, $25,913,527 and total $174,652,411. By supplementary is meant the gold from the Forty Mile, Eagle and other nearby camps on the American side tributary to Dawson, which have shipped virtually all their gold through that place and gold from the Klondike in early days, which is acknowledged to have escaped duty long.

### TORONTO—Oct. 29

**An Important Decision** has been rendered by the Supreme Court of Canada in a case affecting the jurisdiction of the federal and provincial governments over incorporated companies, after litigation extending over four years. The principal issue was the right of the provincial governments to incorporate companies to do business outside their limits, which was questioned by the federal government. The court sustained the provinces' right to incorporate companies.

**Recent Oil Discoveries** near Okotoks, Alberta, are to be investigated by the Canadian Department of Mines which is now taking the preliminary steps to such an investigation. A. B. Dowling has been commissioned to make a geological survey of the district, with a view of determining the probabilities of large deposits. The oil samples received by the department indicate a high-grade oil. The board of trade and city officials of Calgary issued, Oct. 24, a warning to the public stating that after several months of boring crude petroleum in limited quantity had been struck Oct. 7 at a depth of 1562 ft. on the property of the Calgary Petroleum Products Co. Ltd. It is impossible to state whether the oil found merely came from a seepage or indicates the existence of a large deposit. Boring continues with some promise of ultimate success, but until oil has been struck in volume the public is warned against placing too great confidence in circulated reports and particularly urged to exercise care in investments in oil leases or stocks.

# THE MINING NEWS

## ALASKA

THE COPPER CENTER STRIKE of placer gold recently made about 100 miles from Valdez is arousing considerable interest. The district is reported to be a large one, lower in altitude than the Chisana and more accessible.

EBNER GROUP upon which U. S. Smelting, Refining & Mining Co. has taken option, was one time controlled through stock ownership by California Nevada Copper Co., now in bankruptcy, which was succeeded by Alaska Ebner Gold Mines Co. Practically no development work of importance was accomplished on the Alaska claims, due largely, it is understood, to lack of sufficient funds. When Alaska Gold Mines Co. was formed the Ebner was so seriously tied up in litigation that its acquisition could not have been considered at that time even had the new company so desired. Arrangements were made several months ago whereby the United States company was to advance sufficient money to carry on some development work in hope of picking up either a continuation of the adjoining Juneau development, placed at considerably more than 100,000,000 tons, or locating the general gold-bearing belt of the district. This work has been undertaken through a tunnel which has been driven several hundred feet. The United States company, it is said, has agreed to spend between $200,000 and $300,000, taking receivers' certificates for money so advanced.

NEWSBOY (Cleary)—A call has been issued for bids for the delivery of 1000 cords of wood at the mine. It is reported that L. M. Drury, the Fairbanks assayer, will succeed Louis Golden, resigned, as general manager.

TATUM-IRVING (Port Wells)—Colonel Millard has taken a bond on the property and has a force of men clearing a site for a mill. It is estimated that there is already $100,000 worth of ore in sight, most of it of high grade.

TOLOVANA (Cleary)—Work has been resumed at this property on a vein of exceptionally rich ore that was discovered recently by surface trenching. A prospect shaft has been sunk about 30 ft., and 50 ft. of drift have been driven. The new discovery lies up the ridge from the vein on which several hundred feet of adit had previously been driven, but it is thought by the management that it can be reached underground by a 60-ft. crosscut from the end of the adit.

## ARIZONA

### Gila County

SOUTHWESTERN MIAMI (Miami)—Drilling is proceeding at a satisfactory rate, and since the erection of coal bins at the terminus of the Live Oak branch of the railroad, steadier and more economical operation is assured. Hole No. 15 is now 1155 ft. deep. No. 16 has reached a depth of 787 ft., and No. 17 is down 449 ft. Nos. 15 and 16 are in the silicified schist.

INTERNATIONAL SMELTING & REFINING CO. has bought 32 acres of nonmineral territory from Miami Copper Co., upon which smelting works will be built to reduce concentrates from Miami and Inspiration mills. Land lies in northern part of Miami property. Proposed plant will be about one mile from either mill. Ground has already been broken.

INSPIRATION CONSOLIDATED (Miami)—Within another week riveting will have been commenced on the ore-storage bins. Steel is being placed rapidly, all columns on the south side bins now being in place. Sheet steel is being bolted in place and practically all of the sheet steel has been placed for one compartment of the bins at the east end. Foreman Wissner estimates that it will take about six weeks longer to bolt all steel in place on these bins. The placing of steel will be closely followed by riveting machines. All steel is now in place for the concentrator warehouse and machine shop and riveting was started Oct. 21. Work will shortly start on the steel trestle reaching over the concentrator bins. Within a few days steel will commence to arrive for the main east and west shaft headframes. This will be a twin frame fastened together for the two shafts, the main west frame being 165 ft. high while the main east will be 185 ft. high. Work on them will commence as soon as the steel arrives. Excavation is now in progress, just east of the main shafts where an electrical supply building, air-compressor plant and several smaller buildings will be erected. It is expected that this excavation will be completed and concrete poured all ready for steel erection within 30 days. However, as considerable excavation will be necessary, it looks very doubtful as to the progress being as rapid as estimated. As soon as the retaining walls and other concrete foundations have been completed work will start on the large concentrator. Surveyors have been at work lately on the hills adjoining Webster gulch, and it is expected that the erection of a number of dwellings will soon be started.

### Maricopa County

MONTE CRISTO (Wickenburg)—The new hoist on the No. 1 shaft is in operation and sinking has been resumed. The old hoist has been moved to the No. 2 shaft. Each shaft is to be continued to a depth of 1000 ft. The No. 1 shaft at present has reached a depth of 670 ft. with several thousand feet of drifting. At a depth of 1000 ft. a long drift will be driven to connect the two shafts.

### Mohave County

HOT TAMALE (Chloride)—Since recently made strike, mining force has been increased. Owners intend to develop extensively and later build mill.

ARIZONA SOUTHWESTERN (Kingman)—New mill was put in commission Oct. 23. Some readjustment of launders and sizers will be necessary, otherwise work is satisfactory.

### Pinal County

GOLD BULLION—Tests are being made on the ores from this mine with the Krom dry concentrator in the laboratory of A. L. Pellegrin, at Tucson.

LAS GUIJAS (Amadoville)—The output of tungsten concentrates from the Bent & Sampson tungsten property for the first two weeks in October was a little over four tons.

### Yavapai County

COMMERCIAL (Skull Valley)—Two auto trucks of three tons capacity made by Lauth-Juergens company will be used to haul ore from mine in Copper Basin to Skull Valley. Mine is producing at rate of 150 tons per day.

### Yuma County

FORTUNA (Yuma)—Continuation of vein from which much high-grade ore was shipped during ownership by C. D. Lane has been found and shows wide shoot of $35 ore. New management has turned some of the old drifts and shafts into a reservoir by building concrete dam in cañon near mouth of shaft; this water will be used for mill and camp needs.

## CALIFORNIA

### Amador County

AN ACCIDENT TO A MINER, employed in the Zeila mine at Jackson, resulted in the loss of both eyes by an accidental explosion of dynamite while working in the 250-ft. level, Oct. 13. The miner's face was also badly torn and his body as well. It was supposed that he struck a missed hole with his pick; his eyes had to be removed.

PLYMOUTH CONSOLIDATED (Plymouth)—The winze has been deepened to a depth of 2000 ft., a station has been cut, and drifting was begun about Oct. 1. The ore is looking well at this level, which is 400 ft. deeper than the old workings. Some drifting in fair grade of ore was done on the 1850-ft. level. This is an old mine that was a large producer in the early days of California quartz mining. The prospecting is being done by the California Exploration Co., a subsidiary of Bewick, Moreing & Co. Albert Burch, of San Francisco, is manager.

### Butte County

SOUTH BANNER MINING CO. (Oroville)—The capital stock has been increased from $50,000 to $250,000. It is reported that a syndicate of Englishmen will take over the property.

PROGRESSIVE PLACER MINING CO. (Iowa Hill)—High-grade gravel is reported at this mine. A drag-line scraper is used.

EXCELSIOR (Forest Hill)—This mine has been taken over by Mr. Englebright, of Nevada City. The old Baltimore tunnel will be cleaned out, and will be advanced 800 ft. into Excelsior ground. Electric power will be installed.

PACIFIC GOLD DREDGING CO. (Auburn)—The reconstructed dredge built of the machinery formerly used on Pacific No. 1 dredge, in the Oroville field, and a new hull, was put in commission, Sept. 30, on middle fork of American River. The construction occupied 73 days from the date of landing the lumber for the hull to the starting of the bucket line. This is record work in dredge building.

### Plumas County

CROWN POINT (Quincy)—It is reported that this mine has been purchased by F. W. Johnson, of Sacramento. The 10-stamp mill will be put in commission in December.

GOLD LEAF (Spring Garden)—The 5-stamp mill is crushing good ore, said to assay as high as $10 per ton. Gross, Sutton, Hammock & Look, of Sacramento, are operating on a royalty basis.

PLUMAS-EUREKA (Quincy)—It is reported that negotiations are pending for the sale of this mine to Eastern men. This is one of the oldest mines in the state and has a record of more than $2,000,000 paid in dividends.

### Shasta County

MOUNTAIN COPPER CO. (Keswick)—Ore from the Hornet mine is being shipped at the rate of 250 cars of 50 tons each per month. The machine shops and railroad of the company at Keswick are employing 100 men.

GLADSTONE (French Gulch)—Retimbering of the first 400 ft. of the 1100-ft. shaft is completed, and 50 of the men laid off in September have returned to work, making a total of 150 now employed. The old hoist will be used until the new electric hoist is installed.

BULLY HILL (Winthrop)—John B. Keating, manager, states that work at the smelting plant is progressing and has reached a point where it is thought that a commercial demonstration of the process for saving the zinc in the ore can be made within 90 days. The directors have recently visited the property to witness the tests.

### Sierra County

LEE (Sierra City)—A commodious boarding house has been completed at this property, and other improvements are progressing, looking to the employment of a large crew of men throughout the winter months.

## COLORADO

### Clear Creek County

SEATON—A 3-ft. vein of $40 ore has been opened in the east drift from the Newhouse tunnel.

NATIONAL (West Argentine)—Development work will be continued throughout the winter, and with this end in view supplies are being shipped to the mine. Recent developments have been encouraging.

PAPOOSE—Development will be resumed at this property near the head of Virginia Cañon, and the shaft which has been sunk 100 ft. on a 4-ft. vein of $8 ore, will be sunk another 100 ft. An electric hoist is to be installed.

SUN AND MOON—This property was recently reopened by Olsen & Anderson, under lease. Ore shipments are being made to the Combination mill at Idaho Springs. It is intimated that the production will be increased in the near future.

TERRIBLE-DUNDERBERG (Silver Plume)—Early in 1913 an option on the control of these silver-lead-zinc mines was taken by Gay & Sturgis, of Boston. Work began in May and continued for three months, under the supervision of Arthur L. Carnahan. Favorable consideration is being given now to the plan of operating the property, and for the purpose of holding the option and directing the work the Terrible-Dunderberg Mining & Power Co. has been organized. Should work go on as planned, extensive development would be done to create suitable ore reserves before the milling plans are outlined. The properties have a very large number of openings from which production was obtained in earlier operations. The property is partially equipped, including a large mill building erected during recent years, and has a water-power plant, including a mile of pipe line that is operative seven to eight months in the year.

### Eagle County

PROSPECTING WORK is being done, but so far Lady Belle is the only regular producer in Bush Creek district. That mine employs 28 men and is shipping 13 tons daily of 52-oz. silver ore. Vein is a contact between sandstone and schist and dips at 35° and is well defined. Ore has been found in Dakotas north of the Lady Belle and a test carload has been shipped. At head of Lake Creek in Eagle County, East Lake Creek Mining & Milling Co. has driven a tunnel 3100 ft. and one vein just intersected is 20 ft. wide and assays $6 per ton with 8-in. streak on footwall that runs $87 per ton, a carload of which has been shipped. Another vein, the Anna, has 3 ft. of $30 ore.

### Lake County

SILVER BOW MINING CO. (Leadville)—Having taken over holdings of Big Four, on Breece Hill, has commenced shipping silver-lead ore carrying gold to Arkansas Valley plant.

### Teller County

GOLDEN CYCLE (Goldfield)—At the 1600-ft. level of the Legal Tender claim, an important strike has been made, the oreshoot being 15 ft. wide. Carload lots sent to the Golden Cycle mill show the ore to be worth $40 per ton.

REQUA-SAVAGE (Cripple Creek)—Trail claim has been leased for three years to E. S. Johnson, president of the Blue Bird, and will be worked by a lateral from Blue Bird shaft, which is 1750 ft. deep, deepest in the district.

## IDAHO

### Cœur d'Alene District

MOON CREEK (Osborne)—A three-compartment shaft will be sunk starting at a point between the two veins. It is planned to crosscut to both veins every 100 ft.

CROWN POINT (Wardner)—A lease has been obtained on the upper workings. The property was at one time one of the greatest producers in the district. It has been idle for some time and still contains considerable ore which will now prove profitable.

BENTON (Burke)—Ore has been encountered in the shaft, which is down only 15 ft. The shaft was begun in the creek level tunnel only about 25 ft. from the surface. A great deal of work has been done on the property in the past but no ore was encountered until the shaft was begun.

LUCKY BOY (Pine Creek)—A shaft is being sunk on the vein, and from present indications ore will soon be encountered. This property is entangled in the Pine Creek land controversy, as to whether the property is more valuable as mineral or agricultural land. The vein is the same as the one in which the Hypotheek struck rich ore recently.

STEWART (Wardner)—The gross value of mine and mill products for the quarter ended Sept. 30 totaled $335,032; net earnings, $204,802; miscellaneous income, $314; development and prospecting, $14,681; net income, $190,435 at the rate of over 60% per annum on the capitalization of $1,238,362; cash Sept. 30, $451,851; quarterly dividend of 10% and 2½% extra paid Oct. 3.

H. E. M. (Burke)—Financing for mill construction and tunnel driving that is expected to put the property on a producing basis, has been completed. A new tunnel has been started from Dago Peak, tapping the ore at depth of 260 ft. under the No. 3 level, the lowest yet attained, and will furnish an outlet for ore on the mill-site on the bank of the Cœur d'Alene River. The machinery has been purchased and is being installed.

GOLD BACK (Murray)—A 6-ft. vein of ore, half of which is first-class, has been found in an opencut. It is one of the best surface showings ever made in the district. The vein can be traced for miles across the country, but this is the first pay shoot ever opened on it. It is planned to open the vein at depth which can be done with a short tunnel. The strike has caused no little excitement and development work will be pushed as rapidly as possible.

### Kootenai County

WATL[illegible] MINING COMPANY (Springston)—An old property in which many Easterners are interested. Operations have been resumed with small crew. Victor Waltman, formerly county commissioner of Kootenai County, and treasurer of the mining company, has replaced F. Waters as manager.

## MICHIGAN

### Iron

PICKANDS, MATHER & CO. (Iron River)—Bengal, Fogarty, Caspian and Baltic mines were shut down Oct. 27 because unexpected order was received from Cleveland to stop all ore shipments. None of the mines were ready for stocking ore and so no mining will be done until surface work is completed, which will be within a few weeks as a large force is employed.

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—A drill has been placed in operation short distance south of old Saginaw mine and old-time miners believe that ore of a good grade will be encountered. Saginaw was an active producer years ago, as were Goodrich, New England and Albion properties nearby. Saginaw is four miles from Ishpeming and reopening of that district would mean much for the town.

JONES & LAUGHLIN (Ishpeming)—Work has been started on mine which is going to be opened near Iron Mountain Lake. An old shaft, sunk several years ago, will be deepened several hundred feet, where drills have located good ore. Chicago & Northwestern Ry. will construct side track to property from Cascade. District was active one several years ago but little work has been done during last 25 years. Most of the men will be transferred from the Lake Angeline mine, which is about exhausted.

## MINNESOTA

MINNESOTA STEEL CO. (Duluth)—The plant of this subsidiary of the Steel Corporation is now about 75% completed. It will be ready for operation by the autumn of 1914, but on account of the approach of winter the plant may not be put into its full blast before the spring of 1915. The plant will have a new organization, all new machinery, and a new waterworks to try out in winter weather, and these conditions are expected to keep the new plant from operating at full capacity before the following spring, in 1916, but when it is completed the Duluth steel plant will be the last word in steel-plant construction. It will be one of the largest and most modern of its kind.

### Cuyuna Range

PENNINGTON (Crosby)—This mine's 1913 order, 100,000 tons, has about been filled, and it is expected that stockpiling will begin shortly.

CUYUNA-DULUTH IRON CO. (Ironton)—Now producing 100 tons daily. The orebody of this company, while small and definitely outlined, is of high grade, averaging above 60% iron.

BRAINERD-CUYUNA MINING CO. (Brainerd)—Shaft sinking continues. A depth of 45 ft. has now been reached, and some water is being encountered. The Northern Pacific Ry. has constructed a spur to the property.

BARROWS (Barrows)—Shipping from stockpile will begin shortly. The mine has about 12,000 tons in stock. This is the only stockpile of a shipping mine on the Cuyuna range which has not been shipped this season; in fact, no other shipping mine on the range has any of last season's ore in stock now.

CUYUNA-MILLE LACS (Crosby)—Now shipping about 300 tons per day. To date 1500 ft. of drifting has been done. Negotiations now pending for the sale of the entire 1914 production of this shaft. Recently, two small cargoes were shipped from the Northern Pacific dock, one going to Pittsburgh Steel Co. and the other to the Standard Steel Co., of Parry Sound, Ontario. The cut-and-slice system is being adopted in the mine.

### Mesabi Range

OLIVER IRON MINING CO. (Chisholm)—Orders were received Oct. 23 to discontinue all ore shipments until further notice. The mines affected are the Leonard, Monroe and Chisholm. The mines did not cease operations, but began stocking ore. It is thought the cessation is but temporary, and that shipments will be resumed soon.

OLIVER IRON MINING CO. (Biwabik)—This company still has 20 drills in operation near Biwabik and McKinley but it is impossible to obtain information regarding the results. Most of the work is being done on land belonging to the Higgins heirs. The options will expire in a short time and it is believed that then some definite announcement will be made.

### Vermilion Range

McCOMBER (Ely)—It is believed that this mine is to develop into a fine property as drill records look promising. Shaft is being sunk and has passed through 30 ft. of ore of good grade, which appeared to be dipping to north. After sufficient depth has been attained, drifting into ore will be started and extent of deposit will be ascertained.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

HOUGH LAND (Webb City, Mo.)—A new strike of lead ore has been made by Harrison, Eldridge & Julian.

COURTWRIGHT & CO. (Joplin, Mo.)—Lead turn-ins are being made, operations being in progress at 50-ft. level.

GALENA ZINC MINING CO. (Galena, Kan.)—Low price of ore has caused operations to cease, at least temporarily; has been operating Alabama Coon.

MALANG MINING CO. (Spring City, Mo.)—Seven drills are at work on lease of 20 acres; largest number of drill rigs ever operating simultaneously on a tract of this size. Seven shafts already are situated on lease, all in ore.

KRAMER (Cave Springs, Mo.)—This mine, once one of the most prolific producers of the district, has been closed down, leaving the Big Brownie now the largest Cave Springs property. The Kramer mill is to be disposed of.

W. O. CRAGG (Joplin, Mo.)—The new concentrator is in operation on the James Luke land. It has a capacity of 300 tons. An old mill is situated nearby and both will be kept in operation. Considerable mineralized ground has been blocked out.

## MONTANA

### Butte District

TIMBER BUTTE MILLING CO. (Butte)—At the present rate of progress the new zinc concentrator will be ready to go into commission soon after the first of the year.

BUTTE CENTRAL (Butte)—An effort is being made to settle the financial difficulties of this company so as to admit of the Ophir mine being reopened. It is contended that there is some good ore in the mine which can be treated at a profit at the concentrator. The shaft is down to a depth of 1000 ft., and among mining men the impression prevails that at greater depth ore of a good commercial grade would be encountered.

TUOLUMNE (Butte)—The shaft has reached a point near the 2400-ft. level and it is probable that a station will be cut at that depth and cross-cutting to the veins will be started. The management is undecided, however, whether to continue on to the 2600-ft. level before doing any development work. Good ore was recently cut on the 800-ft. level in a heretofore undeveloped territory. A little work has been done since the strike, but the ore opened has a width of 10 ft. carrying between 4½ and 6% copper. The first shipment of first-class ore made in the last five months was sent recently to the Washoe works.

NORTH BUTTE (Butte)—According to present indications the shaft of the Granite Mountain mine will be down to a depth of 2800 ft., a station cut and connection made with the Speculator shaft by the first of the year. An inspection of the Speculator shows that with repairs being made from time to time there will not be any necessity for the closing down of the shaft for many months yet. The big electric hoist to be installed for the operation of the Granite Mountain will be delivered by spring and possibly early in the coming summer the Speculator shaft will be closed down for retimbering throughout. This will not in the least interfere with the output of the North Butte, as all the ore will be hoisted through the Granite Mountain.

REINS COPPER (Butte)—The fractional claims of this company now are controlled by the Anaconda company, having been secured lately through the purchase of judgments outstanding against the company. The claims adjoin the Leonard mine and are considered valuable. Several years ago the Reins company, chiefly controlled by Eastern men, among the most prominent being Colonel Guffey, of Pennsylvania, spent a large amount of money sinking a shaft to a depth of 1200 ft., and in addition did considerable development work. It had a capital of $3,000,000, but when the panic came some five years ago the Eastern men found themselves unable to finance the company further and the property was closed down. Colonel Guffey had a claim against the company for a note of $130,472, and it is understood that he made an arrangement with the Anaconda to take the property over for him with the privilege of redeeming it.

PILOT BUTTE (Butte)—Vice-president Kelley of the Anaconda company has been called to New York, and it is generally understood that among the matters to be considered is that of the injunction proceedings recently brought against the Pilot-Butte company. It appears that there exists a considerable difference of opinion as to the real ownership of the ground in dispute, and for the purpose of determining that question the Anaconda company has consented to a postponement of the hearing until March. In the meantime both companies will have men at work endeavoring to decide the question of ownership, and it may be that when the time arrives for the case to go to a hearing there will be a motion for its dismissal. There is no disposition on the part of the Anaconda company to take any advantage of the Pilot Butte or any other company, the sole desire in bringing the suit being to settle for all time the right to the ground. The Pilot-Butte is still conducting mining in other portions of its property.

## NEVADA

### Churchill County

KINNEY SALT DEPOSIT (Fallon Mountain)—A force of men is now at work taking out a 200-ton shipment of salt for the local and export market. With better transportation facilities this deposit would be an important producer.

### Clark County

YELLOW PINE (Goodsprings)—The mill now produces daily about 65 tons of zinc concentrate and 15 tons of lead concentrate, the capacity having been augmented by additions to the concentrating equipment during the last few months. The new oreshoot on the sixth level has been opened for a distance of 200 ft. on the strike, in width averaging in excess of 25 ft., and a winze is being sunk to determine its depth. The ore is remarkably clean, averaging 40% zinc, 12% lead and 8 oz. silver. In order to facilitate the mining of this ore and that on adjacent levels, it has been decided to sink a new three-compartment shaft from the surface and a new 50-hp. gasoline hoisting engine will be purchased. The management has also decided to install a sorting plant at the mine to relieve the mill plant. The new 100-hp. gas engine, burning low-grade fuel, is now in operation at the mill and has resulted in a considerable saving in fuel costs.

### Humboldt County

SHIPMENTS FROM ROCHESTER now average two railroad cars per day. Ore is shipped by rail from station of Nenzel, formerly known as Oreana.

WEAVER CONSOLIDATED (Rochester)—Ore was discovered recently on south extension of main Nenzel vein at depth of 350 ft. This is the greatest depth at which ore has been opened in the district to date.

PACKARD (Rochester)—Ore is being shipped from a shoot 4 ft. wide which has been uncovered for 200 ft., plow and scraper being used to strip overburden. This shoot assays well in silver, and gold appears to increase in amount with depth. A new vein, 400 ft. from old workings, has been discovered. Leases will be granted on portions of the ground in order to rapidly increase production. Erection of a mill with profits from high-grade shipments, in order that large tonnage of low-grade ore can be profitably treated, is contemplated.

### Lyon County

BLACK COPPER GROUP (Yerington)—Operations will be resumed in the near future.

COPPER BELT R.R. (Mason)—Five more auto trucks have been put into service hauling freight from Hudson station to Aurora. At present 12 auto trucks are hauling from Aurora.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at smelting plant for week ended Oct. 23, 1913, were as follows: From Mason Valley mine, 2245 tons; from Nevada-Douglas, 1163 tons; from others, 818 tons; total, 4226, or daily average of 604 tons. During same week five cars of matte were shipped.

### Mineral County

PINE GROVE MINING CO. (Pine Grove)—The 60,000-volt power line of Truckee River General Electric Co. was cut in recently, and the 10-stamp mill is ready for operation.

NEVADA CHAMPION COPPER CO. (Luning)—Property was sold recently to W. C. Reynolds, of Goldfield. Work will be started at once, and a 25-hp. hoist will be installed.

### Nye County

WHITE CAPS (Manhattan)—A shoot of good-grade ore has been developed between the 165- and 300-ft. levels. In the west drift on the 300-ft. level a shoot 100-ft. in length has been opened. Ore is being shipped to the Western Ore Purchasing Co.

UNION NO. 9 (Manhattan)—Drifting on the 580-ft. level toward the oreshoots, which have been mined on the levels above, is in progress. The increased flow of water encountered in sinking the last 100 ft. of the shaft is now being handled by a larger pumping plant.

### Washoe County

MINERAL GROUP (Reno)—A shaft is being sunk on this property, which is five miles northwest of Reno and adjoining the Nevada Central Co.

RED METALS CO. (Reno)—Shoot of ore rich in bornite has been opened on this property, six miles northeast of Reno; also carries gold and silver.

TOHOQUA MINING CO. (Leadville)—Shaft is 600 ft. deep and levels have been opened every 100 ft.; 50-ton concentrator is running steadily. Wagon haul of 40 miles to Gerlach, nearest accessible railroad point, will be shortened 15 miles by construction of road to Trego.

## NEW MEXICO

### Socorro County

DEADWOOD (Mogollon)—Raise on fourth level has opened into excellent milling ore.

ERNESTINE (Mogollon)—Two slime tanks are being added to mill equipment, made necessary by recent increase in crushing capacity.

SOCORRO MINING & MILLING CO. (Mogollon)—Clifton tunnel, driven on Queen vein, is expected daily to tap large body of water encountered in 500-ft. level in mine last year, which was bulk-headed at the time. Good mill ore has been opened at several places in tunnel.

PACIFIC (Mogollon)—Adit tunnel was recently completed to south endline, making connections with old workings in Confidence mine, which has been stoped out to Pacific line for a depth of 235 ft. Mine now has excellent ventilation, which will accelerate other development work being done.

LINCOLN (Mogollon)—Sinking of No. 1 winze has been stopped until new 25-hp. gasoline hoist, recently shipped ,is installed. Old 8-hp. hoist was unable to raise muck and water, which latter continued to increase with depth. A small compressor will also be operated and machines will be used in sinking. Station at winze is being enlarged to accommodate new equipment.

## NORTH CAROLINA

### Mecklenburg County

PARTRIDGE SMELTER (Charlotte)—This plant erected here in the early part of the year has been sold. The new owner is a mining corporation owning land containing both iron and lead deposits, and it is reported will use the furnace for experimental purposes.

## OREGON

### Jackson County

A DISCOVERY OF GOLD ORE has been made by A. D. Walters, working on the survey of the new permanent highway over the Siskiyous. He has caused no little excitement by bringing in a few samples of gold ore taken from a vein found in the survey of the road. The ore is rich in gold and no doubt a rush will be started for the diggings, as the find is easily accessible. It has always been thought that the gold deposits of Jackson County were all in the western foothills and toward the coast, the Siskiyou range being regarded as a dead prospect. The vein struck is 3 ft. wide and well defined.

### Josephine County

GOLDEN DRIFT MINING CO.—Judgment for plaintiff stockholders has been rendered by Judge Calkins in the Josephine circuit court in the case of the company against C. W. Ament, the original promoter of the enterprise. This is a suit which has been pending since 1909, and is familiarly known as the Ament dam litigaton. Orginally a mining promotion, it later developed into a plan involving irrigation features, as well as affording water for mining purposes. The decision practically compels Ament to account for moneys received in behalf of the mining corporation. The Golden Drift company was originally capitalized at $1,500,000, of which $150,000 has been expended on the dam project.

### Multnomah County

U. S. STEEL (Portland)—Officials of this company have obtained 800 ft. of river frontage with docks and warehouses, from which their Northwestern business will be handled. It is understood that construction work will soon commence so that the plant will be ready immediately following the completion of the Panama Canal. It is planned then to ship the products of the Eastern steel mills to Portland by water and distribute them from that port.

## UTAH

### Beaver County

MAGNOLIA (Star District)—This property of four claims has recently changed hands. Development has thus far been carried on by means of a windlass and bucket. There are about 50 tons of shipping ore on the dump, with 2 ft. of ore of the same character in the bottom of an 80-ft. winze.

### Juab County

CROWN POINT—Operations have been suspended until spring.

KING WILLIAM (Eureka)—An 8-in. air line has been installed on the 1600, and another shift added.

IRON BLOSSOM (Silver City)—A dividend for the fourth quarter of the year of 10c. per share or a total of $100,000 has been declared.

GRAND CENTRAL (Robinson)—Timbering the shaft between the 400 level and the surface has practically finished, and shipments will soon be resumed.

### Salt Lake County

UTAH METAL (Bingham)—Silver-lead ore has been opened from the 1100-ft. drain and transportation tunnel.

NEW ENGLAND GOLD & COPPER (Bingham)—This company's property, consisting of mining claims, a mill and mill site, water rights, machinery, etc., is to be sold to satisfy a judgment secured by the Bingham Coal & Lumber Co.

UTAH CONSOLIDATED (Bingham)—A dividend of 50c. per share or $150,000 has been declared, two dividends of like amount having been paid earlier in the year. The total of dividends by this company, including the present one, will amount to $8,950,000.

ALTA CONSOLIDATED (Alta)—At the special stockholders' meeting held Oct. 10, the capitalization was increased from 300,000 to 500,000 shares. The additional 200,000 shares will be placed in the treasury to be used for development. Ore is being shipped over the tramway to Tanner's Flat, and hauled by wagon to Sandy. A winze which is being sunk in a new part of the mine from one of the sublevels is down 40 ft. The ground here looks promising.

### Summit County

SILVER KING CONSOLIDATED (Park City)—The 1800-ft. station and sump in the main shaft are practically completed, and the McIlwee company will soon finish its contract, removing all machinery and supplies. The work of opening up the ore cut shortly before the 1500-ft. level was reached will be started immediately by the company.

DALY-JUDGE (Park City)—The McIlwee contract for carrying on development work has expired, and the company has taken in charge all underground development work. During the last year approximately 2000 ft. along the trend of the vein system was opened. The company will develop by raising on various fissures, etc. Shipments of first-class ore have been increased during the last few weeks.

SNAKE CREEK TUNNEL—One thousand feet of tunnel has been completed by F. T. Williams, who is doing the work under contract. Operations have been suspended for a time, while an electric haulage system is being installed. This will make possible an increased speed, the maximum monthly footage with animal haulage being 300 ft. During the last few weeks another water course has been cut, and the flow in the tunnel has been materially increased. Plans are being drawn for a storage reservoir at the mouth of the tunnel.

## WASHINGTON

### Ferry County

POWER USERS AT REPUBLIC at a recent meeting to consider installation of Diesel oil engines at a central power plant, appointed committee of five to formulate plans for organization of a company and to get plans and prices from engine manufacturers

QUILP (Republic)—First car of ore is being shipped. Mine is under lease to Imperator-Quilp Co.

NORTH WASHINGTON POWER & REDUCTION CO. (Republic)—Plans are being made for resuming operations at cyanide plant; $10,000 having been subscribed by stockholders for this purpose.

### Okanogan County

KELLER—Hoist and engine have been purchased and will be installed at once

APACHE (Nespelem)—Fourth shipment of silver ore has been made; mine under lease to Hoyt & Beggs

### Stevens County

COPPER HOARD—Property has been inspected with view to further development work.

CHEWELAH CONSOLIDATED MINES CO. (Chewelah)—Organized to take over holdings of German Silver & Gold Co., operations will be started at once

## WISCONSIN

### Platteville District

GREAT WESTERN (Galena)—A carload of hand-cobbed blende, shipped from old Pittsburgh property four miles south of Galena, was taken out in sinking shaft through 30-ft. vein of ore.

WISCONSIN ZINC CO. (Benton)—Churn drilling has revealed 30 ft. of rich jack ground on Champion farm of 432 acres near New Diggings held under lease and option by company.

MINERAL POINT ZINC CO. (Highland)—Shipments have been resumed from Kennedy and Lewis properties which have been idle for nearly a year pending settlement and transfer of title and fee to Mineral Point company. Extensive improvements in machinery and equipment have been made which will greatly increase tonnage of both mines which formerly produced over 80% of carbonate ore output of Wisconsin.

## CANADA

### British Columbia

ENGINEER (Atlin)—Developments on this mine have been such that James Alexander, manager of the mine, has announced that a 100-stamp mill will be built. A two-stamp mill is working now, and in one week in October it produced 188 oz. of gold.

### Ontario

SWASTIKA (Swastika)—Arrangements are being made for opening property.

TOUGH-OAKES (Kirkland Lake)—A rich strike of coarse gold in plates has been made on the 200-ft. level.

HOLLINGER RESERVE (Timmins)—Property under option to Lewisohns is being developed below 200-ft. level.

WEST BEAVER—This property in the Silver Mountain district has been taken over on a 12-months' working option by the Trethewey.

CROWN RESERVE (Cobalt)—Regular quarterly dividend of 2% has been declared, bringing total disbursement to date to 308%, or $5,437,537.

CONIAGAS (Cobalt)—An additional dividend bonus of 3%, making 14% in all, payable Nov. 1, has been declared, bringing the total returns to shareholders up to $5,920,000.

KERR LAKE (Cobalt)—Three of the veins found at bottom of lake after water had been partially pumped out, have been cut on 140-ft. level, and are now being developed. Where intercepted underground, they were mere cracks and did not show any high-grade ore.

NORTH DOME (South Porcupine)—Plaintiff, for loss of eyesight in an underground explosion, was awarded damages of $3250 and costs. Jury found negligence in fact that mine captain failed to inspect work after it had been reported that there were several missed holes in preceding round.

TIMISKAMING (Cobalt)—Announcement has been made of intention to discontinue payment of dividends and also work on North Dome property in Porcupine on account of insufficient funds. Development on lower levels while succeeding in opening several pockets of rich ore, has been disappointing.

PORCUPINE CROWN (South Porcupine)—Winze, which has been sunk 60 ft. below the 400-ft. level, shows average of $80 per ton over width of 5 ft.; general average of mine, however, is about $22 and general manager states that to date, ore to value of $1,700,000 has been developed above the 400-ft. level. Cleanup from 10-stamp mill in September returned $29,000. With addition to mill in operation, plant will treat 100 tons per day. A new shaft is being sunk 1000 ft. south of present main working, where ore has been proved to depth of 300 ft. by diamond drilling.

## MEXICO

### Sonora

MONTE CRISTO (Moctezuma)—A recent strike of high-grade ore has been encountered on the fifth level

GREENE-CANANEA (Cananea)—Operations continue at 60% capacity. From its own ores company is producing about 2,500,000 lb. of copper per month, while from custom ores secures 500,000 lb. additional. Aside from this yield plant, treating Miami concentrates, produces approximately 3,000,000 lb. or a total of 6,000,000 lb. per month.

## NICARAGUA

ORGANIZING CURRENCY SYSTEM has been done. There is a central national bank representing the interests of American capital in establishing sound financial conditions. New standard is a coin exactly equivalent to U. S. dollar. Representatives of American bankers who will have charge of collection of Nicaragua custom dues and administration of financing of country through central bank are to have moral support of this Government. Washington dispatches intimate that Secretary of State is to be authorized to appoint one of two directors nominated by Nicaraguan minister of finance on board of national bank and be represented in administration of Nicaraguan railroad.

## COLOMBIA

### Antioquia

S. PEARSON & SONS, LTD. (London)—This company has made a contract with the Colombian government for the exploration of oil fields in Colombia, which contract is now before Congress in session at Bogota, and will no doubt be ratified. The contract gives the privilege of exploration, on certain conditions respecting subsequent exploitation, of zones not exceeding 10,000 km. in extent, for the period of two years. The contract, however, is said not to prohibit others from obtaining similar privileges, under similar conditions, respecting districts not included in those specified in this contract, and, therefore, is claimed to be not a monopoly in any sense of the word. At the same time it is true that there are other petitions before the government for similar privileges, and that these will also be obtained is also probable. The only monopoly in fact that does exist today in Colombia in the oil industry may be said to be that given to a company for refining oil on the Atlantic coast, which company was given a concession for 25 years with the sole privilege of refining oil within a zone of 50 km. width along the entire Atlantic coast. This company afterward obtained the privilege for the importation of crude oil free of duty and for the full capacity of their refinery, in case sufficient oil was not obtained from the exploitation of their own wells, and in fact this refinery imports most of its crude oil from the United States and besides enjoys the benefits of a high duty on refined oil from other countries. However, only four years remain for the termination of this concession.

## SPAIN

STRIKE SITUATION at Huelva is serious. It is estimated that about $2,000,000 has been lost, and it is known that miners are suffering greatly. Rio Tinto company has received an offer of 1000 German strikebreakers, but the offer has not been accepted yet, as it is certain that such action would be followed by serious disorders.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Nov. 5

The metal markets have been inclined to quiet and have been rather weak as to prices. There has been some irregularity in the general movement.

### Copper, Tin, Lead and Zinc

**Copper**—The market has been quiet and weak. It is evident that on account of the recession in business the supplies and purchases of consumers are going to carry them further than had been previously anticipated. This in a great measure explains the recent paucity of orders. Several of the agencies in their efforts to draw business have offered copper down from day to day without succeeding in placing more than a few million pounds. The outstanding feature of the last week has been the fact that one of the large agencies, which heretofore has held firmly for 16⅞c., has been soliciting bids at lower figures. However, we do not hear of any business having resulted as yet.

We have heard of some few carloads of Lake copper sold at 16¾c., while the large producer is supposed to be still naming 17¼c. Conditions in this market continue unchanged and quotations but nominal.

Casting copper offered liberally has failed to find buyers.

At the close we quote Lake copper, nominally, at 16¾@17¼c.; electrolytic in cakes, ingots and wirebars at 16.10@16.25c. Casting copper is quoted nominally at 15¾@16c. as an average for the week.

The London standard market has been very weak and considerable bear selling is reported. It is noteworthy that a large backwardation of over £1 as between cash and three months continues. On Thursday, Oct. 30, spot standard was £73 10s. and three months £72 7s. 6d. On Friday it was about 5s. lower, but on Monday it dropped £2, spot being £71 10s. and three months £70 7s. 6d. On Wednesday there was a slight reaction, spot closing at £71 12s. 6d. and three months £70 7s. 6d. per ton.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Exports of copper from New York for the week were 3371 long tons. Our special correspondent gives the exports from Baltimore for the week at 2974 tons.

**Visible stocks of Copper in Europe** on Oct. 31 are reported as follows: Great Britain, 12,280; France, 2970; Rotterdam, 2400; Hamburg, 1080; Bremen, 1000; other European ports, 1050; total, 21,780 long tons, or 48,787,200 lb.; a decrease of 1400 tons from Oct. 15. In addition to the stocks above 1350 tons are reported afloat from Chile and 2750 from Australia, making a total of 26,880 tons.

**Tin**—Statistics for the American position which were published on Nov. 1 turned out better than anticipated, and the expectation of a resumption of buying by the tinplate mills gave the market a very strong tone at the end of last week. There was good buying by consumers, and quotations on Nov. 1 were marked about ¼c. per lb. over the London closing price of Oct. 31. The London market did not respond to the better tone in our market and became weak on Nov. 3. Since then, however, it has again strengthened materially and closes firm at £183 7d. 6s. for spot and £184 7s. 6d. for three months, and about 40¼c. for November tin here.

Shipments of tin from the Straits in October were 5020 long tons; an increase of 570 tons over October of last year.

Visible stocks of tin on Oct. 31 are reported as follows, including tin afloat: London, 6215; Holland, 850; United States, excluding Pacific ports, 4792; total 11,857 long tons, a decrease of 1086 tons during October.

**Lead**—The market is active, but orders are very eagerly competed for. Prices are unchanged at 4.17½@4.20c. St. Louis and 4.32½@4.35c., New York.

At London, Spanish lead is quoted £20 12s. 6d. and English lead 10s. higher.

**Spelter**—The market is quiet and without special feature. St. Louis is quoted 5.15@5.20c., and New York 5.30@5.25 cents.

The London market is slightly lower, good ordinaries being quoted £20 5s. and specials £21 5s. per ton.

The base price of sheet zinc in carload lots is now $7.50 per 100 lb, f.o.b. cars Peru, Ill., less 8% discount.

**Mineral Exports of Spain** seven months ended July 31, reported by "Revista Minera" in metric tons.

| Exports | Metals 1912 | Metals 1913 | Ores 1912 | Ores 1913 |
|---|---|---|---|---|
| Iron | 26,137 | 7,500 | 4,826,584 | 5,677,485 |
| Copper | 13,484 | 13,607 | 85,900 | 103,530 |
| Copper precipitate | 8,510 | 3,401 | ..... | ..... |
| Lead | 109,883 | 121,474 | 3,686 | 1,274 |
| Zinc | 1,368 | 519 | 68,931 | 73,817 |
| Quicksilver | 1,476 | 1,472 | ..... | ..... |
| Manganese | .... | .... | 19,936 | 11,760 |
| Pyrites | .... | .... | 1,709,598 | 1,679,183 |

Pyritic ores carrying 2.5% or over in copper are classed as copper ore; below that they are classed as pyrites. Exports of salt were 403,171 tons in 1912, and 358,792 tons this year.

### DAILY PRICES OF METALS

#### NEW YORK

| Oct.-Nov. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 4.8515 | 59½ | *16¾<br>@17¼ | 16.35<br>@16.40 | 40 | 4.32½<br>@4.35 | 4.17½<br>@4.20 | 5.32½<br>@5.37½ | 5.17½<br>@5.22½ |
| 31 | 4.8495 | 59¾ | *16¾<br>@17¼ | 16.25<br>@16.35 | 40 | 4.32½<br>@4.35 | 4.17½<br>@4.20 | 5.30<br>@5.35 | 5.15<br>@5.20 |
| 1 | 4.8505 | 59⅝ | *16¾<br>@17¼ | 16.25<br>@16.35 | 40¼ | 4.32½<br>@4.35 | 4.17½<br>@4.20 | 5.30<br>@5.35 | 5.15<br>@5.20 |
| 3 | 4.8485 | 59⅜ | *16¾<br>@17¼ | 16.15<br>@16.30 | 39⅞ | 4.32½<br>@4.35 | 4.17½<br>@4.20 | 5.30<br>@5.35 | 5.15<br>@5.20 |
| 4 | ...... | ... | ...... | ....... | .. | .... | 4.17½<br>@4.20 | ...... | 5.15<br>@5.20 |
| 5 | 4.8510 | 59½ | *16¾<br>@17¼ | 16.10<br>@16.25 | 40¼ | 4.32½<br>@4.35 | 4.17½<br>@4.20 | 5.30<br>@5.35 | 5.15<br>@5.20 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

#### LONDON

| Oct.-Nov. | Silver | Copper: Spot, £ per Ton | Copper: Spot, Cts. per Lb. | Copper: 3 Mos. | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos. | Lead: £ per Ton | Lead: Cts. per Lb. | Zinc: £ per Ton | Zinc: Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 27½ | 73½ | 15.97 | 72⅜ | 79½ | 182½ | 183¾ | 20⅝ | 4.48 | 20⅝ | 4.48 |
| 31 | 27⅝ | 73⅜ | 15.94 | 72⅛ | 79 | 183 | 184 | 20⅝ | 4.48 | 20¼ | 4.40 |
| 1 | 27 9/16 | .... | ..... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ..... |
| 3 | 27 7/16 | 71½ | 15.53 | 70⅜ | 77½ | 181¾ | 183 | 20⅝ | 4.48 | 20¼ | 4.40 |
| 4 | 27 7/16 | 71⅝ | 15.56 | 70⅜ | 77½ | 183¼ | 184¼ | 20½ | 4.44 | 20½ | 4.44 |
| 5 | 27½ | 71⅝ | 15.56 | 70⅜ | 77½ | 183⅜ | 184⅜ | 20⅝ | 4.48 | 20¼ | 4.40 |

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately, Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

**Exports and Imports of Metals,** other than iron and steel, in the United States, eight months ended Aug. 31, are reported as follows:

| Metals | Exports 1912 | Exports 1913 | Imports 1912 | Imports 1913 |
|---|---|---|---|---|
| Copper, long tons | 246,760 | 285,783 | 119,190 | 120,090 |
| Tin, long tons | 372 | 936 | 35,485 | 32,693 |
| Lead, short tons | 46,276 | 37,580 | 61,857 | 47,356 |
| Zinc, short tons | 6,428 | 8,124 | 4,069 | 5,632 |
| Zinc in ore, lb. | 13,480,634 | 10,224,121 | 18,930,781 | 19,805,154 |
| Nickel, lb. | 17,708,024 | 20,556,411 | 26,573,202 | 30,874,863 |
| Antimony, lb. | 40,992 | 63,620 | 11,432,269 | 11,673,666 |
| Aluminum, lb. | 211,036 | 39,077 | 12,029,888 | 18,597,057 |
| Quicksilver, lb. | 16,479 | 37,686 | | |
| Platinum, oz. | ........ | 1,191 | 68,187 | 78,711 |
| Ores, etc.: | | | | |
| Zinc Oxide, lb. | 23,223,275 | 20,726,722 | | |
| Zinc Dross, lb. | 403,918 | 56,696 | ..... | .. |
| Zinc dust, lb. | 27,398 | 154,451 | 789,035 | 2,805,290 |
| Zinc Ores, tons | 15,279 | 11,555 | 27,517 | 19,401 |

Copper, lead, nickel and antimony include the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately prior to July 1, 1912. The exports include reëxports of foreign material.

## Other Metals

**Aluminum**—The market remains dull and prices are unchanged. Current quotation is 19½c. per lb. for No. 1 ingots, New York. The foreign market is easy.

**Antimony**—A good jobbing demand continues and prices are steady. Cookson's is quoted at 7.60@7.70c. per lb.; Hallett's 7¼@7⅜c.; while 6½@6¾c. per lb. is paid for Chinese, Hungarion, and other outside brands.

**Quicksilver**—Business is improving and prices are a shade firmer. The New York quotation is $38.50@39 per flask of 75 lb. with 56@57c. per lb, for retail lots. San Francisco price is $38.50 per flask, with special terms for export business. The London price is £7 5s. per flask, with £7 quoted from second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Cadmium**—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

**Nickel**—Quotations for ordinary forms, shot, blocks, or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higner.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold is still going to Egypt. No more gold has been taken for New York, beyond the $2,500,000 reported last week.

Imports of gold at New York, week ended Nov. 1, were $1.-028,479, from Mexico, Cuba, South America and Australia. There were no exports.

**Iridium**—There is no change in this metal. Dealers continue to ask $83@85 per oz., New York. The foreign market is reported easier.

**Platinum**—The market is steadier and prices a little firmer. We quote $44.50@45 per oz. for refined platinum. Hard metal is $49@52 per oz., according to quality. The foreign market is reported firmer

**Silver**—The market having fallen to 27$\frac{7}{16}$d. as the result of the unsettled condition of India owing to financial speculators, remains dull and steady at current prices, and it is not at all unlikely that orders of any large amount could only be executed at a somewhat higher price

Shipments of silver from London to the East, Jan. 1 to Oct 23, as reported by Messrs Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £8,791,500 | £8,156,500 | D £ 635,000 |
| China | 1,066,000 | 702,000 | D 364,000 |
| Total | £9,857,500 | £8,858,500 | D £ 999,000 |

Exports of silver from New York for the week were $796,-451, to London and Paris. Imports were $311,102, from Central and South America.

Imports of silver into France, eight months ended Aug. 31, were valued at 247,743,000 fr.; exports were 242,765,000 fr.; net imports 4,978,000 fr. against 2,984,000 fr. last year.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Nov. 1

The high price of zinc blende is $46, the base per ton of 60% zinc ranging from $39 to $43 for choice grades. With the $1 advance in best grades came a general strengthening in all grades. Large orders were filled and the shipment shows an increase. Calamine is still unaffected in the base range of $21@23 per ton of 40% zinc, but the shipment was largely increased the past two weeks, cleaning up an accumulation of 1500 tons at Granby. The total shipment of zinc is the largest for two months. The average of all grades of zinc is $37.54 per ton. Activity in the purchase of lead ore seems not to advance the price, still $52 per ton of 80% metal content. The average of all grades is $50.86 per ton.

SHIPMENTS WEEK ENDED NOV. 1

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 11,709,490 | 1,354,320 | 2,116,400 | $314,925 |
| Totals 44 weeks. | 480,718,890 | 35,941,360 | 79,497,320 | $13,095,509 |

Blende value, the week, $244,755; 44 weeks, $11,416,286.

Calamine value, the week, $16,350; 44 weeks, $461,994.

Lead value, the week, $53,820; 44 weeks, $2,117,239.

HOBART

### PLATTEVILLE, WIS.—Nov. 1

The base price paid this week for 60% zinc ore was $42@43 per ton.

The base price paid for 80% lead ore was $53 per ton.

SHIPMENTS WEEK ENDED NOV. 1

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,703,260 | ........ | 490,200 |
| Year to date | 123,751,680 | 5,652,670 | 48,780,000 |

Shipped during week to separating plants, 2,312,350 lb. zinc ore.

## IRON TRADE REVIEW

### NEW YORK—Nov. 5

Production of steel continues to decline. Practically all the steel mills are reducing their working forces. This week steel is being produced at not much above 75% of full capacity.

Prices are declining, but not rapidly. Evidently the mills feel that buying would not be tempted by drastic reductions at this time, but it is intimated that when buyers are ready to take hold attractive prices will be made.

Even the more optimistic in the trade do not seem to expect any definite improvement in the situation in less than from four to six months. While much has been said about the necessity of readjusting steel prices, the present view seems to be that the future of the steel market will depend chiefly upon the state of trade generally.

Pig iron is rather slow, with new orders generally of small quantities for early delivery. Prices are pretty well maintained, though concessions are reported here and there.

### PITTSBURGH—Nov. 4

The season price for tin plate has been announced at $3.40 for 100-lb. cokes, against $3.60 a year ago. The new price will be the basis for the large contracts made by can makers and other consumers for 1914 delivery, and will also govern jobbers' contracts for the first quarter. Last season's price was named on Sept. 4, 1912, by a large independent interest and immediately adopted by other sellers. At the time the general opinion was that the new price was announced too soon, but the present announcement is correspondingly late, buyers having shown little interest. The reduction of approximately $4 a ton in tinplate as compared with a year ago is due to the lower prices ruling for the chief raw materials, sheet bars and pig tin. Terneplates were reduced less than tinplate, the new price being $6.90 per double box, 214-lb., for 8-lb. coated ternes.

**Pig Iron**—Foundry iron has been altogether stagnant. Basic iron has sold at sharp cuts from the old quotation of $14, Valley. A 1500-ton lot of bessemer sold at $15.50, Valley, but two lots of 500 and 400 tons went at slight cuts. We now quote, as representing the outside of the market: Bessemer, $15.50; basic, $13.50; malleable, $14; No. 2 foundry, $13.75; forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

W. P. Snyder & Co. announce the October pig-iron averages, computed from the actual sales made in the trade, at $15.703, Valley, for bessemer, a decrease of 4.7c. from September, and $13.709 Valley, for basic, a decrease of 42.85 cents.

**Ferromanganese**—The market is dull but with prices well maintained at $50 for English and $49.50 for German, at Baltimore.

**Steel**—The billet and sheet-bar market continues to be made in irregular fashion, chiefly by mills offering concessions to their contract customers to prevent the business going elsewhere. We quote prices 50c. lower than a week ago, at $20.50 for billets and $21.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown. Rods are quotable weak at $26, Pittsburgh.

**Pig Iron Production in Germany** in September was 1,589,197 metric tons, or 49,627 tons less than in August. For the nine months ended Sept. 30 the total make was, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Foundry iron.................. | 2,449,780 | 2,740,263 | I. 290,483 |
| Forge iron..................... | 401,250 | 377,351 | D. 23,899 |
| Steel pig....................... | 1,594,686 | 1,924,335 | I. 329,649 |
| Bessemer pig.................. | 286,715 | 270,076 | D. 16,639 |
| Thomas (basic) pig............ | 8,383,371 | 9,131,380 | I. 748,009 |
| Total..................... | 13,115,802 | 14,443,405 | I. 1,327,603 |

The total increase was 10.1%. Steel pig includes speigeleisen, ferromanganese and all similar alloys.

### IRON ORE

Lake Superior shipments in October were close to 7,000,000 tons; the full figures have not yet been received. There is no rush, as shipments are slowing down toward the end of the season. Shippers generally expect to close up everything in November. Some of the larger companies intend to make the last shipments about Nov. 20 at latest.

A dispatch from Duluth, Nov. 4, reports total shipments for the season to Nov. 1 at 37,942,412 tons.

### COKE

The Connellsville coke market is pretty well demoralized by the sharp break reported last week. The effort to maintain prices for furnace coke has been entirely given up, and some competition for orders is reported. Prices are rather uncertain, both for spot and contract coke.

**Fuel Exports of Great Britain** nine months ended Sept. 30, long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal................................ | 45,750,423 | 54,517,788 | I. 8,767,365 |
| Coke................................ | 680,713 | 838,055 | I. 157,342 |
| Briquettes......................... | 1,115,631 | 1,542,365 | I. 426,734 |
| Steamer Coal...................... | 13,202,091 | 15,545,617 | I. 2,343,526 |
| Total.......................... | 60,748,858 | 72,443,825 | I. 11,694,967 |

Exports in 1912 were reduced by the general strike of miners. Imports were only 183,197 tons in 1912, and 16,180 tons this year.

**Coal Production of German Empire** eight months ended Aug. 31, in metric tons:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| Coal......................... | 116,395,324 | 127,318,665 | I | 10,923,341 |
| Brown coal.................. | 52,880,655 | 56,658,980 | I | 3,778,325 |
| Total mined............ | 169,275,979 | 183,977,645 | I | 14,701,666 |
| Coke made.................. | 18,688,125 | 21,418,997 | I | 2,730,872 |
| Briquettes made............ | 15,834,316 | 17,995,383 | I | 2,161,067 |

Of the briquettes reported this year 14,084,566 tons were made from brown coal or lignite.

**Coal Production in France** for the half-year ended June 30, is reported as below, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal.............................. | 19,825,768 | 20,208,779 | I. 383,011 |
| Lignite............................ | 368,626 | 402,813 | I. 34,187 |
| Total.......................... | 20,194,394 | 20,611,592 | I. 417,198 |

Of the total coal mined this year 13,848,970 tons came from the districts of the Nord and Pas-de-Calais.

## CHEMICALS

### NEW YORK—Nov. 5

The general market is a little steadier, but business is not especially active.

**Arsenic**—The market remains dull and not much improvement is expected this month. Prices are nominally unchanged, about $3 per 100 lb. being asked.

**Copper Sulphate**—The market is steady though not very active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is still dull and unsettled. Prices are unchanged at 2.25c. per lb. for October, 2.30c. for November and December and 2.35c. for January-May delivery.

### PETROLEUM

The monthly report of the "Oil City Derrick" gives the number of new wells completed in the United States—excepting California—in October as follows: Pennsylvania grade, 711; Lima-Indiana, 140; Kentucky, 13; Illinois, 184; Kansas-Oklahoma, 1057; Texas-Louisiana, 154. A grand total of 2339 wells was completed, with an initial production of 64,236 bbl. There were 380 dry holes and 176 gas wells. Compared with the September report there was an increase of 146 in wells completed, and 9906 bbl. in new production. New work at the close of the month comprised 685 rigs and 2292 drilling wells.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | June | July | August | September | October |
|---|---|---|---|---|---|
| Alaska shipments | 2,203,191 | 2,705,136 | 1,847,785 | 2,261,216 | ........ |
| Anaconda....... | 21,500,000 | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 |
| Arizona, Ltd..... | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 | ........ |
| Copper Queen ... | 7,477,936 | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 |
| Calumet & Ariz... | 4,000,000 | 3,800,000 | 4,500,000 | 4,000,000 | ........ |
| Chino........... | 3,682,706 | 4,831,185 | 6,050,867 | 4,308,296 | ........ |
| Detroit......... | 1,750,601 | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 |
| East Butte...... | 1,055,646 | 1,060,257 | 1,162,007 | 1,233,018 | ........ |
| Giroux......... | 598,240 | 584,546 | 524,953 | 198,178 | ........ |
| Mason Valley.. | 1,097,014 | 908,892 | 867,060 | ........ | ........ |
| Miami.......... | 2,612,000 | ........ | ........ | ........ | ........ |
| Mammoth....... | 1,750,000 | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 |
| Nevada Con..... | 6,344,863 | 5,403,919 | 5,989,973 | 4,441,671 | ........ |
| Ohio........... | 537,400 | 601,700 | 689,000 | 685,900 | ........ |
| Old Dominion.... | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 | ........ |
| Ray............ | 4,392,612 | 4,097,000 | 4,269,519 | 4,336,434 | ........ |
| Shannon......... | 924,000 | 880,000 | 1,248,000 | 1,232,000 | ........ |
| South Utah...... | 185,000 | 140,000 | 223,498 | 241,843 | ........ |
| Tennessee...... | 1,379,115 | 1,379,220 | 1,247,804 | 1,309,950 | ........ |
| United Verde*... | 2,900,000 | 3,000,000 | 3,000,000 | 3,000,000 | ........ |
| Utah Copper Co.. | 11,637,949 | 9,849,043 | 10,302,251 | 11,463,905 | ........ |
| Lake Superior* .. | 16,500,000 | 17,500,000 | 9,700,000 | 6,950,008 | ........ |
| Non-rep. mines*. | 6,000,000 | 6,200,000 | 6,200,000 | 6,000,000 | ........ |
| Total prod..... | 104,051,138 | 101,758,167 | 96,769,607 | ........ | ........ |
| Total blister... | 122,306,405 | 130,788,157 | 119,244,077 | ........ | ........ |
| Imp. ore & matte. | 7,497,002 | 8,527,046 | 9,171,351 | ........ | ........ |
| Total Amer.... | 129,803,407 | 139,315,203 | 128,415,428 | ........ | ........ |
| Miami†......... | ........ | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 |
| Shattuck-Arizona | 1,059,625 | 1,019,388 | 1,001,634 | 1,163,237 | ........ |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop.. | 634,238 | 618,379 | 647,905 | 621,120 | ........ |
| Granby......... | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 | ........ |
| Mexican Cos.: | | | | | |
| Boleo†.......... | 1,984,640 | 2,240,720 | 2,264,640 | 2,369,920 | ........ |
| Cananea........ | 2,908,000 | 3,328,000 | 3,186,000 | 3,148,000 | ........ |
| Moctezuma...... | 3,438,793 | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 |
| Other Foreign: | | | | | |
| Braden, Chile.... | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 | ........ |
| Cape Cop., S. Af. | 414,400 | ........ | ........ | ........ | ........ |
| Kyshtim, Russia. | 1,000,000 | 2,500,000 | 1,585,000 | ........ | ........ |
| Spassky, Russia.. | 835,520 | 660,800 | 1,048,320 | 1,025,920 | ........ |
| Exports from | | | | | |
| Chile.......... | 5,824,000 | 9,856,000 | 8,736,000 | 5,600,000 | ........ |
| Australia...... | 7,616,000 | 10,304,000 | 7,720,000 | 6,944,000 | ........ |
| Arrivals-Europe‡ | 5,277,440 | 11,728,640 | 14,624,960 | 9,661,120 | ........ |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| X, '12. | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI..... | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII.... | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ........ | ........ | ........ |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II..... | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III.... | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV..... | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V...... | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI..... | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII.... | 138,074,602 | 58,904,192 | 78,480,071 | 52,811,606 | 71,904,000 | 124,808,606 |
| VIII... | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX..... | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X..... | ........ | ........ | ........ | 29,793,094 | 53,625,600 | 83,418,694 |
| XI.... | ........ | ........ | ........ | ........ | 48,787,200 | ........ |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Alameda, Ida | Oct. 21 | Nov. 20 | 0.0015 |
| Bismarck, S. D. | | | 0.01 |
| Carbonate, Ida | Nov. 3 | Nov. 22 | 0.001 |
| Carlo-Nevada, Nev | Oct. 25 | Nov. 11 | 0.001 |
| Cedar Extension, Utah | Oct. 30 | Nov. 17 | 0.005 |
| Central Eureka, Calif | Oct. 13 | Nov. 14 | 0.05 |
| Comet, Ida | Oct. 20 | Nov. 20 | 0.0005 |
| Copper King, Ida (postpon'd) | Sept. 14 | Nov. 14 | 0.01 |
| Corbin, Mont | | Nov. 14 | 1.00 |
| Crown Point, Nev | Oct. 20 | Nov. 12 | 0.10 |
| [illegible], Ida | Oct. 20 | Nov. 20 | 0.0025 |
| Eureka, Utah | Oct. 21 | Nov. 11 | 0.001 |
| Globe Cons., Utah | Nov. 6 | Nov. 28 | 0.001 |
| Gold Bond, Utah | Nov. 10 | Nov. 24 | 0.001 |
| Hamburg-American | July 22 | Nov. 9 | 0.0075 |
| Lead-Bullion, Utah | Nov. 5 | Nov. 26 | 0.004 |
| Lewis & Clark, Ida | Oct. 15 | Nov. 18 | 0.0075 |
| Mountain Queen, Ida | Oct. 17 | Nov. 17 | 0.0005 |
| North Star, Ida | Oct. 23 | Nov. 24 | 0.0005 |
| Payson-Eldorado, Utah | Oct. 31 | Nov. 21 | 0.0005 |
| Revenue Cons., Utah | Oct. 29 | Nov. 19 | 0.005 |
| Spider, Utah | Oct. 23 | Nov. 15 | 0.0025 |
| Sunset, Ida | Oct. 18 | Nov. 12 | 0.002 |
| Sunset, Nev. (postpon'd) | | Nov. 17 | |
| Tonopah, Gypsy Queen | Oct. 20 | Nov. 24 | 0.01 |
| Utah United, Utah | Oct. 1 | Oct. 30 | 0.01 |
| Wisconsin, Ida | Oct. 9 | Nov. 10 | 0.002 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53.340 | 63.471 | 60.793 | 24.594 | 29.299 | 28.083 |
| November | 55.719 | 62.792 | | 25.649 | 29.012 | |
| December | 54.905 | 63.365 | | 25.349 | 29.320 | |
| Year | 53.304 | 60.835 | | 24.592 | 28.042 | |

New York quotations, cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | 16.328 | 17.698 | 16.799 | 78.762 | 73.125 |
| October | 17.314 | 16.337 | 17.661 | 16.913 | 76.389 | 73.383 |
| November | 17.326 | | 17.617 | | 76.890 | |
| December | 17.376 | | 17.600 | | 75.516 | |
| Year | 16.341 | | 16.560 | | 72.942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.140 |
| March | 42.577 | 46.832 | 192.619 | 213.615 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | 42.410 | 223.762 | 193.074 |
| October | 50.077 | 40.462 | 228.351 | 184.837 |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York, cents per pound. London in pounds sterling per long ton

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | 4.698 | 4.924 | 4.579 | 22.292 | 20.648 |
| October | 5.071 | 4.402 | 4.894 | 4.253 | 20.630 | 20.302 |
| November | 4.615 | | 4.463 | | 18.193 | |
| December | 4.303 | | 4.152 | | 18.069 | |
| Year | 4.471 | | 4.360 | | 17.929 | |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7.426 | 5.340 | 7.276 | 5.188 | 27.543 | 20.614 |
| November | 7.371 | | 7.221 | | 26.804 | |
| December | 7.162 | | 7.081 | | 26.494 | |
| Year | 6.943 | | 6.799 | | 26.421 | |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.65 | 16.03 | 15.04 | 15.63 | 14.93 |
| October | 17.90 | 16.60 | 17.18 | 14.61 | 17.22 | 14.80 |
| November | 18.07 | .. | 17.09 | | 18.00 | ... |
| December | 18.15 | . | 17.45 | . | 18.73 | ... |
| Year | $16.01 | . . | $14.93 | . . . | $15.28 | ... |

## STOCK QUOTATIONS

**COLO. SPRINGS Nov. 4**

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02¼ |
| Cripple Cr'k Con | .01¼ |
| C. K. & N. | .08½ |
| Doctor Jack Pot | .06 |
| Elkton Con | 54½ |
| El Paso | 2.80 |
| Findlay | 02 |
| Gold Dollar | 09 |
| Gold Sovereign | 02¼ |
| Isabella | 09¾ |
| Jack Pot | 05 |
| Jennie Sample | 04 |
| Jerry Johnson | 03 |
| Lexington | ‡.005 |
| Moon Anchor | ‡.006 |
| Old Gold | 01¼ |
| Mary McKinney | 55¼ |
| Pharmacist | 01 |
| Portland | 95 |
| Vindicator | 82 |

**SALT LAKE Nov. 3**

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .04 |
| Black Jack | 07 |
| Cedar Talisman | 00½ |
| Colorado Mining | 10½ |
| Columbus Con | ‡.01 |
| Crown Point | 00½ |
| Daly-Judge | 5.50 |
| Grand Central | 52 |
| Iron Blossom | 1.10 |
| Little Bell | ‡.10 |
| Lower Mammoth | 01 |
| Mason Valley | 4.00 |
| May Day | 04 |
| Nevada Hills | 50 |
| New York | ‡.02½ |
| Prince Con | 25 |
| Silver King Coal'n | 3.82½ |
| Sioux Con. | 01 |
| Uncle Sam | 03½ |
| Yankee | ‡.08½ |

**TORONTO Nov. 4**

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | 07¼ | Foley O'Brien | 15 |
| Coniagas | 7.00 | Hollinger | 17.12½ |
| T. & Hudson Bay | ‡70.00 | Imperial | ‡.02 |
| Timiskaming | 11 | Jupiter | 08 |
| Wettlaufer-Lor. | 08 | Pearl Lake | 12 |
| Apex | ‡.01 | Porcu. Gold | 12 |
| Big Dome | 10.00 | Preston E. D. | 03 |
| Crown Chartered | ‡.00½ | Rea | 16 |
| Dobie | 10 | Swastika | 03 |
| Dome Exten | 08 | West Dome | 05 |

**SAN FRANCISCO Nov. 4**

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | .06 | Belmont | 7.25 |
| Belcher | 23 | Jim Butler | 64 |
| Best & Belcher | .06 | MacNamara | 10 |
| Caledonia | 1.75 | Midway | 39 |
| Challenge Con | 08 | Mont.-Tonopah | 1.05 |
| Chollar | 06 | North Star | 42 |
| Confidence | 38 | West End Con. | 1.20 |
| Con. Virginia | .18 | Atlanta | 12 |
| Crown Point | 28 | Booth | 02 |
| Gould & Curry | 03 | C.O.D. Con | 03 |
| Hale & Norcross | 11 | Comb. Frac | 03 |
| Mexican | 1.45 | Jumbo Extension | 08 |
| Occidental | 70 | Pitts.-Silver Peak | 40 |
| Ophir | 28 | Round Mountain | 38 |
| Overman | 41 | Sandstorm Kendall | 08 |
| Potosi | 04 | Silver Pick | 03 |
| Savage | 14 | Argonaut | 3.00 |
| Sierra Nevada | 13 | Bunker Hill | ‡1.50 |
| Union Con. | 23 | Central Eureka | .16 |
| Yellow Jacket | 30 | So. Eureka | 2.00 |

**N. Y. EXCH. Nov. 3**

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 71½ |
| Am. Agri. Chem | 43 |
| Am.Sm.&Ref.,com | 62¾ |
| Am. Sm. & Ref., pf. | 99½ |
| Am. Sm. Sec., pf. B | 84¾ |
| Anaconda | 34½ |
| Batopilas Min. | 1 |
| Bethlehem Steel,pf | 70 |
| Chino | 38¾ |
| Federal M. & S., pf | 38 |
| Great Nor.,ore.,ctf. | 31½ |
| Guggen. Exp. | 44½ |
| Homestake | 107 |
| Inspiration Con. | 14¾ |
| Miami Copper | 22½ |
| Nat'l Lead, com. | 43½ |
| National Lead, pf | 101½ |
| Nev. Consol. | 15¼ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf | 89¼ |
| Quicksilver, pf. | 4½ |
| Ray Con. | 18½ |
| Republic I&S,com | 19 |
| Republic I&S, pf. | 79 |
| SlossSheff'd,com | 26 |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper | 28¾ |
| Utah Copper | 51 |
| U. S. Steel, com. | 56 |
| U. S. Steel, pf | 105½ |
| Va.Car.Chem.,pf. | 93 |

**N. Y. CURB Nov. 3**

| Name of Comp. | Clg. |
|---|---|
| Ariz. Belmont | 11 |
| Barnes King | 1½ |
| Beaver Con. | .32 |
| Big Four | 19 |
| Braden Copper | 6½ |
| B. C. Copper | 2¾ |
| Buffalo Mines | 2 |
| Can. G. & S. | 19 |
| Caribou | 60 |
| Con. Ariz. Sm. | 25 |
| Coppermines Cons | 3 |
| Davis-Daly | 1¾ |
| Diam'field-Daisy | 04 |
| Ely Con | 06 |
| Florence | 23 |
| Gold Hill Con | 25 |
| Goldfield Con | 1 3/16 |
| Greene Cananea | 32 |
| Greenwater | 05 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 4½ |
| La Rose | 1¾ |
| McKinley-Dar-Sa | 1½ |
| Min. Co. of A. new | 2½ |
| New Utah Bingham | 79 |
| Nipissing Mines | 8 |
| Ohio Copper | .50 |
| Pacific Sm. & M. | ‡¼ |
| Puebla S. & R. | 3 |
| South Utah M&S | 3/16 |
| Stand'd Oil of N. J. | 377 |
| Stewart | 1½ |
| Tonopah | 4½ |
| Tonopah Ex. | 1¾ |
| Tonopah Merger | 59 |
| Tri-Bullion | ⅛ |
| Tularosa | ½ |
| Union Mines | 08 |
| United Cop., pfd | ‡3 |
| Yukon Gold | 2¾ |

**LONDON Oct. 25**

| Name of Comp. | Clg. |
|---|---|
| Camp Bird | £0 14s 9d |
| El Oro | 0 14 6 |
| Esperanza | 0 17 6 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 8 0 |
| Santa Gert'dis | 0 14 6 |
| Stratton's | 0 1 0 |
| Tomboy | 1 6 3 |

**BOSTON EXCH. Nov. 3**

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1¾ |
| Ahmeek | 275 |
| Alaska Gold M. | 21¾ |
| Algomah | 1¼ |
| Allouez | 34½ |
| Am. Zinc | 17¾ |
| Ariz. Com., ctfs. | 4 11/16 |
| Bonanza | .35 |
| Boston & Corbin | 50 |
| Butte & Balak | 4⅞ |
| Calumet & Ariz. | 63½ |
| Calumet & Hecla | 410 |
| Centennial | 13½ |
| Cliff | 1 |
| Copper Range | 37½ |
| Daly West | 2 |
| East Butte | 11¾ |
| Franklin | 3 |
| Granby | 69½ |
| Hancock | 15½ |
| Hedley Gold | 30 |
| Helvetia | .25 |
| Indiana | 3½ |
| Island Cr'k, com. | 46¾ |
| Island Cr'k, pfd. | 82 |
| Isle Royale | 18 |
| Keweenaw | 1½ |
| Lake | 8 |
| La Salle | 3½ |
| Mass | 2 |
| Michigan | 1 |
| Mohawk | 41 |
| New Arcadian | 1½ |
| New Idria Quick. | 2½ |
| North Butte | 23½ |
| North Lake | 1½ |
| Ojibway | .50 |
| Old Dominion | 48½ |
| Osceola | 78 |
| Quincy | 58 |
| Shannon | 6¾ |
| Shattuck-Ariz. | 26½ |
| Superior | 23 |
| Superior & Bost. | 2½ |
| Tamarack | 28 |
| Trinity | 4½ |
| Tuolumne | .85 |
| U. S. Smelting | 37 |
| U. S. Smelt'g, pf. | 46½ |
| Utah Apex | 1¾ |
| Utah Con. | 8½ |
| Victoria | 1½ |
| Winona | 1½ |
| Wolverine | 42 |
| Wyandot | .50 |

**BOSTON CURB Nov. 3**

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | 5½ |
| Boston Ely | 47 |
| Butte&Lon'nDev. | 28 |
| Cactus | 02 |
| Calaveras | 1½ |
| Chief Cons. | 1 1/16 |
| Corbin | 30 |
| Cortez | 20 |
| Crown Reserve | 1 11/16 |
| Eagle & Blue Bell | 1 |
| First Nat. Cop. | 2 11/16 |
| Houghton Copper | 3½ |
| Majestic | 27 |
| Mexican Metals | 11 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 1½ |
| New Baltic | .50 |
| Oneco | 80 |
| Raven Copper | 08½ |
| Rhode Island Coal | ‡.01 |
| Smokey Dev. | 75 |
| So. Lake | 3½ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | 28 |
| Trethewey | .25 |
| United Verde Ext. | 45 |

‡Last Quotation

The Engineering and Mining Journal

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# Lead, Zinc and Copper Smelting in America—II

*SYNOPSIS—A continuation of F. Heberlein's observations and comments on current American nonferrous metallurgical practice.*

⁂

Hand furnaces for roasting blende I have not seen anywhere in my travels. For this last purpose, the well known Hegeler furnace is used, even where it is not intended to utilize the sulphur of the blende which is most usually everywhere the case. Outside of the Hegeler furnace we find a whole series of Zellweger or Cappeau furnaces in operation. The latter is a kind of Ropp furnace altered to suit mechanical blende roasting. Neither of these furnaces has muffles, but a direct grate fire.

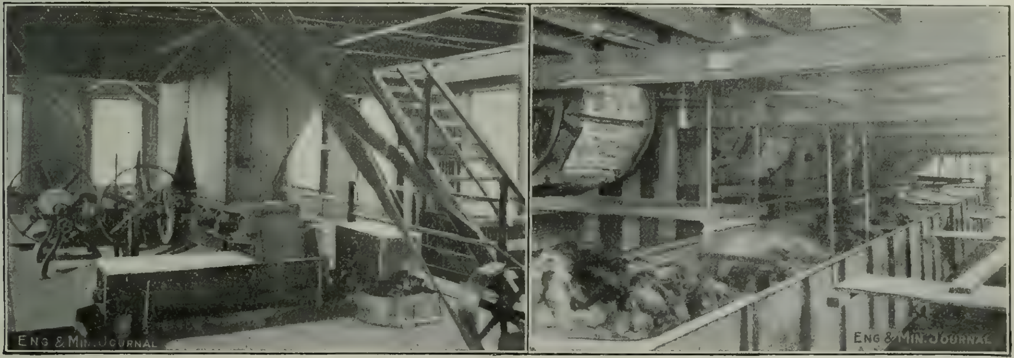

Fig. 1. Dwight-Lloyd Straight-Line Roasting Plant

In reverberatory smelting for copper it is necessary to put the roasted ore as hot as possible into the furnace. The roasted ore from the Herreshoff and similar furnaces is dropped into skips suspended on an aërial ropeway, which delivers it, red hot, into the hoppers of the furnace. Moist ores intended to be smelted in the reverberatory furnace must undergo a previous sharp drying operation in a mechanical furnace. At one works I saw a Wedge drying furnace capable of drying 160 tons of copper concentrate with 7% moisture in 24 hr., and heating it up to 350° Centigrade.

### Cheap Fuel Leads to Differences in Practice

As mentioned in the preamble, fuel is comparatively cheap in most reduction works of North America. The consequence of this circumstance is that not so much attention is paid to a thorough utilization of the fuel as with us. Even in zinc works, regenerators or recuperators are seldom used. In some places natural gas is still to be had at comparatively cheap prices, for instance in Pennsylvania, Kansas, Oklahoma, etc. The gas contains about 94% hydrocarbons (almost exclusively marsh gas), 1% CO and 4% N, and costs about ⅛c. per cu.m. Nearly 600 cu.m. of gas are equivalent in calorific value to about 100 kg. good coal corresponding to a coal price of $1.25 per ton. A particular advantage of natural gas is that the cost of construction of the furnaces in which gas is burned is cheap and the operating of the furnaces is particularly clean on account of the absence of ashes and dust. Through the growing consumption of natural gas for lighting cities, for the generation of steam, etc., not only the gas pressure, but also the volume of gas, is rapidly getting less, so that the life of the gas wells is comparatively short and the plants relying upon them have to be amortized rapidly.

In some states, for instance, in California, Texas and Utah, oil is used as fuel for metallurgical furnaces and the experience had with this kind of fuel is exceedingly favorable even where the application of oil does not recommend itself by its cheapness. Not taking into account the clean work, easy transportation to the reduction works and inside of them, the easy handling of the oil, the flame can be regulated with great facility in regard to degrees of heat as well as to oxidation and reduction processes. Considering that a large copper reverberatory furnace consumes 80 tons of coal daily, of which about 16 tons are reproduced as waste in the shape of ashes, it will be readily understood what saving there will be effected in transportation by replacing coal by oil.

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Note—Abstract by O. H. Hahn, of F. Heberlein's "Eine Exkursion auf nordamerikanische-mexikanische Blei-, Zink- und Kupferhütten," in "Metall und Erz," 1913, p. 717.

One of these large copper-smelting reverberatories, 6 m. wide by 33 m. long, consumes with a daily smelting capacity of from 350 to 400 tons of ore between 45 and 50 tons of oil. The gases escaping at the end of the furnace pass through flue boilers and generate sufficient steam for 600 hp. Dust coal heating plants are few and far between, probably on account of the heavy cost of installation and because the flue ashes are too apt to settle on the metal and slag baths, thereby not only toughening, but also contaminating them.

Without doubt the metallurgy of copper is an art in which the American metallurgists excel, and nowhere can the most modern devices of copper works be studied better than in North America. The great evolution of this industry during the last 10 years is founded on the most varied occurences, and the manifold working conditions have raised the metallurgy of copper to a high state of perfection. Not only has the yield in metal constantly increased, but the working costs have been steadily decreasing, so that today copper ores may be beneficiated which 15 years ago nobody would touch. The great perfection of copper-smelting methods has deprived the wet methods formerly employed on a large scale of much of their prestige, so that today, whenever possible, preference is given to the dry methods.

### COPPER SMELTING STILL AHEAD OF HYDROMETALLURGY

From the literature of the past years the various appliances and furnaces of a copper smeltery are well known to all, so that I can restrict myself to making some general remarks on the principles of copper extraction in use at the present day. As a general thing the sulphide ores are treated separately, according to their size. Coarse ores above ¾ in. are consigned to the shaft-furnace without previous roasting and are there subjected to a kind of pyritic smelting for a 40 to 45% matte, if possible. About 75% of the sulphur burns off in this operation, passing as $SO_2$ into the open or into sulphuric-acid chambers.

While the matte accumulates in the forehearth the waste slag with about 0.4% copper is run into slag pots, the liquid contents of which are emptied over the dump. The fine sulphide ores below ¾ in. are roasted, if high enough in sulphur, or if poor, assigned to the reverberatory-smelting operation along with the roasted ore. These modern mammoth reverberatories are at the present moment popular with copper smelters, particularly where oil is cheap. The products are likewise waste slag with about 0.4% copper and a matte with 40 to 45% copper. The latter is, with that from the forehearths of the shaft furnaces, tapped into ladles and poured while liquid into the converters with the addition of acid copper ores. By blowing, a blister copper with about 96% Cu and a varying tenor of precious metals is obtained, which by means of ladles and casting machines, is cast into blocks and molds.

### BASIC CONVERTING

A few years ago basic converters began to replace those with acid lining for blowing copper matte. Their greater durability has rapidly contributed to their general introduction. While with the acid converters formerly only three charges were blown, yielding in the most favorable case 150 tons; today in similar converters with a basic lining, as much as 6000 tons of blister copper may be produced. Recently experiments have been made in several places with a view to blow lead-copper matte, even with low copper content, in the basic converter. Technically, these experiments are said to have been successful, but on the economy of blowing lead matte poor in copper, the opinion of the profession is much divided.

The further treatment of the blister copper by electrolysis takes place for the most part in refining works, situated in the vicinity of New York. The method most used is the multiple one, the series being the exception. There are electrolytic works with a daily capacity of 500 tons electrolytic copper. Some refining and wire-bar furnaces put through more than 300 tons copper per 24 hr., while the capacity of the copper blast and reverberatory furnaces in smelting ore rises to 800 tons and 500 tons, respectively[1]. Excepting the Mansfeld works, which smelt the largest tonnage in Europe, a single American furnace would almost suffice to smelt the entirety of the copper ore put through in Europe in one day.

The lead-smelting works of North America may be divided into two groups, "to wit," such as treat ores rich in lead (with 65% Pb) by themselves, and such as treat a smelting mixture poor in lead in conjunction with silver-gold ores poor in copper. The smelting plants for rich lead ores are mostly situated in the Missouri district, and produce about 130,000 tons of commercial lead per annum. From the second group about 250,000 tons lead will probably originate, which would correspond to about 1.8 to 2 million tons of smelting charge.

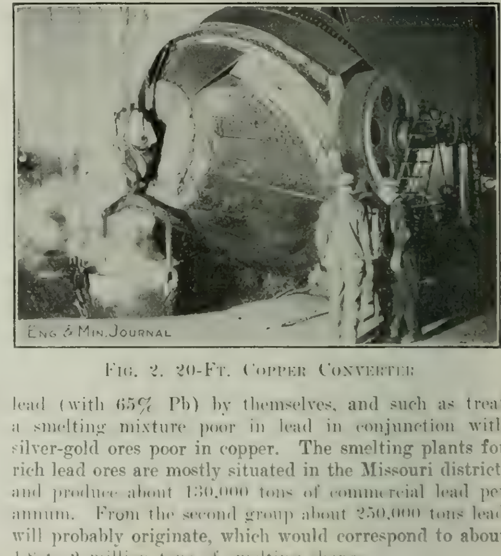

FIG. 2. 20-FT. COPPER CONVERTER

### SMELTING NON-ARGENTIFEROUS LEAD ORES

The Missouri ores contain so little silver that the resulting lead bullion shows only 2 oz. Ag per ton. For this reason, it is not desilvered, but refined directly by poling with steam and air. Small quantities of copper, therefore, remain in the lead besides the silver, rendering it unfit for the manufacture of white lead, but desirable for rolling.

The rich lead ores are either preroasted in a Scotch hearth and thereby liberated from 50% of their lead content, to be subsequently smelted in the shaft furnace; or, these ores are roasted, for instance, in the H.-H. circular furnace or in H.-H. converters, or directly with addition of silica and some flue dust in the Dwight-Lloyd machine (Fig. 1), whereupon the reduction in the shaft furnace follows:

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[1] The smaller blast furnaces at the Washoe works have a capacity of about 1600 tons of charge per day, the large one about 3000 tons.—Editor.

The shaft furnaces are almost exclusively of rectangular section, being 96 to 144 in. long by 36 to 42 in. wide at the tuyere level. The number of tuyeres ranges from 12 to 18 with a mouth of about 4 in. The pressure of blast applied varies between 120 and 160 cm. water column. The consumption of coke is generally given in solid carbon and amounts to about 12% of the latter, calculated on the smelting charge, in which, however, the slag returned to the furnace is not included. Despite the small copper content and the kindly nature of the Missouri ores, the amount of matte falling and the consumption of coke are exceedingly high in my conception. In my opinion, this is due principally to the difference of the European way of roasting as compared with the American.

The ores poor in lead, with about 4½% sulphur, go directly to the shaft furnace; with a higher percentage of sulphur they are, like the ores rich in lead, roasted and sintered either by the H.-H. or by the Dwight-Lloyd method prior to being sent to the shaft furnace. It is claimed that for good work in the latter, the smelting mixture must not contain less than 10 to 12% lead and that a good extraction of gold and silver can only be attained if the weight of lead bullion plus matte produced amounts to at least 18% of that of the smelting mixture. The matte is from time to time caught in a forehearth (Fig. 3), and the poor slag runs from it into slag pots which are taken to the dump. The first matte scarcely ever runs higher in copper than 10 to 12%. With a higher percentage than that it is difficult to keep the automatic tap from clogging. This first matte is ground, roasted and sintered in the above mentioned apparatus and concentrated in the shaft furnace to 40 or 45% Cu when it goes to the copper smeltery.

The lead bullion of the many smelting plants in the United States is refined in large desilvering establishments, much in the same manner as with us. As fuel for refining and cupeling furnaces and zinc-distillation retorts oil is used altogether of late. For taking off the zinc alloy the Howard press is used exclusively, also the Howard mixer for stirring the zinc into the lead bullion.

### Zinc Metallurgy

The zinc smelteries of the States have been located preferably in places where cheap coal or natural gas is at hand. The sulphur of the blende is, as mentioned already, hardly utilized anywhere not even where roasting is performed in the Hegeler furnaces which are provided with muffles. The Zellweger roasting furnaces are about 35 m. long and have a height of not less than 7 ft. at the higest point of the arch. In 24 hr. about 30 tons of raw blende are put through with a consumption of gas amounting to 600,000 cu.ft. corresponding to an approximate calorific value of 30 tons coal or 100% of the weight of the ore. The roasting is nevertheless cheap and good. Nor are the losses in metal high. Much less gas is consumed by the Capeau furnace (with a height of arch of 3 ft. 7 in.). In this furnace the consumption of gas on 25 tons of raw blende amounts to only 300,000 cu.ft., equal to 15 tons of coal and corresponding to 60% of the weight of the ore. The zinc-distillation furnaces on the basis of natural gas and also the Hegeler furnaces are operated without regenerator and recuperator systems, but put through large quantities of ore per furnace, to wit, in 860 muffles upward of 18,000 kg. One peculiarity of the furnaces is the absence of *allonges,* as the receivers which are partially protruding from the furnace are pretty cool. There is hardly any *poussière* (zinc dust) produced.

The discharge of the muffles is mostly performed by squirting water or steam into them and subsequent scraping out of the adhering slag. Usually each furnace is in a building by itself.

The fuel consumption of the distillation furnaces is, of course, considerable and may approach 180% of the weight of the roasted blende.

### Wet Processes

Among the wet processes the cyanidation of gold and silver stands in the front rank. Frequently mercury is added from the start to the cyanide solution in the process of crushing the ore. The ores of the Cripple Creek district which were formerly worked by the Plattner chlorination process are also cyanided at the present time after the sulphides and tellurides have been decomposed by roasting. Even from the arsenic-cobalt ores rich in silver, the precious metals are extracted by amalgamation in combination with cyanidation. The extraction of copper by chloridizing roasting of burnt pyrites and poor ores which cuts such a figure in Europe is at present only carried out at Philadelphia on a large scale. Much was said about many new copper-leaching processes at the International Congress, but as to their success the future must decide. Owing the large annual production of precious metals in the United States, the parting of gold and silver plays a very important part. Much to my surprise I found that the large parting establishments have returned from the electrolytic to the sulphuric-acid process. As far as I could gather, the latter process gives quicker results and therefore saves interest on capital. For the refining of gold with recovery of the metals of the platinum group at the same time the Wohlwill process is exclusively used.

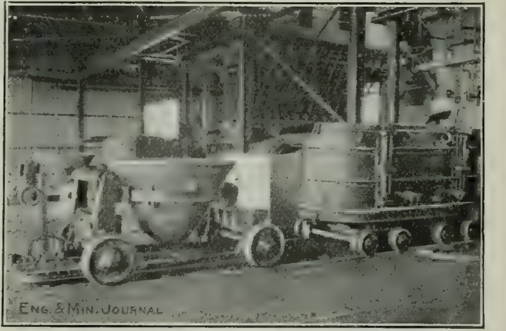

Fig. 3. Forehearth and Slag Pot

During the last few years the greatest attention has been paid in the United States to the problem of flue-dust condensation and large sums of money have been expended for experiments and plants in this direction. Contrary to our European practice, to condense wet as much as possible, in the United States, preference is given to the so called baghouses or sack filters which, in some parts, are automatically shaken up. They undoubtedly work well where very acid gases do not come into play. However, the space they require and their cost of construction is a matter of serious consideration (Fig. 4). The flues which may be cheap in construction and good in cooling effect are built on the catenary plan. The old Friedrichshütte wire chambers are also popular and are said to give good results.

At some works experiments have been made with the Cottrell method to precipitate flue dust by a high-tension direct current which gave good results, especially with wet gases. An oxidation of $SO_2$ to $SO_3$ and condensation of the latter was not attained by this process. As several large works had been obliged to suspend operations on account of fume damages, many experiments to render the sulphurous acid harmless have been carried out. Yet an economically successful method of rendering gases poor in $SO_2$ innocuous has not even been discovered in America. The only remedy I see in that case is to dilute the $SO_2$ with air till it reaches the limit of innocuousness. Professor Young proposes to render concentrated $SO_2$ gases harmless by reducing them at a high temperature with hydrocarbons and in the presence of a catalysator to elemental sulphur. Young's method is said to work well on gases with high $SO_2$ and a low O content, but it will prove too expensive on poorer gases.

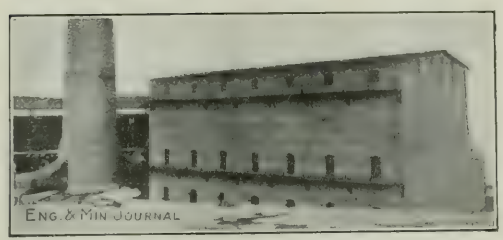

FIG. 4. TYPICAL BAG HOUSE

Much was said at the Congress of Chemistry about new methods for the preparation of potash salts from phonolites and leucites. I have not heard anything, though, about the economy of these processes. However, it is a sure thing that great efforts are being made in the United States to become independent of the German potash market.

Much work is being done on the preparation of high-grade fertilizers from crude phosphate without the use of sulphuric acid. Accordingly a mixture of phosphate with lime is to be burned at a high temperature, yielding an excellent fertilizer with phosphoric acid soluble in citric acid, but not in water.

There is not much to be said about the sanitary arrangements at American reduction works. Although the regulations of the health officers are not so strictly carried out as with us, the correctness of the principle that employees can only perform a maximum task if the fundamental conditions of good work are present, that is, if light and pure air are abundant and that it is to the best interest of the employers to provide for good, well lighted working rooms with sufficient ventilation, has been recognized.

One word about technical bookkeeping. I had occasion at [illegible] works to gain an insight into it and have had the very best impression of it. Not only is the control of workmen, ore and stores carried out minutely, but the daily reports enable the manager to make an almost exact calculation of his costs at any time.

As a result of my observations, I must say that the Americans are far ahead of us in the metallurgy of copper. In regard to the beneficiation of large quantities of smelting mixtures poor in lead, no comparison can be drawn, because the conditions for such work are wanting in Europe. However, this work is carried out admirably in America. In regard to the treatment of ores rich in lead, we European smelters can stand a comparison with our American colleagues very well. In the metallurgy of zinc we are somewhat ahead of the Americans in the quality of the work (that is the extraction of metal and consumption of coal). Thanks to their cheap fuel many of their zinc works work cheaper than ours.

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## Nature of Porcupine Gold Occurrence

Writing in *Economic Geology*, August, 1913, Reginald E. Hore outlines some of the characteristics of the Porcupine deposits. The ore is native gold in pyritic quartz. The quartz occurs as: (1) Single fissure fillings or true veins; (2) a series of fissure fillings or a vein system; (3) quartz-ferrodolomite lodes in which quartz veins penetrate bands of ferrodolomite; (4) irregular quartz masses in the form of chimneys, kidneys, etc. The quartz in the veins is readily divided into two classes, the coarse and the fine, the grains in the former being about 10 times the size of the grains in the latter. The microscope shows gold occurring in the following forms: (1) A grain of gold completely inclosed in a grain of the coarse quartz; (2) gold in spaces between grains of the coarse quartz; (3) gold in crystals and grains of pyrite; (4) gold grains in calcite, completely or partly inclosed; (5) gold among grains of the fine quartz.

The explanation of the formation of the deposits supposes the gold to have been in solution with iron, sulphur, silica, potassium and carbon dioxide. The potassium and carbon dioxide escaped into the wall rock to aid in the formation of sericite and ferrodolomite. Part of the iron and sulphur similarly escaped to form pyrite and ferrodolomite. The rest of the iron and sulphur with most of the gold and silica was deposited in the fissures. The more ready penetration of the wall rock by the carbon dioxide, potassium, sulphur and iron, left the gold more concentrated in the solution and consequently more easily precipitated. The pyrite first formed in the veins was poorly crystallized, being quickly formed; that in the wall rock and that in the veins which is of secondary origin, formed slower and shows better crystals. In the first crystallization, the gold and pyrite tended to segregate here and there, the proximity of pieces of inclosed rock favoring deposition. After filling, the fissures were shattered, and in the crushed zones, secondary minerals, including sericite, chlorite, calcite, ferrodolomite, pyrite and some gold, were again deposited. Probably these originated in the vein and in the wall rock. This gold is coarser and probably grew slowly by accretion of small particles. The fine gold in the vicinity probably contributed to its growth, thus leaving low-grade quartz in the neighborhood of coarse gold. While showy, this coarse gold is subordinate in amount to the fine, although some of the fine gold also may be secondary. There is nothing to indicate great changes in the character of the deposits since glacial erosion, and there is no relation between the character of the ore and the present surface. The secondary changes are not surface alterations.

# The Buckeye-mobile

*SYNOPSIS—A self-contained superheated steam-driven unit which turns out an indicated horsepower on a trifle over a pound of coal per hour, in sizes of less than 200 horsepower capacity.*

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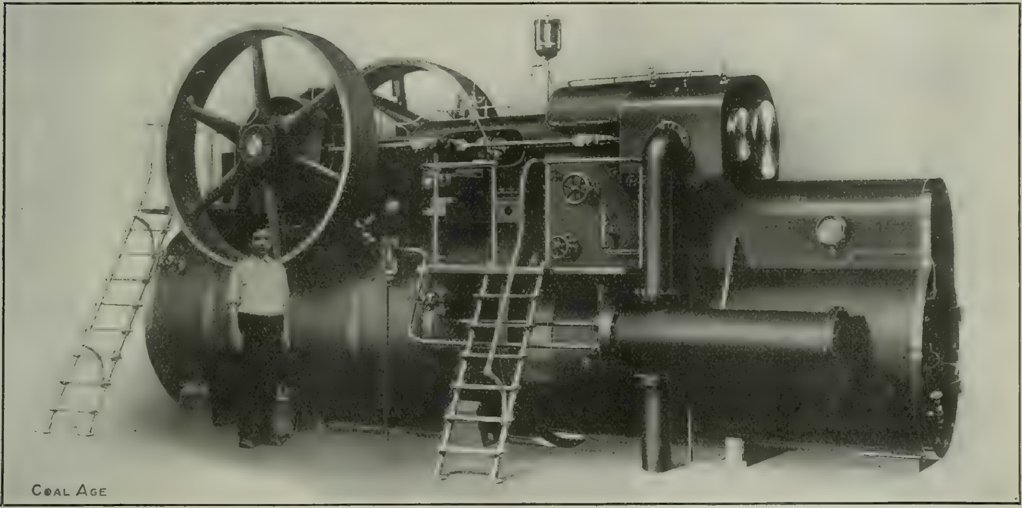
The type of prime mover known variously in Europe as the "locomobile," "overtype," and "semi-fixé" is a complete self-contained power plant, consisting of a boiler on which is mounted a compound engine, the cylinders of which are inclosed in the smoke box. These cylinders are equipped with piston valves adapted for the use of highly superheated steam. The smoke box also contains a superheater, a reheater and the necessary piping for leading the steam from the boiler through the initial superheater to the high-pressure cylinder and from it through the secondary superheater or reheater to the low-pressure cylinder.



THE COMPLETE SELF-CONTAINED UNIT. NOTE SIZE OF BOILER COMPARED TO ENGINE

The superheaters are inclosed in a special casing whereby the hot gases emerging from the boiler tubes are compelled to traverse first the initial superheater and next the reheater before being discharged into the smoke box proper.

The unit comprises also a boiler-feed pump driven directly from the engine valve gear, a closed feeder-water heater in the exhaust line from the low-pressure cylinder and a suitable jet or surface condenser with a rotary air pump driven from the main shaft of the engine.

The initial superheater is a single coil of seamless steel tubing through which the steam passes in a direction counter to that of the hot gases. The reheater consists of two headers joined by a large number of small seamless tubes. An effective steam-jet blower enables the operator to remove all soot and dust from these superheaters as well as the boiler tubes as often as may be necessary. In order that the boiler may be thoroughly inspected and cleaned, the furnace and tubes are made removable by simply unscrewing a row of bolts on each end of the boiler.

The amount of fuel used by these units is surprisingly small, and it was the adoption of a self-contained steam plant of this sort for its propulsion that gave the name Locomobile to a well known American motor car. These units, not at all of the rough-and-ready order of the ordinary portable outfit, but highly finished and adapted to the ornate surroundings of the high-class continental power plant, are in common use abroad. The economical results obtained by this device have been so marked that the Buckeye Engine Co., of Salem, Ohio, has made careful and thorough investigation of the principles employed with a view of offering to the American power-using public a machine of equal merit.

This unit through its effective utilization of heat makes possible a power cost hitherto unobtainable by any type of small or moderate-sized steam plant. Small installations as a rule are wasteful of fuel, coal consumptions of 5 to 8 lb. per housepower-hour being common. The cause for this may be found in the disposition to employ simple high-speed noncondensing engines using 30 lb. of steam or more per horsepower-hour and the failure to provide the heat-saving auxiliaries commonly installed in large plants. Radiation losses are relatively greater in small engines, boilers and piping than in large plants.

Economy tests of the Buckeye-mobile show that one horsepower can be generated on between 9 and 10 lb. of steam per hour or a trifle over one pound of coal. The fuel consumption curve is nearly flat, that is to say, this excellent economy is obtainable not only at normal load but at practically all loads above 50% of the rating and therefore the efficiency of the plant is varied but little by a changing load factor.

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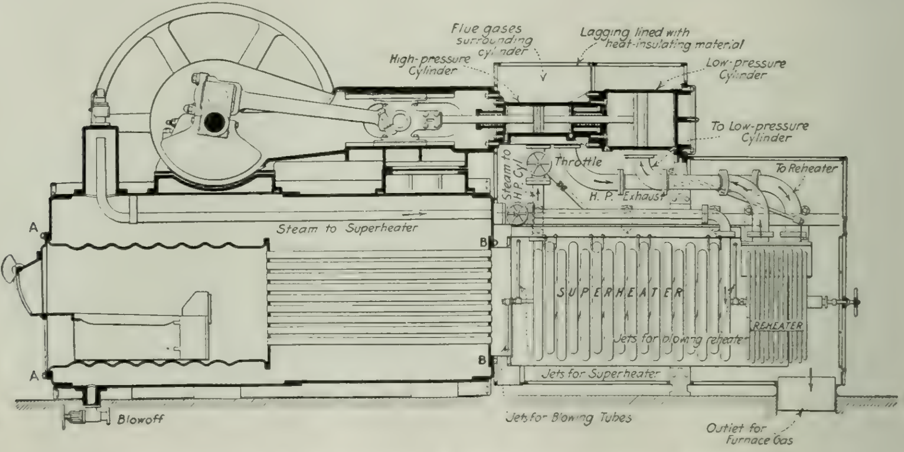
Note—Abstracted from "Power," May 20, 1913, and "Coal Age," Sept. 13, 1913.

Since one manufacturer makes and delivers the complete unit a division of responsibility between the makers of the various elements which enter into the usual type of power plant is avoided. Owing to the compactness of the plant, its simplicity and high efficiency, the cost of operation and maintenance is materially reduced. The fact that a small quantity of fuel has to be handled makes it possible to decrease greatly the labor cost usual to power-plant operation.

### Only a Small Floor Space Is Required

The floor space required by a plant of this design is about one-half that required by any other form of steam plant making any pretense to economy. The unit is accessible in all its parts and has shown in practice a reliability fully equal to any other prime mover. It is built in sizes from 75 hp. to 600 hp. and is applicable to all power purposes. It ordinarily operates condensing, but where exhaust steam is required for heating purposes the machine operates noncondensing with moderate increase in fuel consumption. In contrast with the internal-combustion engine the Buckeye-mobile is capable of utilizing any available fuel, coal, oil, lignite or refuse.



Cross-Section through Machine, Showing the Various Elements

In the Buckeye-mobile, owing to the intimate connection between all the elements of the plant, there is no radiation loss from pipe lines, since all steam lines with their fittings and valves are located in the smoke box and jacketed by the hot flue gases. Radiation from both high- and low-pressure cylinders is prevented by the same means, since both the cylinders and their valve chests are exposed to a current of hot waste gases. Radiation losses from the boiler are reduced to a minimum through the adoption of an internal furnace and effective jacketing of the boiler shell.

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**The Franklin Mine, in Fauquier County, Va.**, is one of the earliest profitably operated gold mines in the Southeast. It was worked up to the beginning of the Civil War, but not since. There was no underground working, all ore coming from open cuts. The mine was operated continuously for about 10 years, the ore being milled in a 10-stamp mill having wooden stamps.

## Explosion during Aluminum Granulation

During the granulation of some fused aluminum in a steel works of Austria, a peculiar explosion occurred which has been much discussed at the Technical High School of Vienna on account of its wide interest, according to *Engineering*, Aug. 15, 1913. The aluminum was used for steel refining and had been granulated in the same way for over a year without giving any trouble, when an accident occurred, which injured four men seriously, two of whom died. Ordinarily, about 10 kg. of the aluminum in lumps are put into a graphite crucible and melted. The metal is then poured from the crucible through a sieve consisting of the perforated bottom of an old graphite crucible, resting on a tub containing about 60 gal. of water. The fused aluminum passes through the holes of the sieve and the latter is tapped with a hammer to hasten the operation. On the day in question a small explosion was heard as the metal dropped into the water and a second explosion followed soon after when the operation was repeated. In their report on the accident, in *Zeitschrift für Angewandte Chemie,* June 13, 1913, Bamberger and Jüptner express the opinion that it was simply a steam explosion, not one of hydrogen, since hot aluminum does not decompose water. Aluminum, they point out, melts at 650° or 660° C., according to various estimates. The melting point thus does not lie very high, but the latent heat of fusion of aluminum is large, 80 Cal. per kg., and one kilogram of aluminum yields 239.4 Cal. on being cooled from 626° to 0 C. According to Favre and Silbermann, one kilogram of water, of 99.81° C., absorbs 535.77 Cal. in being turned into steam, and it requires 85 Cal. to heat it from 15° up to boiling, a total of 620 Cal. Thus one kilogram of fused aluminum could generate 650 liters of steam from water at 15° at atmospheric pressure, and as this generation would be almost instantaneous, the steam pressure might momentarily rise to 1600 atmospheres.

Although the melting point of iron is far higher, 1400 to 1500° C., the granulation of iron would be a much less risky operation than that of aluminum, because fused iron yields only 32 Cal. for grey cast, or 20 Cal. for steel, in cooling. Experiments with 250 grams of aluminum, made by the investigators, led to discordant results. Sometimes violent explosions were observed, particularly when they were using only a small amount of water. At other times, however, no explosion took place, although the aluminum was superheated to 1050° C. They therefore concluded that the accident might be due to the Leidenfrost phenomenon. The first minor explosion, they say, startled the men, who possibly left some lumps of aluminum and little water in the tub. When the new metal was poured in, some water was caught in a hollow and exploded, after the temperature had sufficiently decreased. Cavities were seen to form in cooled lumps of aluminum. The investigators mention that, according to a new process for which patent protection has been applied, aluminum can be granulated by allowing it to cool to a certain degree, and then stirring it with a metallic rod.

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# Drilling in the Michigan Copper Mines

The following discussion of the one- and two-man drill is taken from the report of the Copper Country Commercial Club on the Michigan strike:

It is claimed by the Western Federation of Miners and its members that the one-man drill, so called, has placed a burden upon the miners in the copper mines of Michigan which is not commensurate with the wages paid. In this connection, in order to clarify the situation, it may be stated that drilling originally was done by hand. In the early days this work was done by two or more men, one of the men holding the drill while other men acted as strikers. As the mining industry developed, a power drill was introduced which was operated by two men. The introduction of the first power drill operated by two men met with the same resistance which is now being offered to the one-man drill. The claim was made that it would put a great many men out of employment, which same claim is also made at the present time in reference to the one-man drill.

It may be stated generally that in the Lake Superior copper district the average copper contents of the rock decreases with depth. This has been the history of the district and the cost of mining increases proportionately with depth. As has been shown briefly in this report by tables, the Michigan copper mines are operating with rock carrying lower copper contents than the other copper-mining districts of the United States, and the Michigan copper mines are operating at greater depth and consequently at greater cost than the other copper mines of the United States. In order to compete with the other copper districts of the United States, the above facts have made it absolutely imperative that the mines of Michigan should be operated with the closest economy. The committee believes that the tables, hereinafter given, of wages paid in the Michigan copper district will demonstrate the fact that the operators in Michigan have attempted to practice their greatest economy in the way of improved machinery and equipment and the greatest step that has been made in this direction in recent years is the installation of the one-man drill. The standpoint of the operators in regard to the one-man drill cannot be given any more clearly than in quoting from a statement made by the superintendent of one of the mines, as follows:

> The necessity for further close economy in the operation of our mines forced us to go into the market for a more efficient drilling machine and, if possible, a machine that could be operated with one man, as compared with two, which was standard practice. After about 18 months of experimenting we adopted our present machine. Our intention was to divide the benefits accruing to us from the use of the one-man machine with the men. This benefit to take the form of higher wages to machine operators (called miners). That we have carried out this plan is shown by the following table, which shows the increase in wages to the men operating one-man drills over wages made when operating two-man drills.

STATISTICS ON ONE-MAN DRILL AND TWO-MAN DRILL FOR YEAR ENDED DEC. 31, 1912

| | Shifts | Amt. Rec'd | Supplies | Total | Av. Wage per Shift |
|---|---|---|---|---|---|
| Two-man drill.. | 350,012 | $1,024,802 | $291,526 | $1,316,328 | $2.83 |
| One-man drill... | 54,758 | 193,936 | 94,058 | 287,994 | 3.34 |

> The miners' wages largely depend upon the efficiency of the man, as our work is all on the bonus system and is so arranged that increased efficiency is of mutual benefit to the employer and the employee. We have a fixed contract which is not cut as the efficiency of the employee increases. It is also one of our rules that in case a man does not make what we call a fair rate he is paid off at a rate of not less than $65 per month, but this ruling affects a small portion of our employees. In fact, for the month of June this year it was not necessary to use this minimum wage for a single employee. The one-man drill has resulted in a decided increase in efficiency, which, with further experience, will increase and will result in not only lower costs, but in higher wages to the men. What is more, the drill is popular with the good miners and any sentiment against it is made from without. Any attempt to return to the two-man drill would be a backward step in industrial progress and would work untold hardship to this district in its competition with other copper-producing districts. It is as little to be thought of as the elimination of any other labor-saving device. If copper mining in Michigan is to be a progressive and permanent institution, we must shape our methods now to be able to work deposits of a still lower grade than have been worked up to the present time, and the one-man drill and the further possible increase in the efficiency along this line is the most important step now before us.

This committee, in order to understand the drill and its workings, inspected the drill at work underground in four of the mines. The members of the committee talked to men operating it. They operated it themselves, they saw the drill taken down and set up. The committee talked to a number of miners who were operating the one-man drill, and in no case found any specific objection to its use. In a few instances the men claimed that it was difficult to set up in some places, but the committee found that it is a practice among the miners for one man to help another whenever necessary. The one-man drill operators interviewed invariably admitted that they are making more money on the one-man drill than they were on the two-man drill, and not in a single instance did the committee find a man that would give up his one-man drill to go back to the two-man drill. The committee found in some cases men who said that two men should be on the drill, but when requested for their reasons and asked of what assistance the second man would be in operating the drill, they were unable to give any except that the assistance would be given to set up the drill in the morning and to take it out of the way before blasting. The committee on one of its trips underground saw one man set up his drill in nine minutes, but from what the committee has been able to ascertain, the average time required by miners to make their places of work safe by barring down loose rock, preparing the place for the drill and setting up the drill seems to be about one and one-half hours.

The claim has also been made to the committee that a great many men would be thrown out of work by the adoption of this drill, but mining men and engineers in this particular district claim that the installation of this one-man drill will permit mining companies to work poorer ground than has ever before been handled in the district and that instead of throwing miners out of employment it will create a demand for more miners.

On its trips underground the committee took occasion to ascertain whether or not the mining companies were operating in accordance with the law passed at the recent session of the Legislature in reference to the one-man drill, namely: the act providing that men operating these machines should not be stationed more than 150 ft. from the place where other employees were at work, and the committee found, as a matter of fact, that the mining companies generally were operating in accordance with this act.

From its investigation the committee has concluded that the one-man drill in this district is an economic necessity and that the mining companies operating in the district will insist on continuing its use. The average weight of the two-man drilling machine is 290 pounds, that of the one-man drilling machine is 150 pounds.

The committee made some inquiry as to how the one-man drill is received by miners in other copper districts, especially the Bisbee district of Arizona, and quotes herewith from a letter received by it dated Sept. 29, 1913, from one of the mining engineers of the property of the Calumet & Arizona mine:

> The company has in operation at the present time 100 one-man drills, which is 90% of the total number of drills now in development work. Sixty-five of these drills were purchased during the last four months. The miners have no complaints to make relative to these drills and in the majority of cases prefer these to any larger drill. The one-man drill will no doubt replace all other larger drills in the near future. I cannot understand why the Michigan miners should object to the drill when the Bisbee miners can find no fault whatever.

# War-Time Railroading in Mexico

Maj. Charles DeLano Hine, who recently resigned as vice-president and general manager of the Southern Pacific R.R. of Mexico, entertained the members and guests of the St. Louis Railway Club on Oct. 10 with some interesting reminiscences of his experience in operating a railroad during the Mexican Revolution. An abstract[1] of Major Hine's paper is given below:

In the 20 months since February, 1912, when the second of recent Mexican revolutions was started, the Southern Pacific of Mexico has been in full operation only six months. During the other 14 months from 10 to 80% of its mileage has been out of commission at various times and in various places.

At first the officials, who are all Americans, and the employees, who are nearly 90% Mexicans, strained every nerve to crib bridges and to resume traffic. As time has worn on, however, all reserve energy has naturally been dissipated, the abnormal has become the normal, and the exceptional has lapsed into the routine. A train dispatcher is not startled if his wire suddenly goes down before the orders are completed. He knows from experience that the wire may not come up until perhaps tomorrow, next week, or mayhap next month or next year.

Occasionally the attacking band will take possession of the locomotive and burn some or all of the cars in the train. Usually, however, in the course of a week or two the wire comes up and a conductor asks for running orders from an office many miles from where he was last located.

Such primitive conditions have developed splendid initiative and resourcefulness on the part of officials and employees of all grades. From the president (Epes Randolph, a famous engineer and railway builder), who happened to be on the first train held up by armed force, down to the humblest laborer, all have followed Rule L of the standard code, reading: "In case of danger to the company's property, employees must unite to protect it."

Ofttimes this has meant dauntless and unflinching exposure to rifle or cannon fire. Habitually, it has entailed inconvenience and physical hardship. Officials who normally use comfortable business cars have taken to small motor cars, to track velocipedes, to push cars, or have traveled many miles on foot.

On one occasion my own motor car was run by a man who has been a railroader, a frontier deputy marshal and a chauffeur. For the particular trip in question he united the desirable qualities of a careful motorman, a crack shot and a good cook. The first night was spent in a tool house, one night in a freight house, another in a waiting room and still another in the open country. The car was towed around burned bridges through the arroyos (channels of dry streams).

On another trip a good-sized river had to be crossed, the long trestle approach to the steel bridge having been burned some weeks before. Visions of swimming the river like Funston in the Philippines were ended when the thoughtfulness of an assistant superintendent showed a section gang as water rats towing a raft made of ties.

This interchangeability of function is typical of the all-around training inculcated on the Southern Pacific of Mexico by the unit system of organization. Two years of complete and consistent application of the underlying principles of this rational and practical system have produced gratifying results. Today every department, including traffic and accounting, has available from one to three developed and tested understudies for every official position. Coincidentally during the only period of eight months when conditions approached normal, the operating ratio with normal maintenance charges fell from 97 to 78%.

In May, 1912, after operation of the Sinaloa division had been suspended for over three weeks, it was deemed advisable to move all obtainable equipment north to Empalme, Sonora, near Guaymas, where conditions were tranquil. There were only a dozen locomotives at division headquarters in Mazatlan, Sinaloa, 275 miles south of San Blas, Sinaloa, the north end of the division, and a total of some [illegible] cars within reach. It was feared that insurrectos might cripple the movement by burning bridges between trains. Not only did bridges have to be hurriedly cribbed, but water tanks had to be repaired, some having been riddled with bullets.

On [illegible] morning the procession started with a train order reading somewhat as follows: "All engines on division run extra to San Blas with right over all southbound trains until 10 p.m., Friday, May 10, and protecting carefully against following trains." Some 60 hours later the senior vice-president, renewing his yardmaster days, tied up the last train on the main track, at San Blas, and then issued an order congratulating the Sinaloa division, through its superintendent, on a performance easy anywhere else, but most difficult under the circumstances.

Regular traffic was not resumed for several weeks. Meantime a "cruiser train" was put on. Passengers rode in the caboose. No cars were left at stations, but freight offered was loaded in empties in the train. After cruising all day, the train tied up wherever night overtook it. The danger of encountering a hole instead of a bridge precludes much night running in times like these.

On Mar. 5, 1913, the state of Sonora revolted against the newly established Huerta government, and seized that portion of the Southern Pacific of Mexico lying north of Enpalme. For six weeks the officials of the road were powerless. Operation was carried on from Hermosillo, the capital of the state of Sonora, by the state officials, with six locomotives and other equipment forcibly seized. Methods of alleged confiscation of railway property in the United States are perhaps crude after all. Six weeks of such operation gave the state officials their fill. Outgo so exceeded income that the road was unconditionally returned to its owners.

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# Open-Cut Copper Mining at Butte

For many years, Butte has known of the existence of the vast body of oxidized ore lying along the base of the low hills near the Pittsmont smelter. From time to time shipments of the higher-grade material have been made for direct treatment in the blast furnace. Within the past two years, plans have been made to mine and treat these ores by hydrometallurgical methods.

BUTTE & DULUTH OPENCUT

The ore consist of the usual Butte granite, stained or enriched by copper minerals, chiefly chrysocolla and malachite. There are no well defined limiting walls to these deposits, and, owing to their proximity to the surface, mining is being carried on open-cast. The accompanying illustration shows a face of ore now being mined on the property of the Butte & Duluth company. The ore goes about 2% copper, and is of such character as to yield readily to wet treatment processes.

Two leaching plants are now in operation, having a combined capacity of 300 tons. These are the Butte & Duluth and the Bullwhacker. They were designed as experimental plants and are to be enlarged, if things turn as well as is hoped. The crushed ore is treated with weak sulphuric acid, readily dissolving out the copper. From the resulting solution the copper is deposited electrolytically.

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[1] Prepared by "Eng. News." The paper is printed in full in the "Railway Age Gazette," of Oct. 17.

# Grinding Ores for Cyanidation—II

By Herbert A. Megraw

*SYNOPSIS—Continuation of the discussion of grinding machines. Comparison methods of crushing efficiency valued. The crushing-surface diagram used to locate the department of highest efficiency of grinding mills. Suggestion of most economical systems for reducing ores.*

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### Efficiency of Grinding Machines

The comparison of the efficiency of grinding machines is a point upon which discussion has been energetically carried on for several years, and began to bear fruit in May, 1910, when H. Stadler proposed his method of energy-unit calculations. Mr. Stadler, in a lengthy paper read before the Institution of Mining and Metallurgy, in London, proposed a system by means of which the energy expended in producing fine material of certain grades could be represented by a number. It is not my intention to review Stadler's work extensively at this time, but the basis of his suggested comparison may be briefly stated.

> The mechanical work done is represented by the product of the force by the distance, but as in a regular scale of reduction by volume the diameters of the particles decrease at the same ratio as the area of fracture increases, the product, or the mechanical work required for reducing the volume (or weight) of the unit from one grade to the next following, is a constant for each grade, called the crushing or energy unit (E.U.). The same conclusion is also arrived at by application of Kick's law, which reads: The energy required for producing analogous changes of configuration of geometrically similar bodies of equal technological state varies as the volumes or weights of these bodies.

The volumes of the particles decrease from grade to grade at the same ratio as the number of the particles, constituting in their total the volume of the unity, increases, and the product of the volumes into the number of the particles of that grade is, therefore, constant for each grade. As in conformity to the above law, the amount of energy absorbed is proportional to the volume of the body to be crushed, it follows again also that the total energy required for reducing the weight of the unit is constant for each grade.

In a separate table, Stadler gives the constant, or energy unit, corresponding to all the screens in ordinary use, and also those recommended as test sizes by the Institution of Mining and Metallurgy. For obtaining the relative mechanical value of dry pulp containing any mixture of sizes, it is only necessary to multiply the percentage of each grade by the corresponding energy unit of the respective grade and add the products. In other words, a screen analysis is made, ascertaining the percentage of the ground material remaining upon each screen of the series, from the coarsest down to that which is —200-mesh grade, and each of these percentages is multiplied by its corresponding energy unit. The energy unit of that product is thus obtained, and the sum of all the energy units of the separate products in the screen analysis, represents the energy unit of the total pulp.

### Del Mar Varies Stadler's Method

This method of comparison has been largely used and has served a useful purpose in comparing the efficiency of any grinding machine with that of any other. In extending Stadler's work, Algernon Del Mar[1] states that as the work done in crushing is proportional to the surface exposed, and as Rittinger states that the work required for crushing is proportional to the reduction in diameter, then both statements are identical, or the same idea may be stated thus: "The work required to crush rock is very nearly proportional to the reciprocals of the diameters crushed to." That the law is not exact is mainly due to the fact that the amount of ore crushed by a given amount of power often depends upon the size of the particle being crushed, and this is particularly true of the finer meshes where an approach is made to the colloidal state. Del Mar believes that 5% would be sufficient allowance to cover the inaccuracies in the calculation.

In this method of comparison it is only necessary to obtain the reciprocal of the aperture of the screen to which the material is crushed, and multiply by the percentage remaining on the screen. This affords a simple and easy way of comparing efficiencies. Del Mar illustrates his method of comparison by contrasting the results obtained in various mills. The method may be used, with some reservations, of course, for comparing the work done by grinding machines of different kinds.

### Gates' Graphic System

A later development of these methods of comparison is given by Arthur O. Gates,[2] who published in the Journal a method of illustrating graphically the work done in crushing. By this means it is comparatively simple to understand at a glance the difference in the work done by two crushing machines, and to see at which point one is better than the other. Gates claims that Kick's law, though frequently referred to in connection with the subject, especially since the publication of Stadler's work, does not properly apply and that Rittinger's law is the one most applicable. Rittinger's law, as has already been stated, is interpreted to mean that the work done in crushing is proportional to the surface exposed by the operation, or better expressed for this purpose, the work done on a given mass of rock is proportional to the reciprocal of the diameter of the final product, assuming that all the mass has been reduced to one exact size, which is only theoretically possible.

### Comparison of Machines Difficult

These three methods of comparison having been examined, it ought to be easy to compare the efficiencies of various grinding machines upon ores in general. The factors which interfere with the accuracy of such determinations are several, but the principal one is the difference in cohesion between the particles of different rocks. Were experiments to be made upon the same rock by different machines and compared by these methods, there

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Note—This is the fourth of a new series of articles by Mr. Megraw. The series deals with comparative details of cyanide practice, discussing points of possible improvement. Preceding articles of this series appeared in the issues of Sept. 6, 1913, Oct. 4, 1913, and Nov. 1, 1913. The next article will deal with "Slime Agitation for Cyanidation," and will appear in the issue of Dec. 20, 1913.

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[1] "Eng. and Min. Journ.," Dec. 14, 1912.

[2] "Eng. and Min. Journ.," May 24, 1913.

would be no difficulty in ascertaining which was the more efficient.

Another difficulty which confronts the investigator who wishes to compare results of different machines from published accounts giving the screen analyses and other data, is the fact that screens have not yet been so standardized that for any particular stated mesh, one would know exactly what the aperture is. Of course, in the finer meshes there would be little difference between the different apertures for any given mesh, because the wires could not differ greatly in size. On coarse screen, however, the differences might be important.

TABLE V. MECHANICAL CRUSHING EFFICIENCY—HARDINGE VS. CHILEAN MILLS

| | | Hardinge | | | | Chilean | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mesh | Reciprocal of Average Size | Feed % | Relative Surface in Feed | Product % | Relative Surface in Product | Feed % | Relative Surface in Feed | Product % | Relative Surface in Product |
| +4 | 4.1 | 12.9 | 53 | 0.0 | ... | 13.9 | 57 | 0.0 | . |
| +10 | 7.2 | 47.3 | 341 | 0.0 | ... | 47.5 | 342 | 0.0 | |
| +20 | 18.3 | 26.8 | 490 | 0.2 | 4 | 22.9 | 419 | 2.3 | 42 |
| +30 | 37.7 | 5.0 | 189 | 3.2 | 121 | 5.2 | 196 | 11.8 | 445 |
| +40 | 58.4 | 0.8 | 47 | 4.9 | 286 | 0.9 | 53 | 6.7 | 391 |
| +60 | 83.6 | 0.8 | 67 | 13.8 | 1154 | 1.0 | 84 | 11.4 | 953 |
| +80 | 138.0 | 0.4 | 55 | 10.4 | 1435 | 0.5 | 69 | 6.7 | 925 |
| +100 | 163.0 | 0.3 | 49 | 8.6 | 1402 | 0.4 | 65 | 5.4 | 880 |
| +150 | 220.0 | 0.3 | 66 | 8.0 | 1760 | 0.5 | 110 | 6.3 | 1386 |
| +200 | 303.0 | 0.5 | 151 | 10.0 | 3,030 | 0.7 | 212 | 7.2 | 2,182 |
| —200 | 400.0 | 4.9 | 1960 | 40.9 | 16,350 | 6.5 | 2600 | 42.2 | 16,880 |
| .... | ... | 100.0 | 3465 | 100.0 | 25,552 | 100.0 | 4207 | 100.0 | 24,084 |

SUMMARY

| | Hardinge | Chilean |
|---|---|---|
| Units of work in product | 25,552 | 24,084 |
| Units of work in feed | 3,468 | 4,207 |
| Units of work done by mill for uncorrected capacity | 22,084 | 19,877 |
| Units of capacities of 2.50 and 2.25 tons per h.p.-day respectively | 55,210 | 44,723 |
| Excess unit of work done by Hardinage mill | | 108.47 |
| Excess efficiency, assuming method correct | | 23.45% |
| Excess efficiency, assuming 5% as limit of error | | 18.45% |

Both Del Mar's and Gates' system can be used in combination to compare results, and it will be interesting to note the work of different machines according to data published and additional facts which may be obtainable from private sources. Setting aside Stadler's method for the present, we will use Del Mar's and Gates' system of comparison.

### Efficiencies of Machines Shown

In order to show the comparative efficiency of the work done by various grinding machines, there is herewith shown in Table VI the efficiency, according to Del Mar's method, of some of the machines whose general characteristics have already been shown in Tables I, II and III, that is, stamps and the fast- and slow-speed chilean mills. With most of these we have a close approximation of the size of the material sent to the machine, and the total efficiency of both feeds and products may be worked out. By subtracting the numerical value of the feed from that of the product, the number representing the work done by the machine is arrived at. Of course, it is to be remembered that the data upon which these calculations are based is from information which has been published or volunteered, and as the screen sizes are usually stated in meshes, the exact size of the screen aperture cannot be stated with perfect accuracy. It is, however, near enough to give us a superficial comparison. When one considers that these efficiencies are on different kinds of ore, and have already an inaccuracy introduced by the different screens already mentioned it will be understood that too much dependence must not be placed upon them. They are used here simply as an indication of what may be expected with machines of each particular style. Together with these are figures showing the effect of stamp-mill work, as derived from published accounts which give the size of feed and screen test of the product.

TABLE VI CRUSHING EFFICIENCIES OF VARIOUS MACHINES

| Plant | Machine | Relative Surface in Feed | Relative Surface in Product | Index of Work done by Machine |
|---|---|---|---|---|
| Goldfield Con | Stamps | 100 | 14,007 | 13,907 |
| Dome | Stamps | 100 | 18,036 | 17,936 |
| Goldfield Con | High-speed chilean | 720 | 27,239 | 26,519 |
| Mogal | High-speed chilean | 100 | 22,835 | 22,735 |
| Gold Belt | Slow-speed chilean | 100 | 32,913 | 32,813 |
| Sta Elena | Slow-speed chilean | 75 | 35,640 | 35,565 |
| La Union | Slow-speed chilean | 100 | 37,140 | 37,040 |
| Llano | Slow-speed chilean | 100 | 33,108 | 33,008 |
| Bolivia | Wheeler pan | 18,363 | 36,678 | 18,315 |

The great trouble with most published accounts, particularly where various machines are compared, is that there is usually a tendency to eulogize one machine at the expense of another. Even where there is no particular attempt to do this, the operator's natural inclination is likely to have some effect on his results. Of course, where the investigator is an employee or interested in the company which manufactures a certain machine, his results indicate what he desires to prove. It may be said that while such accounts may, and probably do, contain a large amount of useful information, final determinations ought to be based solely upon work performed by oneself upon the ore which is to be handled. In this way the probable effect of each machine may be truly estimated and no mistake will be made.

### An Example of Comparison

A recent publication has given such an interesting account of the comparative work done by two machines in the same place and upon the same ore that it will be advantageous to use the information given in it as an example in this discussion. I refer to the paper on Hardinge mills vs. Chilean mills, by Robert Franke, read at the Butte meeting of the American Institute of Mining Engineers, August, 1913. The article has been abstracted and published in the JOURNAL[3] on account of the interest of the comparison. It is based upon the work done at the Miami Copper Co.'s mill by the two machines mentioned.

The plant was at first equipped with chilean mills on account of the definite knowledge of the fine-grinding qualities of the machine, and at the same time one section of the plant was equipped with Hardinge mills to serve as a test for the guidance of future installation. After a test of 1.5 years' duration, the operators have come to the conclusion that the Hardinge mill is best suited to their work, and a detailed comparison is made in this article.

In view of the fact, however, that the conditions at the Miami mill are somewhat different from those which might be found at other mills, and are certainly different from those which are found in the ordinary cyanide plant, it is possible to accept the data published and to still believe that the same conclusions would by no means apply in the latter case. There is no doubt that the Hardinge mill is an extremely good machine for producing fine, granular product suitable for concentration, but it has not yet succeeded in producing slime or colloid material satisfactory for agitation and cyanidation. It is rather interesting, therefore, to discuss this article from the viewpoint of the cyanide plant.

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[3] "Eng. and Min. Journ.," Sept. 13, 1913.

### Hardinge and Chilean Mills Used

Briefly stating the conditions, it may be said that the conical mill used was the 8-ft. Hardinge pebble mill having a cylinder 22 in. in length. The cylindrical portion of the mill was lined with cast-iron plates and the conical part with silex bricks bound together by cement. Lining plates carried a lifter, the function of which was to increase the height of drop when lifting material. Danish No. 5 pebbles, obtained from the coast deposits of Denmark, were used for the grinding. The chilean mill used is a fast-running, three-roller, 6-ft. Saturn mill, with screens of 0.037-in. opening. The feed to these mills is the oversize of Callow screens, having 0.029-in. openings, which follow roll crushing to 0.5 in. The ore of the mine is a moderately hard but fissile schist, impregnated with finely disseminated granular chalcocite.

In presenting primarily the advantage of the Hardinge over the chilean mill, this article states that discharge screens, dies and mullers are eliminated, and in their place more desirable crushing equivalents are substituted. Thus, the screen of the chilean mill is replaced by a perpetual device; the dies by linings which have long life, and the mullers by flint pebbles, which are replaceable without interruption to operation. The statement is also made that with chilean mills the total delay amounts to 2.11% of operating time, and with the Hardinge mills 1.29%.

The argument is made that with the Hardinge mill the repair delays are mainly due to relining, at which time the mill has to remain standing 48 hr., so as to allow the cement of the lining to set. Attention is called to the fact that this could be avoided by having extra shells already relined which could be swung into place of a shell whose lining had been worn out. This argument seems to me to be entirely without force as an argument against chilean mills because the lined shell is about all there is of the Hardinge mill, and having an extra machine ready for emergency will apply just as well to chilean mills as to any other.

Screen delays are charged against the chilean mill as is also the cost of the screens and their replacement, while with the Hardinge mill it is claimed that the screen is avoided and no such charges are made against it. This may be true, but in an advertisement of a screening machine appearing in a technical journal a short time after this article was published, it is stated that "the scope of this popular device has been widened by the use of screenless mills of the tube-mill type in the place of the chilean type of mill for granular crushing, the 'Blank' screen being used as a guard, screening the product of the mill to a positive size and returning the oversize for regrinding." It certainly looks as if the product of the Hardinge mill had to be screened and the oversize returned, and if this is true, the cost of screening ought to be charged against the mill and not dropped out simply because a separate machine happens to be called upon to do the work.

### Efficiency by Numbers and by Graphics

The mechanical crushing efficiency of the Hardinge and chilean mills at this plant, published in the article mentioned, is reprinted in Table V, the calculation being made after the method of Del Mar. This table shows that the relative surface in the product of the two machines, which is proportional to the work done, is more by 18 to 23% with the Hardinge than with the chilean mill. This is apparently true under the circumstances, but these circumstances could not be transferred to the cyanide plant and made to work out the same way. In the first place, the product of the Hardinge mill is not what is desired in the cyanide plant. And in the second place, the material fed to the chilean mill is not that calculated to make use of its efficiency to the greatest extent. The greater part of the feed to the chilean mill is four-mesh material, and this, as has already been mentioned in this article, is not best adapted to successful chilean-mill grinding. Even under the circumstances, however, it is seen that the amount of 200-mesh material, which is what the cyanide plant wants, is greater in the product of the chilean mill than in the product of the Hardinge, and it may be shown that the highest efficiency of the chilean mill is along toward the 200-mesh end of the product.

This can be clearly and easily shown by making use of the crushing-surface diagram of Gates, for which purpose I append here Fig. 1, a diagram showing graphically the work done by these two machines. The diagram is on the especially-ruled logarithmic paper supplied by the W. S. Tyler Co., for plotting the curve of materials separated by their standard testing screens. It applies to this case excellently and gives a clear analysis of what each one of these mills succeeds in doing. From these diagrams it will be evident that the Hardinge mill produces a large proportion of fine granular material, as shown by the width of the diagram at the point of the small-aperture screens, while the chilean mill produces a large quantity of —200-mesh material and has its greatest efficiency at the fine end of the diagram, as shown by its much greater width at and below the —200-mesh point. It is probable that the best efficiency of the chilean mill is in the production of a maximum amount of —200-mesh product, which has heretofore received little attention from investigators. It seems that this exposition should remove the uncertainty about the most efficient field for Hardinge and chilean mills. The Hardinge is undoubtedly better for producing a fine granular product with a minimum of slime for concentration, while the chilean is clearly superior for producing a maximum quantity of —200-mesh material for agitation in the cyanide plant.

If the material fed to the chilean mill in question here had been much larger in size, the mill would have shown a much higher mechanical efficiency. In this connection, compare the efficiencies shown in Table VI for the high-speed and slow-speed mills already mentioned. It will be found that many of them exceed that of the Hardinge materially. When one considers the cost of slow-speed milling as against that of high-speed, the conclusion is forced upon us that this is apparently about the most economical one could use for the purpose.

It may be that in my advocacy of the slow-speed chilean mill I fall into the error of exhibiting undue partiality. I am, however, convinced that this is not the case, because previous to my personal experience with these machines I was rather prejudiced against them, but after having given them a fair trial, I reached the conclusion that in many instances they will do better and cheaper work with more convenience than any other machine that I know of. I do not, by any means, recommend the chilean mill or any other mill for any service without giving it a thorough trial on the material which it will have to handle. That is the point which ought always to be settled in advance, but I do believe that the chilean ought to be considered as a possible factor in grinding and ought to be included in the list of machines which are given a trial. Too often stamps or some other favorite machine is installed without any trial at all, simply taking popular opinion of what ought to be done under the circumstances.

### Impossibility of Comparing Costs

The cost of ore breaking, crushing and grinding in the various plants is interesting to note, and for that reason Table VII, showing them, is appended herewith. It is to be understood, however, that this is done simply as a matter of interest, so that operators may know what is being done at these mills which are more or less well known to everyone. Comparisons cannot be made from this table, nor from any published cost data. One cannot insist too strongly upon the fact that the comparison of costs at different mills, in different parts of the country, upon different ores, handled by labor of different classes, with different efficiency, can never, by any possible means, be a fair test of the work which is being done. It ought to be perfectly evident to engineers that a cost of $1 per ton in one camp might be the result of much better, more careful and more efficient work than that accomplished in another camp, where the cost was only half that amount. If one regards these costs simply as interesting facts or records of what is being done, there is no harm in it, but as soon as one regards them as indices of efficiency at the various mills, damage results.

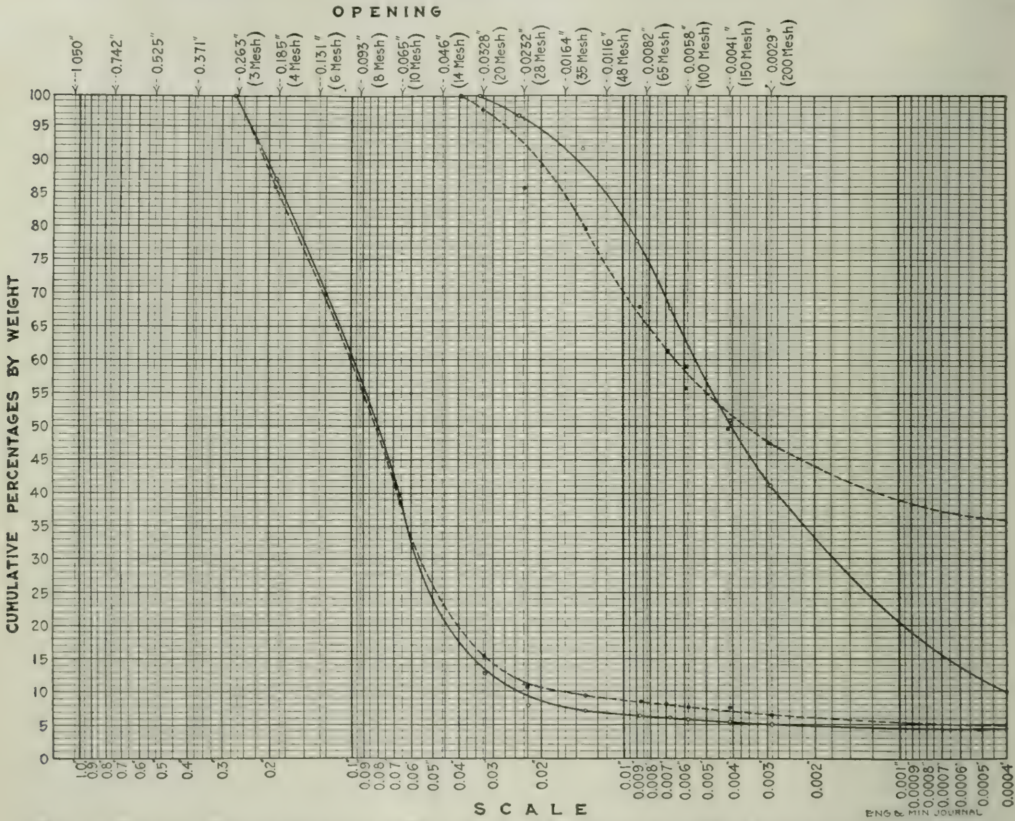

Fig. 1 Crushing Surface Diagram of Work Done by Hardinge Mill (Full Line) and Chilean Mill (Dotted Line)

### Tube Mills Already Fully Discussed

Little has been said in this article about the tube mill or its work, but the machine is so well known and so well adapted to its peculiar functions, that there is nothing more to be said in regard to it. The cost of tube-mill work and notes of its efficiency have been published widely and all operators interested in cyaniding are perfectly familiar with the facts concerning it. With the other machines mentioned, however, this is not so much the case. Rolls and chilean mills have not received that degree of careful attention which has been given to stamp and tube mills, and have not as yet reached the degree of popularity which they deserve.

On ordinarily hard ores, my choice for a milling installation would begin with gyratory breakers followed by jaw-type machines feeding into rolls or chilean mills. In the case of rolls, the product could be separated into a portion fitted for direct reduction in the tube mill and another for reduction in chilean mills, or the whole could be finely reduced in the rolls that it could all be handled in a tube mill. In the case of the chilean mill replacing the rolls, it should be fed with material varying from ½- to 1-in. size for maximum pieces and the product, which would consist largely of slime should be separated in a classifier and either reground in tube mills or leached directly, the slime being agitated.

TABLE VII. COST DATA AT VARIOUS MILLS

| Plant | Breaking Cents per Ton | Crushing Cents per Ton | Grinding Cents per Ton | Method |
|---|---|---|---|---|
| Homestake | 6 | 34.6 | 25.7‡ | Stamps, pans and tube mills |
| Goldfield Con. | 3.8 | 13.4 | 10 6 chilean<br>16.6 tube | Stamps, chilean and tube mills |
| West End Con., Tonopah. | 10.3* | 24.8 | 49 2 | Stamps and tube mills |
| Hollinger | 7.3 | 18.1 | 27.7 | Stamps and tube mills |
| Wonder, Nev. | 12.1* | 29.5 | 41.8 | Stamps, tubes and high-speed chileans |
| Liberty Bell | 7.25 | 19.08 | 7.69 | Stamps and tube mills |
| Independence | 16.33 | 52.17† | | Rolls and high-speed chilean |
| Nevada Hills | 7.1 | 24.7 | 29.3 | Stamps and tube mills |
| Black Oak | 5.74 | 11.26 | 7.99 | Stamps and tube mills |
| Sta. Elena | | 21.22§ | | Slow-speed chileans |
| La Union | | 21 46§ | | Slow-speed chileans |

* Includes conveying. ‡ Only part of material reground. Cost per ton reground. † Separate treatment plant. Cost includes rolls and chileans. § Includes both crushing and grinding.

In cases where leaching is possible, I can imagine nothing more simple or economical, both to install and to operate, than the chilean-mill plant, which takes its feed directly from the breaker and delivers directly to the treatment system, after classification. No doubt more careful study will be necessary before a great change is made in the method now followed of crushing and grinding, but I predict with the greatest confidence that in the not far future, rolls and chilean mills, the latter especially of the slow-speed variety, will be much more widely used and will be an important factor in reducing the cost of cyaniding.

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## Co-operation in Geologic Studies

By F. W. De Wolf

A significant and important field conference of geologists interested in problems of the Mississippian formation met Oct. 10 to 12, in Missouri. The purpose was to plan coöperation between the several states and the U. S. Geological Survey in all future work in Mississippian formations. The states represented were as follows:

Arkansas, Purdue.
Illinois, DeWolf.
Indiana, Barrett, Beede.
Iowa, Kay.
Missouri, Buehler, Hughes.
Ohio, Prosser.
Oklahoma, Ohern, Snider.
Tennessee, Purdue.

The U. S. Geological Survey was represented by David White, chief geologist, and W. H. Herron, geographer in charge of the central section.

Mining engineers and geologists who have been confused by the rapid invention of geologic-formation names will approve of this effort to get together regardless of state lines.

The discussion showed clearly the evils of independent work in adjoining states without knowledge of work already done or in progress in adjacent territory. Since the next few years will see considerable work done on the Mississippian formations, it is highly important that the new names for units of formation shall be duly considered in the light of past usage and general, rather than local, needs. A permanent committee of the states concerned was provided for, to act in coöperation with the U. S. Geological Survey. The directing committee includes H. A. Buehler, of Missouri, G. F. Kay, of Iowa, and A. H. Purdue, of Tennessee.

This proposed coöperation is significant since it foreshadows an attempt to get together on all problems of broad interest, rather than to continue work at cross-purposes and occasionally with considerable friction. In the past there has been too little consideration for neighboring states and too little coöperation of the state and the Federal surveys.

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## Food Prices, Michigan and Butte

A committee was appointed on Sept. 13, 1913, by the board of directors of the Copper Country Commercial Club, to investigate strike conditions in the Michigan copper region. The Copper Country Commercial Club is an organization of 500 men of Houghton and Keweenaw Counties, and an attempt was made by its committee to make unbiassed comparisons. The following is the Committee's report on food prices:

> Under the heading of living conditions in the Michigan copper district, and of value when considering the wages paid in the Michigan copper district, will be the following table giving the prices of various food stuffs and staple articles. Inasmuch as the scale of wages that is demanded by the Western Federation of Miners is the scale which is in vogue in the Butte district, Montana, a comparison of prices between the Michigan district and the Butte district is given.

MEATS

| Articles | Michigan Price | Butte Price | Butte Price % Excess |
|---|---|---|---|
| Steak, round | 22c. | 28c. | 27 |
| Steak, sirloin | 24c. | 30c. | 25 |
| Steak, porterhouse | 25c. | 30c. | 20 |
| Pork chops | 22c. | 25c. | 13½ |
| Veal steak, leg | 30c. | 35c. | 16⅔ |
| Lamb steak | 25c. | 35c. | 40 |
| Roast beef | 24c. | 28c. | 16⅔ |
| Legs lamb | 25c. | 25c. | 0 |
| Hamburger steak | 20c. | 25c. | 25 |
| Pork sausage | 18c. | 25c. | 38¾ |
| Mutton chops | 20c. | 25c. | 25 |
| Rib roast beef | 22c. | 28c. | 27 |

GROCERIES

| Articles | Michigan Price | Butte Price | Butte Price % Excess |
|---|---|---|---|
| Flour, 100 lb. best | $3.00 | $3.75 | 25 |
| 60 lb. potatoes (1 bu.) | 0.75 | 1 05 | 40 |
| Eggs, per dozen | 0.28 | 0.40 | 43 |
| 100 lb. sack gran. sugar | 5.40 | 6.80 | 26 |
| Kerosene oil, per gal. | 0.15 | 0.30 | 100 |
| Lard, 5 lb. (Silver Leaf) | 0.75 | 0.90 | 20 |
| Karo syrup, 5 lb. | 0.25 | 0.35 | 40 |
| Baked beans, best | 0.10 | 0.12½ | 25 |
| Navy beans, per lb. | 0 06 | 0.08⅓ | 39 |
| Red kidney beans, lb. | 0 06 | 0 08⅓ | 39 |
| Premium butter, per lb. | 0.41 | 0.45 | 9¾ |
| Barley (pearl) | 0.05 | 0 08⅓ | 66.67 |
| Bran, 100 lb. | 1.40 | 1.50 | 7.14 |
| Codfish, per lb. | 0.10 | 0.12½ | 25 |
| Cottolene, 4 lb. tin | 0.60 | 0.70 | 16⅔ |
| Salmon, 1 lb. can | 0.15 | 0.20 | 33⅓ |
| American cheese, per lb. | 0.22 | 0.26 | 18.18 |
| Molasses, per gal. | 0 45 | 0 65 | 44 44 |
| English breakfast tea, per lb. | 0.50 | 0.60 | 20 |
| 1 bu. beets | 1.00 | 2.00 | 100 |
| Cabbage, 100 lb. | 2.75 | 3.25 | 18 |
| Standard cereals, per pkg. | 0 10 | 0 12⅓ | 25 |
| Rolled Oats, 5 lb. pkg. | 0.25 | 0.35 | 40 |
| Tomatoes, 24 cans | 2.35 | 2.75 | 17 |
| Standard canned fruits | 0.20 | 0.25 | 25 |
| Dry raisins, per lb. | 0.10 | 0.12½ | 25 |
| Prunes, per lb. | 0.10 | 0.12½ | 25 |
| Currants, per lb. | 0.12½ | 0.15 | 20 |
| Dates, per 2 lb. | 0.25 | 0.35 | 40 |
| Bananas, per dozen | 0 25 | 0 35 | 40 |
| Apples, 1 bu. | 2.00 | 3.25 | 62½ |
| Chocolate, Baker's, per lb. | 0.40 | 0.50 | 25 |
| Pepper, 16 oz. | 0.30 | 0.40 | 33⅓ |
| Bluing, 1 qt. bottle | 0.10 | 0.15 | 50 |
| Average excess | | | 34 82 |

Note.—In Michigan a discount of 2 to 3 per cent. on the prices listed above is given when bill is paid. The Butte prices are taken from a store that gives no such discount.

FUEL

| Articles | Butte Price Per Ton | Michigan Price Per Ton |
|---|---|---|
| Hard coal | $16 00 | $8 00 to $8 50 |
| Soft coal | 7 00 to 7 50 | 4 50 to 5 00 |

From the above tables it would appear that on a grocery and meat bill of $35, which is fairly approximate for an average miner's bill, there is a saving in Michigan of 25 per cent. over the Butte prices; in other words, the same articles in Butte would cost $8.75 more.

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## Iron-Ore Mining in Algeria

Great satisfaction is felt throughout Algeria at the news from Paris that after more than 10 years' conflict the question of the development of the important Ouenza iron-ore deposits, near Tebessa, at the south of the Province of Constantine, has been solved favorably to the colony (*Daily Consular and Trade Reports,* Nov. 6, 1913). Under auspices of the government an agreement has been arrived at by the two groups, consisting of the Société d'Etudes and the International Syndicate, formed to work the mines, by which one franc ($0.193) per ton on the output (with a minimum of 750,000 fr. ($144,750) per annum), together with 50% of the net profit, is assured to the colony. It is expected that the production of the Ouenza mine alone will amount to over 1,000,000 tons per annum, and the important revenue arising therefrom will prove a valuable aid in the development and prosperity of Algeria.

In addition to the Ouenza mine arrangements are being made to work the neighboring mines of Bou-Kadra, Kouif and Djebel Onk, and it is anticipated that eventually not less than 4,000,000 tons of ore will be extracted annually from this district for exportation. A 137-mile railway is to be constructed, probably by the colony, and this will also prove a fruitful source of revenue. The ore will be shipped at Bona, where considerable extensions have been made to the port to enable it to deal with the increased traffic. The proprietors of the Kouif mine have already ordered equipment to ship their ore at the rate of 8000 tons per day.

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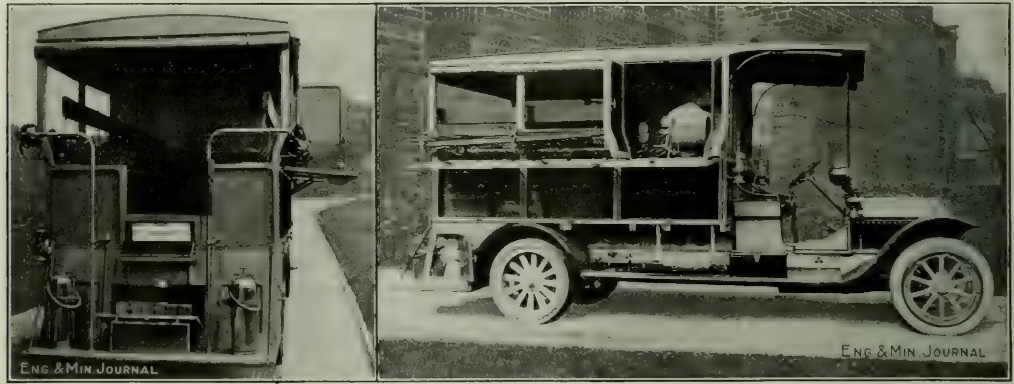
**Mine Telephones Have Long Been** acknowledged to be of decided value in the operating system of mines of medium and large [illegible]. A somewhat novel use of them, however, which has not yet been widely practiced, but which may be of some value, is to use them for listening, at the surface, to the shot firing in a distant heading. The telephone is left in position at a safe distance from the heading, and the shots [illegible] be easily heard and counted at the surface.

## Motor Truck for Rescue Work

The Bureau of Mines has evolved a new plan of relief work, involving the extensive use of motor rescue trucks equipped with all paraphernalia for relief work. The first vehicle of the new type, built according to government specifications, was constructed by the White Co., of Cleveland, Ohio, and delivered to the Bureau of Mines, in Pittsburgh, Penn. It is a veritable hospital, carrying all portable equipment that is useful in administering first aid.

Included in the equipment are two pulmotors, six oxygen tanks, 50 regenerators, an oxygen pump, two stretchers, a life line, box of explosives, lanterns, tents, fire extinguishers, complete telephone system and a full complement of hose, axes, saws, miner's tools and medical and surgical supplies. The equipment is complete even to the extent of providing for the bird and cage that are used in detecting poisonous gases in mine shafts.

Inasmuch as instant access to everything is essential, the truck body has been built with a special place for everything it carries. The entire carrying space, except for the crew of trained rescuers, consists of compartments of varying size and odd shape nearly all opening on the outside of the truck by means of snatch hooks.



Motor Truck for Mine-Rescue Work

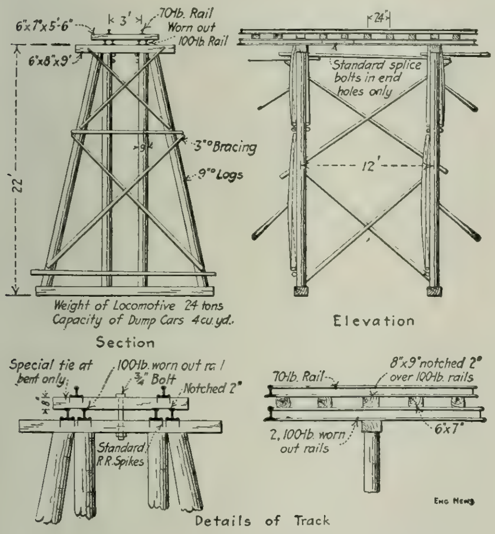
Under the driver's seat are 10 Draeger reviving outfits. Six oxygen tanks are carried beneath the body, the tanks lying crosswise of the truck, so that they may be pulled out quickly when necessary. On the left side of the chassis frame there is an oxygen pump operated by the power of the motor. Back of the driver's seat there are hooks for 5-ft. crowbar and tent poles. Immediately back of the driver's seat and extending the full height of the truck there is a series of compartments opening on the outside of the truck. These compartments carry a tent, 22 ft. of hose, three miner's picks, three miner's shovels, one 4-lb. sledge and two hand axes. Back of these compartments are two seats, arranged lengthwise, with folding lazy-backs, and beneath the seats there is a series of smaller compartments. Bneath the rear steps there is another compartment with doors at each side and in the end. There are also shallow drawers to take saws, hose couplings, reducers, spanners and 200 ft. of ½-in. rope. The central compartments along the sides of the body contain all other implements pertinent to the function of the truck.

# DETAILS OF PRACTICAL MINING

## Old Rails as Trestle Stringers

In the reconstruction of the line of the Pennsylvania R.R. at Rahway, N. J., the Keystone State Construction Co. has a considerable length of timber trestle in which the stringers are made of old rails discarded by the railway. These trestles, states *Engineering News,* are of two types, one used as a construction railway and the other as a filling trestle which is covered by the fill as it progresses.

The construction railway trestle is the heavier of the two and is shown in the accompanying illustration. It is made up of the usual framed bents with round log uprights and sapling braces and a squared 6x8-in. cap. On this cap run the stringers, four old 100-lb. rails, in groups of two, spanning the 12-ft. opening between bents. These rails are spiked with standard railway spikes to the cap and are spliced wherever the breaks come with the standard rail splices with bolts only in the end holes.



Construction Trestle with Rail Stringers

The 3-ft. gage construction track is built of old 70-lb. rails spiked to 6x7-in. ties with an 8x9-in. tie dapped 2 in. over the stringer rails at the bents. These latter ties are bolted with ¾-in. bolts to the bent caps, and this is the only fastening of the track to the bents or stringers.

In the filling trestle, the track rails also act as stringers. This track is of 3-ft. gage and is made up of old 100-lb. rails, spiked to 6x7-in. ties, which act merely as spacers between bents and as caps at the bents. The dirt train is backed onto the trestle and the cars are dumped at the edge of the fill so that no load but that of empty cars comes on the trestle. The ties and rails remain in the fill and form the construction track on the embankment.

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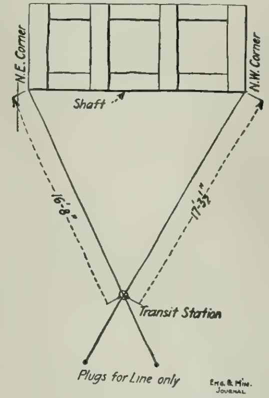
## Giving Line for Raising to Shaft

By A. Carr Harris*

In extending shafts at Cananea, it is customary to raise with temporary timbering, hole through as soon as possible and proceed downward with the permanent shaft timbering. This is a much simpler operation from the surveyor's point of view than carrying the permanent shaft timbers up with the raise.

To give line for starting, the surveyor selects a point convenient to the raise and calculates bearings and distances to two corners corresponding to corners of the shaft above. Backsights are established to give line to the corners and a sketch is made for the use of the foreman similar to that shown herewith. The transit point is set some distance, 15 to 40 ft. from the shaft, so as to prevent its being shot out.



Foreman's Lines for Raise

Carrying the permanent shaft timbers up with the raise requires a degree of accuracy in starting, which is not necessary with this method. Setting such permanent timbers usually necessitates a special survey. Other considerations, also, not connected with the surveying, render it preferable in many cases to set only temporary timber while raising.

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## Safety of Gasoline Mine Locomotive

In conjunction with the article descriptive of internal-combustion mine locomotives in the Journal, Aug. 23, 1913, the following opinion in regard to their safety published by *Coal Age,* Oct. 11, 1913, is of interest. Except for the absence of explosive mine gas, the same considerations apply to metal mines:

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*Mining engineer, 445 Piccadilly St., London, Ont., Canada.

Opinions vary in regard to the question of safety, in respect to installing a gasoline locomotive in a coal mine, particularly a gaseous mine. There is, naturally, a strong objection to permitting so large a quantity of so explosive a liquid as gasoline, to be taken into the mine. For the purpose of haulage, the gasoline is handled in sealed tanks, which are taken into the mines and installed under heavy covers near the center of the machine, to guard against possible accidents and the ignition of the gasoline, due to the breaking of the tanks in the event of collision.

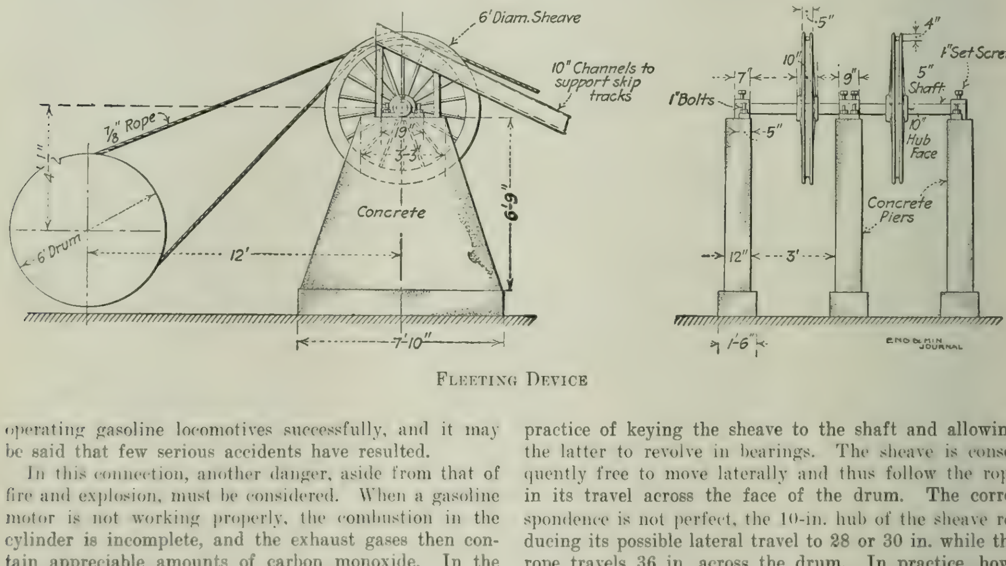
It is claimed that with reasonable care the gasoline mine locomotive, as now built, is safer than the electric locomotive used for the same purpose, in mines. It cannot be denied, however, that the presence of gasoline in the quantities required for mine haulage is and must necessarily be regarded as a menace to the safe working of the mine. The majority of mine accidents are due to carelessness or neglect; and, to avoid disaster from these sources, all explosive material should be kept out of the mine, as far as possible. Many mines, however, are operating gasoline locomotives successfully, and it may be said that few serious accidents have resulted.

In this connection, another danger, aside from that of fire and explosion, must be considered. When a gasoline motor is not working properly, the combustion in the cylinder is incomplete, and the exhaust gases then contain appreciable amounts of carbon monoxide. In the normal working of the engine, the exhaust gases consist chiefly of nitrogen and carbon dioxide, with water vapor. The possibility of poisonous gases in the exhaust, though comparatively slight, may result in fatal consequences under the varied conditions in coal mining. In well ventilated workings there is little danger to be anticipated from the exhaust of the engine; but the poisonous effect of the gases should be thoroughly understood by all concerned in the operation of this class of motors. When the engine is working properly, there is little smoke or odor noticeable in the exhaust; and when these are observable, they indicate incomplete combustion in the cylinder, which should be remedied in order to avoid danger and also in order to obtain the highest efficiency of the machine.

# Concrete Headframe with Fleeting Device

By L. O. Kellogg*

The flat-lying shaft of the Sterling Iron & Railway Co. reaches the surface at an angle only a little greater than the slope of the ground. The hoist is set on the hill about 100 ft. above the collar and the dump, bin and headframe built in this space, at no place rise more than 12 or 15 ft. above the ground. There is thus no use for a high headframe and all that is used is a concrete foundation under the sheaves and some channels to support the track. The general arrangement is shown in two elevations in the accompanying drawing. The 10-in. channels extend toward the shaft collar and carry crossties on which the rails rest. The centers of the sheaves and the drums being so close together and the 2500 ft. of rope requiring several wraps on the 3x6-ft. drums, it is evident that smooth winding could not be had without some provision for taking care of the fleet. For this reason, the sheaves are made to revolve on the shaft which is held fixed, contrary to the more usual practice of keying the sheave to the shaft and allowing the latter to revolve in bearings. The sheave is consequently free to move laterally and thus follow the rope in its travel across the face of the drum. The correspondence is not perfect, the 10-in. hub of the sheave reducing its possible lateral travel to 28 or 30 in. while the rope travels 36 in. across the drum. In practice, however, the rope winds perfectly.



Fleeting Device

The sheave hub is lined with brasses about ¼ in. thick and lubrication is had by means of two grease cups in the middle of the hub, diametrically opposite. The shaft is 5 in. in diameter and is held in the castings which rest on the concrete piers, by means of setscrews.

Although the cars on the incline are hoisted at rather a slow rate of speed, the dumping point is so near the sheaves and the sheaves so near the drums, that the danger of an overwind with serious results is rather greater than is usually the case. Provision against this danger, however, is taken. The hoist is of Lidgerwood make operated by a General Electric motor. The latter is rated at 54 amp., 2200 volts, 225 hp., 600 r.p.m. under no load and 575 r.p.m. under full load. It operates on a 60-cycle, three-phase current. A band brake on the motor shaft is actuated by a weight which is usually kept suspended by connection to a bar through a solenoid. There is a trigger on the mounting of the hoisting-indicator which is tripped by the indicator as it passes a certain point. This shuts off the current from the motor and from the solenoid. The bar is therefore allowed to drop, and the weight applies the brake at the same time that the power is shut off. The relatively high speed of the motor shaft makes this rather light brake both powerful and rapid. With this safety device in use, only a high speed on the car would enable it to come over the sheave into the hoist room. If this should happen, there would still be no danger of injury to the engineer, as his platform is set on one side and rather high. The same platform also extends to the sheaves which are thus easy of access.

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*Of editorial staff, "Engineering and Mining Journal."

A countershaft between the motor shaft and the drum shaft gives a double reduction of speed. Of the drums, themselves, one is fixed to the shaft and the other is clutched in and out. For the ordinary manipulation of the hoist, regulation post brakes are used. An additional safety precaution lies in the "dead man" switches—aptly called. There are two of these set in the platform floor, one in front of the brake and reverse levers and the other in front of the controller box. These are the two points where the engineer may be standing while running the hoist. His foot must be on one switch or the other in order to complete the circuit of the current through the motor. In case of vertigo or any other incapacity of the engineer, the switch flies open and the power is shut off.

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## Safety Rules—Timbering*

(1) Each miner should see that his timbering is safe. Ground should not be broken in advance of the timbering for a greater distance than the space necessary properly to install one set of timbers.

(2) No defective timber should be sent down in the mine.

(3) Ash, birch, balsam and poplar should not be used as caps.

(4) The captain should see that there is a sufficient supply of timber at all levels and places wherever needed.

(5) Miners are warned to secure the roof of their working place by extending poles from the cap timbers of the foremost set into holes picked into the ground ahead. In case this cannot be done, use props or head boards. These should be left as lagging when the permanent set is put in. All holes above drifts and slices should be blocked or lagged.

(6) All timbers should be securely wedged in position and set in a proper, straight, safe manner.

(7) Great care should be exercised in picking the loose material from the back or sides, particularly after each blast.

(8) In stopes timbered with square sets the working floors shall be closely and securely lagged over.

(9) Lagging shall be long enough to reach clear across the caps.

(10) When working in raises miners should put in stage poles, one on each side of the raise, and about 2½ ft. apart, vertically.

(11) Cribbing in all raises should be solid.

(12) Winzes opening directly from the floor of the drift or stope should be kept covered by rails and protected by a guard railing to prevent persons falling therein.

(13) When placing timbers, see that the staging and platforms are secure and safe.

(14) In sinking, not more than sufficient room for another set of timber shall be left unprotected at the bottom of the shaft, except in extremely hard and firm ground, when timber shall be kept as close to the shaft bottom as good practice will permit.

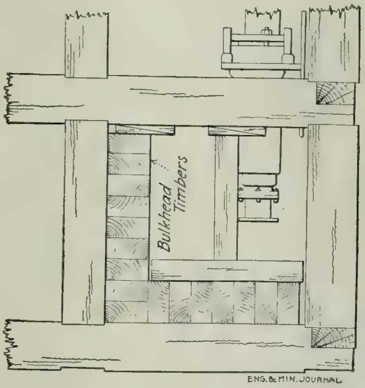
(15) Timbers should be hoisted or lowered through a compartment equipped with a ladder only when absolutely necessary, and then after timber is hoisted or lowered, the ladder should be inspected to see that it has not been broken.

(16) Spikes and nails should be removed from all planking not in use, to avoid danger of stepping thereon.

⁂

## Sinking Pump Bulkhead

Pumps used in sinking at Butte are protected against blasting by a bulkhead of the type shown in the accompanying illustration. As the bulkheads have to be lowered every time the pump is lowered, they are made of pieces as light as possible, 5x10-in. or 4x10-in. material set on edge serving the purpose excellently ("Bull." A. I. M. E., August, 1913). The pump suction extends through the bulkhead and provision must be made for closing this opening. One way of arranging this is to have the pieces below the pump wedged so that they can be pulled up and out or to leave them loose so that they can be spread. Another method is to use directly under the pumps two 10x10-in. timbers with a 5x10-in. hole in each, thus obtaining a 10x10-in. hole for the suction. This is either covered by a block during blasting, or plugged by the strainer which is pulled just high enough for the purpose. Since the 10x10-in. timbers, however, are extremely heavy when wet, the former method is usually preferred.



Removable Bulkhead to Protect Sinker

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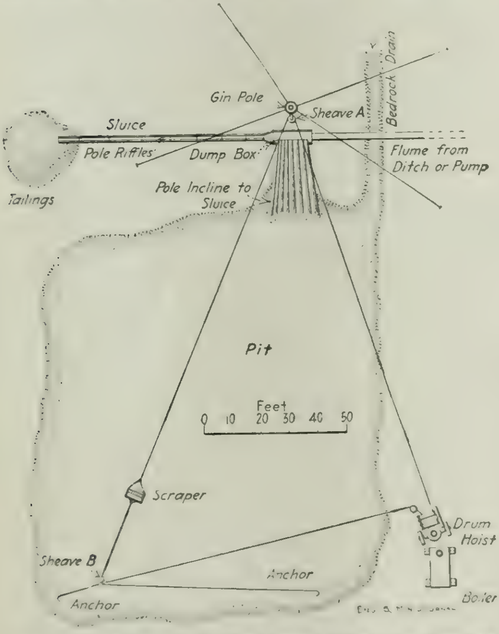
*From Inland Steel Co.'s book of rules.

## Fairbanks Opencut Placer Method

A method employed in working an opencut placer mine, on Pedro Creek, of the Fairbanks district, is illustrated herewith. Operations begin by clearing the ground of brush and then plowing and scraping off the overburden to a waste heap at one side, according to F. J. Katz (U. S. Geol. Surv., Bull. No. 525). Although the ground is frozen, no artificial thawing is required, since the natural thawing keeps pace with the rate of stripping. After about 3½ ft. of waste material has been removed, the extraction of the gravel begins. This is plowed during the night and scraped during the day. Both plow and scraper are actuated by a continuous rope passing over a sheave *A* on a gin pole and a sheave *B* be anchored in the cut, as well as over the hoist drum. The plow and scraper can thus be moved in either direction. When the scraper is full the hoist engine pulls it to the pole incline and up the incline to the dump box where its teeth are engaged by a log; this stops its progress so that further pulling overturns it into the dump box.



Layout for Placer Mining with Plow and Scraper

When the scraper is dumped, the engineer reverses the direction of haulage and brings it back into the pit again. No man is needed at the dump box but two men are required to guide the scraper while filling and two men on the plow. The average depth of the gravel is 8½ feet.

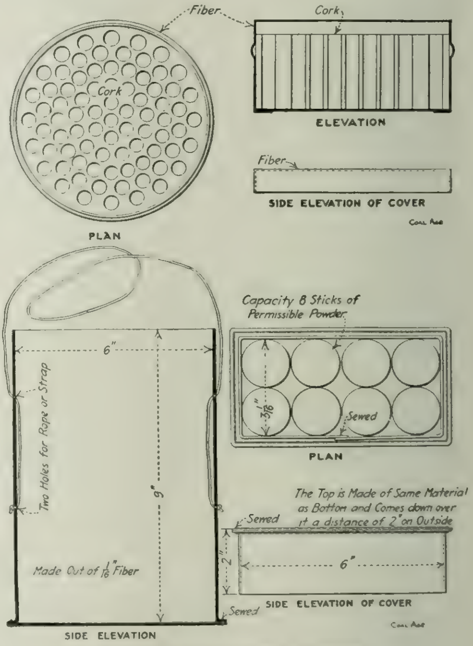
The material from the dump box is sluiced and washed over riffles in the usual way. When one area has been extracted, the plant is moved upstream to the next cut. During a working season of about 120 days, two cuts measuring together 135 ft. by 275 ft. were made. About 5000 cu.yd. of overburden and 11,500 cu.yd. of productive gravel were removed. Water was obtained by gravity but had to be elevated about 15 ft. with a centrifugal pump. Good wood fuel cost $8 per cord at the plant. About a cord per day was consumed. The cost of handling the gravel is said to have averaged about 30c. per bedrock sq.ft., the usual unit of the district. The total cost of operating, including cost of installation of plant and amortization charges, would be about 42 to 45c. per bedrock square foot.

⁂

## Carrying Cases for Explosives

Receptacles for carrying powder and caps are herewith illustrated. The box made of fiber is light to carry and has an air- and moisture-proof cover (*Coal Age,* Oct. 11. 1913). In use, it is hung from the shoulder by a rope or strap. It is probably too small for use in a metal mine, but the design may carry suggestions.

The cap box consists of a piece of cork with 72 holes drilled in it, of a size suitable for holding a cap, the cap being thus protected against jar and check. The cork is encased in fiber. It sometimes becomes necessary for a such case this cork box should prove useful in preventing accidents.



Carrying Cases for Powder

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**Flat, Tapered, Fiber, Hoisting Ropes** are used at the Grand Hornu coal mines in Belgium. The ropes are made of aloe (Agave Americana) fiber, and taper both in width and thickness. They are used in hoisting from a depth of 3280 ft., and at the large end measure 12½ in. wide and are 2 in. thick. At the cage end the ropes are 8½ in. wide and 1¼ in. thick. The weight ranges from 9.8 to 4.75 lb. per ft. The weight of each rope is 10½ tons. Each of the cages has six decks, and weighs 4800 lb., weight of the six cars is 2778 lb., the loads of coal total 6000 lb., making a total weight of 13,570 lb., not including the weight of the rope. The wind is made in 144 sec. actual winding time.

# DETAILS OF METALLURGICAL PRACTICE

## Pebble Lining for Hardinge Mills

By David Cole*

In view of the unsatisfactory situation prevailing at present in the silex market, it is interesting to know that the flint pebbles regularly employed as a grinding medium may also be successfully used for lining pebble mills, and are being so used at the No. 6 Concentrator of the Arizona Copper Co., Ltd., at Morenci, Ariz., in 8 ft. by 22 in. Hardinge mills.

In our experience of the past nine months, silex linings have not averaged more than 75 days in use, the longest period being one of 117 days.

One of the pebble-lined mills was started in service June 20, has now been in operation more than 80 consecutive days, and at this writing the lining is in excellent condition.[1] The pebbles are only slightly flattened and apparently not half worn out, thus indicating a life of at least four months, as compared with the above record for 2½-in. Belgian silex blocks.

Lifters are necessary with silex, and are hard to maintain. With the pebble lining, the whole interior of the grinding chamber is rough, thus eliminating the necessity for "lifters." The cascading effect is ideal for the reason that the slip of the charge is absent, or limited. The small pebbles of the charge fit themselves into the spaces between the ends of the large pebbles in the lining, and a large percentage of them remain wedged in these spaces for some time, preventing slippage. The lining in the short cone end of the mill becomes flattened first, for the reason that the charge necessarily slips on the steeply inclined surface of that end.

The cost of lining with No. 4 pebbles is about the same as with the regular 2½-in. silex blocks. Mortar made with one part portland cement to 1½ parts clean, sharp sand, is used in the same way as when lining with silex. The larger pebbles are used in the cylindrical part of the shell, in the short cone, and in the larger part of the long cone, and successively smaller ones in the remainder of the long cone. Pebbles are set endwise, tight together. The inlet and discharge throats are lined with small worn pebbles instead of iron lining as formerly. The inlet and discharge funnels are coated with neat cement to a thickness of ¼ in., painted on, in successive layers. Thus, no portion of the shell or the interior of the mill is left unprotected against "copper water." Cement covers the pebbles for two-thirds of their height.

I think no flint need be "scrapped," as the worn pebbles of discarded lining may be used subsequently in the pebble charge. The pebble lining tends to increase capacity through preserving maximum "cascading" effect. No. 5 and No. 6 pebbles will be used in the 8-ft. by 36-in. new Hardinge mills now being installed, and we expect a life of six months with these.

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*Engineer-in-charge, No. 6 Concentrator, Morenci, Ariz.

[1] We are since advised that the lining is in good condition after 125 days' use.—Editor.

## Ullrich Magnetic Separator

The field of magnetic separation of minerals has been a fertile one for metallurgists during the past few years, and a number of devices have been offered to the operator for separating commercially valuable products from complex ores. A new machine has been invented by Georg Ullrich, of Broken Hill, New South Wales, Australia (U. S. pat. No. 1,026,685). This invention is for the magnetic treatment of ore of different degrees of magnetic permeability. Its object is to provide a magnetic separator which will enable ore to be divided into various grades of different degrees of magnetic permeability, in a rapid and inexpensive manner, and, at the same time, permit of such fine adjustment, that ore, or mixtures of ore, in which the various component parts differ from each other but slightly, may be economically treated so as to produce a high degree of concentration at low cost.

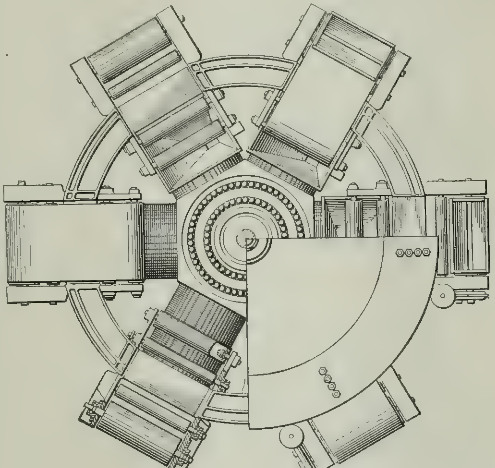
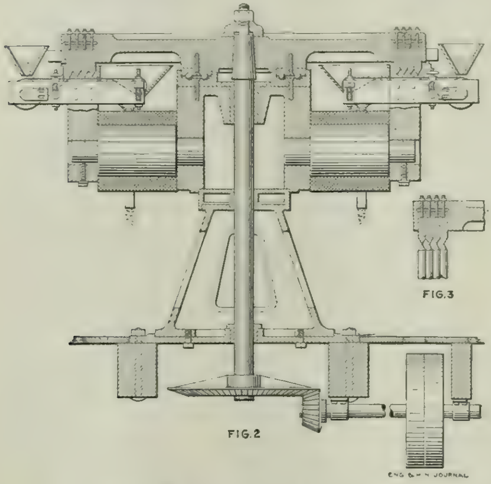


FIG. 1

Plan of the Ullrich Magnetic Separator

The principle of this machine is the passing of the finely divided metal-bearing ore through a magnetic field having zones of different strengths, so that the various constituent parts of the ore which present different degrees of magnetic permeability are separated from each other in the same magnetic field, but by different zones. The ore is passed through the field in one direction by a constantly traveling belt, which is returned in the opposite direction through the same field but on a lower plane. The various strengths of zones in this field are produced by induction rings moving in a horizontal plane and mounted so that they can be adjusted vertically nearer to, or farther from, the pole pieces of the electromagnets. These adjustable separating rings operate so that each raises ore particles of the particular degree of magnetic permeability for which it is adapted and set, and carries them out of the magnetic field, when a change of polarity of the ring, as it passes from the field of one magnet to the other, will cause the metallic particles to be repelled and discharged from the ring.

The accompanying drawings make clear the working of the machine. Fig. 2 shows a vertical section of the separator as preferably constructed, and Fig. 1 a plan view of the machine having a portion of the rotating ring carrier and other parts removed. A number of polepieces are provided arranged around a common center as shown in the figure. In this example, six of these polepieces are provided, each formed by a horizontally arranged field magnet projecting radially from and supported by a suitable central yoke. The upper surfaces of the polepieces are in the same horizontal plane, and each pole has mounted upon it a frame carrying an endless conveyor belt.



Ullrich Magnetic Separator

A central vertical shaft is provided carrying a horizontally rotating disk, around the edge of which are arranged any preferred number of adjustable separating rings, so arranged that they travel in a path immediately above the polepieces. These separating rings are supported by setscrews so that they can be adjusted vertically to any desired distance above the pole. As shown in Fig. 3, there will be a series of magnetic zones formed in the magnetic field between each of the rings and the polepieces, and the strength of said zones will vary, as illustrated diagrammatically, according to the distance of the rings from the pole. These adjustments can be produced within wide limits without altering the total strength of the magnetic field. By adjusting the ring so that each successive zone is stronger than the preceding one, the material can be separated into as many grades of product as there are rings, or, if preferred, two or more of the rings can be set to the same distance above the polepieces so as to separate material of the same magnetic permeability. The material to be treated is fed onto the conveyor belt by a hopper and is conveyed to the magnetic field by the belt in a regular stream and at a regular rate of speed, so that although the entire separation can be conducted rapidly and in a thoroughly efficient manner and with comparatively small expenditure of power.

When the ore is fed by the conveyor belt to the magnetic field between one of the polepieces and the separating rings, the particles having the greatest magnetic permeability are lifted off the belt by the first ring and are carried latterly until they are moved from the influence of the magnetic field, when they drop into a receiving hopper, provided for the purpose, and from thence are conveyed to any suitable bin or receptacle. The change of polarity will cause all of the material to be discharged from the ring as it passes from the field of one magnet into that of another. The proper mechanical appliances and devices are provided for revolving the rings and providing the course for the magnet.

⁂

## Electric Furnace Lining

Dorsey A. Lyon and Edwin R. Cox, Jr., remark in a recent patent specification that it is well known that no refractory lining has yet been devised for an electric furnace, which does not become a fairly good conductor of electricity at the temperature of the electric crucible, and that the heat-resisting properties of the usual refractory lining, such as firebrick, have about reached their limit in a blast furnace; wherefore, if to the heat which the walls receive by direct radiation and conduction from the melting zone, there be added heat generated by stray electric currents passing through the walls of the crucible, the life of the lining is very short, the refractory material being rapidly melted down and passing away into the slag.

⁂

## Improvement in Parral Tank

Under No. 1,071,447, Bernard MacDonald, of Guanajuato, Mexico, has received U. S. patent rights covering an improvement upon his familiar Parral tank for agitating slime in the cyanide process. This tank, or the system of operation, differs only slightly from the original patent granted to Mr. MacDonald. In the more recent case the tank is flat-bottomed and can be made in any proportions, not requiring necessarily a tall, narrow tank. The agitation may be performed by one or more air-lift pipes, these being, as formerly, situated around the periphery of the tank. These air-lifts now terminate in bends which deliver the pulp in a manner practically parallel to the side walls of the tanks, thus insuring a rotary or whirling motion to the contents of the tank, very similar to that obtained by agitating with mechanically moved paddles. A new type of ball valve has been designed by Mr. MacDonald for use with this tank, and this, it seems, will give satisfactory results.

The Parral tank has had satisfactory experience in some places, though it has occasionally failed to justify expectations. It is believed by Mr. MacDonald that these improvements will insure a wider popularity to the tank.

⁂

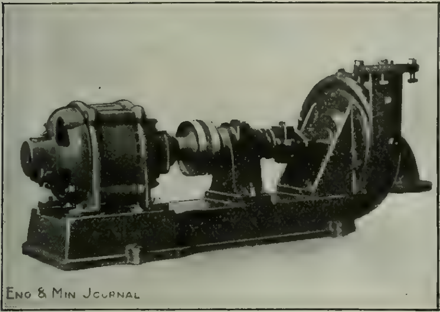
**The Murex Magnetic Concentration** process has been applied successfully to both sulphide and carbonate ores, says "Metallurgical and Chemical Engineering," November, 1913. The crushed ore is mixed and agitated with an emulsion of oil and magnetic oxide of iron, after which it is passed under an electromagnet which lifts the particles which have been coated with the emulsion. The process has been used at the Cordoba copper mine in Spain, and the Whim Well copper mine in Australia. At the latter place carbonate ore is treated producing a concentrate of 20% to 25% copper from 6% ore, yielding a recovery of about 80 per cent.

# MINING & METALLURGICAL MACHINERY

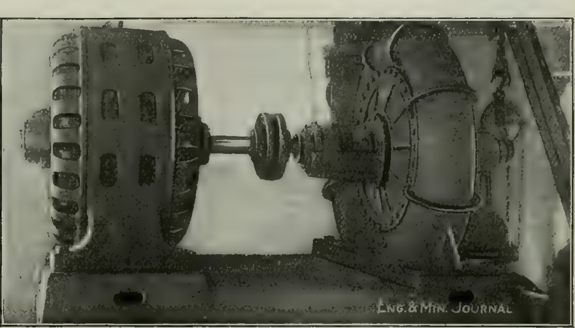
## Low Lift Centrifugal Pumps of High Efficiency

Besides its line of dredge pumps, which are used by many of the large dredge operators in California, the Yuba Construction Co. is manufacturing a line of low-lift centrifugal pumps of the types illustrated herewith. The small direct-connected units shown in the upper illustration have been giving most satisfactory results in service and for comparatively inexpensive pumps have shown remarkably high efficiency in tests conducted at the company's works at Marysville, Calif., where a complete testing laboratory was equipped for developing the design of this line of pumps. For some of the small pumps, efficiencies running up to 65% and even 70% have been obtained in the company's testing department, where V-notch weirs and carefully calibrated weighing and measuring sets have been installed to test the efficiency of the pumps and of the pump-and-motor unit.

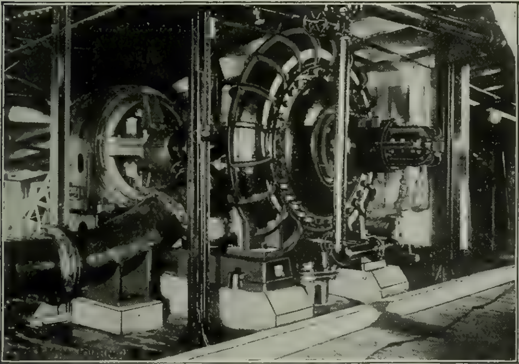
In designing these small pumps, the Yuba Construction Co. adopted the plan of partly overcoming the thrust of the runner by a simple hydraulic balance and taking care of the remainder by a mechanical thrust bearing. Thus in the latest types, the thrust is partly balanced by the pressure of the water around the outside of the runner, the leakage ring on the suction side of the runner being of smaller diameter than on the side toward the back head of the pump. The thrust being partly taken care of in this way eliminates the necessity of so large and expensive a thrust bearing as is required with pumps arranged with single suction but with leakage rings of the same size on each side of the runner. The chamber between the runner and the back head of the pump inside the leakage ring is connected with the suction side of the runner by holes around the hub; consequently the water in this chamber is under only a small pressure. In place of the usual water-sealed stuffing box, which is unsuitable to intermittent operation, the company preserves the packing by using an oil seal. An oil reservoir is cast integral with the compression member of the gland; an oil



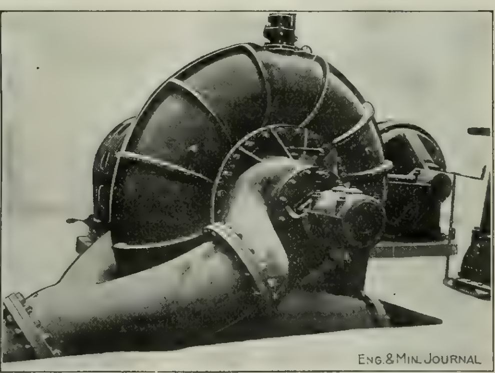
4-In. Centrifugal for Low Lifts



14-In. High-Pressure Centrifugal Natoma No. 8



12-In. Pump for 200-Ft. Head, Natoma Dredge No. 10



22-In. Double-Suction Pump, Alder Creek Pumping Station ring running on the shaft constantly keeps a film of oil on the packing, which is preserved in good condition indefinitely.

In these small pumps, instead of changing the speed to provide for different pumping heads, the company manufactures several runners of correct diameters for various heads, filler rings of corresponding size being sent with the runners to fill the space between the periphery of the runner and the entrance of the collection chamber. The runners are readily changed by opening the casing and inserting the desired runner and filler ring. By this method the water leaving the periphery of the runner with a high velocity passes through a comparatively long channel between the entrance to the collection chamber, thus producing a gradual change of velocity, eliminating serious eddies from abrupt velocity change, and increasing the efficiency of the pump. A feature of the efficiency curves taken on these pumps is the flat top, which carries the favorable operating efficiency of the pump when in actual service over a much wider range than in the case with pumps designed to give a peaked-top efficiency curve.

In addition to this line of small direct-connected units and its regular gold-dredge pumps, the Yuba Construction Co. has built a number of large centrifugal pumps that are of interest. Among these are four 22-in. double-suction pumps in the Alder Creek pumping station of Natomas Consolidated. These are direct connected to 200-hp. General Electric constant-speed motors and operate at 490 r.p.m. against a 50-ft. head and pump 11,250 gal. per min. The company has built a number of 20-in. centrifugal pumps for use on suction dredges in the Sacramento Valley. Illustrations are presented herewith of two gold-dredge pumps, one of which is a high-pressure two-stage monitor pump installed on Natoma No. 10. It is a 12-in. pump driven by a 250-hp. General Electric motor at 580 r.p.m., delivering 3600 gal. of water per minute at 200-ft. head. The other is a typical 14-in. high-duty dredge pump installed on Natoma No. 8 for supplying water to the revolving screen. It is operated by 150-hp. Westinghouse Type CCL motor at 580 r.p.m., and delivers 5500 gal. of water per minute at 60-ft. head.

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## Synchronous Motors for Compressors

The use of synchronous motors for driving compressors is comparatively new practice. A typical example of this kind of utilization is furnished by the compressors at the mines of the Wickwire Mining Co., Iron River, Mich. The two compressors on this property are each driven by a Westinghouse self-starting synchronous motor. Both compressors are of Ingersoll-Rand make; one delivers 1352 cu.ft. of free air per minute, at 200 r.p.m., and is driven by a 220-hp. motor; the other delivers 995 cu.ft. of air at 225 r.p.m., and is driven by a 175-hp. motor. These compressors have been in operation over a year and have proved satisfactory.

The synchronous motors used at this mine are characterized by great strength and simplicity of construction. The stator is supported by a heavy cast-iron frame, and the coils are form wound and so arranged that they can be easily removed and replaced if the necessity ever arises. The rotor consists of a cast-iron spider, which carries the field poles. The windings are so arranged that they receive ample ventilation and each field coil can be easily removed. An interesting feature of the rotor is the squirrel-cage winding that encircles the field poles. This winding makes the motor self-starting and eliminates "hunting," or surging.

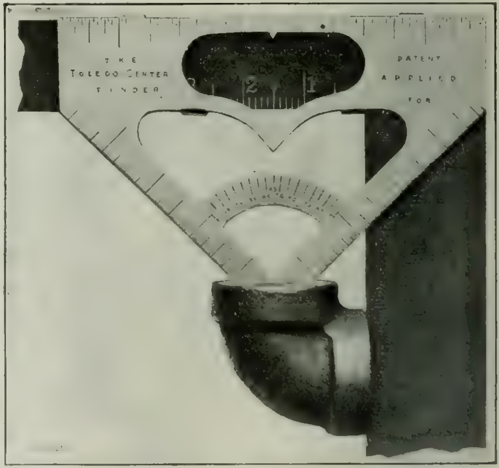
The Wickwire mine is operated from 6600-volt, 60-cycle, three-phase power, supplied by the Peninsular Power Co. This voltage is stepped down to 2200 volts for the synchronous motors, and 220 volts for the motors for driving pumps and other apparatus.

Compared with other forms of drive for large compressors, numerous advantages are claimed for the synchronous motor. This type of motor is especially adapted for direct connection, so that it costs less to install and takes up minimum floor space. The elimination of belts also decreases the maintenance expense. It is able to operate at 100% power factor, which tends to improve the operation of generators and to increase the capacity of transformers and transmission lines. These motors can be arranged to raise the power factor of the entire circuit by being supplied with excess capacity and used as synchronous condensers, thus greatly increasing the operating efficiency of the generating and transmission systems. Another advantage of these motors is their reliability. The modern synchronous motor is self-starting and self-synchronizing, thereby eliminating one of the chief objections to the old type of synchronous motors, which required an auxiliary starting device.

⁂

## Toledo Center Finder

This tool is made to use with a carpenter's steel square, as illustrated, when it will readily determine the center measurement of pipe fittings; it covers a range of sizes from 1 to 6 in. (*Power*, Sept. 23, 1913). Each straight-edge is graduated, one edge to $\frac{1}{16}$ in., one to $\frac{1}{8}$ in., and one to $\frac{1}{4}$ in. The cross brace forms an arc of a circle and serves as a protractor, being graduated to 5°. The instrument can also be used for striking correct angles and inclinations in laying out piping. The device is made by the Toledo Pipe Threading Machine Co., Toledo, Ohio.



DEVICE FOR DETERMINING CENTER MEASUREMENTS OF PIPE FITTINGS

# Metal Mine Accidents in British Columbia

By Frederick L. Hoffman*

*SYNOPSIS—An analysis of metal-mine accidents in British Columbia during the last 10 years. The 1912 mine output was the largest in the province's history; the accident rate the lowest.*

⁂

In an analysis of the accident statistics of British Columbia for the last 10 years, it is necessary first to refer to the annual report of Thomas Graham, Chief Inspector of Coal and Metalliferous Mines, who is assisted by six district inspectors. Considering the area of British Columbia and the wide distribution of the mining industry, the inspectorial staff would hardly seem sufficient. It requires to be taken into consideration that the scope of inspectorial duties has been materially broadened within recent years and now includes extended consideration of accident prevention, mine-rescue work, instruction of miners in first aid to the injured, public lectures on mine safety and accident prevention, etc. In 1912 there were seven separate fatal accidents in metalliferous mines, causing the loss of eight lives, against 17 deaths in 1911. The fatality rate was, therefore, 2.35 per 1000 as compared with 5.25 for 1911, in spite of the fact that the production of the metalliferous mines in 1912 was the largest recorded in the history of the industry in the province; whereas the fatality rate was the lowest during recent years.

## No Fatal Falls of Ground in 1912

Another notable feature of the annual record for 1912 is contained in the statement that: "One noticeable feature of this year's accidents is that there were no fatalities from falls of ground; when we consider that many of the largest producing mines are worked on the large open-stope system, with no timbering, it speaks volumes for the supervision and care of the officials and employees, and suggests to us that with a fraction of the amount of care which must have been devoted to this work bestowed on the open chutes, we might eliminate the chute accidents entirely." The table following exhibits the accidents in metal mines of British Columbia for the decade ending with 1912. The record differentiates fatal, serious, and slight accidents, and for each the rates have been worked out on the usual basis of 1000 employees. It is not stated in the reports how the number of employees is precisely arrived at, and it is therefore assumed that the number represents the average for the 12 months of the year. It is possible, however, that for mines working only part of the time the number of employees has been adjusted and reduced to an annual basis of exposure, which, however, would probably not materially affect the returns for most of the districts operated practically throughout the year.

According to this table the average fatality rate for the decade was 4.74 per 1000. The rate was highest in 1903, when it was 7.27, and lowest in 1912, when it was 2.35. Comparing the last five years with the first, it appears that there has been a reduction in the rate from 4.94 to 4.53 per 1000.

What reliance can be placed upon the returns of serious nonfatal accidents is rather doubtful. The reported number of such accidents has varied considerably for the different years, and it is practically certain that the actual number of such accidents occurring has been larger than the number reported. The average rate of serious nonfatal accidents as reported for the decade was 3.14 per 1000, the rate having been highest (5.64) in 1906, and lowest (0.97) in 1910. Comparing the first five years with the last, it appears that the rate has decreased from 3.75 to 2.51 per 1000.

The same conclusion and suggestion of caution apply to the returns of slight nonfatal accidents, which reached the maximum in 1907, when the rate was 14.61 per 1000, and the minimum in 1909, when it was only 0.33. The average rate of such accidents for the decade was 5.53 per 1000, the rate having been 7.09 for the first five years, as compared with 3.92 for the last.

TABLE 1.

ACCIDENTS IN METAL MINES OF BRITISH COLUMBIA, 1903–1912

| | | Fatal Accidents | | Serious Non-Fatal | | Slight Non-Fatal | |
|---|---|---|---|---|---|---|---|
| Year | Employees | Number | Rate per 1,000 Employed | Number | Rate per 1,000 Employed | Number | Rate per 1,000 Employed |
| 1903 | 2476 | 18 | 7.27 | 4 | 1.62 | 13 | 5.25 |
| 1904 | 3306 | 14 | 4.23 | 9 | 2.72 | 22 | 6.65 |
| 1905 | 3596 | 14 | 3.89 | 9 | 2.50 | 8 | 2.22 |
| 1906 | 3718 | 17 | 4.57 | 21 | 5.64 | 22 | 5.92 |
| 1907 | 3697 | 20 | 5.41 | 20 | 5.41 | 54 | 14.61 |
| 1908 | 3537 | 21 | 5.94 | 13 | 3.68 | 12 | 3.39 |
| 1909 | 3037 | 15 | 4.94 | 9 | 2.96 | 1 | 0.33 |
| 1910 | 3107 | 13 | 4.18 | 3 | 0.97 | 22 | 7.08 |
| 1911 | 3241 | 17 | 5.25 | 10 | 3.09 | 23 | 7.10 |
| 1912 | 3402 | 8 | 2.35 | 6 | 1.76 | 6 | 1.76 |
| 1903–1907 | 16,793 | 83 | 4.94 | 63 | 3.75 | 119 | 7.09 |
| 1908–1912 | 16,324 | 74 | 4.53 | 41 | 2.51 | 64 | 3.92 |
| 1903–1912 | 33,117 | 157 | 4.74 | 104 | 3.14 | 183 | 5.53 |

For practical purposes the fatality rate is a reasonably trustworthy indication of the hazards of mining in the Province of British Columbia. It should be stated in the report, however, whether the term "fatal accidents" is limited to deaths occurring within a specified period of time, or whether some accidents originally reported as nonfatal may, after some months, have been changed to fatalities, on the basis of supplementary information. Uniformity in the methods of reporting is necessary for purposes of comparison, and an understanding should be arrived at between the several mine inspectors of the United States and the Canadian provinces, for at the present time a reasonable doubt exists as to whether the rates are strictly comparable. For the year 1911 the fatality rate for the metal mines of the United States, according to the Bureau of Mines, was 4.19 per 1000, which compares with a rate of 5.25 for British Columbia. It may also be stated in this connection that the average fatality rate in British Columbia coal mines for the decade ending with 1912 was 4.87 per 1000, against 4.74 for metal mines. As shown by the previous table, there were 157 fatalities during the decade, of which a complete analysis, by occupation and causes, is given in the table on the following page.

Information is not available as regards the number of men employed in the several occupations, so that specific fatality rates cannot be calculated.

Out of the 157 deaths from all causes, 35, or 22.2%, were caused by falls of rock or ore; 25, or 15.9%, were

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*Statistician, Prudential Insurance Co., Newark, N. J.

the result of drilling or picking into missed shots; 18, or 11.5%, were the result of falls down chutes, and 16, or 10.2%, were caused by premature blasts, etc. Mention may also be made of 11 deaths resulting from men being caught in the shaft by the cage or skip; 14 deaths due to asphyxiation by gas or powder smoke; 9 deaths due to falls down shafts; and 8 deaths due to mine cars. The table is of interest, but not conclusive without a further analysis of the deaths in detail, as regards which, however, considerable information can be derived, by means of a special analysis, from the annual reports.

As typical illustrations of fatal accidents in the metalliferous mines of British Columbia in 1912, I quote the following in some detail: A mucker boss was killed on the surface by allowing muck to drag him into a chute; a cage tender was killed in the shaft by a cage; a miner was killed by falling into an ore pocket; another miner was killed by falling from a bench into a chute; a miner picked into a missed hole, which exploded and killed him and another miner; a blaster returned to his place of work too soon and was killed by a delayed blast; another miner was suffocated by powder gas in a raise.

TABLE 2. FATAL ACCIDENTS BY OCCUPATION AND CAUSES

| Occupation | Falls of Rock or Ore | Drilled or Picked Missed Shot | Blasts, Premature, etc. | Thawing Dynamite | Falls down Chute | Falls down Shaft | Other Falls | Caught in Shaft by Cage or Skip | Asphyxiation by Gas or Powder Smoke | Caught under Falling or Rolling Timbers | Mine Cars | Caught in Machinery | Electricity | Miscellaneous | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Miners | 19 | 21 | 10 | 1 | 9 | 1 | 1 | 2 | 12 | 2 | 1 | | | 1 | 80 |
| Shovelers | 2 | 1 | | | 3 | | | | | | | | 1 | 1 | 8 |
| Muckers | 4 | | | | 1 | | | | | | | | 1 | | 6 |
| Laborers | 2 | | | | | | | 1 | | 1 | | 1 | | | 5 |
| Blasters | | | 4 | | | | | | | | | | | | 4 |
| Machine men | 1 | 3 | | | | | | | | | | | | | 4 |
| Carloaders | | | | | 1 | | 1 | | | | 1 | | | | 3 |
| Mucker bosses | 2 | | | | 1 | | | | | | | | | | 3 |
| Timber men | 1 | | | | 2 | | | 2 | | | | | | | 5 |
| Skip tenders | | | | | | 3 | | 3 | | | | | | | 6 |
| Trammers | | | | | 1 | 1 | 1 | | | | 1 | | | 1 | 5 |
| Nippers | 1 | | | | | | | 1 | | | 1 | | | | 3 |
| Brake men | | | | | | | | | | | 2 | | | | 2 |
| Cage tenders | | | | | | | | 2 | | | | | | | 2 |
| Chute men | 1 | | 1 | | | | | | | | | | | | 2 |
| Shift bosses | 1 | | | | | | | | 1 | | | | | | 2 |
| Loco engineer | | | | | | | | | | | 1 | | | | 1 |
| Mine foreman | | | 1 | | | | | | | | | | | | 1 |
| Powder tender | | | | 1 | | | | | | | | | | | 1 |
| Top cager | | | | | | 1 | | | | | | | | | 1 |
| Top carman | | | | | | 1 | | | | | | | | | 1 |
| Carpenters | | | | | | | 2 | | | | | | 1 | | 3 |
| Manager and superintendts | 1 | | | | | | | | 1 | | | | | 1 | 3 |
| Crusherman | | | | | | 1 | | | | | | | | | 1 |
| Oiler | | | | | | | | | | | | 1 | | | 1 |
| Ore sorter | | | | | | 1 | | | | | | | | | 1 |
| Physician | | | | | | | | | | | 1 | | | | 1 |
| Sawyer | | | | | | | | | | 1 | | | | | 1 |
| Teamster | | | | | | | | | | 1 | | | | | 1 |
| Totals | 35 | 25 | 16 | 2 | 18 | 9 | 5 | 11 | 14 | 5 | 8 | 2 | 3 | 4 | 157 |

The reports, unfortunately, are too meager in matters of detail and more information should be given in each case, with special reference to surrounding circumstances, the age of the injured employee, and possibly the length of mine experience. Mention may also be made of some of the more serious accidents briefly referred to in the report, including a foreman who was injured by exploding powder while picking muck and who lost one eye and was otherwise injured. Another serious accident was a case of a chuteman whose foot was crushed on a surface ore dump by a car, necessitating amputation.

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## Mineral Output of Western Australia in 1912

The total value of the mineral production, according to the Report of the Department of Mines of Western Australia was £5,760,207, which was £345,646 less than that of the preceding year. This decrease is more than accounted for by the falling off in gold. Copper also showed a decrease, while the value of coal, tin and lead ore increased. Dividends paid amounted to £814,256, as compared with £826,976 in 1911.

The gold produced amounted to 1,282,658 fine oz. Other minerals produced, given in order of descending values, were as follows: Coal, 295,079 tons; copper ore, 9556 tons; tin ore and ingot, 575 tons; lead ore, 1868 tons; silver, 138,039 fine oz.; pyritic ore, 7626 tons; copper ingot matte, etc., 8 tons; zinc, spelter, etc., 14 tons. Other miscellaneous mineral products were exported to the amount of £3172.

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## "High Grading"

BY G. L. SHELDON*

It is an undoubted fact that the majority of miners the world over will appropriate to their own use rich ore, whenever they find it in the mine. Why, it is hard to explain. I have known many miners that I was perfectly willing to trust in any ordinary business transaction, men who could be relied upon ordinarily, but given the opportunity, they would invariably take rich ore, if it appeared safe to get away with it. Once, to a partner in some mining claims, I said, "Jim, I have always found you a straight, honorable man in all your dealings; I am willing to and have trusted you; I believe you to be an honest man generally, but you admit that you take rich ore whenever you find it. How can you satisfy your conscience in doing it?" He answered: "Why, God Almighty put that ore there! If I am the first man to find it, why, it is mine." "Yes, but the ground on which it is found is owned by the other fellow!" "But he might never have found it or known of it, if it had not been for me."

Probably Cripple Creek has been the greatest camp in the world for the theft of rich ores. The amount stolen has run into the millions, and covered an active period of 10 or 12 years, even yet, today to some extent. Goldfield, in its palmy, leasing days, may have exceeded it for a very short time. The lessee could not afford to say or do a thing. His time was short and he was making so much money no questions were asked. Men were known to have paid a thousand dollars to the foreman for a job, then be ahead of the game within three days.

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*Ely, Nevada.

The ores of Cripple Creek were so much alike in appearance that it was an impossibility for a mine owner to recognize his own. The sylvanite and calaverite specimens were certainly beautiful and immediately lost their identity when roasted. In the boom days nearly every third or fourth man one met on Bennett Avenue had a specimen to sell at from one-tenth to 10 times its value. The greater portion of the stolen ores were purchased by some of the many assay offices in the district.

It was customary to pay for about one-half of its value. There was one fence, an assay office, located in one of the small towns, the owner of which kept cutting down the value of the ores that the boys brought him, until he paid them less than 25% of the value. They cussed and threatened. His location was good, near several rich leases, convenient for the boys to slip in and out unseen. He considered himself safe, as they could not denounce him without involving themselves. One dark night when going home, he was set on by several men, pounded and beaten up thoroughly, and evidently his life was threatened, for as soon as he was able to get out, he closed up his office and left town. It was said he knew his assailants, but he did nothing.

There was another assayer who built up a wholesale business in receiving stolen ores. He had a back room fixed up with crushers and a furnace kept hot, so that at any time, night or day, he could get away with several hundred pounds of rich ore on short notice, and smelt it. Sometimes he would get it in ton lots at night by appointment with the boys, and by morning there would be no evidence left. He was arrested several times, but they were never able to convict him. Later he quit, and bought business property on one of Denver's main streets.

Around a camp fire in Alaska, a miner told me that for 18 months he averaged more than $50 per day of high grade, which he took from a well known Gold Hill producer. We know that he worked on this mine, during the time specified, and upon his return from Alaska, where he did not make a dollar, he put $10,000 or $12,000 into a saloon on Bennett Avenue.

Large amounts of stolen ore were shipped out by express, freight and wagons, the greater portion going to Pueblo and Denver. It was an exceedingly profitable business to everyone connected with it, as much of the ore would run from $5 to $50 per pound.

For ingenuity and cunning in stealing rich ores, the Mexican beats them all. I have known of his greasing the hair of his head and his body, rubbing in thoroughly the fine drillings of native silver.

The water boys who carry a five-gallon oil can of water on each end of a bamboo stick, which is light, strong and hollow, except at the joints or knots, which are drilled through, join with the miners in filling the bamboo stick with the native-silver drillings, thus getting away with several ounces at each trip.

In Northern Mexico, in recent years, the theft of rich ore from a well known producer was enormous. From a distance I saw, one morning, 35 mule-loads of ore going to a distant ranch, where it could be ground up in the *tahonas*. For a distance from 10 to 100 miles from the mine, we have seen this ore, which was easily recognized, being ground in a *tahona* run by a burro or mule.

Two miners were caught one day going out on the main trail with over $2000 worth of ore on their backs. In the company doctor's trunk was found several thousand dollars worth of amalgam.

But the *gambucino* is the shrewdest. He makes a business of robbing mines, especially those not in active operation, to such an extent that it is a notorious fact in Mexico that one rarely finds any rich ore in sight. If a free ore, he grinds it in the *tahona*, and if base he will smelt it in an adobe furnace, using plenty of lead ore and litharge from some other adobe smelter. In either case, its identity is quickly changed.

Some merchant will always buy a product at a fraction of its value. I recall one case where the merchant and the Prefect of the district stood in together, took the *gambucino's* gold, worth $300, and only gave him $20 worth of goods. Then when he would not tell where he got the gold, they threw him in jail for 40 days. Later, during the Madero revolution, both the merchant and the Prefect had to make themselves scarce. The latter was caught, his mule taken from him, and he was made to walk a distance of 60 miles to Culiacan, where he was turned over to the rebels in control. I never learned what became of him.

I have known rich gold ores to be pounded up in an old quicksilver flask with a short drill, and then washed and panned down with a horn spoon. But rich silver ores and an adobe furnace seem to have the preference. Often within a radius of 10 miles of a rich mine, there will be several adobe furnaces, the owners of which make a living from stolen ores. They generally have a prospect nearby from which they claim to obtain the ores, but I never could find any rich ore in the prospect.

Often the Mexican mine owner is not very particular, allowing some ore to be stolen, rather than to make trouble. At one rich gold mine belonging to Mexicans, some of the employees are relatives and friends of the owners and it is rare that anything is said or any interference made with their stealing small amounts of ore, though it is a well known fact that there is considerable stolen all the time. This mine has run continuously during all of the revolutions with profit to the owners.

The only successful system of stopping the theft seems to be the one adopted in South Africa at the diamond mines. There the employees are kept in an inclosed compound, never allowed outside or to communicate with outsiders. When one leaves, he is stripped and examined for a stone which might be slipped under the skin. In some cases he is physicked as well, before being allowed to leave, and even with these precautions, a valuable stone is occasionally stolen.

In our country, a self-respecting, honest man objects to being searched, the fellow who wants to get away with the ore objects, and as it is often hard for the management to enforce searching of men as they come off shift, the theft goes on. Many say it makes a better, livelier camp with more money in circulation.

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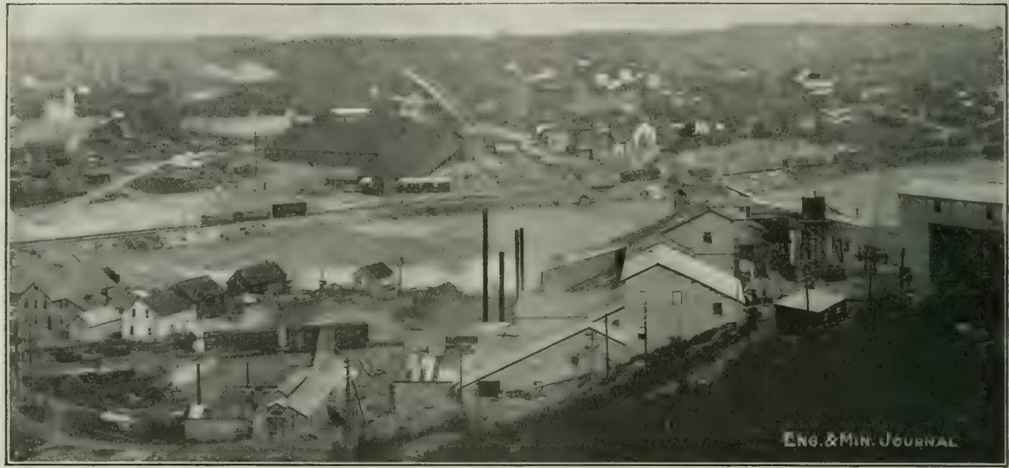
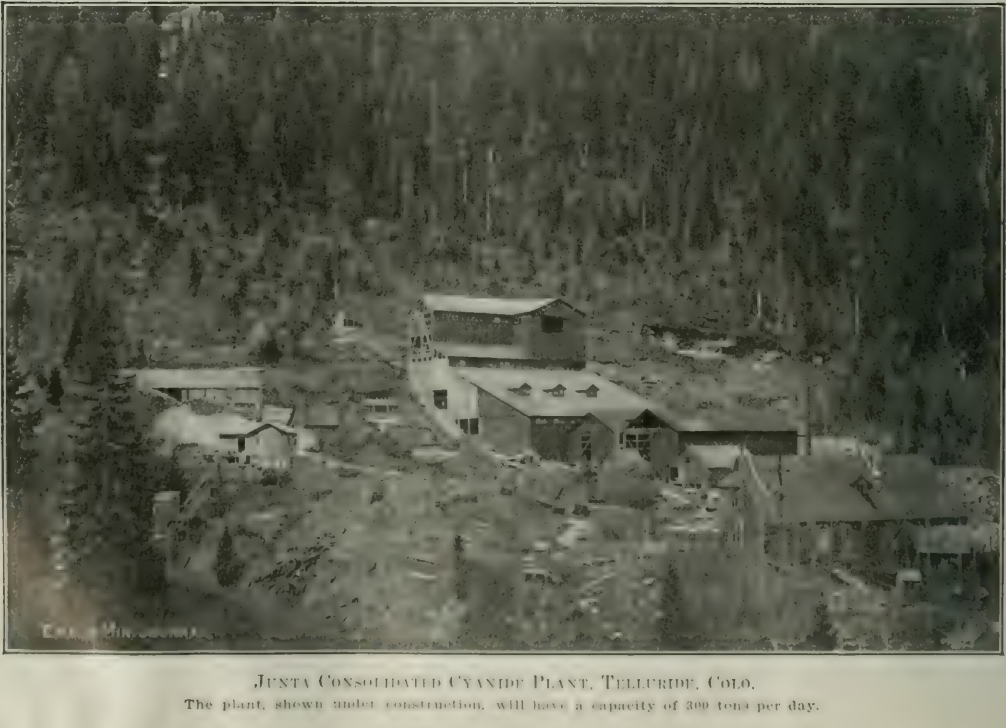
**The Neutralization of Mine Water Before Pumping** is customary on the Rand, according to the September "Bulletin of the South African Institution of Engineers." The water carries a considerable quantity of free acid and this is neutralized in the sump with carbonate of either soda or lime. The cost of this process has been more than repaid by the reductions in cost of pump and pipe replacements. It is suggested that such neutralized mine water needs only to be freed of its flocculent impurities to make it excellent for milling purposes.

# PHOTOGRAPHS FROM THE FIELD



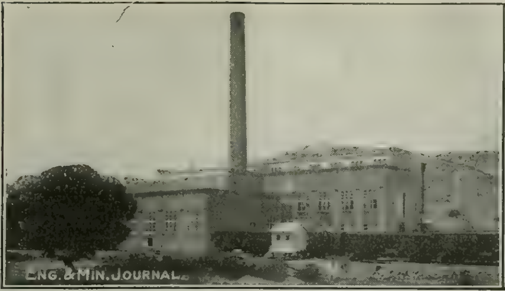
GENERAL VIEW OF THE MILLS AT COBALT, ONTARIO

McKinley-Darragh-Savage mill is in the foreground, across Cobalt Lake is the town of Cobalt. The view shows all the important mills in the camp. The Northern Customs concentrator is at left of center in background.



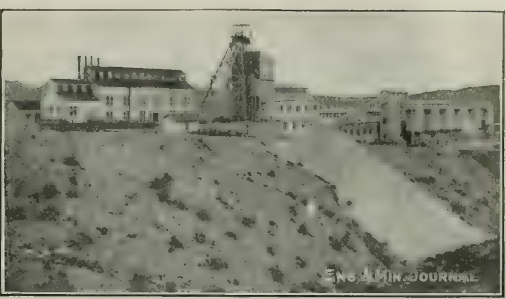
JUNTA CONSOLIDATED CYANIDE PLANT, TELLURIDE, COLO.

The plant, shown under construction, will have a capacity of 300 tons per day.



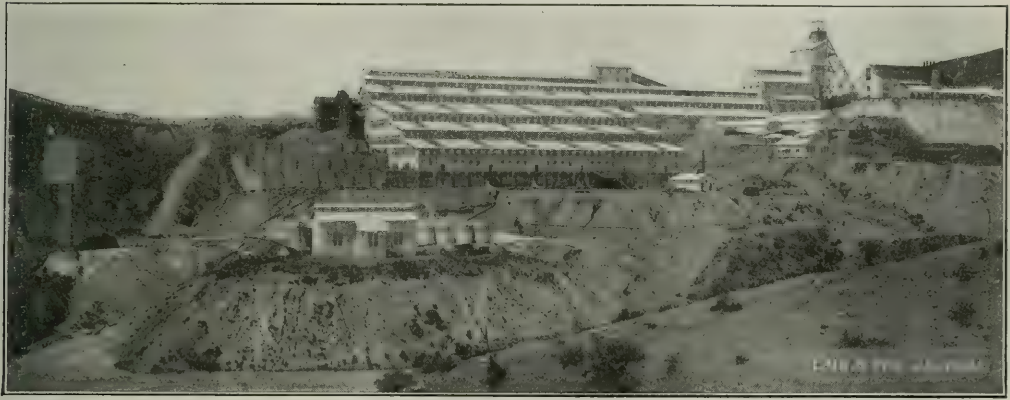
Miami Power House on Flat below Mine

Built of steel and reinforced concrete. Edge Moor boilers, Green economizers and Foster superheaters are used. Petroleum is burned, but coal could be used. Stack is 200 ft. high. Air is compressed to 90 lb. for mine use and 25-cycle electric current at 6600 volts is generated.



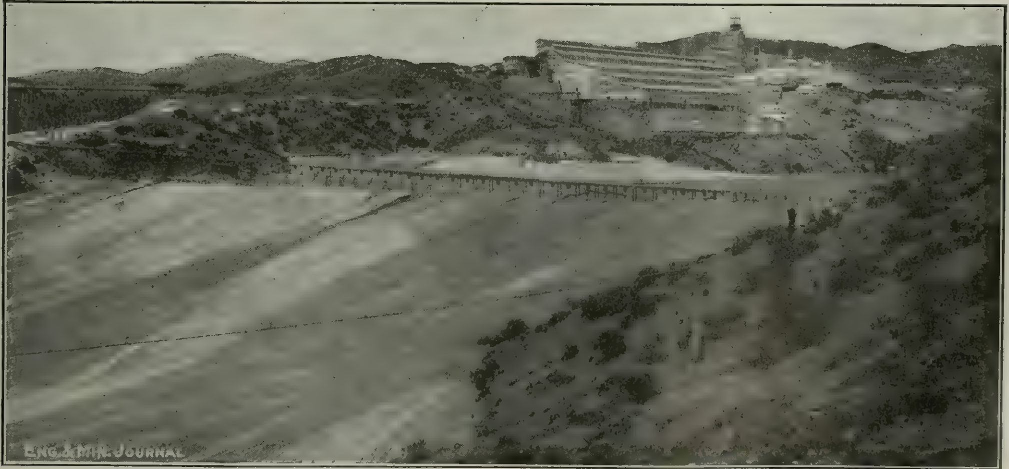
Miami No. 4 or Main Hoisting Shaft

Hoisting capacity 5000 tons per day. Five-compartment shaft 720 ft. deep, 12x16 ft. inside timbers, timbered with creosoted Louisiana long-leaf yellow pine. Each of the circular steel bins at back of the mill to right of shaft holds 1000 tons and serves one unit of the mill.



Miami Mill from across Tailings Pond

No. 4 shaft is seen in the right background. Mill structure is of steel and concrete, only the launders are made of wood. Capacity, 6000 tons concentrating about 20 into 1.



Concentrator of the Miami Copper Co., at Miami, Ariz.

Tailings Pond in foreground in which water may be clarified for reuse. Gulches to east of mill will afford dumping room for years after this gulch is filled.

# NEW PUBLICATIONS

ANNUAL TABLES OF CONSTANTS AND NUMERICAL DATA, CHEMICAL, PHYSICAL AND TECHNOLOGICAL. VOL. II. 1911. 9x11, pp. 759; $6.80 (paper bound, $6). University of Chicago Press, Chicago.

HANDBUCH DER MINERALCHEMIE. VOL. II, Part 3. Edited by C. Doelter. 7x10, pp. 160, paper; 6.50 marks. Theodor Steinkopff, Dresden, Germany.

THE GEOGRAPHY AND INDUSTRIES OF WISCONSIN. By Ray Hughes Whitbeck. 6½x10, pp. 94, illus. Bull. 26, Wisconsin Geological and Natural History Survey, Madison, Wis.

OIL AND GAS PROSPECTS OF THE NORTHWEST PROVINCES OF CANADA. By Wyatt Malcolm. 6½x9¾, pp. 109, illus., paper. Memoir 29-E, Canada Dept. of Mines, Geological Survey, Ottawa.

THE GEOLOGY OF KALGOORLIE, WESTERN AUSTRALIA, WITH SPECIAL REFERENCE TO THE ORE DEPOSITS. By C. O. G. Larcombe. 5½x8¾, pp. 315, illus. Australasian Institute of Mining Engineers, Melbourne, Australia.

CONTRIBUTIONS TO THE STUDY OF THE GEOLOGY AND ORE DEPOSITS OF KALGOORLIE. EAST COOLGARDIE GOLDFIELD, Part I. By E. S. Simpson and C. G. Gibson. Pp. 198, illus. Bull. 42, Western Australia Geological Survey, Perth.

STATISTICS OF THE CLAY-WORKING INDUSTRIES IN THE UNITED STATES IN 1912. By Jefferson Middleton. With Notes on the Occurrence of the Different Varieties of Clay, by J. H. Hance. Advance Chapter from Mineral Resources of the U. S., 1912. Pp. 100. U. S. Geological Survey, Washington, D. C.

MERCURY, OR "QUICKSILVER," IN NEW SOUTH WALES WITH NOTES ON ITS OCCURRENCE IN OTHER COLONIES AND COUNTRIES. By J. E. Carne. Second Edition. 6x9¾, pp. 53, illus. board covers; 2s. 6d. Mineral Resources No. 7, Geological Survey Branch, New South Wales Dept. of Mines, Sydney.

THE MINERAL INDUSTRY DURING 1912. Vol. XXI. Edited by Charles Of. 6¼x9¼; pp. 1090, illus.; $10. McGraw-Hill Book Co., New York.

This is the 21st volume of the well known annual started by R. P. Rothwell, and published for many years by the "Engineering & Mining Journal." The present volume follows the main lines established by its previous editors. These are so well known that it is unnecessary for us to describe them anew. Each volume brings up to date the statistics and the commercial and technical history of the mining and metallurgical industry in the several parts of the world. This is done through the studies of the editor and his assistants and through contributions by experts in the respective subjects. The list of contributors to "The Mineral Industry" is always impressive, in the last volume no less than its predecessors.

A noteworthy improvement of the volume is the introduction of even more extensive bibliographies of the periodical literature than in previous years. A single volume, not even such a one as "The Mineral Industry," cannot be expected to include in abstract an account of everything that everybody may want to know. With its comprehensive reviews, however, supplemented by copious references the chances are that anybody will at least be put on the track of what he is looking for. Whenever information be needed the investigator may well begin his search by reference to "The Mineral Industry." It is a great labor saver, and consequently a necessity in every technical library.

APPLICATION OF ELECTRIC POWER TO MINES AND HEAVY INDUSTRIES. By W. H. Patchell. 5¾x9, pp. 333, illus., $4. D. Van Nostrand Co., New York.

The subject matter of this book was originally presented as a course of lectures, whence it is natural that the work shows a certain lack of finish in some details, and somewhat of discursiveness in others. Thus, in the opening chapters, the statistics of coal production, of labor employed, and of fatal accidents in the United Kingdom, are only casually connected with the subject, likewise with the discussion of the strength of wire ropes in the chapters on hoisting and hauling. The treatment is based almost exclusively on practical examples; theoretical discussions occur, but they are not usually analytical in character.

The chapter on the methods of laying, supporting, and connecting cables for underground work contains many valuable points of information. That on coal cutters presents a comparison of efficiency between air and electrically operated machines, greatly to the advantage of the latter. The two chapters on haulage contain much information on the subject in general, in addition to the electrical aspect of the problem. The chapter on hoisting first presents an analysis of the whole problem, and then describes the several methods of applying electric power to this operation; this is the most valuable section of the book. In connection with fan ventilation, a series of tests on modern installations is tabulated. The section on air compression relates mainly to turbo-machines, while the chapter on pumping goes with considerable detail into a comparison between plunger and turbo types. In the chapter on rolling mills, after a discussion of the advantages of electric motors for this service, details are given of a number of recent installations throughout Europe. The chapter on cranes presents a number of striking examples of the use of electricity for this purpose, concluding with data on magnetic cranes. The final chapters on electric welding and electric furnaces presents the latest advances in these arts, describing the typical designs of apparatus and the methods of using them. A number of electric iron furnaces are illustrated.

IGNEOUS ROCKS: COMPOSITION, TEXTURE AND CLASSIFICATION, DESCRIPTION AND OCCURRENCE, VOL. II. By Joseph P. Iddings. 6¼x9¼, pp. 685, illus.; $6. John Wiley & Sons, New York.

Vol. I of this book covered the composition, texture and classification of igneous rocks; the present volume describes the rocks in detail, and reviews their occurrence throughout the world. While the chemical composition of rocks is taken as the basis for their grouping into families, and the results of 2000 rock analyses are tabulated, still the chemical composition, in the description of a given group of rocks, is made subordinate to both mineralogy and texture, a condescension for which the old-school petrologists should be duly appreciative, coming from the one who has been most active in bringing forward the new quantitative scheme of classification. The new names appear, it is true, but generally in italics, and inconspicuously. The author, however, does not fail to present his reasons for the faith that is in him regarding the inconsistencies and confusion inherent in the old qualitative schemes, and the merits of the new system.

The volume is divided into two parts. The first describes the rocks, in groups and individually. All rocks are classed into six divisions, characterized as follows, the coarsely crystallized rocks being distinguished by their mineral components, and the finely crystallized or glassy rocks by their chemical composition: (1) By quartz; (2) by quartz and feldspar; (3) by feldspar; (4) by feldspar and feldspathoids; (5) by feldspathoids; (6) by mafic minerals (pyroxenes, hornblende, olivine, mica, garnets, etc.). In each division the rocks are first defined in general terms. The phanerites (coarsely crystallized) are described first, and in divisions 1 to 5 are divided into groups according to the preponderating feldspars or feldspathoids, and in division 6 according to mafic minerals. The descriptions are first mineralogical, then textural, and lastly chemical. Aphanitic (finely crystallized or glassy) equivalents of the phanerites in each division are then described, and, so far as possible, are considered in groups corresponding to those established for the phanerites.

To illustrate the method employed, the following synopsis of division 2 may be given: General definition and method of subdivision. Mineral composition of the phanerites. Specific characters of the constituent minerals. Textures. Group A—Granites. B—Quartz-monzonites and granodiorites. C—Quartz diorites and quartz-gabbros. (Under each group, all the related types are fully discussed.) Chemical composition of the phanerites (grouped as above). Aphanites of division 2 in general. Composition of the constituent minerals. Group A—Rhyolites (with its related types). B—Dellinites C—Dacites. Finally, in tabulated form, come about 270 analyses of rocks belonging to this division, the footnotes under each table stating the name and locality of the rock, and the chemist who made the analysis. Under each analysis, also, is given the recalculated criteria by which the rock is assigned to its place in the quantitative scheme. This same method is followed in each of the six divisions. The striking characteristic of this part of the volume is the widely separated habitat of the rocks discussed, ranging from Greenland to the Antarctic and from Asia Minor to Java.

In the second part of the volume, the occurrence of igneous rocks all over the known world is described. The descriptions are necessarily brief, and in some cases are little more than indicative, but they serve as a basis for the discussion of petrographic provinces. The world's area is divided as follows: North America and contiguous islands; South America; Europe and western Asia; Africa; islands of the southern Indian Ocean and Antarctica; Asia and Japan, Philippine islands and the East Indies; Australia and New Zealand; islands of the Pacific Ocean. The different districts of the United States are naturally treated in more detail than other parts of the world. In the preparation of part II, geological literature has been drawn upon to the widest extent; no fewer than 977 references are cited, all being classified and tabulated in a separate section at the back of the book. Finally, an index covering 11 closely printed pages renders quickly available the mass of data in the book.

# CORRESPONDENCE AND DISCUSSION

## Calculation of Extraction in Cyanidation

The accompanying extracts from recent Bulletins of the Institution of Mining and Metallurgy have some bearing on the discussion of methods of estimating extraction in gold mills and cyanide plants, which has been inaugurated by Mr. Megraw's articles[1] and the comments by Messrs. Cadogan[2], Simpson[3], Additon[4] and Welton[5]. In the paper by Allan J. Clark and W. J. Sharwood, on the "Metallurgy of the Homestake Ore," the authors describe the control of operations, in part, as follows:

"Mill feed is not directly sampled, but in metallurgical summaries is calculated from tailings assays and bullion actually recovered. The feed to the sand plants has been sampled by means of a horizontal slotted pipe, pivoted at one end, which was swung at intervals by hand across the stream of pulp. An improved sampler has lately been installed, in which the slotted pipe is suspended from a small car running on rails, and is moved through the stream parallel to itself and at a uniform rate, by a sprocket chain driven by a winch. Three portions of 1.5 a.t. each are assayed from each vat charged, and the gold buttons are weighed progressively.

"Sand residues are sampled after the final draining by making a number of vertical holes with a pipe having a slot with one lip projecting to form a cutting edge, and a conical solid point.. The sampler is then laid over a trough divided into three equal sections, giving a 'top,' 'middle' and 'bottom' section. Two portions of 2 a.t. are assayed from each sample, and the two buttons are weighed together. The assays of the three layers, and their average, are reported, and the average is used with the corresponding 'charge' assay in computing extraction.

"Sand is estimated from the depth of each charge, after leveling the top, and is based on the area of the vat and the average weight of a cubic foot of sand, after drying.

"Slime heads or charge samples are drawn from the main feed pipe, one being taken when each press commences filling, and a general sample being cut from the accumulation of each 24 hr. Four melts are made of 2 a.t. each. The result is checked by daily samples taken hourly with a cup from the 'No. 1 sludge' and 'No. 2 sludge' streams.

"The slime plant is divided into three sections of nine or ten presses each. In each section there are placed three residue-sample buckets, *A*, *B* and *C*, corresponding to the 'fast,' 'average,' and 'slow' leaching rates of the charges. During the sluicing of each charge a cup sample is caught at the outlet cocks and put into the sample bucket corresponding to its leaching rate. Three fusions of 2 a.t. each are made on each of the three samples caught daily.

"Slime tonnage is assumed at 25 tons of dry solid per press charged, and is based on a number of determinations of the net contents of equidistant frames.

"All slime samples are dewatered on a horizontal laboratory filter press, having a working surface 18 in. square. Compressed air is used, as no vacuum is available. The thin, tough cake obtained is rolled into a cylinder on the cloth and cut into sections with a knife or spatula. Sand samples, after draining if necessary, are cut down with a trowel while moist. Dried samples, either of sand, slime or crushed ore, are cut down with the Jones riffle.

"Stamp-mill tonnage is usually averaged at 4.2 tons per stamp per 24 hr. The numbers of cars hoisted and delivered to the mills are also recorded. When the performance of particular batteries is to be accurately determined it is done by timing with a stop-watch the filling of a measure holding 2 cu.ft., and then weighing the amount collected.

"The daily performance of tube-mill and pans is determined by timing the filling of a 5-gal. bucket ($\frac{2}{3}$ cu.ft.), and weighing the catch. Wherever possible the tipple is used for diverting the flow to the sampler. Suitable tables have been drawn up so that the rate in tons per day, and the water ratio can be read at a glance from these data. The readings are made twice a shift, six times daily, and averaged.

"Assay samples of the feed to pans and tube mill are taken with slotted-top hand samplers, and are used for assay and sizing tests. Similar samples of the tails or ground product are taken. Three samples of 1.5 a.t. each are taken for assay.

"The specific gravity of various samples is determined by the hydrometer in the case of slime pulp, or by the weighing of a tared liter flask full of coarser material. From the gravity of such pulp the water ratio is at once calculable, as for nearly all purposes the density of all products can be assumed as constant at 3. The chlorite and hornblende have a specific gravity somewhat over 3, quartz 2.6, and the iron sulphides about 5. When concentrating by cones the coarse quartz of low gravity and the sulphides of high gravity tend to go together, so that the average is not much changed.

"At the sand plants it is the practice to fill a vat with pregnant solution to a fixed point, and then precipitate it, so that the tonnage of each precipitation is known. The pregnant sample is taken by a drip system, a small iron pipe, tapped into the main and controlled by an iron screw, dripping into an enameled iron bucket, from which a sample is dipped into a bottle after the vat is full. This is occasionally checked by taking a 'dipper' sample from the full vat.

"At the slime plant continuous pumping is practiced, and a similar sample is taken for each eight-hour shift, the tonnage being computed from the speed of the electric pump.

"The 'barren' solution samples, corresponding in periods to the various 'pregnants,' are taken by a similar drip system from the launders leading from the precipitation presses. A special barren sample is usually taken to cover the first half hour of a tank precipitation, and occasionally hand samples are taken half hourly from suspected sections of presses, if precipitation is not entirely satisfactory. As a further check on the barren solutions, daily samples are taken from the storage vats in which they are collected.

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[1] Engineering and Mining Journal, March 8 and Sept. 6, 1913.
[2] Engineering and Mining Journal, May 31 and Sept. 6, 1913.
[3] Engineering and Mining Journal, June 21 and Sept. 6, 1913.
[4] Engineering and Mining Journal, July 5 and Sept. 6, 1913.
[5] Engineering and Mining Journal, July 12 and Sept. 6, 1913.

"Common quart glass bottles are used to convey solution samples to the assay office. By holding these lightly on an emery wheel a label is ground on them, so that they can be legibly marked with a lead pencil.

"Solution samples are assayed by precipitation with zinc dust in presence of acetate, followed by heating and addition of hydrochloric acid. The lead sponge obtained is filtered off and scorified with the addition of metallic silver, and then cupeled and parted. This is a modification of the Chiddey method, and has been in use since 1904. In the case of rich solutions 250 c.c. are taken, and from 'barrens' 500 c.c.; a special table is used to convert the milligrams of gold obtained to the basis of dollars per ton.

"During a clean-up the wet precipitate from the press is mixed well in the shallow collecting tray, and is then shoveled into boxes. Usually every fifth shovel is thrown upon an iron plate, where it is systematically quartered down at once to a sample of 2 lb. to 4 lb.

"An alternative method is to take a tryer sample (four or five cores) from each of the filled boxes, which is further reduced by the tryer.

"The boxes are weighed on a platform scale as soon as filled, and again when delivered for acid treatment.

"The final sample is put in an iron jar with air-tight cover, and is taken to the assay office. Here it is weighed in a shallow pan, dried at 100° C., and moisture is calculated to 0.1%. The dried precipitate is then roughly crushed and quartered down on a Jones riffle sampler to about 100 grams or 150 grams. This sample is ground fine in a Wedgewood mortar, without sifting, and samples of 0.1 a.t. (usually triplicates) are weighed out for assay as quickly as possible, weighing to the nearest milligram or half milligram. Better results are obtained by grinding without sifting, as dusting, oxidation and absorption of moisture are thus avoided, and there are no actual metallics as in zinc-box product.

"For the assay of precipitates a fusion method is used, one-third of the flux being retained for use as a cover, with a further addition of a little borax glass. The slag and cupel of each sample are fused together with a special flux, and the resulting lead cupeled; the correction button thus obtained is weighed with the main button. These are inquarted and cupeled with proof, etc., and parted in a standard platinum apparatus. When fusions are performed in a muffle this method gives results which agree closely among themselves, and also with parallel determinations made by the best 'combination' acid-scorification methods.

"Samples of bullion bars are taken from two opposite corners with a pneumatic drill in the case of mill bullion, and by chipping with a chisel in the case of bars from the cyanide plants. After sampling, the bars are weighed to the nearest hundredth of an ounce. One assay (0.5 gram) is run on each sample for gold; silver is determined by cupellation of only one sample from each bar. The fineness is reported to the nearest quarter-millième for gold and half-millième for silver, which conforms to the practice of the United States mint, to which the bullion is sold.

"The total weight of quicksilver fed to the batteries is reported daily to the main office by the mill foreman, together with the weight of each individual lot of amalgam; the amalgam weights are checked later when delivered at the assay office, and the corresponding weight of bullion and 'retort percentage' are reported for each mill. The daily weighings of mercury and amalgam indicate closely the amount recovered, and the probable value of the clean-up.

"The standard sizing test is made by passing the dry material over sieves of 100 and 200 meshes to the linear inch, the percentage of the three products being respectively reported as coarse, middle and fine. Others of 50- and 80-mesh are used where necessary. The apertures are given in Table I:

TABLE I. SCREEN APERTURES

| Nominal mesh per lineal inch | Aperture calculated from nominal mesh and wire diameter, in. | Average measured aperture in. | Nearest Equivalent I.M.M. Standard Mesh in. | Nearest Equivalent I.M.M. Standard Aperture in. |
|---|---|---|---|---|
| 50 | 0.011 | 0.0115 | 50 | 0.010 |
| 80 | 0.0071 | 0.007 | 70 | 0.0071 |
| 100 | 0.0051 | 0.0057 | 100 | 0.005 |
| 200 | 0.0029 | 0.0027 | 200 | 0.0025 |

**The fines are still further separated by a centrifuge into two grades, which are styled "granular" and "flocculent."**

"A comparison of the actual production of a cyanide plant with the estimates based upon daily samples and tonnage is always of interest; we have prepared such a record to cover the first 10 years' operation of the No. 1 sand plant, which is the oldest of the three, and to include also the entire product of No. 2 sand plant (eight years) and the slime plant (four years) up to the close of 1910. The figures include gold only, and the total value of product is between $8,000,000 and $9,000,000, from over 9,000,000 tons treated.

COMPARISON OF GOLD VALUE

| | |
|---|---|
| Gold value of bullion actually sold | 100.00% |
| Called for by assays of precipitate | 100.10% |
| Called for by assays of charges and residues | 100.67% |
| Called for by assays of solutions before and after precipitation | 99.55% |

"The excess in the case of the charge-residue estimate is partly due to the imperfect charge sampler used during this period at No. 1 plant, which has invariably given somewhat higher gold values than check core samples taken from top to bottom of the charge, in the same manner as the residue samples are obtained. The use of the core or tryer method, however, is not advisable in the case of the charge, as it offers too many chances for channeling and 'short-circuiting' of air and solution during subsequent treatment.

"The main assay office at Lead includes the laboratory, refinery and electro-plating equipment, and serves the mine and cyanide plant No. 1, and here all assays of bullion and precipitate are made. A small assay office is operated by one man at cyanide plant No. 2, and another at the slime plant.

"At the slime plant no grinding is necessary; at the other offices disk grinders are in use, and ore samples have a preliminary crushing with a small Gates crusher and bell grinder."

In discussing the paper quoted, W. H. Shockley said: With regard to the question of the extraction at the Homestake, it seemed to him they did not know. They did not know how much ore they milled, and they did not know the value of it and, without knowing those factors, they could not tell what percentage they extracted. That was plain enough. They did not sample the ore, they did not sample the mill feed, and they also said they did not weigh it. They kept an account of the number of cars hoisted and delivered to the mill, and estimated the tonnage at 4.2 tons per stamp. It was only by those indirect methods that they got at the amount of the ore. It seemed to him that a company like that ought to have one mill where they knew what they were doing.

In reply to the above the authors wrote:

"The tone of finality in Mr. Shockley's comments makes it somewhat difficult to formulate a reply; apparently, however, his objection to our methods of computing the percentage extraction, etc., is simply the fact that they are not the methods most commonly followed. Others have also questioned their accuracy from time to time, because, like the concentration formulas described by Gahl, Hoover and others, they are less obvious in principle than methods involving the direct weighing of every pound of ore, together with sampling and assaying it before milling. But must a surveyor drag a chain to a remote object to determine its distance, when he has the means of measuring a base line and a couple of angles? Does not Mr. Shockley overlook the fact that the sampling and weighing of large tonnages of coarse, low-grade, and more or less spotty gold ore, with the accompanying moisture determinations and assays, can rarely be carried out without larger aggregate errors than our system involves? True, we do not weigh the ore directly, nor before milling, nor do we sample or assay it directly. We do, however, determine, by methods which are mathematically correct in principle, and probably within 1% of actual physical accuracy, the weights of all the separate products collected in the three cyanide plants. The weight of escaping slime is similarly determined, but, as the amount is relatively small, the percentage error may be greater, though the absolute error is trifling. The sum of the dry weights of sand treated at No. 1 and No. 2 plants, of the slime treated, and of the small proportion of slime going to waste, necessarily equals the total weight of ore crushed. The value of the bullion extracted at the mills and plants is accurately known, as our assays agree closely with those of the U. S. Treasury Department, which purchases it. The residue of every charge at the various plants is very carefully sampled and assayed, and the wasted slime is also periodically sampled and assayed.

"In the matter of assays the customary close agreement over long periods between the charge-residue figure ('theoretical extraction'), the solution values, the precipitate, and the resulting bullion, has given us a reasonable degree of confidence in this branch of the work.

"To show that we have not neglected the question of measurement, we refer to a description of some of these methods published in the *Mining Magazine*.[6] By checking them in various ways we have convinced ourselves that 2% represents the maximum error in our weights, and nearly all our tests have indicated that we are well within 1% of the truth.

"But, adopting the methods of computation which we use, namely, taking the total content of the residues, etc., escaping (determined by weight and assay), and the total bullion content, as together equaling the original ore content, the percentage error in the 'extraction' thus computed may be demonstrated to be very much smaller than the percentage error in the weight of ore. This is always the case when the actual extraction is reasonably high.

"While we must apologize for devoting so much space to this portion of our reply, the matter is so vital that we feel obliged to attempt to make our point clear, and we invite Mr. Shockley's attention to the following analysis of what we may call the Homestake method of computation (though it is not entirely original with us) as contrasted with the orthodox procedure.

"When the percentage recovery is based simply on assays of the original mill feed, and of the final tailing or residue discharged, the calculation is entirely independent of the tonnage. Thus, if $p$ is the original assay, and $r$ that of the residue, the percentage recovery is:

$$\frac{100\ (p - r)}{p}$$

For any variations $dp$ and $dr$ in the values obtained for $p$ and $r$, the corresponding variation in the final percentage is:

$$d\left(\frac{100\ (p - r)}{p}\right) = 100\left(\frac{r}{p^2}\,dp - \frac{1}{p}\,dr\right)$$

If we take $p = \$4$ and $r = \$0.24$, we have:
*Percentage variation in extraction* $= 1.5\ dp - 25.0\ dr$.

"The reasoning adopted covers the simplest case, where only one kind of residue is considered, and that is equal in weight to the original ore. The latter condition applies to ores of the precious metals where roasting and concentration are not practiced. For instance, at the Homestake the monthly 125,000 tons of ore yield only about one ton of gold bullion. When there are several residues, or products of considerable weight, to be taken into consideration, the expressions become somewhat more complicated, but the final results are similar.

"In calculating the percentage extraction by this orthodox method (by assays alone) an error of one cent (\$0.01) value in the heads assay ($p$) has therefore less than one-sixteenth the influence of an equal error in the assay of tails or residue ($r$). If the error is 10% of the value in each we have $dp = \pm 0.40$, $dr = \pm 0.024$, whence the maximum error in the final percentage becomes approximately:

$$\pm 0.6 \pm 0.6 = \pm 1.2\ \% \quad \text{(Case I)}$$

"If, on the other hand, no precautions are taken to sample the heads or feed, but only the residue or tails, while the tonnage ($t$) is approximately determined, the original content can be computed by adding to the residue assay ($r$) the quotient obtained by dividing the total recovery ($V$) by the tons ($t$).

The percentage recovery is then:

$$\frac{100\,\frac{V}{t}}{\frac{V}{t} + r} = \frac{100\,V}{V + rt}$$

"The error introduced in the percentage recovery thus calculated, by variations $dr$ and $dt$ in the values of residue and tonnage ($V$, the total recovery, being known and constant), is:

$$(d)\left(\frac{100\,V}{V + rt}\right) = \left(\frac{100\,V}{(V + rt)^2}\right)(t\,dr + r\,dt)$$

"If, in a particular case, $V = \$37,600$, $t = 10,000$ tons, and as before, $r = \$0.24$, we have:

---

[6] W. J. Sharwood: "The Measurement of Pulp and Tailing," Ming. Mag., I (1909), pp. 226 and 297; II, p. 45.

"Variation in calculated percentage recovery

$$= -23.5\ dr - 0.000564\ dt.$$

"And if $dr$ = 10% of $r$ = $0.024, and $dt$ = 10% of $t$, = 1000 tons, we should have, as the approximate maximum error in the percentage recovery,

$$\pm 0.564 \pm 0.564 = \pm 1.128\% \quad \text{(Case II)}$$

"If, again, the error in $t$ is only 2%, or $dt$ = 200 tons, the maximum error in the percentage recovery calculated would approximate:

$$\pm 0.564 \pm 0.1128 = \pm 0.67\% \quad \text{(Case III)}$$

"As a concrete example is usually more convincing than mere mathematical demonstration, we have worked out a case in detail, to show how small is the effect on the calculated percentage extraction, of excessive percentage errors in the assumptions made regarding the heads, tails and tonnage.

"Assume that 10,000 tons of ore are treated, which actually contain $4 gold per ton; that gold to the value of $37,600 is actually obtained therefrom; and that the tailing or residue contains $0.24 gold per ton.

"By whatever method we calculate, we have:

| | |
|---|---|
| Heads | $4.00 per ton |
| Tails | 0.24 per ton |
| Extraction | 3.76 per ton |
| Extraction | 94% |

"Now assume an error of 10% in the assays, and in opposite directions, giving the most unfavorable conditions. We have two cases: (*a*) Heads high and tails low, and (*b*) *vice versa*. Consider the extraction based on assays alone:

| | *a* | *b* |
|---|---|---|
| Heads | $4.40 | $3.60 |
| Tails | 0.216 | 0.264 |
| Extraction | 4.184 | 3.336 |
| Percentage extraction | 95.091 | 92.666 |
| Maximum error in percentage | 1.091 | 1.333 |

"If the error were in the heads assay alone, the percentages would be 94.545 and 93.333; if in the tails alone, 94.60 and 93.40.

"Again, assume that the extraction is to be calculated by the method adopted at the Homestake; namely, by dividing the actual value of the bullion sold by the estimated tonnage, and adding the residue assay to this figure to obtain the original value of the ore. In this case we may also assume the error in estimating tonnage at the absurdly high figure of 10%, and consider also the worst conditions, when the residue assay varies 10% in the direction which increases the error.

| | *a* | *b* |
|---|---|---|
| Bullion value | $37,600 | $37,600 |
| Tons | 9,000 | 11,000 |
| Extraction calculated from bullion and tonnage | $4.178 | $3.418 |
| Tails by assay | 0.216 | 0.264 |
| Heads (sum of above) | 4.394 | 3.682 |
| Percentage extraction | 95.084 | 92.830 |
| Maximum error in percentage | 1.084 | 1.170 |

"Here, again, if the error in tailing assay is zero, the percentages become 94.567 and 93.441.

"As in fact we have evidence of the highest class that the error in estimating tonnage is less than 2%, and probably within 1%, we will recalculate the percentage extraction, as before, on a hypothetical $4 ore yielding a 24c. tailing, but assuming an error of 2% in the tonnage estimate; at the same time considering the possibility of a 10% error in the tailing assay. Here there are several variations depending on the coincidence of errors:

| | | | | | | |
|---|---|---|---|---|---|---|
| Tonnage estimate | High | High | Low | Low | High | Low |
| Tailing assay | Low | High | Low | High | High | Low |
| Tons | 10,200 | 10,200 | 9,800 | 9,800 | 10,200 | 9,800 |
| Extraction calculated from bullion and tonnage | $3.686 | $3.686 | $3.837 | $3.837 | $3.686 | $3.837 |
| Tails by assay | 0.216 | 0.264 | 0.216 | 0.264 | 0.240 | 0.240 |
| Heads (sum of above) | 3.902 | 3.950 | 4.053 | 4.101 | 3.926 | 4.077 |
| Percentage extraction | 94.464 | 93.316 | 94.670 | 93.562 | 93.887 | 94.113 |
| Error in percentage | 0.464 | 0.694 | 0.670 | 0.438 | 0.113 | 0.113 |

"From a consideration of this specific example, as well as from the general analysis preceding, it is evident that the error in the calculated percentage extraction depends much more upon errors in the tailing assay than in that of the heads or in the tonnage.

"Experience has shown that the true tonnage per stamp per 24 hours so nearly averages 4.2, that it is safe to accept this figure for all ordinary approximations.

"We may add that mechanical samplers have for years been attached to certain batteries of stamps for experimental purposes, so that parallel tests can be made for comparison of various adjustments, screens, etc. The tonnage performance of any 5-stamp battery can at any time be determined by a time-gravity measurement.

"As examples of actual measurements we may cite some made on a fairly large scale within the last few months, which have closely verified previous results. For instance, the 54-ft. sand vats at No. 2 plant have been deepened during 1912 by adding a further extension of sheet-iron to the staves, thus making the depth of sand about 13 ft. 6 in., with a tonnage of about 1350 per charge. The tonnage of the special charge measured, by the standard everyday system of computation, based on the depth and weight of sand from a number of cubic-foot boxes, is given as (*a*) below.

"Another system was used to check this in two ways. At the start the sand vat was completely filled with water. A large tank (1246 cu.ft.) was arranged so that the entire overflow (equaling in volume the entering pulp) could be switched into it, and the time of filling the 1246 cu.ft. noted. This tank was filled 53 times at equal intervals during the 48 hr. required to fill the sand vat, the total volume of pulp being thence calculated as 92,711 cu.ft. Meanwhile the pulp was systematically sampled by a mechanical cutter, a standardized bucket of ⅔ cu.ft. capacity (5 U. S. gallons) being filled and weighed 116 times at equal intervals. The samples were all thrown upon a filter, to be dried and weighed later. The specific gravity of the dry solid was accurately determined. From these data the following computations (*b*) and (*c*), were made:

(a) Tonnage for a depth of 160 in., based on former accepted weight of cu.ft. boxes.... 1344.0 tons.

(b) Sp. gr. of ore 2.985. Average weight of 116 buckets of ⅔ cu.ft. = 54.575 lb., or 81.862 lb. per cu.ft. pulp. Average sp. gr. of pulp 1.31, whence 1 cu.ft. contains 29.062 lb. dry sand 29.062 dry lb. sand per cu.ft. × 92,711 cu.ft. ÷ 2000 .......................... = 1347.2 tons.

(c) Total dried sand from 116 buckets totaling 77.333 cu.ft. pulp weighed 2261 lb., or 29.24 lb. per cu.ft. pulp. 29.24 dry lb. per cu.ft. × 92,711 cu.ft. ÷ 2000 .................. 1355.4 tons.

Maximum variation = 11.4 tons = 0.85%.

"By similar methods the tonnage of a charge at No. 1 plant was found to be: *a*, 569; *b*, 566.0; *c*, 564.4; variation, 0.81%.

"In reply to the question as to the method of computing the 94% extraction, this figure is based on the total gold content of the ore mined and milled. As stated, 72% of this is obtained as amalgam, 22% by cyanidation. The average extraction from sand and slime together, is therefore approximately 22/28, or about 78.5%, including the loss in slime wasted. We omitted to mention that the actual average extraction from the sand cyanided is ¾, or 75%, and from the slime treated is 8/9, or 88.9%."

W. J. SHARWOOD.

Lead, S. D., Sept. 10, 1913.

# EDITORIALS

## The Downfall in Copper

The report of the Copper Producers' Association for October shows that in spite of the restriction of output in Michigan and Mexico, the production by the refiners continues to run rather high. This may imply simply drafts on the stock of unrefined copper, of which a surplus was carried over from 1912, and which increased further during the period of the strike at the Nichols refinery last summer; or the appearance of copper refined from crude imported from Europe, and temporarily converted into invisible supply, the quantities of copper afloat between Europe and America not being reported in any of the statistics; or both these conditions may be playing a part.

The maintenance of deliveries, both domestic and foreign, is discouraging rather than encouraging. In view of the fact, now well established, that American brassmakers are operating at reduced capacity, while things are not just right in other branches of the copper-manufacturing industry, all of this reflecting the general recession in trade, the maintenance of large deliveries to the manufacturers indicates their overbought situation, and their ability to remain out of the market for some time yet to come. As we have previously pointed out, it is not the spot and near-by position that is worrying the producers, but rather the state of their order books for December and later deliveries.

We have witnessed during the last week something akin to demoralization in the copper market, the metal having been steadily offered down and the market being apparently headed for 15c., plus or minus. The old asked price of 16⅞c., which is still nominally maintained, and is talked about in the newspapers, is as meaningless now as would be an asked price of 25c. Even the producers which maintain that price intimate, prayerfully, that any substantial bid will receive careful consideration. Indeed, certain of these producers as long back as a fortnight ago began surreptitiously to do rather more than intimate willingness. In the meanwhile, the other important agencies have been openly and severely cutting prices in their efforts to sell.

We have been during the last week favored with the usual newspaper pabulum for public consumption, denying that the price of copper is anything but the top price, dwelling upon the strong statistical position, which "an important producer says is superior to anything that ever occurred within his memory," etc. If people like to talk such half truths or nonsense, and other people like to be deceived by it, they may, of course, suit themselves.

The statistical position is apparently strong on the face of things, and it is true that the Rio Tinto and Michigan strikes and the Mexican troubles have materially restricted the output of crude copper. The output of refined copper has not yet been restricted in just the same proportion, on account of the working off of old accumulations of crude copper, some operations of 1912 here coming home to roost. We do not think that the pessimistic notions respecting the effect of full resumption of the Michigan output in the near future are sound. The strike there has become a stalemate, out of which the companies will gradually extricate themselves, but their production is going to be restricted for a long time because of scarcity of labor. As to the Mexican troubles, he would be an optimist indeed who can see any near outcome from them.

The thing that has caused the temporary downfall of copper is not increasing production or the prospect of it, but rather diminished consumption, reflecting the general recession in business. Whenever such a condition develops, the feelings of producers become of the gloomiest. They persuade themselves almost that the consumption of copper is going to cease altogether, that nobody is ever going to buy any more. In fact, the difference between the normal rate of consumption and the rate in the nadir of depression is perhaps not more than 10%, and consumers will continue to have to buy a great deal of copper, and, moreover, to buy it right along. At present, the market is simply going through one of its recurrent agonies of trying to establish the price at which buyers will be generally interested.

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## The Situation in Mexico

We should like to find a cheerful optimist who can see any improvement in the state of affairs in Mexico. To us they seem to be steadily going downhill. If we may judge from the newspaper dispatches, this also is the view in Washington. The administration seems still to be without a definite policy.

There is talk of aiding the constitutionalists, of declaring Mexico an outlaw among nations, cutting off its supplies of arms, ammunition and money, and finally of intervention, with or without appropriation of Mexican territory.

As against recognition of the constitutionalists, it is argued that their success would simply substitute a different kind of disorder in Mexico, that the United States would have to intervene eventually, and that in such event the arms supplied by us would be turned against us. Moreover, it is argued, recognition of the constitutionalists would jeopardize subsequent claims for loss of life and property, the bill for which is increasing steadily.

In favor of the outlawry of Mexico it is argued that if intervention should finally become necessary, the Mexicans would have scarcely anything better than bows and arrows to fight with. On the other hand, such isolation of Mexico would paralyze industry for many years to come.

As to intervention, everybody recognizes the serious consequences to come from it, and hesitates to advocate it. Yet, it is being admitted more and more that the logic of events is pointing that way.

There is one very important thing that is being quite lost sight of. It is assumed that when order is finally restored in Mexico and a strong, legitimate government has been established there, all that foreign corporations which have lost their property will have to do will be to file their bills and collect their damages. Let us assume that after prolonged diplomatic negotiations such a result is attained, who, then, will pay the money and how will it be obtained? Of course, the money will have to be raised by taxation and the taxation will fall heaviest upon the industrial companies. In other words, they will collect their indemnities but they will, themselves, pay it, so they will be no better off. The experience of the gold-mining companies of the Transvaal, after the war there, will illustrate this. It is a sad economic truth that there is no recouping of the capital that is destroyed by war, fire, pestilence and acts of God. The longer such destruction goes on the worse is it for everybody.

⁂

## Reducing Losses

The managers of our mining and metallurgical companies have never given so much attention to the reduction of losses in ore treatment as they are now. The discharge of tailings carrying nearly one-third of the original copper content of an ore, even if it be only a low-grade ore that 10 years ago was unworkable at all, is more of an offense in their own estimation than it is in the eyes of the most voluble conservationist. "I don't believe we'll have any trouble from the farmers on account of these tailings," said a mill superintendent to his general manager. "It's not the farmers that I'm thinking about," replied his superior. "It's the 10 lb. of copper per ton that we're letting go. I don't know now how to get that copper, but I don't want to let the tailings go to places where I can't get it some day when I know how."

We think it not premature to say that a great deal of the "knowing how" has been learned during the last two or three years, and a great deal more will be learned in the next year or two.

The problem, briefly stated, is to recover the copper which can be released only by fine grinding, and which in ordinary mechanical concentration disappears in the slime, the *bete noir* of the millman. In the solution of this problem experimentation is proceeding along the following lines:

(1) The improvement of existing methods of mechanical concentration.

(2) The introduction of new methods of mechanical concentration.

(3) The development of hydrometallurgical methods.

None of the companies that have engaged themselves in this matter has tied itself to any one of these lines. Rather is it the idea to try everything and adopt the best. The work of the Anaconda company, which is perhaps further ahead than any other, has been of this nature.

The Anaconda company has a large accumulation of slime and is adding to it every day. This accumulation is comparable, both in assay and tonnage, to the orebody of a first-class porphyry mine, with the differences that on the one hand the copper is more difficult of extraction and on the other hand the ore is already mined and is lying on the surface. Plants to treat this deposit have been erected by the Bradley process company, a hydrometallurgical project, and by the Peck concentrator interests. The Bradley process proved a failure, but the Peck concentrator has been a success. This employs a new principle in mechanical concentration, viz., centrifugal force. For a year or more it has been in regular operation, delivering a considerable tonnage of commercial product.

At the same time the Anaconda company itself has been experimenting with the time-honored round table and finally has constructed a 20-decker. The multiplicity of decks, which results in a tower-like structure, does not introduce any new physical principle, but reduces cost of construction, floor space, etc., and permits the use of a great deal more table area than is commonly the practice. These features, together with the cement surface of the tables and other details of construction are considered to have gone far in solving the slime problem at Anaconda. The Peck centrifugal concentrator and the 20-deck buddle give results of a similar character, but the 20-deck buddle is thought to be the superior. It is announced that a large plant of this type will be built.

The Anaconda company has also experimented with the Laist process, a hydrometallurgical method, and has erected a plant of 80 tons daily capacity. Hydrometallurgical methods of copper extraction are no new thing, but away from the peculiar conditions of Spain and Portugal they have never been employed on a very large scale, at least, not in this country; and certainly they have not received the high degree of mechanical development that the cyanide process of gold and silver extraction has experienced. The Laist process does not appear to embody any new chemical reactions, but appears to depend chiefly upon conducting the roasting in just the right way. The copper having been obtained in solution, several methods of precipitation—electrolysis, hydrogen sulphide, or iron—are open. As to this part of the process, no decision has yet been reached. An idea of reducing iron ore to spongy iron and using that as precipitant is regarded favorably. Anyway, the Anaconda metallurgists consider that their hydrometallurgical work is well advanced and will probably result in the profitable extraction of a great deal of copper that now escapes.

So far as we are aware the Anaconda metallurgists have done no extensive experimentation with the flotation process, a relatively new method of mechanical concentration. This, however, has been exhaustively studied by the Utah Copper Co., Nevada Consolidated, and Inspiration. The Inspiration will probably make a large installation using this process, and it is not unlikely that the Utah and Nevada companies will introduce it as an accessory to their present methods.

The flotation process offers the advantage of being able to treat excessively fine material—200-mesh stuff and such sort. It is the one method of mechanical concentration in which the formation of slime or dust is not to be feared. Consequently, ore containing finely disseminated mineral may be reduced almost to impalpable powder in tube mills, and nearly all the mineral being thus released separation may be made.

The flotation process is commonly used in connection with ordinary concentration by jigging and tabling. As much of the valuable mineral is taken out by the jigs and tables as can be, and the middlings or tailings are passed on to the grinders and thence to the flotation vats.

In the case of some of the porphyry ore deposits, as in the Miami district, there are, associated with the sulphides, oxidized copper minerals, which neither settle well nor float well. It has been contemplated in the Miami district to pass on the flotation tailings to a hydrometallurgical process, but such a chain of treatments suggests the idea "Instead of making three bites at the cherry, why not try only one?" In other words, why not put the ore right away into the chemical treatment? In some cases that may, indeed, be the proper thing to do; in other cases it may be better to do things step by step. This is something that must be decided for each ore.

We are practically taking it for granted that there is going to be a new hydrometallurgy of copper. The character of the experimental work that is going on and the kind of metallurgists who are conducting it practically assure this. Probably there are not going to be any new reactions discovered, but the old well known principles are going to be employed in large, modern mills along with modern machinery and methods. In other words, the hydrometallurgy of copper is going to be raised to the same standard that now obtains in the hydrometallurgy of gold and silver.

## BY THE WAY

Copper statistics favor an advance in the price of the metal more than at any time before, remarks the *Evening Post*, but copper statistics cannot be counted on too much, for, as pointed out by one who is bearish on copper, there are three kinds of lies: plain lies, horrible lies and statistics.

⁂

In the White Island sulphur article in the Journal of Nov. 1, 1913, it is stated that the water of the White Island lake has been freely taken away for its medicinal value. A correspondent says that he "doesn't see why." It strikes him as a long haul to take dilute sulphuric and hydrochloric acids over.

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Sometimes the daily press is not so speedy as it looks. Recently we saw, in a Western daily, what looked to be an interesting construction note concerning a new quartz mill and wrote for further particulars. The reply was: "This notice was given out more than 30 years ago. Mr. ————" (the promoter) "died in 1904."

⁂

A Washington press dispatch of date Nov. 5, said that of the 50,000 or more Americans who were in Mexico prior to the beginning of the present diplomatic difficulties between the United States and that country, only about 5000 still remain. According to information reaching the State Department, about 1200 to 1500 Americans remain in the City of Mexico, the remainder of the 5000 being distributed among the towns of Torreon, Monterey, Guaymas and Mazatlan.

⁂

A startling headline in the *Duluth News Tribune* reads, "Copper Mine Discovered by a Goat." Further perusal discloses the fact that the mine in question is the Fahlun in Sweden, and that it was discovered thus capriciously, so to speak, in the twelfth century. The world moves; we know of no modern records of copper mines, nor gold nor silver nor any other mines being discovered by goats. But many are the goats that have awakened and discovered the absence of a mine when their money was gone. There is one born every minute.

⁂

According to newspaper reports, the U. S. Bureau of Standards is looking forward to the receipt of a $1500 consignment of radium reported on its way from Austria. The bureau now has only five milligrams, which is valued at $600. The only other radium known to be in the possession of the Federal Government is in the keeping of the Bureau of Mines, and is necessary to the operation of a delicate instrument. The piece is so small, however, that it can be seen only with the aid of a microscope. We wish we knew what the delicate instrument is, but we suppose the above is official.

⁂

Mrs. Sarah H. Sorin, of Arizona, appeared, on Nov. 5, in the Supreme Court of the United States as sole counsel of a mining corporation. Only on a few occasions have women addressed the court and then, in nearly every instance, only as associate counsel. Mrs. Sorin was defending the claim of the United Globe Mines, a corporation of which she is general counsel, to two mining claims in Gila County, Arizona. James H. Works also claims the mines. When the case was brought to the Supreme Court, Mrs. Sorin was associated with her father, William Herring, as counsel. Since then Mr. Herring has died and Mrs. Sorin has fought the case to the end. The decision in the Supreme Court of Arizona was in her favor.

⁂

The *Boston News Bureau* tells this story, which is not lacking in point: At a meeting of the directors of a copper company, some months ago, there was under discussion the advisability of calling an assessment. Considerable difference of opinion was expressed as to whether stockholders would respond. Finally a director who favored the assessment clinched the argument by the following story: "In the early days of Union Pacific, a traveler alighted from a train at a depot lunch room, purchased a ham sandwich, took a bite and turned to the clerk, saying: 'How much for this sandwich?' 'Five dollars,' answered the clerk. 'That's robbery,' replied the exasperated traveler. 'I know it,' retorted the clerk, 'but you see you're into it now, and besides I need the money.'"

⁂

Setting back the hands of a clock in order to permit legislation to be enacted for other purposes, is a not infrequently noted device. We have never seen mention, however, of setting back the hand of a pressure gage; yet it is stated that this has been found necessary, in cases, when sinking rather deep shafts by the caisson method. The allowable limit of pressure under which men may safely work in caissons is, we believe, usually put at 48 lb. In order to reach depths corresponding to higher pressures without openly violating laws or alarming the men, gages have been manipulated to read from 5 to 10 lb. lower than the actual existing pressure. It is understandable that with only a few feet to go in order to land an expensive shaft which would otherwise be lost, the temptation to take chances and exceed safety limits is enormous. Nevertheless it is a thing not to be countenanced by anybody with the least humanitarian feeling. The occupation of the "sand hog" is sufficiently hazardous without his being made the victim of a crooked deal.

## Alaska Gold and the Porphyries

A visit made by Charles Hayden, of Hayden, Stone & Co., to various of the porphyry-copper propositions and to the Alaska Gold Mines, enable him to voice his opinions of these properties, for each of which his firm has acted as promoter. The *Boston News Bureau,* Nov. 12, 1913, publishes Mr. Hayden's résumé as follows:

At Utah, one is immediately impressed with the fact that had we not built our own railroad it would have been impossible to secure transportation facilities from any one else sufficient to handle the enormous tonnage that is now being treated. On certain days during the past month as high as 26,000 tons per day were moved from the mine to the mills There will be no startling developments at Utah, unless in a year or two copper metal conditions are such as to warrant an increase in mill capacity from 20,000 tons to 30,000 tons per day. Such as increase would, of course, also be contingent upon our making big strides in advance stripping operations.

At Nevada Consolidated there is little new that can be said. The property is being excellently managed, but, as has been said many times, it is a relatively short-lived mine—its present life being from 12 to 13 years at current rate of production.

At Ray everything is working to complete satisfaction, and it really is a remarkable achievement that this, the only underground mine of the four, has been able in such a short period of time to open up the property underground so that it can extract from two shafts 6500 to 7500 tons of ore per day. The full normal capacity of the mill—8000 tons—should be reached by next February, and from now on there should be a steady decrease in the cost per pound, due to the treating of the full tonnage for which the equipment was built.

At Chino there are likely to be for some time variations in monthly production, such as have occurred the last few months, as nearer the surface there are certain bunches of high-grade ore, certain bunches of ore running high in iron, and others with more or less carbonated material. Until the lower levels are reached, there will not be the same uniformity of production that there is at the other properties, but the general average should be a monthly output of around 5,000,000 lb. The percentage of high-iron ores and carbonated ores is very small as compared with the total orebody.

I hardly think that people realize that Butte & Superior is now producing 11,000,000 lb. of zinc concentrates per month, this being only a trifle less than one-half the total amount of copper now coming from the entire Butte district. After the many vicissitudes of a year or so ago, this property has been brought up to a satisfactory condition both as to mine and mill. It is inconceivable to the company's management or any of its legal advisors that the present flotation process, which has been developed and perfected by our Mr. Janney, is in any respect an infringement upon either the Minerals Separation Co. process, or the Hyde process. The primary and broad principle of the flotation process has been in use for years, and the main claim of the Minerals Separation Co. and the decision of the lower court were based upon the use of less than 1% of oil. We have demonstrated at Butte & Superior that we get very satisfactory results with a flotation process using not only 1% of oil, but 2%, 5%, 10% or 20%. The use of varying amounts of oil is largely a question of internal economy, and if an excessive amount of oil is used there is little difficulty in recovering it, and no great expense in so doing It was estimated that the cost of producing spelter would be in the neighborhood of 4½c. per lb., so that the profits of Butte & Superior will be dependent entirely upon the market price of spelter.

At the property of the Alaska Gold Mines I was particularly gratified to find each of the three divisions not only up to schedule as respects construction and equipment, but that the lay-out was most comprehensive and complete. Our general manager, Mr. Thane, we believe is fully competent to carry out the entire proposition to completion by January, 1915, as originally planned. At the mine the various levels are being opened up in readiness to ship to the full capacity of the mill as soon as the plant is entirely completed. At Sheep Creek the grading for the mill is completed, the structural steel is all ordered and erection will be started in the early spring. The record of driving the Sheep Creek tunnel is nothing short of phenomenal, an 8x10 opening having been advanced 600 feet a month. It will be only a month or two before all supplies for the mine will be transported from the steamers at the wharf direct through the Sheep Creek tunnel to all parts of the mine, and they will no longer have to use the road four miles up the cañon.

The big concrete dam for the reservoir at the Salmon Creek power plant is about half completed, and while no pouring of concrete will be done during the winter weather, everything will be ready to start again in the spring, and the entire dam will be completed as originally planned.

All the experimental work which has been done by various metallurgists in respect to extraction of the values from the ore demonstrates that it will be more than satisfactory and that a very high recovery will be obtained, and a remarkably high ratio of concentration secured.

## Nevada Consolidated Copper Co.

Report of the Nevada Consolidated Copper Co. for the quarter ended Sept. 30, 1913, shows a total copper production of 15,835,563 lb., divided into 5,403,919 lb. in July, 5,989,973 lb. in August and 4,441,671 lb. in September. In the first quarter of the year, 14,523,565 lb. were produced and 17,928,746 lb. in the second.

During the quarter 813,153 tons of ore were milled, 93% of which came from the pits and 7% from the underground workings of the Veteran mine. Ore treated averaged 1.53% copper, the cost of which was 10.09c. per lb. Net charge to undivided profits for the quarter was $95,157 after paying the sixteenth quarterly dividend, the further payment of $136,990 to the Steptoe company for depreciation, and charging off $135,082 for ore extinguishment.

Copper on hand and in transit, sold and unsold, was 21,958,859 lb., inventoried at 13.615c. per lb. Earnings for the quarter are based on 15.081c. per lb. for copper.

## Beaver Consolidated

The report of the Beaver Consolidated Mines, Cobalt, Canada, for the quarter ended Aug. 31, 1913, shows the company's cash balance was $26,098; there were $13,235 due from smelters and estimated value of ore ready for shipment was $106,039; total amount available, $145,371. Accounts payable amounted to $17,461, leaving $127,910 as a net balance available. It is stated that the payments on its interest in the Beaver Auxiliary property have been kept up, but three payments of $5000 each must be made to complete the purchase price. The main shaft was down 230 ft. on this property and a station was cut at the 200-ft. level. On the Beaver Consolidated property the main shaft is down 800 ft. On the 530-ft. level in "A" stope the ore chute is reported to be 150 ft. long, and in "B" stope 125 ft. long, with good ore in a stope between which was just being opened up. It is stated that the company is convinced that it should carry its shaft down to 1500 ft., to do this it will be necessary to install a new hoist as the one now in use is taxed to its capacity. A 6-ft. ball mill was being installed at the milling plant to increase its capacity. The profit from the mill was reported to be $40,000 for the quarter.

## Pennsylvania Smelting Co.

It appears that certain persons have believed that the statement on p. 759 of the JOURNAL of Oct. 18, 1913, implied that the Pennsylvania Smelting Co. was controlled by the American Smelting & Refining Co. Such is not the case, nor does the statement, on careful reading, imply it. The statement that the Pennsylvania Smelting works was closed down is an unfortunate error of our correspondent as it has been operating continuously.

## PERSONALS

Robert Linton, of Los Angeles, Calif., is visiting New York.

Phil. J. Hickey, of Seattle, Wash., recently went to Seward, Alaska.

Frank H. Probert, of Los Angeles, is in Plumas County, Calif., on professional business.

Charles A. Banks, manager of the Jewel Denoro mine, Greenwood, B. C., is in New York.

B. B. Gottsberger, general manager of the Miami Copper Co., is expected in New York next week.

C. W. Merrill, of San Francisco, is visiting in New York and expects to remain here for several weeks.

Chester F. Lee, of Seattle, Wash., is examining placer-gold ground on Similkameen river, in British Columbia.

J. O. Baylor has succeeded A. L. Gastman as superintendent of the Horse Mountain mine, Eureka, California.

C. H. Poirier, of Poillon & Poirier, New York, is at the Golden Zone property, near Hedley, B. C., on business.

Pope Yeatman is in Chile visiting the property of the Chile Copper Co. He will probably return next February.

F. Lynwood Garrison, of Philadelphia, has gone West on business and may not return until near the end of December.

Royal Pullen has been appointed assistant superintendent of the operations of the Canadian-Klondike Mining Company.

Oscar Lachmund is back at Greenwood, B. C., from a visit to the British Columbia Copper Co.'s headquarters in New York.

Willard P. Ward has resigned his position as vice-president and director, of the Kerr Lake Mining Co., of Cobalt, Ontario.

M. J. Falkenburg, of Falkenburg & Laucks, Seattle, Wash., has been in San Francisco and Los Angeles, on professional business.

Dr. Baxeres de Alzugaray, consulting chemist and metallurgist, announces the removal of his office to 324 West 83d St., New York.

John Gross, of Denver, has just completed the construction of the mill for the London Mines Co., at Twelve Mile, Gilpin Co., Colorado.

T. Walter Beam has returned to Denver, Colo., from Camp Hedley, B. C., after having spent several months there for a New York syndicate.

L. O. Kellogg, of the editorial staff of the "Journal" is visiting mines in Minnesota, after which he will proceed to Wisconsin and Michigan.

Sir Richard McBride, premier and minister of mines for British Columbia, is again in Canada after having spent several weeks in England.

John Hays Hammond has sold his residence in Washington, one of the handsomest in that city, to the Russian Government for its embassy.

Earl A. Henry is now chief of the West Virginia Department of Mines, succeeding John Laing. Mr. Henry was formerly district mine inspector of the state.

H. S. Robinson, engineer of the Trethewey Mining Co., Cobalt, Ont., is now at the West Beaver mine, in the Port Arthur district, which is under option to the Trethewey.

W. D. Greenough, manager of the Atlas Mining Co.'s mines in Whitehorse copper camp, Southern Yukon, left that camp last month for a trip to see his principals in the United States.

J. W. Gates, an engineer well known among Utah miners, has taken charge of the new office which the Stephens-Adamson Manufacturing Co., of Aurora, Ill., has just opened at Salt Lake City, Utah.

Julius M. Cohen has resigned his position with Graphite Ltd., St. Remi d' Amherst, Quebec, to accept the position of assistant manager with the Porcupine Crown Mines, Ltd., Porcupine, Ontario.

Frank S. Baillie, general manager of the Columbia Gold Mining Co., who resides at the mine near Sumpter, Baker County, Ore., is back to work after a vacation spent at the coast, near Newport, Oregon.

H. N. Thompson, for the past four years superintendent at the International Smelting & Refining Co.'s Tooele plant, resigned Oct. 15. Mr. Thompson was presented with a watch and fob by the employees.

Leo G. Smith, who has been Superintendent of the open-hearth works of the Prime Steel Co., Milwaukee, Wis., since March, 1912, was on Oct. 1 made works manager of that plant and also of the crucible plant.

Cunningham Craig, a British government geologist, after examining the oil fields near Calgary, Alberta, expresses the opinion that oil occurs in commercial quantities and advises a thorough exploration of the district.

Heinrich J. Freyn, formerly consulting engineer of the Gas Engine Department of the Allis-Chalmers Manufacturing Co. of Milwaukee, has recently joined the H. Koppers Co., of Chicago in the capacity of third vice-president.

Geo. Watkin Evans, consulting coal mining engineer of Seattle, Wash., has completed the examination of the Matanuska coal field of Alaska for the United States Navy. Mr. Evans will soon resume his private practice in Seattle.

Henry Kehoe, of Spokane, Washington, who spent several months of last year in Ontario, has been appointed engineer in charge of mining operations of the recently organized London-Arizona Consolidated Copper Co., in Pinal County, Arizona.

Horace Dunbar, who has been mining editor of the "Salt Lake Tribune" has resigned to accept a position with the United States Phosphate Co., as field manager for California. The company has phosphate properties in Utah, Idaho and Wyoming.

F. T. Hamshaw, of New York, formerly managing a placer-gold mine on McKee creek, Atlin, B. C., after having obtained an option on several of the working claims in Shushanna gold field, Alaska, left that field last month for the outside, to make arrangements for operating them next mining season.

Dr. Alfred G. Wilson, of the Mines Branch, Canada Department of Mines, Ottawa, has been making inquiries in British Columbia in connection with a request that the Dominion Government appoint a commission to investigate and report on the requirements of the lead and zinc mining industries of that province.

Miss Daisy Adams Walker, assistant statistician for the past 11 years in the San Francisco office of the U. S. Geological Survey, of which Charles G. Yale is statistician in charge, resigned her position on Nov. 1 to be married on Nov. 11 to Frank Pierce Otis, an attorney at law of Sonora, Tuolumne County, California. Miss Walker, from her long connection with the survey, is known throughout the Pacific Coast by mining people, and has perhaps a larger acquaintance with mining men and affairs than any other woman on the Pacific Coast.

## OBITUARY

Marion Jasper McDonald died at San Francisco, Oct. 29, aged 82 years. He was one of the early settlers in California and was for a number of years interested largely in mining in Amador County, Calif., and was also concerned with several companies on the Comstock Lode. He was prominent in local politics.

Ernest G. Peterson died at Butte, Mont., Oct. 31, aged 43 years. He was connected with several mines in the Butte district, but some years ago went to Salt Lake, when he was concerned in several Utah mines. About a year ago he returned to Butte as superintendent of construction for the Butte & Superior Mining Co. He leaves a widow and three children.

Richard R. Lee died at Silver City, N. M., Oct. 25, aged 53 years. His death was the result of an automobile accident in the Burro Mountains. He was born in Cornwall, England, and came to this country about 25 years ago. After three years in the Michigan copper country he went to New Mexico and settled at Pinos Altos, removing a few years ago to Leopold. He had some important mining interests in the Mogollon district. He leaves a widow and five children.

A dispatch from Eagle Pass, Tex., Nov. 6, says: "R. Weiniger, assistant superintendent of the Penoles Mining Co., at Mapimi, Durango, Mexico, was robbed and then killed at the direction of a Constitutionalist leader, and after the murder his fingers were cut off so that the rebel commander might obtain valuable rings the American wore. This information was brought to Eagle Pass tonight by Ernest Muller, an official of the mining company, who, with other refugees, reached the border after an overland journey of 18 days."

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

PHOSPHORIC ACID—Art of Converting Phosphorites. Henry Vail Dunham, Bainbridge, N. Y., assignor to Nacirema Chemical Co. (U. S. No. 1,074,779, Oct. 7, 1913; and 1,076,200; Oct. 21, 1913.)

PHOSPHORIC ACID—Process of Making Fertilizer. Spencer B. Newberry and Harvey N. Barrett, Baybridge, Ohio. (U. S. No. 1,074,808; Oct. 7, 1913.)

AMPHIDIZING—Apparatus for Amphidizing. Charles S. Bradley, New York, N. Y., assignor to Bradley Copper Process Co., Jersey City, N. J. (U. S. No. 1,077,036; Oct. 28, 1913.)

CHEMICAL FILTER. Charles S. Bradley, New York, N. Y. (U. S. No. 1,077,037; Oct. 28, 1913.)

GOLD-EXTRACTING MACHINE. Charles R. Dennison, Youngstown, Ohio. (U. S. No. 1,077,261; Nov. 4, 1913.)

ALUMINUM SULPHATE—Method of Preparing Aluminum Sulphate. Heinrich F. D. Schwahn, Belleville, Ill. (U. S. No. 1,077,309; Nov. 4, 1913.)

DRILL—Pneumatic Feed and Return Rock Drill. Ebenezer R. Ray, Placerville, Calif. (U. S. No. 1,077,856; Nov. 4, 1913.)

DRILLS—Valve-Motion for Rock Drills. Lewis C. Bayles, Johannesburg, Transvaal, assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,077,584; Nov. 4, 1912.)

DRILL STEEL—Oil Forge for Drill Steel. Willis W. Case, Jr., Denver, Colo. (U. S. No. 1,077,803, Nov. 4, 1913.

) MINE CARS—Running Gear and Draw Bar Attachment for Mine Cars. John F. Fox, Birmingham, Ala. (U. S. No. 1,077,601; Nov. 4, 1913.)

STEAM SHOVELS—Turning Device for Steam Shovels. William L. Strahlem, Middle Point, Ohio. (U. S. No. 1,077,174; Oct. 28, 1913.)

ORE CONCENTRATOR. Frank Picone, Tombstone, Ariz. (U. S. No. 1,076,700; Oct. 28, 1913.)

ELECTRIC FURNACES—Improvements in Crucibles for Electric Furnaces. Morgan Crucible Co. Ltd., London, Eng. (Brit. No. 24,626 of 1912.)

ELECTRIC MELTING FURNACE. Leslie E. Howard, La Grange, Ill., assignor to Simonds Manufacturing Co., Fitchburg, Mass. (U. S. No. 1,076,887; Oct. 28, 1913.)

LEAD-COPPER-TIN COMPOSITIONS, Process of Making. Edward D. Gleason, New York, N. Y., assignor to Plastic Metal Co., New York, N. Y. (U. S. No. 1,077,701; Nov. 4, 1913.)

OIL-FUEL BURNER—Adjustable Impact Atomizer. Robert Schorr, San Francisco, Calif. (U. S. No. 1,076,708; Oct. 28, 1913.)

ROASTING—Improvements in Furnaces for Roasting Ore. E. Dohet, St. Sarvais, Namur, Belgium. (Brit. No. 7892 of 1913.)

CYANIDING—Apparatus for Thickening and Agitating Pulp. John V. N. Dorr, Denver, Colo. (U. S. No. 1,076,666; Oct. 28, 1913.)

HARDENING—Method of Making Case-Hardening Material. Hugh Rodman, Edgewood, Penn., assignor to Rodman Chemical Co. (U. S. No. 1,076,453; Oct. 21, 1913.)

METHOD OF NODULIZING MATERIALS. Lewis P. Ross, Standish, N. Y., assignor of one-half to Northern Iron Co. (U. S. No. 1,076,705; Oct. 28, 1913.)

ALKALI METAL—Method for Extracting Alkali Metals in the Form of Nitrates from Minerals. Anton Messerschmitt, Stolberg, Germany (U. S. No. 1,076,508, Oct. 21, 1913.)

EXCAVATING AND DREDGING MACHINE. William R. Litzenberg, Portland, Ore. (U. S. No. 1,075,923; Oct. 14, 1913.)

LAMP—Electric Safety Lamp. Emil Gottschalck, Treptow, near Berlin, Lothar Werner, Berlin, and August Gast, Steglitz, Germany, assignors to the firm of Chemische Fabrik Griesheim-Elktron, Frankfort-on-the-Main, Germany. (U. S. No. 1,076,495; Oct. 21, 1913.)

ROCK DRILL. Grant W. Smith, Chattanooga, Tenn. (U. S. No. 1,076,246, Oct. 21, 1913.)

STEAM SHOVELS—Dipper for Steam Shovels and Dredges. Cooley Butler, New York, N. Y. (U. S. No. 1,076,548, Oct. 21, 1913.)

CRUSHING—Projectile for Rock Breakers. Mitts Quenner, Nogales, Ariz., assignor to Quenner Dry Crusher Co., Douglas, Ariz. (U. S. No. 1,076,148; Oct. 21, 1913.)

ELECTROMAGNETIC SEPARATOR. Erich Langguth, Neerpelt, Belgium. (U. S. No. 1,076,213. Oct. 21, 1913.)

LEACHING—Process of Extracting Copper from Ore. Frederick Laist, Anaconda, Mont. (U. S. No. 1,076,833, Oct. 28, 1913.)

ORE DRESSING—An Improved Apparatus for Dressing Ores. F. Pooley, Carn Brea, Cornwall, Eng. (Brit. No. 21,054 of 1912.)

ALLOY of Iron, Nickel, Manganese and Aluminum. Walter Rubel, Berlin, Germany, assignor to Rubel Bronze, Ltd., London, Eng. (U. S. No. 1,076,455. Oct. 21, 1913.)

ORE TREATMENT—Process of Treating Ores and Smelting Products Containing Cobalt, Nickel and Silver. G. Borchers, Goslar, Germany. (Brit. No. 18,276 of 1912.)

ORE TREATMENT—Treatment of Ores. Nicolas Henri Marie Derker, Paris, France. (U. S. No. 1,075,409; Oct. 14, 1913.)

PYRITES—Furnace for Decomposing Pyrites or Metallic Sulphides. William Augustus Hall, New York, N. Y. (U. S. No. 1,076,763; Oct. 28, 1913.)

ROASTING—Mechanical System for Roasting Sulphurous Ores by a Continuous Process. Xavier de Spirlet, Brussels, Belgium. (U. S. No. 1,077,010; Oct. 28, 1913.)

PHOSPHORIC ACID—Process for Separating Phosphoric Acid from Natural Phosphates. Maximilian Mattheus Haff, Ottawa, Ont., assignor to Thomas Leopold Willson, Ottawa. (U. S. No. 1,076,497 and 1,076,499; Oct. 21, 1913.)

## INDUSTRIAL NEWS

Hardinge Conical Mill Co., 50 Church St., New York, N. Y., reports the order of two Hardinge Ball mills from the Federal Mining & Smelting Co., of Wallace, Idaho. This company is already operating eight other Hardinge mills.

The royalty agreement under which the Cresson-Morris Co. (formerly the Geo. V. Cresson Co., of Philadelphia, Penn.), manufactured and sold the Buchanan crushing and concentrating machinery to the trade, has expired by limitation, and the C. G. Buchanan Co., of 90 West St., New York, N. Y., has made arrangements with the Birdsboro Steel Foundry & Machine Co., of Birdsboro, Penn., under which all of the Buchanan machinery, as well as new and repair parts, etc., will be manufactured by the Birdsboro company.

The Denver Engineering Works Co., Denver, Colo., reports the following orders recently received: The Furukawa Kune Mine of Japan for a double-drum electric hoist of 5000 lb. capacity. The San Juan Mines of Buenos Aires, Argentine, South America, a 5000-lb. capacity double-drum electric hoist complete with electrical equipment. Takata & Co., New York and Tokio, Japan, a 2500-lb. capacity single-drum electric hoist for shipment to one of its customers at Moji Japan. The Zaaiplaats Mine in South Africa has ordered a Richards Pulsator Classifier. Cia. Minera La Lucha y Anexas, El Oro, Mexico, has ordered from Victor M. Braschi Machinery Co., Inc., a Denver Engineering Works, 10-stamp mill equipment, 1250-lb. stamps, which includes a 4½-ft. diameter by 18-ft. long tire and trunnion-type tube mill.

## TRADE CATALOGS

Pacific Metal Products Co., San Diego, Calif. Catalog Moore Motor Trucks. 40 pp. Illus. 8x11 inches.

National Tube Co., Frick Building, Pittsburgh, Penn. N. T. C. Bulletin No. 17. 40 pp. Illus. 11x8½ inches.

The Diester Concentrator Co., Fort Wayne, Ind. Loose Leaf Catalog. Ore Concentrators. Illus. 6x9 inches.

G. L. Simonds & Co., 115 South La Salle St., Chicago, Ill. Booklet Vulcan Soot Cleaner. 48 pp. Illus. 9x6 inches.

This book on the subject of soot in relation to boiler efficiency contains valuable engineering data. It is sent free to those who request it.

Goldschmidt Thermit Co., 90 West St., New York, N. Y. Booklet. Thermit Railing Welding. 24 pp. Illus. 9½x6 inches.

The Brown Hoisting Machinery Co., Cleveland, Ohio. Catalog E. Brownhoist buckets and tube. 64 pp. Illus. 6x9 inches.

H. W. Johns-Manville Co., New York, N. Y. Booklet. J-M Asbestos Roofing and Waterproofing Specifications. 56 pp. Illus. 6x9 inches.

Chicago Pneumatic Tool Co., Chicago, Ill., Bulletin No. 34-T Class "M" Chicago Pneumatic Corliss Type Steam-Driven Compressors. 12 pp. Illus. 9x6 inches.

Denver Engineering Works Co., Denver, Colo., Bulletin No. 1061. Open Front Stamp Mortar Improved Ore Feeder. 4 pp. Illus. 8½x10½ inches. Bulletin No. 1062. Ovoca classifier. 8 pp. Illus. 8½x10½ inches.

Stephens-Adamson Mfg. Co., Aurora, Ill. The Labor Saver No. 62. 16 pp. Illus. 6x9 inches. Booklet Power Transmission Machinery. Section 2 "S-A" General Catalogue No. 19. 110 pp. Illus. 6x9 inches.

This booklet contains a very complete list of gears of every sort.

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Nov. 5

**Kennedy Extension-Argonaut Suit** on trial before Judge F. V. Wood in the Superior Court of Amador County, closed for the defense, Oct. 22, and a recess was taken until Oct. 27, when the plaintiff began the introduction of evidence in rebuttal. The chief witnesses in behalf of the defendant, following Mr. Rainsford, were Professors Wylie and Lawson and Fred Searles, all of whom testified as to the geological and physical conditions of the Argonaut and the Kennedy Extension in support of the contention of the defendant company that the Argonaut workings are all on the Argonaut (Pioneer) vein and that the vein is continuous from the apex within Argonaut ground to the lowest level, though following its dip under the surface of the Kennedy Extension ground. The defense also placed in evidence records and verbal testimony as to the early operation of the Pioneer mine and its acquisition by the Argonaut Mining Co. The chief witnesses introduced by the plaintiff in rebuttal were Doctor Finch and Professor George. Doctor Finch occupied two and a half days in direct and cross-examination, Professor George following on the afternoon of Oct. 29. Three other witnesses were to follow, and it was expected that the further testimony would not be concluded until the first week in November. By the direct evidence the plaintiff sought to show that the Kennedy Extension mine, which embraces the Muldoon and the Jackson claims, contains within its boundaries the apex of the vein which has been mined by the Argonaut. The defendant sought to maintain that the Argonaut workings are clearly within its extralateral rights, and that there is no other continuous vein within the contested ground. In rebuttal the plaintiff sought chiefly to show that there is no continuous vein apexing in the ground claimed and owned by the Argonaut Mining Co. Some new maps and a plaster of paris model of underground workings of the two properties were introduced in rebuttal; and though adding largely to the volume of documentary evidence, enhanced the interesting features in the case. Whatever may be the judicial outcome of the suit, there has been a large amount of valuable contributions to the literature of the Mother Lode, not alone by Doctor Finch, but by the several other expert witnesses on both sides.

### DENVER—Nov. 8

**The Strike Situation** in the southern coal fields drags along, the agitators so far having achieved little besides an enormous money loss to their organization, to the operators, and the people and business of the state. During the presence of the state troops, of course, matters are comparatively quiet, and the strikers are being disarmed as fast as possible, though comparatively few firearms have been turned in so far, most of them having been hidden. It is said now that Governor Ammons is preparing to withdraw all state troops except the cavalry from the strike zone within 10 days. The coal operators have made a proposal to Governor Ammons offering to re-employ all old miners who have not been guilty of violence but they will not recognize the union. Meanwhile there is no coal in storage in Denver except what is in dealers' hands. The gas and electric company has ceased to make coke and part of the gas for the city is now being made from oil. The following is an excellent summary of the history of the strike up to Nov. 6 as published in "The Independent" of that date: "Since the beginning of the coal miners' strike in southern Colorado 37 days ago, there have been 19 battles between strikers and mine guards, 28 men have been killed, 41 have been wounded, and 11 buildings have been wrecked or destroyed. The majority of the strikers are Greeks who recently fought in the Balkans. They are well armed and they have been drilling every day. State troops have been sent to the scene of disturbance, and martial law has been proclaimed there. There was a series of battles last week, beginning with one in which a striker was killed and a guard wounded. On Oct. 26 there was continuous fighting for 12 hours in Berwind cañon, at Hastings, and near the railroad station at Ludlow. One guard was killed. In the vicinity of Ludlow there were 700 armed strikers. They attacked a railroad train, believing that it was carrying mine guards. Two days later there were three battles, at Berwind, Tabasco and Hastings. One guard was killed; four strikers and two children were wounded. At Hastings the strikers surrounded a camp of guards. At Tabasco the strikers used a machine gun and were aided by a searchlight. The governor of Colorado sent all of the state's militia to the district, with orders to disarm both the strikers and the guards. After the arrival of 600 militiamen, the strikers became violent at a place some distance from their camp, capturing the building of the Southwestern Fuel Co. and burning it. In this building there was a post office. The strikers rifled the mails before setting fire to the structure. By order of the governor both sides were given 24 hours in which to surrender arms and ammunition. It was the avowed purpose of the strikers to establish camps in the hills and to defend them against the militia."

### BUTTE—Nov. 5

**The Butte & Superior Suit** brought by the Minerals Separation Co., of London, to prevent the defendant company from using an oil flotation process for the concentration of zinc ores, a patent upon which process is alleged to be owned by the complainants, was commenced, Nov. 4, in the United States district court under Judge Bourquin. The contention of the defendants is that the process being used by them is not an infringement of the London company's patent, in that considerably more than 1% of oil is being used, whereas the patented process specifies that 1% or less of oil shall be used in concentration. The oil clause of the patent is one of four alleged infringements named in the complaint, and the first day was taken up by chemists and metallurgists in the employ of the defendant company in making a series of practical experiments in the court room, showing different percentages of oil used.

### SALT LAKE CITY—Nov. 6

**At The Utah Apex Mine** at Bingham new machinery is being installed and a number of improvements made. Plans for enlarging the concentrator from 150 tons to 350 tons daily have been approved. This will require all of the winter to complete, and the same general flowsheet as that used at present will be followed. Though the rated capacity of the mill is but 150 tons at present, about 200 tons per day are being treated. A new electrically driven compressor with a capacity of 1300 cu.ft. is being installed, and is nearly ready for operation. A 200-hp. motor and transformer are to be added to the equipment. The Utah Apex in the last few months has opened a large tonnage of lead ore of both shipping and milling grades. This property is one of the largest producers of lead in the Bingham district. About 200 tons of sulphide ore and concentrates daily are being shipped, the output being limited by the ability of the smelting companies to handle the product. Monthly earnings have been between $30,000 and $40,000, and the company is rapidly wiping out its bonded indebtedness, which has been much reduced. This should be out of the way early in the coming year, enabling the company to go on a dividend-paying basis. Plans are being considered for operating the underground hoist by electric power.

### CALUMET—Nov. 8

**No New Developments** in the strike situation have transpired during the last week. The strikers have continued their early morning parades through the district, but without disturbances. The Federation insists that the strikers make these morning demonstrations and anyone not appearing loses his $1 per day. The Federation is establishing a series of so called "cost stores" where they expect to sell to the strikers, clothing and provisions at cost. This particular move is not finding much favor among storekeepers of the district who have been soliciting the Federation orders and returning a 5% discount on these orders back to the Federation, and henceforth it is not likely that this set of business men will continue enthusiastic in their support of the Federation. The Calumet & Hecla has secured practically as many men for underground work as were in its employ before the strike and production is being increased, so that in all probability the November output will be about normal. The Superior company is shipping between 600 and 700 tons of rock daily, which is an increase in production over that for a period some time before the strike. The Copper Range companies secured outside men during the week, most of them coming from Chicago, formerly employed in the steel mills, also a number of men are applying for positions, coming from the iron ranges of Michigan, where curtailment is being made. The Ahmeek, which is in the center of the union stronghold, is making preparations to receive imported men and it is expected that the arrival of these men will precipitate renewed outbreaks of lawlessness and disorder. During the period of forced suspension at the Calumet & Hecla mills, the men were put on construction work, and as a result a large amount of this work was accomplished. At the electric-power plant all the work has been completed and the 900-kv.a. mixed-presure turbine is being finally adjusted, and will be ready to go into regular commission within a few days. The buildings comprising the No. 2 regrinding plant are all completed and the machinery is being rapidly assembled. At the electrolytic plant, the building is completed and the tanks and electrical equipment are being installed. The White Pines company in Ontonogan County, a subsidiary of the Calumet & Hecla, has been operating two shafts full force throughout the strike without interference. The Phœnix company has about 25 men at work sinking an exploratory shaft on the Ashbed lode. Diamond-drill cores taken from this formation have been encouraging and further developments are being awaited with interest. The hull of the hydraulic dredge built for the Calumet & Hecla has been received. This dredge will handle the sands from the stockpile to the pool, from which it will be delivered to the classifying house and then to the mills.

### MARQUETTE—Nov. 7

**The Breitung Corporation** was recently forbidden to sell its stock in Michigan. Following a hearing at Lansing, the securities commission later reversed this order. E. N. Breitung, of Marquette, one of the principal stockholders and one of the state's wealthiest men, appeared before the commission personally. Officers of the corporation, particularly Breitung, were indignant at the first ruling, and especially at some unofficial comment in connection with the decision. They at once took steps to have the hearing reopened. Their indignation arose largely from the fact that the commission had taken the serious step of forbidding the sale of the stock without calling on any of its officials for a personal statement. It now appears that the original action was based on incomplete data relating to the company furnished from the New York offices. In response to a request for information, papers were forwarded that did not give adequate information as to the plans or scope of the corporation. The commission acted on these papers. Because of Breitung's prominence in the business world, the action of the commission received wide publicity.

### ISHPEMING—Nov. 7

**The Movement of Ore** from the Lake Superior region is on the wane. Many mines have, in fact, completed their shipments for the season. Very little ore is going forward from the Crystal Falls district of the Menominee range.

**Failure to Find New Deposits** after several years of persistent exploration through extensions of underground openings and by the use of the diamond drill has caused the Oliver Iron Mining Co. to surrender its lease of the Atlantic mine at Iron Belt, in the Wisconsin division of the Gogebic range. A force of 130 men was employed. Following the surrender of the Plummer exploration by the same company several weeks ago, the abandonment of the Atlantic comes as a hard blow to Iron Belt and the western end of the Gogebic country. The Atlantic has yielded a considerable tonnage in the aggregate, but as the ore was found in the black slates of the hanging wall, a fact regarded at the time of the original discovery as peculiar, the measures did not prove persistent and suspension had long been apprehended.

### DEADWOOD—Nov. 8

**U. S. Assay Office at Deadwood** is purchasing bullion under the new order recently issued by the director of the mint, the only change being that the depositors are required to pay the transportation charges on their product to the mint at Denver. This amounts to 80c. per $1000 of bullion value. The exhaustion of the fund for transportation of bullion between assay offices and mints and the failure of Congress to provide additional funds in the last deficiency bill, has made the action necessary. It is believed that it will be only temporary, and that at the regular session Congress will supply funds to enable work to be continued as in the past.

### SILVER CITY, N. M.—Nov. 6

**Three New Mills** are under construction at Pinos Altos and the [illegible] Key mill is being repaired and will resume operations within a short time. Grading for the C. & O. plant is under way and efforts are being made for completion before winter sets in. All machinery for the J. A. Peterson & Co. mill is on the ground and it is thought operations will commence by Dec. 1. It has been some time since much work has been done in the Pinos Altos district but the present outlook is brighter than it has been in years. The ores of this district are complex but doubtless modern methods will solve the problems that have retarded progress.

**Phelps-Dodge Operations** in the Burro Mountain mining district will soon be under way. It is understood that the visit here last week of Dr. James Douglas and Walter Douglas brought about letting the contract for the grading of the mill and townsite at Tyrone. Chadwick & Deyo,. the contractors building the branch railroad from Whitewater to the Phelps-Dodge property, have practically completed theirwork and it was thought the first train would be run into the camp about Nov. 15. The new townsite will extend from the Pines ranch up the cañon for nearly one mile and the company offices will be moved from Tyrone to the Parker place. The company as yet has not developed a large water supply and it is generally known that extensive experimenting has been done with the oil-flotation process of concentration and from this fact it is generally believed that this method will be used.

### JOPLIN—Nov. 8

**Rapid Falling Off in Drilling** operations and decreasing developments marked October work in the Joplin district. From a field with many drills at work and much new shaft sinking in progress, it changed to one shipping its drills to the oil fields and new development was halted until it could be seen what was going to happen in the spelter and ore markets. During the last 60 days 38 drill rigs have been shipped from the Joplin district into the oil fields of Kansas and Oklahoma and it is believed that the next 30 days will see half that many more shipped out unless there is a rallying of ore prices sufficiently to bring back confidence in the zinc mining business. The passage of the tariff act reducing the duties on spelter and ore discouraged many producers and the drop in prices coming simultaneously so disorganized the prospecting and development part of the industry that many hitherto optimistic operators have either slowed down their activities or are getting into other lines of industry. The fact that petroleum prices have been advancing and that many of the Joplin mining men are also interested in that industry has contributed something to the activity of the prospect-drill men in shipping their machines to the oil fields. Joplin companies are entering the shallow oil regions around Paola, Osawatomie, Rantoul and Moran, in Kansas, while others are going into the old Chanute field. Some are going into Chautauqua County, Kansas, while a large number are becoming interested in wildcatting south of Tulsa and in the new Ardmore field in Oklahoma. One group is also developing in the new territory on the Red River on the Oklahoma side just across from the Electra and Petrolia field in Texas. With oil selling above $1 per barrel the incentive to drill is great to the ordinary man but when such an incentive is placed before a Joplin mine operator who has seen his industry's tariff protection wiped out, and this followed immediately by a price reduction on zinc ores that is a close approach to the worst days of 1907 and 1908, he does not hesitate about taking it up. Hence it is no wonder that Joplin zinc men are turning to the oil fields since they are almost at his doors on the west and southwest. The effect of all this exodus, while not apparent in the production right now, will begin to be felt in the mining field before another summer season comes on. When the drills stop operating in the Joplin field it is not long until the number of mines cutting out overtakes those that are coming in. The short life of the average Joplin mine makes the absence of the drills felt all too quickly and unless there is a readjustment soon in the prospecting and development the tonnage of high-grade ore coming from the Joplin field will suffer considerable reduction. Nothing but a season of high-priced zinc ores will be able to bring that confidence back sufficiently to induce a return of the drills and with present tariffs and present range of prices for spelter in Europe the problem faced by the high-grade zinc ore producer and the smelter of this class of ores is not any too pleasant. The ore producer is trying to forget [illegible] for awhile and is going into the oil business where he can do so.

### TORONTO—Nov. 8

**The Calgary Oil Boom,** despite the warning issued by the Calgary board of trade against too hasty speculation before the occurrence of oil in commercial quantities was assured, has resulted in the formation of numerous companies with the object of placing stock on the market. Up to the end of October 10 companies with a combined capital of nearly $2,000,000 had been registered in Calgary. At least 10 drilling outfits will commence operations within a few months.

# THE MINING NEWS

## ALASKA

COAL-LAND HEARINGS on the three important tracts involving 5872 acres in Katalla field will be heard Oct. 2, 1914. Cases are against McKenzie Anthracite Coal Co., Carbon Mountain Anthracite Coal Co. and Alaska Smokeless Anthracite Coal Co. Lands were located by C. W. Doughton. Government charges fraud in making location and failure to develop. Depositions will be taken in New York, Chicago, Los Angeles, San Francisco, Sacramento, Portland, Spokane and Seattle.

EBNER GROUP is now controlled by U. S. Smelting, Refining & Mining Co., which, it is understood, is under contract to spend up to $200,000 in exploration work. Receivers of Alaska Ebner Gold Mines Co. some months ago entered into contract with H. W. Martin for development work, it being understood that Martin represented United States company. This agreement stipulates that Martin is to provide funds up to $200,000 for extension of a tunnel, work upon which had begun when receivers were appointed for company. At time of receivership tunnel had been extended about 1100 of proposed 4000 ft. Present plans call for tunnel's completion by new year. This tunnel was undertaken for purpose of striking general gold-bearing vein of that region. Property in question is owned by Ebner Gold Mines Co., and is capitalized for 100,000 $5 shares. Entire capital stock was placed in treasury of Alaska Ebner Gold Mines Co., now in receivers' hands. Stock of subsidiary formed part of collateral back of an issue of bonds of parent corporation, of which $600,000 were sold. Arrangement entered into between Martin and Alaska Ebner receivers called for working option; in no way can it be considered an option for control. Foreclosure proceedings against all assets of Alaska Ebner Gold Mines Co. will shortly be instituted which will then make it necessary for United States company to make a bid for Ebner property should developments there warrant its acquisition. Receivers' certificates, to which United States company will be entitled for money advanced, understood to exceed to date $100,000, while a first lien, do not constitute a guarantee that its bid, should one be made, would be successful over all competitors.

ALASKA MEXICAN (Douglas)—In September 17,364 tons of ore yielded $35,709, $2.07 per ton; profit $7625.

ALASKA TREADWELL (Douglas)—In September 78,113 tons of ore yielded $225,908, $2.92 per ton; profit $123,310.

GOLDEN HILL (Willow Creek District)—Ten-stamp mill has been purchased, and will be in operation in early spring.

ALASKA MEXICAN (Douglas)—In August 19,740 tons of ore yielded $1.94 per ton, or a total of $38,060. Net profit estimated at $9094.

GRANITE (Port Wells)—Foos gasoline engine of 25 hp. and Ingersoll-Rand air compressor, have just been purchased and will be installed at once, increasing capacity of plant.

ALASKA UNITED (Douglas)—In August 19,866 tons of ore crushed in the Ready Bullion mill yielded $2.54 per ton; 18,795 tons crushed in the 700 Claim mill yielded $2.18 per ton. Total yield was $90,415; estimated profit $29,342.

KEYS & RETTIG (Chatanika)—These lessees on the Doctor bench claim at the mouth of Cleary Creek have stopped work in the lower shaft on account of the low grade of the ground. Except for the robbing of a few pillars, operations in the upper shaft were finished Sept. 25.

SOO MINING CO. (Dome City, via Fairbanks)—A crosscut into the hanging wall from the end of the east drift on the 100-ft. level recently disclosed considerable high-grade ore, $2 being recovered from panning a single handful. The last 200 ft. of the drift was driven by contract, and following the line of least resistance, the contractors wandered away from the vein. No work is at present being done on the west drift of the 100-ft. level which is in ground belonging to the Wild Rose claim, owing to the inability of the lessees to come to an agreement with the owners in the matter of royalty.

## ARIZONA

### Cochise County

CALUMET & ARIZONA (Warren)—Utley Wedge is reported to have been working on treatment of Cornelia ore. Process is said to consist of mixing pyrites with ore and roasting in Wedge furnace. Roasted ore is leached with dilute sulphuric acid, copper solution being electrolyzed. Expected recovery of copper 92%, costing 7 to 8c. per pound. Plant of 250 tons daily capacity is contemplated at first, cost estimated at $100,000.

### Gila County

MIAMI INDUSTRIAL COUNCIL recently issued a strike notice, but carpenters union refused to be governed by action of council and withdrew from that body, advising its members to return to work at Inspiration mill, giving as their reason that steel work there had not been union work from beginning and that there were virtually no union men to aid by striking.

IRON CAP (Globe)—Aspect of mine as a whole is better than at any time during its development. About 50 ft. remains to be driven before connection is made with Eureka shaft of Arizona Commercial.

SUPERIOR & BOSTON (Globe)—October was most prosperous month in history of mine, shipments exceeded 4000 tons. Diamond drilling to explore country east of present workings was begun Nov. 1, and is making headway of 12 ft. daily.

CASTLE DOME (Miami)—A second tunnel has been started 100 ft. lower than tunnel in which such rich ore was recently encountered. As in tunnel above, a stringer of rich ore was found near beginning of new adit and at present entire face of tunnel is mineralized with chalcocite, chalcopyrite and galena, carrying gold and silver, and occurring in small, rich stringers.

RAY CONSOLIDATED (Hayden)—Mill has been completed and eighth and last section was started about end of October. With all sections operating 8000 tons of ore are treated daily. From now on it is planned to keep concentrator fed at as near capacity as conditions will permit, and at times as much as 10,000 tons per day will be treated, as each section has shown ability to handle as much as 1250 tons daily. This can be done without crowding mill.

ARIZONA COMMERCIAL (Globe)—Work on 1200 level has been temporarily suspended because of water. Present flow can be handled easily enough with pumping equipment now in use but it is feared that further opening of ground now would result in flow too great for pumps. No statement has been made as to when pumping machinery will be augmented. Fourth crosscut had only penetrated vein the distance broken by one round of shots when work was discontinued on the level, but ore was of same character as that exposed in third crosscut and gave evidence of increasing richness as vein was entered. Vein where encountered on 1000 level was 27 ft. wide, 2 ft. excellent ore, rest carrying stringers of good ore that would have to be sorted from gangue. Vein is being drifted on at this level. On 700 level, also on 500 level drifting is proceeding on vein.

INSPIRATION CONSOLIDATED (Miami)—Excavation is now well under way for power house in Webster gulch, and carpenters will soon be making forms for concrete. American Bridge Co. finished structural work on machine shop and warehouse at the millsite Nov. 4, then started riveting on ore bins in Webster gulch. All steel is now in place for about two-thirds length of bins. Work has been started on steel foundation for conveyor belt between coarse-crushing plant and ore bins, and already one tower is in place. Steel for crushing plant will soon arrive and work will be started on this next, in conjunction with headframes for main shafts. Within a few weeks new test mill will be ready for operation, as practically all machinery is now in place and crushing plant at Scorpion shaft is all but completed, conveyor belt being in place and crushing machinery housed with corrugated iron.

MIAMI COPPER CO. (Miami)—It is reported that the determination has been made to alter first five sections of concentrator to conform with sixth unit which now secures two pounds per ton better extraction than rest of plant. Each section will be enlarged sufficiently to permit of total treatment of 4000 tons of ore daily against 3000 tons, existing capacity. Such an enlargement would increase monthly production from 3,000,000 lb. to 4,200,000 lb. If plans materialize this work will be carried out next year. Under direction of J. Parke Channing, there have been carried on for some time a series of experiments which if adopted will be utilized both by Miami and New Keystone. Treatment of mixed sulphide and oxide ores has been most puzzling, not only to Miami but to other companies having similar mixtures. A 20-ton experimental plant will soon be started by Miami upon a new process, details of which follow, in brief: Coarse crushing and removal of fine dust; rough water concentration to take out coarse sulphides; roasting of tailings from preceding operation; leaching with sulphuric-acid solution; precipitation of copper by electrolysis and regeneration of solution with sulphurous-acid gas, solution then being used again for leaching.

### Mohave County

WALDRON (Deluge Wash)—A road is being built to connect with Cedar road and equipment for new mill will be hauled in; Arizona Venture Corporation owner.

TENNESSEE—It is stated that the orebodies on the 900 level are wider and the ore is of better grade as drifting progresses; 150 tons of ore are shipped to the smelters daily.

WALKOVER (Hackberry)—The new owners have nearly completed preparations for the resumption of work on the property and it is expected that a small force will be started at once.

GEORGE WASHINGTON (Mineral Park)—Trustees' sale of interests has been postponed till Nov. 25. It is understood that settlement will probably be made before that date and work will be resumed.

BI-METAL—A shaft is being sunk on this property north of the old workings and some high-grade milling ore has been found. It is understood that a churn drill will be used to prospect a large part of the ground.

BOUNDARY CONE (Oatman)—The main shaft has reached a depth of 520 ft. and drifting is in progress along the vein. Several stockholders have visited the property and are considering the advisability of erecting a mill.

ORO PLATA—This property has just been sold at mortgage sale for approximately $35,000. Gaddis & Perry Co., of Kingman, were the bidders. It is stated that the property is credited with having made a production worth more than $500,000. The deepest workings are less than 300 ft. below the surface.

## CALIFORNIA

### Amador County

KENNEDY EXTENSION VS. ARGONAUT—It is expected that at close of taking evidence further hearing will be postponed for one month to give attorneys time to prepare for oral argument.

PLYMOUTH DISTRICT is attracting attention through bonding of Rhetta and other properties by representatives of large operators. It is reported that U. S. Smelting & Refining Co. has had an engineer examining these mines, but report is not corroborated. Examinations have been made covering large territory in district, and improvements are being made by realty owners in town of Plymouth, encouraged by continued development of Plymouth Consolidated. London Exploration Co. has also recently taken over mining property on east belt of Mother Lode, near Plymouth Consolidated.

### Butte County

MAMMOTH CHANNEL (Magalia) — Proposition recently made to lease this gravel property for 20-year term which calls for investment of $100,000 in a drain tunnel and other development, was to be considered by Mammoth Channel Gold Mining Co. at a meeting of stockholders, Nov. 10.

GOLD BANK-GOLDEN QUEEN (Forbestown) — Further examination, it is reported, is being made by prospective purchasers. The 20-stamp mill was closed during summer months because of lack of water for power, but preparations are being made to resume milling. Should properties be taken over by company with large capital, installation of electric power would follow. Shortage of water during summer was due to fact that power water was taken from local ditch that must supply irrigation water to farmers.

### Calaveras County

MOKELUMNE HILL DISTRICT mining is progressing. The Megaw-Magee tunnel has reached a good prospect of gravel at 1900-ft. point. Large amount of water has come in, which will be handled with water jet. Carpenter shaft is in pay gravel. Five stamps of 8-stamp mill are dropping. Electric power is used. One of the Nuner shafts at base of Stockton hill will be unwatered. Electric power will be used.

LAND CONTEST between F. M. Raymond, mineral contestant and Frank Reister, homestead entryman, has been decided by U. S. registrar and receiver at Sacramento in favor of mineral claim. Ground is at Smith Flat near Angels. Homestead claimant is permitted to proceed to patent the land that does not conflict with mineral claims.

### Eldorado County

HEWITT EXTENSION (Slug Gulch)—Property, including Rody Bar mine and Cosumnes Crystal cave on Cosumnes River has been leased to J. B. White, of Fort Wayne, Ind., who, it is said, will develop mines and explore cave with view of making latter a show place of interest to tourists.

### Fresno County

PACIFIC QUICKSILVER CO. (Dos Palos)—Six new Knox & Osborne condensers went into commission in September.

### Inyo County

BLUE BELL (Bishop)—It is expected that milling will begin soon.

GEM GROUP—A large amount of ore has been milled from this mine in Jail Cañon this summer. A cyanide plant is being built.

MONTROSE MINING CO.—It is reported that road leading to old Panamint mine will be rebuilt and stamp mill will be erected. Pay ore is reported in new territory outside of patented ground.

### Kern County

GOOD HOPE (Randsburg)—Mill has resumed running, treating 70 tons of ore daily. Large shoot of good ore, recently exposed, assures long mill run.

### Lake County

UTOPIA QUICKSILVER MINING CO. (Lakeport)—Assessment of 1½c. per share has been levied on stock for purpose of reopening and developing the mine near Bartlett Landing. About 300 ft. of sinking and drifting had been done and indications of good ore found. H. C. Davy, manager of Guadalupe quicksilver mines in Santa Clara County is one of the largest stockholders and will have supervision of development.

### Madera County

CALIFORNIA-NEVADA — Further litigation is expected regarding title to this property formerly known as Dalton copper mine. It was purchased at sheriff's sale in 1910 by J. R. Barnett, and was sold for delinquent taxes on Oct 18, 1913, by L. M. Bradford, of Madera. Barnett will try to recover title.

### Nevada County

GOLDEN CENTER (Grass Valley)—Ten-stamp mill is being built. It is expected stamps will be dropping in December

GASTON (Gaston)—Ten stamps from upper mill have been removed to point below, where vein has been disclosed at greater depth.

NORTH STAR (Grass Valley)—Third dividend for 1913, [illegible] per share and amounting to $50,000, has been declared Total of $150,000 has been disbursed in nine months. Total dividends of North Star now amount to $8,936,898 on capitalization of $2,500,000, in addition to large sums set aside for purchase and development of Champion mines at Nevada City.

### Placer County

PIONEER GOLD MINES CO. (Auburn)—Articles of incorporation have been filed, capital $1,000,000. Company has purchased Pioneer mine near junction of Humbug Cañon and north fork of American River.

## COLORADO

### Custer County

SPRINGFIELD (Salida)—Mine in Pass Creek which has been lying idle since the '80s has been reopened by Salida men, who in driving crosscut tunnel, opened shoot of ore arsaying $80 to $100 per ton in gold and 5% copper. Old stopes are also said to be full of $15 ore.

### Lake County

DISCOVERY (Leadville)—First ore has been shipped and as oreshoot is now well proved shipments will continue regularly from both zinc and iron shoots. Former carries 30% zinc and latter 10 to 15 oz. silver per ton with 5% lead and 40% excess silica.

MOUNT CHAMPION (Leadville)—In Dick Turpin claim in Lackawanna Gulch, largest shoot of ore yet found in that mine has been opened. It is mostly smelting ore rich in gold as is the milling ore. Mill is running day and night treating 100 tons daily.

### San Juan Region

CONCENTRATE SHIPMENTS from Telluride during October totaled 83 carloads. Cash in mine in Paradox Valley is shipping high-grade copper ore which nets owners good profit over marketing costs of $32 per ton. The 50-stamp mill of the Junta Consolidated is to be ready to operate some time in November. There is plenty of ore blocked out to keep it running continuously.

### Summit County

COLORADO GOLD DREDGING CO. (Breckenridge)—Recent semi-monthly cleanup resulted in two gold bars valued at $14,000 being sent to Denver mint. This represented about 13 days actual dredging. Company has leased Farncomb Hill Gold Dredging Co.'s property known as Snyder placer which has big record for nugget and coarse gold from its bedrock drifting.

### Teller County

MARY McKINNEY (Anaconda)—Sinking has been resumed in main shaft for another lift of 100 feet.

OPHIR (Cripple Creek)—Mine has been bought in at sheriff's sale by James F. Burns under judgment of $1368 and costs in his favor.

GOLCONDA (Victor)—After 10 years idleness mine has been leased to T. Fitzmorris and associates for 5 years on graded royalties from 15 to 25% on net returns.

## IDAHO

### Cœur d'Alene District

AMADOR (Iron Mountain)—First car of copper ore has been shipped since work was resumed after settlement of litigation several months ago. Raise from 400-ft. level has opened up good ore. Narrow-gage railroad from Iron Mountain to mine has been repaired and is in operation. It is equipped with gasoline locomotive and 7-ton cars.

GREEN-HILL CLEVELAND (Mace)—New Nordberg hoist is now installed and in operation and mine will be in operation by Nov. 15. New hoist replaces old one, which was demolished recently when loaded skip dropped 2000 ft. It is of type used in Butte and will raise nine tons 3000 ft. Hoist is designed to compress air when lowering.

INTERSTATE (Wallace)—Mine in Nine-Mile cañon is being equipped with electric haulage for 4000 ft. Milling plant is now running with three shifts to its full capacity of 300 tons per day. Five four-horse teams are hauling crude ore and concentrates to Bunn station. Five more teams are at work hauling from sawmill near mine for construction of 12 new bungalows and 75-room hotel for employees. All buildings will be equipped with steam heat, baths and modern improvements.

TYLER (Wardner)—A caterpillar engine has replaced the motor truck which was used to haul ore during summer. The motor truck could not be operated satisfactorily on hill in deep mud. New engine, which is built by Holt Mfg. Co., of Stockton, Calif., travels through 4 in. of mud without difficulty. It is driven by 65-hp. gasoline engine and travels two miles per hour. Some difficulty was experienced at first in having too light trailers which engine pulled to pieces in mud. Engine now pulls two 7-ton bottom-dump wagons and makes regular trips. In some places grade is from 12 to 15%. It is planned to run caterpillar throughout winter, makers claiming that it will run as good through snow as it does through mud.

IDORA HILL (Wallace)—Tuscumbia property has been bonded and leased at a price of $225,000. Not all Tuscumbia stock was turned in on the option, but enough to give Idora working control of property. Term of bond is for two years, with royalties on all ore extracted from Tuscumbia ground. Consolidation of the properties is of great advantage to stockholders financially, and promises greater convenience in working. Idora is equipped with mill, which is running steadily on Idora ore but with addition of Tuscumbia, which is in shape for immediate production, mill can be run at full capacity and shipments of ore be correspondingly increased. Ore is hauled from Idora mill to Bunn station on the Northern Pacific Ry.

## MICHIGAN

### Iron

IN IRON RIVER DISTRICT mining business does not look any too bright at present, as there is not a single property working in Spring Valley, the seven mines being closed. Youngs, Zimmerman and Berkshire have been shut down for some time, and Baltic, Bengal, Fogarty and Caspian were closed week before last. Last four mines belong to Pickands, Mather & Co., and shut-down is only supposed to be temporary. When orders were received to cease shipments, mines were not in shape for stocking ore and so it was necessary to stop mining until stocking room could be made. Just when operations will be resumed is not known; probably soon. There is little ore in stock at any of the mines in the valley, shipments from that region having been heavy this year.

ATLANTIC (Iron Belt)—Oliver Iron Mining Co. has surrendered its lease, several years of persistent exploratory work having failed to disclose new bodies of ore of importance. Shut-down is serious blow to Iron Belt as only a few days before Plummer lease was given up.

PURCELL (Iron River)—McGreevy Steel Co. has ceased all work with exception of pumping. Considerable new machinery arrived at property a few weeks ago, but it will not be installed now. All ore shipments stopped with shut-down. It is believed that mining operations will be resumed next spring.

HOMER (Iron River)—New mine buildings are hearing completion, transformer house and boiler house being about finished. Two 250-hp. boilers have been installed and are in use. Walls of engine house are up and floor will soon be laid. Change house is now receiving most attention, as company desires to have this structure ready for occupancy at an early date. All new buildings are built of brick, with steel girders, and iron roofs.

CLEVELAND-CLIFFS IRON CO. (Negaunee)—Company closed its crushing plant at South Jackson location, where most of ore shipped from Chase, North Lake and Moro mines this season was crushed. Plant had a busy season and operated with day and night forces all summer. Ore that has been in stock at Moro for several years has been shipped, a little remains which will be sent out next year. Property was abandoned a year ago, having been worked out.

AUSTIN (Gwinn)—Property was shut down lately because there is considerable ore in stock and management deemed it unwise to mine more until improvement in iron market. Men have been given work at other mines of Cleveland-Cliffs Iron Co. in Gwinn district. Stephenson is only large property in district now being operated, although work is being done at Gwinn, Mackinaw and Gardner shafts. Princeton was closed three weeks ago. No mining has been done at Gwinn, Mackinaw and Gardner properties, but shafts have been sunk to ore and sinking is again in progress. Gwinn will probably be a producer in 1914.

## MINNESOTA

CUYUNA-DULUTH IRON CO. (Ironton)—No further shipments will be made this season, but stockpiling will continue throughout the winter.

DULUTH-BRAINERD MINING CO. (Manganese) — New three-compartment shaft is now down 35 ft. Product, manganiferous iron ore. Northern Pacific Ry. is arranging to lay track to property.

BARROWS (Barrows)—Five or six thousand tons will be loaded from stockpile at once, as mine is not hoisting enough to fill the 10,000-ton order before close of navigation. About 200 tons per day are being hoisted.

JAMISON & PEACOCK (Crosby)—The Drilling on Sec. 1, 46-29, continues to show sensational results. Hole No. 514 averaged over 69% iron for a distance of 20 ft., with one sample 69.52% and 0.011 phosphorus. Drilling has shown up highest grade of bessemer hematite ever encountered anywhere in Lake Superior region.

### Mesabi Range

THE TOWN OF FAYTON has been platted on the Western Mesabi between Grand Rapids and Coleraine, near operations just started by Interstate Iron Co.

ORE SHIPMENTS are again being made to Lake Superior docks, after suspension of several days. It is learned that stoppages of shipments was result of congestion at Duluth.

U. S. STEEL CORPORATION—On Oct. 31, the last legal date, the corporation paid its real estate taxes for last half of 1912. These amounted to $1,520,616, made up as follows: Operating mines, $966,266; timberlands and inactive mines, $549,198; Minnesota Steel Co. new plant at Duluth, $5152. The yearly taxes of the Steel Corporation for 1912 in St. Louis County were $3,040,119.

CASHMAN TARIFF LAW, a recent Minnesota enactment, goes into effect Jan. 1, 1914. Sense of the law is to put all freight rates on a "per mile" basis throughout state. It has been ruled that iron-ore shipments to Duluth docks, being destined for Lake Erie ports, are inter-state shipments, and do not, therefore, come under new law. New steel plant at Duluth will be only consuming interest to be affected. No schedule of rates on iron ore has been announced as yet.

LA RUE (Nashwauk)—A concentrator plant is contemplated.

JOHN, JR.—Mine has closed down for winter, after completing its shipping contract.

PEARSON—This underground mine will operate throughout winter, for first time, stockpiling product.

QUINN—Stripping will be continued all winter by Butler Bros., stripping contractors. Pit will produce in 1914.

HAWKINS (Nashwauk)—Stripping operations will continue through winter. Two shovels are at work, with five locomotives.

CROSBY (Nashwauk)—Plans are being prepared for concentrator. This is an underground mine, but will not operate in winter.

COLUMBIA (Virginia)—Preparations are being made to remove houses over orebody, and all will be moved to new location. It is planned to complete the work as soon as possible, so that stripping can be gotten under way.

COLERAINE EXPLORATION CO. (Coleraine)—This company of Duluth mining men was recently organized to explore 16 "forties" east of Trout Lake, near Coleraine. Several drills were started this week. Surface indications of ore were discovered there little less than a year ago, and all the territory will be thoroughly explored.

INTERSTATE IRON CO. (Grand Rapids)—The dredge "John Beckfelt," with which company hopes to remove overburden from its new property, was towed to its moorings several days ago and stripping has been started. Total of 3000 ft. of pipe was laid through which waste material will be carried to dumping ground by aid of suction pump. Machine has not been in operation long enough to make any predictions as to outcome.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

STRIKE OF ZINC ORE was made on farming land near Afton, Okla., last week at depth of 10 ft. by men drilling for water. No mines are situated near tract and scene of strike has been visited by many operators.

MEXICO-JOPLIN (Joplin, Mo.)—Three drifts at 180-ft. level are showing ore.

BRAY MINING CO. (Springfield)—Average of 35 tons of blende is being produced weekly. Operations for several months have been successful.

QUEEN CITY LEAD & ZINC CO. (Aurora, Mo.)—Tract of 30 acres has been sold to Investors' Realty Co., comprising local operators. Development work is to be done.

GRANBY MINING & SMELTING CO. (Joplin, Mo.)—New mine in Chitwood camp is proving profitable, 7% ore being found; development campaign extended over a year.

RAGLAND (Joplin, Mo.)—J. M. Short has leased property and placed four drill rigs at work. Disseminated ore has been encountered at 240 ft.; the tract consists of 80 acres.

BARNES & M'CONNELL (Baxter Springs Kan.)—Concentrator has been completed and will be placed in operation soon. A tram has been built to connect 150-ft. shaft with mill.

LEE HALL (Joplin, Mo.)—Mill has suspended operations pending prospecting work. Mine has been one of the best producers of West Joplin field for last six or seven years.

GENERAL LEAD & ZINC CO. (Carthage, Mo.)—Edward Lanyon and associates are developing a good mine on this tract. An old shaft was sunk deeper and a vein of high-grade ore was encountered.

YELLOW PUP (Galena, Kan.)—O. W. Sparks has made an unusual strike at a deep level near this property. Ore is richer than that of Yellow Pup and Yellow Jacket. Ore from new shaft will be treated at Yellow Jacket mill.

BERTHA A (Webb City, Mo.)—Concentrator is to be enlarged to 500 tons capacity. Operations will be continued while work is in progress. Two new roughers, larger power plant, larger crusher, and elevators will be installed. Three shifts are producing ore.

POCAHONTAS (Thoms Station, Mo.)—Unless prices of ore increase soon, company will withhold its ore, it has been announced. Other companies will do likewise. Powhattan is owned by Pocahontas operators, and rule may apply there also. The two produce on average of 300 tons of ore weekly.

## MONTANA

### Butte District

W. A. CLARK'S GOLDEN ANNIVERSARY of his arrival in Montana will be celebrated by citizens of Butte. Mr. Clark's long activity in development of Butte mines is recognized by Butte's citizens as deserving celebration which they have planned and which promises to mark a red-letter day in history of Butte.

BUTTE & SUPERIOR—(Butte)—Reports are current that company has purchased Deadwood and Deamert claims adjoining Black Rock mine in which latter claim all of present work is carried on. Mill is treating now on an average 1000 tons of ore per day, making recovery of 87 per cent.

NORTH BUTTE (Butte)—Development on Snowball vein is progressing with increasing success. Lode was encountered in crosscut on 1800 level toward close of 1910, and since that time it has been opened on successive levels in depth to 2800 level and also on levels above eighteenth. Of total 10 veins nearly one-third of ore reserves, according to latest estimate, was contained in Snowball vein. Ore in this vein averages 6 to 7% copper and 8 oz. silver per ton.

BOSTON-BUTTE COPPER & ZINC CO (Butte)—Company has been incorporated by Butte men under the laws of Arizona with a capital of $1,000,000. Company owns 750 acres of ground in northwest part of district, which it proposes to develop by sinking central shaft to depth of 1500 ft., and crosscutting north and south to boundaries. It is understood that no stock will be sold at this time as arrangements have been made with Boston men for sufficient money to equip and develop property.

BUTTE CENTRAL (Butte)—F. O. Curry, Nova Scotia holder of 1000 shares, after more than a week's stay, has gone to Vancouver to look after interests there. Mr. Curry after his investigation, was quite satisfied that money would be forthcoming to pay off indebtedness of company and enable it to resume operations. He believed that with careful and prudent management mill could be operated with profit, and that there was sufficient ore blocked out to run concentrator for many months. He is of opinion that shaft should be sunk at least 500 ft. and a thorough examination be made of ground at depth.

BUTTE-BALLAKLAVA (Butte)—There is every reason to believe that mining operations will be resumed within a short time now that litigation with Anaconda company has been settled. All the time mine was closed down a crew has been maintained keeping shaft clear of water so that work can be started up without any delay. When injunction was secured Butte-Ballaklava company was shipping some high-grade ore, and it was over ownership of ground from which this ore was being extracted that dispute arose. Company was making a good profit and paid one dividend of 50c. per share. It is surrounded by some of best producing properties of Anaconda company.

BUTTE-DULUTH (Butte)—New leaching machines which were installed and put in operation last week near Columbia Gardens are doing highly satisfactory work. Machines have increased capacity of original plant to fully 240 tons per day. According to Capt. A. B. Wolvin's statement, average extraction, using ¼-in. perforated screen, has been 83½%. By using finer mesh, tests already made show possible recovery of 90%, which is accomplished in 20 min. Crushing plant for treating 1000 tons per day has been ordered and is expected to be available for operation by Feb. 1, 1914. Claims of Butte-Duluth company are being prospected by churn drills and exploration work has so far revealed existence of extensive orebodies, far richer in copper than had been anticipated. All Butte is watching with intense interest further developments.

ANACONDA (Butte)—The Nettie mine, one of the oldest in Butte district and 1½ miles from city proper, has passed into possession of Anaconda company, and in course of a few months will again be in operation. Workmen are engaged in erecting several buildings for mechanical shops and bunk houses and electrical equipment has been ordered. Mine has three shafts, one 300-ft. deep, another 400, and third is 500 ft. deep. Large amount of development work has been done, and there are several miles of workings. It was a silver producer in old days, and for many years furnished manganese flux for Colorado smelter. It was last operated in 1901. Having been closed down for 13 years shafts are undoubtedly in bad condition and will no doubt require extensive repairs. Shafts are full of water and several weeks will be required for unwatering. It is thought that by first of next year property will be ready for operation.

### Deer Lodge County

GLADSTONE (Anaconda)—Preparations to begin operations are being made, it is reported.

BALTIC COMBINATION (Georgetown)—Owing to heavy snows it has been decided to close property until next spring. Low-grade ore has been opened, but none of shipping grade.

BLUE EYED NELLIE (Anaconda)—Owners of this former producer of silver-lead ore are preparing to operate it again. Shaft has been retimbered, a gasoline hoist has been installed, and old workings cleaned out.

WASHOE WORKS (Anaconda)—Experiments by Anaconda company in leaching of copper tailings is meeting with continued favorable results, and everything points to successful application of this method as a finishing process after water concentration, indicating that large additional profits should result. Method consists of preliminary roast, leaching with sulphuric acid and precipitation, either electrolytically or by scrap iron, or hydrogen-sulphide. It is estimated that cost will not exceed 70c. per ton. Method, though evolved primarily for treatment of mill tailings, will also be applied to enormous accumulation of tailings from previous operations which is estimated to amount to from 20,000,000 to 30,000,000 tons. Recovery of 10 lb. of copper per ton on this material would result in total profit to the Anaconda company of from $14,000,000 to $20,000,000.

### Granite County

BOULDER (Philipsburg)—Arrangements have been made for erection of buildings and at once to begin driving tunnel to vein at depth of 600 ft..

PURITAN—Unwatering of this mine, which has been in progress about a month, is nearly completed, the 400-ft. level having been drained several weeks ago.

## NEVADA

### Churchill County

NEVADA WONDER (Wonder)—Dividend, 10c. per share, has been declared, payable Nov. 21.

GEORGE A. BETHUNE vs. JOHN T. HODSON—A new trial will be asked for. Plaintiff alleges that he is entitled to share in proceeds of mining deal involving sale of property now constituting Nevada Hills Co. at Fairview.

O'CONNELL (White Rock Cañon)—This group of 24 claims, it is stated, has been sold to San Francisco men for $125,000. Property has been partially developed and vein of good-grade copper ore carrying some gold and silver has been discovered.

### Clark County

ST. ANTHONY (Goodsprings)—Joseph Dederich, manager of this property, announces that he will erect an aërial tramway from the upper workings at once. Copper ore is being shipped to smelters at the rate of six cars per month, and a large tonnage is blocked in the mine.

HICKORY DICK—Vanadium-bearing ore has been discovered on the Westminster claim of this group, belonging to Harvey Hardy & Son, of Goodsprings. The mineral in which the vanadium occurs is cupro-descloizite, which also carries small percentages of lead, copper and zinc with a few ounces of silver, the whole occurring in calcite gangue. The vein, as opened, averages over 10 ft. in width and can be traced on the surface for a distance of 200 ft. Assays across the vein have indicated from 3 to 4% vanadium oxide. Preliminary tests have shown that the mineral can be readily concentrated by ordinary methods, and the owners are considering the installation of a small test-plant to treat the ore. On the Bill Nye group adjoining the Hickory Dick, the same mineral has been encountered, and the owners, Allen & Fredrickson, have men at work on development.

### Humboldt County

NATIONAL MINES CO (National)—The 30-ton milling plant has resumed operations.

CHARLESTON NATIONAL MINING CO (National)—Shaft is being sunk at rate of 6 ft. per day.

MONTEZUMA—Property near center of Humboldt County has been taken under bond and lease. Ore is lead-silver and occurs at contact of lime and quartzite.

### Lyon County

MONTANA-YERINGTON (Yerington)—Wingfield option on [illegible] property has expired and work is now being done by co[illegible].

[illegible] COPPER BELT R R (Mason)—Auto stage route ha[illegible] established between Hudson and Aurora, thus making [illegible] trip between Reno and Aurora.

M[illegible] VALLEY MINES CO (Thompson)—Ore receipts at sm[illegible] for week ended Oct 30, 1913, were as follows: From M[illegible] Valley mine, 2155 tons, from Nevada-Douglas, 1167 tons, from other mines, 724 tons, total 4047 or daily average of 57[illegible] tons. During same week five cars of matte were shipped.

NEVADA-DOUGLAS (Ludwig)—Second sublevel, 90 ft. below Douglas Hill tunnel has struck continuation of Maoy stope. Development on this oreshoot, which assays 5% copper, is now in progress. An oreshoot has been cut by Ogden crosscut from No. 2 tunnel, 150 ft. below Douglas Hill level, and is continuation of oreshoot above. A raise will be lifted in ore to connect, and crosscutting will be done to determine width of shoot. Development is being done on second and third levels, and 75 tons per day is being shipped from this section of mine. The 800-ft. level in Ludwig is now advanced 370 ft. from shaft.

### Mineral County

NATIONAL (Rawhide)—The 20-stamp mill has resumed operations.

LUCKY BOY (Hawthorne)—Large flow of water has been struck in tunnel and property is temporarily closed down.

ANDERSON (Luning)—Prospecting shaft has been sunk to the 120-ft. level and 5-hp. hoist installed. Fifty tons per day are now being shipped, ore being hauled to Luning by teams as auto-truck service has been discontinued.

### Nye County

HALIFAX TONOPAH (Tonopah)—At a meeting directors discussed advisability of installation of a crushing plant and ore washer similar to plant now in operation at West End mine, but did not decide finally to build it. Crosscutting is under way on 1100 level to locate oreshoot, which was discovered on 1000 level, which should be done in near future; and, provided vein is cut and it looks as well as it does on 1000-ft. level, it will not be long before such a plant will be built. Company is also undertaking to cut this vein on 1400-ft. level with another crosscut, and work is in right formation on this level. Expected that it will not be long before vein will be found on this 1400-ft. level.

### Washoe County

COPPER QUEEN (Reno)—Roads are being repaired preparatory to shipping.

TWIN METALS (Reno)—Hoist will be installed and stoping will commence at once.

STOKE-POGIS (Reno)—A 60-ft. shaft has been sunk in ore. Roads are being repaired preparatory to shipping.

RENO-PEAVINE (Reno)—Gasoline hoist has been installed at 250-ft. shaft, new engine room and bunk house will be built and shaft will be equipped with new guides. Development in mine will commence as soon as new construction is completed.

### White Pine County

ARGUS MINES CO. (Taylor)—Extensive churn-drill work in blocking out ore is now under way, and it is likely that most of next year will be devoted to this method of blocking out ore in Taylor deposit. Company owns 240 acres of virgin ground of old Taylor deposit, including patented claims of old Argus Mining Co., from which was produced some 30 years ago, over $1,000,000 gross. Vein is a blanket from 40 to 50 ft. in thickness and lies close to surface. Ore channels exist in this vein, similar to vertical veins, and there are two stratas of ore channels, each from 12 to 18 ft. thick. The ore in lower strata assays $16 per ton, mostly silver, 60c. to $1.20 gold. Ore is ideal for cyaniding. It is perhaps the first instance where a large deposit of silver-gold ore is being blocked out similar to porphyry coppers. Although the limestone is hard the work is proceeding nicely.

## NEW JERSEY

### Sussex County

ANDOVER IRON MINE—This old mine has been sold by the Trenton Iron Co. to the American Steel & Wire Co., and it is reported that operations will be resumed shortly. The mine was first opened about 1780 and has been operated at intervals since then. It has been shut down since 1880. For a long time it supplied ore to Andover Forge, and later to Andover Furnace, both now dismantled.

## NEW MEXICO

### Bernalillo County

GOLD RANGE MINING CO. (Albuquerque)—William Jenks, agent, filed incorporation papers Oct. 31. Capital stock is $10,000, and company starts business with $2000 subscribed.

### Grant County

MEERSCHAUM MINES on the Sapello River are closed down for an indefinite period.

PLACER MINING ON BEAR CREEK, 18 miles north of Silver City, is soon to begin. A. H. Jacobs, of Salt Lake City, is at the head of the project. Several weeks ago the dam that had been built across Bear Creek was washed out, but work upon reconstruction was commenced at once.

A PARTY OF ZINC MEN was in Silver City a short time ago inspecting property of Empire Zinc Co. at Hanover and looking over Utter zinc property at Pinos Altos, but nothing definite was given out regarding transaction with Utter for Cleveland group. In party were: J. A. Van Mater, of New York, head of mining department of New Jersey Zinc Co.; Arthur Thacher, of St. Louis; B. A. Hoskins, of Mineral Point, Wisconsin, zinc works, J. H. Troutman, Denver, manager of Empire Zinc Co.; J. E. Dwelle, mining engineer, and C. T. Brown, New Mexico representative of Empire company.

HARDSCRABBLE (Pinos Altos)—J. T. Janes has secured lease and will begin extensive work. Property has been profitable in the past.

BELL & WRIGHT (Pinos Altos)—Lessees have a new hoisting plant on their workings, and will put it into operation in a short time. They are now shipping two cars of high-grade ore to El Paso weekly.

### Socorro County

PACIFIC MINES CO. (Mogollon)—Electrical equipment purchased several months ago is now being installed.

ERNESTINE (Mogollon)—Auxiliary water supply has been established by sinking well in cañon about ½ mile from mill and installing electric pump.

## OREGON

### Baker County

PLACER MINES ARE CLOSED FOR YEAR with exception of dredge near Sumpter, which works daily, in all kinds of weather, winter and summer. Owing to an over-abundance of water for mining purposes, last season, eastern Oregon placers have made a good showing, some of them operating until recently.

### Jackson County

DISCOVERY IN SISKIYOU RANGE, of gold ore, recently made by county engineer, has aroused much interest and many claims are being located and work is being done in district.

## SOUTH DAKOTA

### Custer County

HARTWELL—Boiler, air compressor, drills, etc., have been delivered and are being installed and with hoisting engine, that will soon be installed, will provide for enlarged development work.

### Lawrence County

WASP NO. 2 (Lead)—Operations have been suspended temporarily; it is given out that failure of water supply is cause.

HEIDELBERG—This property, which is being developed by Deadwood Business club, will, according to management, soon be in producing list. From present developments it is believed that steady production of $20 ore can be maintained.

REPUBLIC (Maitland)—Operations under management of W. T. Boley have resulted in disclosure of ore that will pay to ship, as property is but 1½ miles from railway, over downhill road. Some of the ore has been forwarded to Golden Reward mill, at Deadwood; smelting grades will go elsewhere.

## TENNESSEE

### Polk County

TENNESSEE COPPER CO. (Copper Hill)—Company's production of sulphuric acid is more than 600 tons per day, and during November and December it is expected that output will reach 20,000 tons per month. At present output of copper from company's own ores is larger than ever before and return for last quarter of year will be at least 4,500,000 lb., recently stated an official of company.

## UTAH

### Juab County

TINTIC SHIPMENTS, for week ended Oct. 31, 144 cars.

GRAND CENTRAL (Robinson)—Retimbering of upper part of shaft has been completed.

EAGLE & BLUE BELL (Eureka)—Shaft sinking from 1350 to 1550 level began about Nov. 1. Shipments are not interfered with.

GEMINI (Eureka)—With payment on Nov. 15 of the latest dividend, this company will have distributed in all $440 per share on 5000 shares outstanding.

GOLD CHAIN (Mammoth)—Since making arrangements to develop western end of property through deep workings of Lower Mammoth, company has been employing one shift only.

SOUTH IRON BLOSSOM (Silver City)—It is proposed in near future to do some development in main shaft. First object of work will be to cover assessment for this year, but operations will be kept up as long as there are funds.

COLORADO (Silver City)—Some profit was made early in year on operations, but in recent months company is reported to have been making expenses only. There is a good balance in treasury, and a dividend is expected before holidays.

### Piute County

GOLDEN TREASURE (Kimberly)—Active development is being done at this property, in Gold Mountain mining district. Tunnel has been driven for 500 ft., and work on a new tunnel is being done 250 ft. below other. This tunnel is in 700 ft., and has cut three veins. Principal vein for which development is directed is expected to be reached with an additional 600 ft. Ore in veins so far cut carries chiefly gold, with some silver and little copper. It is planned to drive tunnel through Shale Mountain from Deer Creek to Fish Creek side. Property consists of 23 claims, and is directly south of Annie Laurie mine.

### Salt Lake County

BINGHAM MINES (Bingham)—Company has reduced its first mortgage indebtedness by $200,000, leaving balance of $250,000, due Apr. 1, 1914. Income in 1912 amounted to $110,000, dividends on Eagle & Blue Bell stock, and $25,000 from sale of smelter property. Company has outstanding in addition to balance of first mortgage, $578,000 of convertible second-mortgage bonds. Latter are held by some of the principal owners, and it is expected that they will be exchanged for stock. Commercial and Dalton and Lark properties are producing about 100 tons of ore daily, consisting of copper ore from former, and of lead ore from latter. Chief earnings come from the Eagle & Blue Bell in Tintic, 78% of stock of which is owned by Bingham Mines Co.

### Summit County

CALIFORNIA-COMSTOCK (Thayne's Cañon)—Company is stated to have secured sufficient funds to carry on development. There is possibility of consolidating some adjoining properties.

SNAKE CREEK TUNNEL—It is thought that it will take six weeks to complete electrification of tunnel. Driving, suspended for the time being, will be resumed as soon as new system is in working order.

### Tooele County

CONSOLIDATED MERCUR (Mercur)—Last car of machinery has been hauled away from Mercur, and work of tearing up railroad is in progress. Camp, which has produced $18,000,000 in gold, is now practically deserted.

## WASHINGTON

### Lewis County

IF OIL IS STRUCK AT CENTRALIA which, from all indications it will be, Centralia will be the center of one of the most extensive oil fields on the Coast. At present three separate companies are in field searching for fuel. Washington Oil Company is latest to enter field. Two thousand acres are being leased by this company between Tenino and Skookumuck River in southern Thurston and northern Lewis Counties, and after considerable investigation and prospecting, drilling for oil and gas will now begin. Crescent Oil Co., of Seattle is erecting a derrick on Dixon farm near Little Rock, and drilling will begin as soon as outfit arrives. Dixon farm is part of 10,000 acres just leased by company. In addition to these two, Tenino Sandstone Co. has reported escaping natural gas in its quarries, and is taking steps to determine whether or not it exists in quantity. Crescent Oil Co., of Seattle, is erecting a derrick on Dixon farm near Little ment of what it was doing until it had secured 10,000 acres of prospective oil lands by lease. This company has sought advice of Lewis and Thurston County engineers as to right-of-ways for pipe lines for natural gas. Existence of oil and gas in this section has been predicted for some time past, but only actual drilling ever done to test it was made near Tenino, in 1903 by a man named Christopher. At that time it was reported that oil existed in large quantities. Old Christopher well will be one of first worked by Crescent company.

## WISCONSIN

### Platteville District

BURRICHTER (Highland)—Preparations are being made to resume operations on this land.

GROTKIN (Benton)—The Frontier Mining Co. is building a 100-ton mill on this old Hird property.

ST. ANTHONY (Highland)—Muldowney & Gunn are opening ground on this property and have struck some rich carbonate.

KENNEDY & EGAN (Highland)—Good run of zinc ore has been opened and shipments are being made from Muldoon land.

## CANADA

### British Columbia

IN QUATSINO DISTRICT on Vancouver Island, M. W. Bacon, of Butte, Mont., and New York associates have taken over three groups of copper claims. Bacon has for many years been connected with Heinze interests in Butte and is at present general manager for Stewart Mining Co., in Cœur d'Alene district, Idaho. Purchase price of claims is reported to be $500,000. It is proposed to start operations as soon as equipment, which is now in transit, can be installed.

RAMBLER-CARIBOO (Three Forks)—New cable is being put in aërial tramway

HIGHLAND (Ainsworth)—Production has been resumed after long period during which no ore was shipped. Mine is being operated by Consolidated Mining & Smelting Co. which has developed new shoots of silver-lead ore.

### Ontario

GOLDEN ROSE (Cobalt)—A small mill is in operation. It is only gold prospect being worked in Temagami district.

DANE COPPER (Swastika)—Part of plant was destroyed by fire, but it is stated that it will be rebuilt. Developments to date have not been promising.

NIPISSING (Cobalt)—Recent decline in stock from $8.50 to $7.50 has given rise to rumors that bonus paid with regular quarterly dividend is to be dropped. Directors, however, state that property is in excellent condition and that question of dropping bonus has not been considered.

CHAMBERS-FERLAND (Cobalt)—Asking for declaration that all alleged meetings of directors of company since June 23 are illegal and void, Henry Cecil, on behalf of himself and shareholders, has issued a writ against directors and asks for an injunction restraining defendants from proceeding with proposed sale of mine to Northern Concentrators, Ltd.

## COLUMBIA

ANGLO-COLOMBIAN DEVELOPMENT CO. (London)—Estimates for 7-cu.ft. dredge are being obtained. Company recently made payments of $200,000 on gold-platinum placer property in San Juan River district.

## NICARAGUA

CANADIAN AGENCY LTD.—It is rumored in New Orleans that this company, which lately bought Bonanza mine in Pis Pis district, has now acquired Lone Star, Constancia and Siempre Viva. If true it will mean that the three big mines of the district and one of the smaller will be under one management, which those familiar with the properties have long considered would eventually come about. Something interesting in way of low costs may be expected.

## RHODESIA

GOLD PRODUCTION OF RHODESIA in September was 59,535 oz.; making a total for the nine months ended Sept. 30 of 513,835 oz., an increase of 32,076 oz. over last year. Other production in September included 11,541 oz. silver, 23 tons lead, 98 tons asbestos, 1516 tons chrome ore and 18,818 tons coal.

## TRANSVAAL

GOLD PRODUCTION in October is reported by cable at 718,431 oz., which is 12,243 oz. more than in August, but 50,250 oz. less than in October, 1912. The decrease was due to the labor troubles this year. For the 10 months ended Oct. 31 the total was 7,582,561 oz. in 1912, and 7,448,523 oz.—or $153,960,970—in 1913; a decrease of 134,038 oz., or 1.8%, this year.

## WEST AFRICA

GOLD PRODUCTION of the Gold Coast and Ashanti in September was 32,142 oz. For the nine months ended Sept. 30 it was 260,404 oz. in 1912, and 298,729 oz. in 1913; an increase of 38,325 oz. this year.

# THE MARKET REPORT

## METAL MARKETS

METAL MARKETS

The metal markets have not been active. Copper has been slow and prices have been weaker. In fact, nearly all the metals reported have been easier.

### Copper, Tin, Lead and Zinc

**Copper**—Immediately following the date of our last report the copper market became very weak, the efforts to sell on the part of agencies previously indifferent, to which we referred in our last report, having become more generally known. Since then there has been active competition from all quarters except one, although there has been a lot of moonshine for popular consumption about maintaining prices, etc.; in fact nearly all of the agencies have been desirous of placing copper and have been cutting each other's prices from day to day. By Nov. 12 all disguise was discarded and no secret was any longer made about the real situation, which in fact dated back at least 10 days. On Nov. 7, 16c., delivered, usual terms, was offered about all around, but failed to command business, which was taken by cheaper sellers. On Nov. 8, there were sellers at 15¾c., delivered anywhere, and sales were made. On Nov. 10, 15¾c., delivered, was commonly offered and there were shadings of that price. On Nov. 11 copper was offered at 15¾@15⅝c. in the early part of the day and at 15⅝@15½c. in the latter part. Some fair lots were sold, including deliveries so far inland as Detroit. On Nov. 12, copper was freely offered at 15½@15⅜c., delivered, and sales were made. Right through the week the market was unsettled and prices changed not only from day to day but also from sale to sale in the same day. Up to Nov. 11 no large volume of business was done, but on Nov. 11 and 12 buyers became more interested and took some fairish quantities. The larger part of the sales of the week were for delivery in Europe. However, the place of delivery cut no great figure in the minds of sellers.

We have not heard of any sales at all of Lake copper. The leading Lake company, which is the only one having any supply of consequence to offer, was understood to be naming no price, but will probably name a new price shortly inasmuch as some of its regular customers will shortly be needing further supplies. What the new price will be does not yet appear to have been settled. We quote Lake copper nominally at 16@17c., which is named in the absence of any business and is a mere guess rather than anything else.

Casting copper has again been offered liberally at concessions without attracting buyers. The accumulation of this kind of metal has lately increased rather materially.

Electrolytic copper in cakes, wirebars or ingots at the close is quoted at 15.25@15.30c. We quote casting copper nominally at 15.20@15.30c. as an average for the week.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¼@17¾c., carload lots at mill.

Exports of copper from New York for the week were 10,547 long tons. Our special correspondent gives the exports from Baltimore for the week at 2865 tons.

The London market for standard copper was weak. On Monday, Nov. 10, it had a perpendicular drop of £2, spot going to £67 2s. 6d. and three months to £66 15s. There was a reaction of £1 on Tuesday, spot going to £68 7s 6d and three months to £68. On Wednesday, Nov. 12, it closed at £68 for spot and £67 10s. for three months. There has been considerable bear selling.

**Tin**—The London market was adversely affected by the serious decline in standard copper. While quotations in London gave way easily, considerable transactions took place in the Far East, where purchases, presumably for American interests, were made direct from the producers, at prices which were a good deal higher than the London parity. There was quite an active business in this market, especially in the retail trade. The market closes firm at £179 15s for spot and £181 10s. for three months, and about 39½c. for November [illegible] here.

**Lead**—Some carload business has been done right along through the week at 4.35c., New York, and 4.20c., St. Louis, but offers to sell moderate tonnages at those prices have failed to result in business, while a large tonnage of the metal is reported to have been offered still lower. We quote New York at 4.30@4.35c., and St. Louis 4.15@4.20c.

The London market is lower, Spanish lead being quoted £19 6s. 3d., English 2s. 6d. higher.

**Spelter**—The galvanizing and brass business being quiet, the demand for spelter is small, even though buyers are believed to be poorly covered, and the market has been weaker. Some producers have steadily been offering the market down and capturing such business as consumers have offered. At the close St. Louis is quoted at 5.05@5.10c.; New York, 5.30@5.35c.

The London market is also somewhat lower, good ordinaries being quoted £20 12s. 6d., specials £1 higher.

DAILY PRICES OF METALS

NEW YORK

| Nov. | Sterling Exchange | Silver | Copper<br>Lake, Cts. per lb. | Copper<br>Electrolytic, Cts. per lb. | Tin<br>Cts. per lb. | Lead<br>New York, Cts. per lb. | Lead<br>St. Louis, Cts. per lb. | Zinc<br>New York, Cts. per lb. | Zinc<br>St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 4 8490 | 59¼ | *16<br>@17 | 15.75<br>@16 00 | 40 | 4.30<br>@4.35 | 4.15<br>@4 20 | 5.25<br>@5.30 | 5 10<br>@5 15 |
| 7 | 4 8485 | 59¾ | *16<br>@17 | 15 65<br>@15 75 | 40 | 4.30<br>@4.35 | 4 15<br>@4 20 | 5.20<br>@5 30 | 5 05<br>@5 15 |
| 8 | 4.8480 | 59½ | *16<br>@17 | 15.55<br>@15 60 | 40 | 4 30<br>@4.35 | 4 15<br>@4 20 | 5 20<br>@5 25 | 5 05<br>@5 10 |
| 10 | 4 8485 | 59½ | *16<br>@17 | 15 50<br>@15 60 | 39¾ | 4.30<br>@4 35 | 4 15<br>@4 20 | 5.20<br>@5.25 | 5.05<br>@5 10 |
| 11 | 4 8490 | 59⅞ | *16<br>@17 | 15 35<br>@15 30 | 39¼ | 4.30<br>@4.35 | 4 15<br>@4 20 | 5.20<br>@5.25 | 5 05<br>@5 10 |
| 12 | 4.8510 | 59¾ | *16<br>@17 | 15 25<br>@15 30 | 39½ | 4.30<br>@4.35 | 4 15<br>@4 20 | 5 20<br>@5 25 | 5 05<br>@5 10 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0 05 to 0 10c below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Nov. | Silver | Copper<br>Spot<br>£ per Ton | Copper<br>Spot<br>Cts. per Lb. | Copper<br>3 Mos | Copper<br>Best Sel'td | Tin<br>Spot | Tin<br>3 Mos. | Lead<br>£ per Ton | Lead<br>Cts per Lb | Zinc<br>£ per Ton | Zinc<br>Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 27 11/16 | 69¾ | 15 15 | 69¼ | 76 | 182¼ | 183½ | 20¼ | 4 40 | 20⅜ | 4 48 |
| 7 | 27⅝ | 69⅜ | 15 13 | 68⅞ | 75½ | 182 | 183¼ | 20 | 4 35 | 20⅜ | 4 48 |
| 8 | 27 9/16 | | | | | | | | | | |
| 10 | 27 9/16 | 67⅛ | 14 58 | 66¾ | 73 | 179½ | 181 | 19¾ | 4 29 | 20⅜ | 4 48 |
| 11 | 27 11/16 | 68⅜ | 14 86 | 68 | 74½ | 179 | 180½ | 19⅝ | 4 21 | 20¼ | 4 45 |
| 12 | 27⅝ | 68 | 14 77 | 67⅛ | 74 | 179¾ | 181½ | 19 9/16 | 4 17 | 20⅜ | 4 48 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0 925 fine Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent discount For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2 17¼c.; £15 = 3 26c. = £25 = 5 44c.; £70 = 15 22c Variations, £1 = 0 21¾c

## Other Metals

**Aluminum**—Current business is dull, with mainly small transactions and little demand. Prices are about the same, 19¼@19¾c. for No. 1 ingots, New York. The foreign market is reported easier.

**Antimony**—The market is little changed with a good jobbing trade. Cookson's is in rather short supply, and is a shade firmer at 7.60@7.75c. per lb. Hallet's is quoted at 7⅛@7⅜c., and 6⅜@6½c. per lb. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business has been rather quiet, but the market is steady, and there is no material change in prices. The New York quotation is $38.50 per flask of 75 lb. with 56@57c. per lb. for retail lots. San Francisco price is $38.50 per flask, with special terms for export business. The London price is £7 5s. per flask, with £7 quoted from second hands.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London was unchanged, at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India. There is talk of more gold being taken for New York, but so far only the shipment of $2,000,000, reported two weeks ago, has been made.

Sales of gold bars from the New York Assay Office in October were $3,477,880. For the 10 months ended Oct. 31 the total sales were $25,574,684 in 1912, and $28,666,374 in 1913; an increase of $3,091,690 this year.

Gold in the United States Nov. 1 is estimated by the Treasury Department as follows: Held in treasury against gold certificates outstanding, $1,098,995,169; in Treasury current balances, $192,428,146; in banks and circulation, $614,478,201; total, $1,905,901,516, an increase of $10,463,271 during October.

**Iridium**—The market is a little easier and sales are reported at $80@81 per oz., New York. The foreign market is easier.

**Platinum**—The market is more active but inclined to be easy. Quotations are again rather lower, $43@44 per oz. for refined platinum and $49@52 per oz. for hard metal.

Our Russian correspondent writes under date of Oct. 23 that dealers look forward to higher prices, as the season of active work in the Urals is nearly over, and production will be restricted by winter. So far, however, there has been no actual advance. Prices at Ekaterinberg are 9.50 rubles per zolotnik—$35.72 per oz.—for crude metal, 83% platinum; in St. Petersburg, 36,400@36,500 rubles per pood—equal to $35.72 per oz.—for the same grade.

**Silver**—The market has ruled quiet and steady between $27\frac{9}{16}$d. and $27\frac{11}{16}$d. in London, and is without special feature.

Shipments of silver from London to the East, Jan 1 to Oct. 30, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £8,950,500 | £8,561,500 | D. £389,000 |
| China | 1,081,000 | 702,000 | D. 37,9000 |
| Total | 3£10,01,500 | £9,263,500 | D. £768,000 |

Imports of silver at New York for the week ended Nov. 8 were $344,102, chiefly from Mexico and Central America. Exports were $796,451, principally to London and Paris.

Coined silver in the United States Nov. 1, is estimated by the Treasury Department: Standard dollars, $565,683,263; subsidiary coins, $176,239,292; total, $741,922,555. Of the dollars, $491,637,000 are held against silver certificates outstanding.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Nov. 8

The base price paid this week for 60% zinc ore was unchanged at $42@43 per ton. The base price paid for 80% lead ore was $53 per ton.

SHIPMENTS WEEK ENDED NOV. 8

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,865,030 | ...... | 1,278,900 |
| Year to date | 126,616,710 | 5,855,550 | 50,058,900 |

Total shipped during week to separating plants, 2,151,970 lb. zinc.

### MONTANA ZINC ORE

The production of blende concentrates in the Butte district, Montana, in October was about 12,000 tons.

### JOPLIN, MO.—Nov. 8

The high price of zinc blende is $46, the base per ton of 60% zinc ranging from $41.50 to $43.50 for choice grades. Heavy buying constitutes the feature, despite the declining spelter market and the shipment is one of the largest of the year. Calamine remains on a base of $21@23 per ton of 40% zinc with a shipment of upward of 2000 tons of stock the past three weeks. The average price of all grades of zinc is $40.18. Lead is in strong demand and buyers are watchful of every small production. The high price is $56. the base $52 per ton of 80% lead, and the average price of all grades is $50.26 per ton.

SHIPMENTS ENDED NOV. 8

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week .. | 13,074,670 | 1,483,020 | 2,518,590 | $355,725 |
| Totals 45 weeks .. | 493,793,560 | 37,424,380 | 82,015,920 | $13,451,234 |

Blende value, the week; $272,940; 45 weeks, $11,416,286.

Calamine value, the week, $19,505; 45 weeks, $481,499

Lead value, the week, $63,280; 45 weeks, $2,180,519.

## IRON TRADE REVIEW

### NEW YORK—Nov. 12

The iron and steel markets show no material change. New orders come in slowly and there is an evident hesitation to buy, which promises to keep matters quiet at least until the new year opens. The railroads are making inquiries for equipment, but not many purchases as yet.

Pig iron remains quiet, though a little more inquiry has developed for foundry iron. No large contracts are reported, but consumers are evidently short of supplies.

It is understood that some German and Belgian interests are making a push for business on the Pacific Coast. Quotations have been made at Los Angeles and San Francisco for German steel at 1.81c. for plates, 1.76c. for shapes and girders and 1.61c. for bars. As the freight rates from Pittsburgh are 66c. rail and water and 50c. all rail, these quotations are much below Pittsburgh parity. The Steel Corporation's current rate for bars is 1.75c. San Francisco.

Frank W. Blair, Detroit, Mich., has been appointed receiver of the Lake Superior Iron & Chemical Co., by the Federal Court at Grand Rapids, Mich. This action is understood to be in pursuance of a plan of reorganization. The company is a consolidation which owns several charcoal furnaces, with by-product charcoal plants in Michigan. The stock is largely owned in Canada and England.

**The United States Steel Corporation** reports a total of unfinished orders on its books Nov. 1 of 4,513,767 tons of material. This is a decrease of 490,018 tons from Oct. 1, and is the smallest total reported since Nov. 1, 1911.

**Pig-Iron Production**—The statements of the blast furnaces, as collected and published by the "Iron Age," show that on Nov. 1 there were 244 coke and anthracite stacks in blast, having a total daily capacity of 78,550 tons; a decrease of 4825 tons, as compared with Oct. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in the United States in October was 2,571,200 tons; for the 10 months it was 26,791,900 tons. Of this total 18,817,800 tons, or 70.2%, were made by the furnaces owned or operated by steel companies.

### PITTSBURGH—Nov. 11

This district has been visited by a severe snowstorm, quite unexpectedly and unusually early in the season. No one was prepared for it, so there has been a good deal of trouble, much more than if it had come later in the season. Railroad communication was cut off for two days and mill operations badly delayed.

Under these circumstances there was little business and it cannot be said that there have been any changes of importance. New orders have been small and prices weak, though little change is noted in the last 10 days, except that some contracts for sheets have been placed at lower figures.

**Pig Iron**—The market is quiet. The production is being curtailed, especially by the merchant furnaces. Quotations are weaker, if anything. Bessemer pig is $15.25 per ton; basic, $13.50; No. 2 foundry, $13.50, all f.o.b. Valley furnace, 90c. higher delivered Pittsburgh.

**Ferromanganese**—Prices are unchanged at $50, Baltimore, for English and $49.50 for German.

**Steel**—The billet and sheet-bar market is still irregular. We continue to quote prices at $20.50 for billets and $21.50 for sheet bars, Pittsburgh or Youngstown. Rods are uncertain at $25@26, Pittsburgh.

## IRON ORE

Shipments of iron ore from the Lake Superior region in October were 6,521,884 tons. For the season to Nov. 1 the shipments were as follows, in long tons:

| Port | 1912 | 1913 | Changes |
|---|---|---|---|
| Escanaba ... | 4,663,879 | 4,914,342 | I. 250,463 |
| Marquette .... | 3,082,331 | 2,942,897 | D. 139,434 |
| Ashland ..... | 4,382,877 | 4,056,754 | D. 326,123 |
| Superior ... | 13,100,043 | 12,846,823 | D. 253,220 |
| Duluth .... | 9,415,511 | 11,520,153 | I. 2,104,642 |
| Two Harbors ... | 8,703,960 | 9,506,399 | I. 802,439 |
| Totals .. ..... | 43,348,601 | 45,787,368 | I. 2,438,767 |

Shipments now are slow, the demand for ore not being urgent, and it is estimated that the season total will be between 48,000,000 and 49,000,000 tons.

A severe storm accompanied by unusually cold weather swept over the Lakes this week, causing a number of wrecks and interfering materially with the movement of iron ore.

**Imports of Iron Ore in Germany** nine months ended Sept. 30, were 10,629,812 metric tons; exports, 1,955,882 tons. Imports of manganese ore were 510,254 tons; exports, 6362 tons.

## COKE

Production of coke in the Connellsville region continues quite steady, but shipments are falling off. Prices are still irregular but the tendency is downward.

**Anthracite Shipments in October** were 6,338,194 long tons, being 327,127 tons less than in October, 1912. For the 10 months ended Oct. 31 the total shipments were 51,500,540 tons in 1912, and 57,620,079 in 1913; an increase of 6,119,539 tons, or 11.9%, this year.

**Coal Passing through Sault Ste. Marie** Canals, season to Oct. 1, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite.. | 1,321,452 | 2,110,934 | I 789,482 |
| Bituminous | 9,544,129 | 12,610,557 | I 3,066,428 |
| Total.......................... | 10,865,581 | 14,721,491 | I. 3,855,910 |

The gain in anthracite was 59.8%, and in bituminous, 24.3%; the total increase being 35.5% this year.

## SAULT STE. MARIE CANALS

Freight passing through the Sault Ste. Marie Canals in September was 10,916,365 tons, being 579,077 tons less than in August, but 448,583 tons more than in September, 1912. For the season to Oct. 1 the total freight was, in short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| East-bound..... | 39,613,431 | 44,005,765 | I. 4,392,334 |
| West-bound.. | 12,339,277 | 16,067,529 | I. 3,728,252 |
| Total.... | 51,952,708 | 60,073,294 | I. 8,120,586 |

The total number of vessel passages this year was 17,472, showing an average cargo of 3438 tons. The mineral freights included in the totals were, in short tons, except salt, which is in barrels:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal . | 10,865,581 | 14,721,491 | I. 3,855,910 |
| Iron ore . | 35,096,829 | 38,018,387 | I 2,921,558 |
| Pig and manufactured iron | 459,756 | 281,160 | D. 178,596 |
| Copper . | 73,784 | 72,466 | D. 1,318 |
| Building stone | 2,282 | 6,181 | I. 3,899 |
| Salt, bbl . | 486,719 | 504,659 | I. 17,940 |

Iron ore was 63.3% of the total freight, and coal 24.5% this year.

# CHEMICALS

## NEW YORK—Nov. 12

The general market is rather quiet, with only moderate sales reported.

**Imports and Exports of Chemicals** and raw materials in the United States, eight months ended Aug. 31, were as follows.

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Arsenic, lb. | 3,503,731 | 5,301,887 | | 66,000 |
| Copper sulphate, lb. | | | 5,537,588 | 3,603,593 |
| [illegible], lb. | 18,515,139 | 42,861,542 | 400 | 13,200 |
| [illegible] salts, lb. | 420,654,157 | 369,131,757 | 1,976,350 | 6,701,645 |
| [illegible], lb. | 8,260,089 | 7,913,713 | 328,362 | 423,878 |
| [illegible], lb. | | | 54,191,192 | 52,150,607 |
| N[illegible], tons | 322,305 | 163,689 | 6,069 | 3,727 |
| S[illegible] ammonia, tons | 25,907 | 32,242 | 160 | |
| P[illegible] | | | 836,803 | 933,992 |
| S[illegible] | 16,854 | 4,841 | 28,147 | 32,684 |
| P[illegible] | 560,366 | 614,288 | | |
| M[illegible] | 69,657 | 112,010 | 861 | 723 |
| C[illegible] | 36,646 | 45,779 | | |

Exports [illegible] reexports of foreign material. Some phosphate is [illegible]ted, but it is not given separately in the returns.

**Nitrate of Soda**—The market is still dull and unsettled. Prices are unchanged at 2.25c. per lb. for October, 2.30c. for November and December and 2.35c. for January-May delivery.

**Arsenic**—The market continues dull, with good supplies, but little present demand. Prices are nominally unchanged, about $3 per 100 lb. being asked.

**Copper Sulphate**—The market remains steady, though not very active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

## OTHER ORES

Recent British quotations for manganese ore reported as follows: Indian or Brazilian, 50%, 21½@22c. per unit; 48%, 20½@21c.; 45%, 20@20½c. Caucasian is quoted at 19@19¼ for 50%, 18½@19c. per unit.

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## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | June | July | August | September | October |
|---|---|---|---|---|---|
| Alaska shipments | 2,203,191 | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 |
| Anaconda ... | 21,500,000 | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 |
| Arizona, Ltd... | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 |
| Copper Queen ... | 7,477,936 | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 |
| Calumet & Ariz... | 4,000,000 | 3,800,000 | 4,500,000 | 4,000,000 | |
| Chino ..... .... | 3,682,706 | 4,831,185 | 6,050,867 | 4,308,296 | ... |
| Detroit .. ... | 1,750,601 | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 |
| East Butte. .... | 1,055,646 | 1,060,257 | 1,162,007 | 1,233,018 | . |
| Giroux. ... | 598,240 | 584,546 | 524,953 | 198,178 | . |
| Mason Valley.... | 1,097,014 | 908,892 | 867,060 | 918,000 | 1,052,000 |
| Miami.. ...... | 2,612,000 | . | .. | .. | |
| Mammoth....... | 1,750,000 | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 |
| Nevada Con..... | 6,344,863 | 5,403,919 | 5,989,973 | 4,441,671 | ....... |
| Ohio. ..... | 537,400 | 601,700 | 689,000 | 685,900 | .. |
| Old Dominion.... | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 |
| Ray..... ..... | 4,392,612 | 4,097,000 | 4,269,519 | 4,336,434 | .. |
| Shannon......... | 924,000 | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 |
| South Utah...... | 185,000 | 140,000 | 223,498 | 241,843 | ... |
| Tennessee.. . | 1,379,220 | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 |
| United Verde*.. | 2,900,000 | 3,000,000 | 3,000,000 | 3,000,000 | . |
| Utah Copper Co.. | 11,637,949 | 9,849,043 | 10,302,251 | 11,463,905 | |
| Lake Superior* .. | 16,500,000 | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 |
| Non-rep. mines* | 6,000,000 | 6,200,000 | 6,200,000 | 6,000,000 | . |
| Total prod..... | 104,051,138 | 101,758,167 | 96,769,607 | 92,037,034 | . |
| Imp., bars, etc | 18,255,267 | 29,029,990 | 22,474,471 | ... | .... ... |
| Total blister. | 122,306,405 | 130,788,157 | 119,244,077 | ... | .... |
| Imp. ore & matte. | 7,497,002 | 8,527,046 | 9,171,351 | . . | .... |
| Total Amer. | 129,803,407 | 139,315,203 | 128,415,428 | | |
| Miami†.. | | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 |
| Shattuck-Arizona | 1,059,625 | 1,019,388 | 1,001,634 | 1,163,237 | . |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop.. | 634,238 | 618,379 | 647,905 | 621,120 | |
| Granby. . | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 |
| Mexican Cos.: | | | | | |
| Boleo† ......... | 1,984,640 | 2,240,720 | 2,264,640 | 2,369,920 | . . |
| Cananea .. . | 2,908,000 | 3,328,000 | 3,186,060 | 3,148,000 | |
| Moctezuma... | 3,438,793 | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 |
| Other Foreign: | | | | | |
| Braden, Chile.. | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 |
| Cape Cop., S. Af. | 414,400 | | . | ... | . |
| Kyshtim, Russia. | 1,000,000 | 2,500,000 | 1,585,000 | . ... | . . |
| Spassky, Russia | 835,520 | 660,800 | 1,048,320 | 1,025,920 | |
| Exports from | | | | | |
| Chile . . | 5,824,000 | 9,856,000 | 8,736,000 | 5,600,000 | |
| Australia | 7,616,000 | 10,304,000 | 7,720,000 | 6,944,000 | . |
| Arrivals-Europe‡ | 5,277,440 | 11,728,640 | 14,624,960 | 9,661,120 | |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

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## STATISTICS OF COPPER

| | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| Month | U. S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| X, '12 | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI | 134,695,400 | 69,369,795 | 55,006,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | | | . |
| I, 1913 | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,591,840 | 183,904,422 |
| II . | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III . | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV . | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V ... | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI . . | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,994,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X | 139,070,481 | 68,173,720 | 68,123,473 | 29,793,094 | 53,625,600 | 83,418,694 |
| XI | | | | 32,566,382 | 48,787,200 | 81,353,582 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Mining Companies—United States

| Name of Company and Situation | | Shares | | Dividends | | | |
|---|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | | Amt. |
| Acacia, g | Colo. | 1,438,989 | $ 1 | $ 129,618 | Jan | '11 | $0.01 |
| Adams, s.l.c | Colo. | 80,000 | 10 | 778,000 | Dec. | '09 | 0.04 |
| Ahmeek, c | Mich. | 50,000 | 25 | 2,100,000 | Oct. | '13 | 3.00 |
| Alaska Mexican, g. | Alas. | 180,000 | 5 | 3,241,381 | Aug. | '13 | 0.30 |
| Alaska Treadwell, g. | Alas. | 200,000 | 25 | 13,385,000 | Aug. | '13 | 1.00 |
| Alaska United, g. | Alas. | 180,200 | 5 | 1,397,150 | Aug. | '13 | 0.60 |
| Am. Zinc, Lead & Sm. | U. S. | 165,360 | 25 | 985,820 | Apr. | '13 | 0.50 |
| Anaconda, c | Mont. | 4,332,500 | 25 | 81,418,125 | Oct. | '13 | 0.75 |
| Argonaut, g. | Calif. | 200,000 | 5 | 1,200,000 | June | '10 | 0.05 |
| Arizona Copper, pf. | Ariz. | 1,426,120 | 1 20 | 1,836,780 | Oct. | '13 | ..... |
| Arizona Copper, com. | Ariz. | 1,519,896 | 1.20 | 15,983,475 | July | '13 | 0.48 |
| Bagdad-Chase, g., pf. | Calif. | 84,819 | 5 | 202,394 | Jan. | '09 | 0.10 |
| Baltic, c | Mich. | 100,000 | 25 | 7,750,000 | Dec. | '12 | 7.00 |
| Bingham N. H., c. | Utah. | 228,690 | 5 | 317,088 | Sept. | '13 | 0.10 |
| Bonanza Dev., g. | Colo. | 300,000 | 1 | 1,425,000 | Oct. | '11 | 0.20 |
| Bunker Hill Con., g. | Calif. | 200,000 | 1 | 781,000 | Oct. | '13 | 0.05 |
| Bunker Hill & Sul., l.s. | Ida. | 327,000 | 10 | 14,565,750 | Oct. | '13 | 0.20 |
| Butte-Alex Scott, c. | Mont. | 74,000 | 10 | 148,000 | Oct. | '13 | 0.50 |
| Butte & Ballaklava, c. | Mont. | 250,000 | 10 | 125,000 | Aug. | '10 | 0.50 |
| Caledonia, l.s.c | Ida. | 1,300,000 | 1 | 52,000 | June | '10 | 0.01 |
| Calumet & Arizona, c. | Ariz. | 596,353 | 10 | 15,170,882 | Sept. | '13 | 1.25 |
| Calumet & Hecla, c. | Mich. | 100,000 | 25 | 122,650,000 | Sept. | '13 | 10.00 |
| Camp Bird, g.s. | Colo. | 1,100,051 | 5 | 9,650,812 | Aug. | '13 | 0.24 |
| Centen'l-Eur., l.s.g.c. | Utah. | 100,000 | 5 | 3,750,000 | Apr. | '13 | 1.50 |
| Center Creek, l.z. | Mo | 100,000 | 10 | 425,000 | July | '13 | 0.05 |
| Champion, c | Mich. | 100,000 | 25 | 8,100,000 | Oct. | '13 | 1.00 |
| Chief Consolidated, s.g.l. | Utah. | 876,453 | 1 | 175,290 | Sept. | '13 | 0.10 |
| Cliff, g | Utah. | 300,000 | 1 | 120,000 | Jan. | '13 | 0.10 |
| Cliff, g | Alas. | 100,000 | 1 | 180,000 | Nov. | '12 | 0.05 |
| Colo. Gold Dredging. | Colo. | 100,000 | 10 | 325,000 | Oct. | '13 | 0.25 |
| Colorado, l.s.g. | Utah. | 1,000,000 | 0 20 | 2,570,000 | Dec. | '12 | 0.03 |
| Columbus Con., g.s. | Utah. | 285,540 | 5 | 226,832 | Oct. | '07 | 0.20 |
| Commercial Gold | Ore. | 1,750,000 | 1 | 43,750 | Dec. | '10 | 0.00½ |
| Con. Mercur, g | Utah. | 1,000,000 | 1 | 3,415,313 | July | '12 | 0.03 |
| Continental, z l. | Mo. | 22,000 | 25 | 297,000 | July | '13 | 0.50 |
| Copper Range Con., c. | Mich. | 393,445 | 100 | 13,985,021 | Oct. | '13 | 0.75 |
| Daly Judge, s.l. | Utah. | 300,000 | 1 | 620,000 | Oct. | '13 | 0.15 |
| Daly West, s.l. | Utah. | 180,000 | 20 | 6,606,000 | Jan. | '13 | 0.15 |
| Doctor Jackpot, g. | Colo. | 3,000,000 | 0.10 | 45,000 | Mar. | '11 | 0.00½ |
| Doe Run, l. | Mo. | 65,782 | 100 | 3,500,974 | Sept. | '13 | 1.00 |
| Elkton Con., g. | Colo. | 2,500,000 | 1 | 3,079,460 | Aug. | '13 | 0.02 |
| El Paso, g | Colo | 490,000 | 5 | 1,658,545 | Mar. | '13 | 0.12½ |
| Ernestine, g.s. | N.M. | 300,000 | 5 | 400,000 | Dec. | '12 | 0.00½ |
| Fed. M. & S., com | Idaho. | 60,000 | 100 | 2,708,750 | Jan. | '09 | 1.50 |
| Fed. M. & S., pf. | Idaho. | 120,000 | 100 | 9,207,851 | Sept. | '13 | 1.50 |
| Florence, g. | Nev. | 1,050,000 | 1 | 840,000 | Apr. | '11 | 0.10 |
| Frances-Mohawk, g. | Nev. | 912,000 | 1 | 546,000 | Jan. | '08 | 0.05 |
| Free Coinage, g. | Colo. | 10,000 | 100 | 180,000 | Dec. | '09 | 1.00 |
| Fremont Con., g. | Calif. | 200,000 | 2 50 | 210,000 | Oct. | '13 | 0.02 |
| Frontier, z | Wis. | 1,250 | 100 | 176,272 | Oct. | '13 | 2.00 |
| Gemini-Key'ne, l.g.s. | Utah. | 5,000 | 100 | 2,110,000 | May | '13 | 10.00 |
| Gold Chain, g. | Utah. | 1,000,000 | 1 | 130,000 | May | '13 | 0.03 |
| Gold Coin of Victor. | Colo. | 1,000,000 | 1 | 1,350,000 | Feb. | '09 | 0.02 |
| Gold Dollar Con | Colo. | 2,500,000 | 0 10 | 100,000 | Dec. | '12 | 0.00½ |
| Gold King Con., g. | Colo. | 5,750,370 | 1 | 1,407,319 | Dec. | '11 | 0.03 |
| Golden Cycle, g. | Colo. | 1,500,000 | 5 | 2,576,000 | Oct. | '13 | 0.02 |
| Golden Star, g. | Ariz. | 400,000 | 5 | 140,000 | Mar. | '10 | 0.05 |
| Goldfield Con , g. | Nev. | 3,558,367 | 10 | 26,330,470 | Oct. | '13 | 0.40 |
| Grand Central, g | Utah. | 500,000 | 1 | 1,545,750 | Sept. | '13 | 0.05 |
| Granite, g. | Colo. | 1,650,000 | 1 | 269,500 | Nov. | '12 | 0.01 |
| Hazel, g | Cal | 900,000 | 1 | 873,000 | Nov. | '12 | 0.01 |
| Hecla, l.s. | Idaho. | 1,000,000 | 0 25 | 2,930,000 | Oct. | '13 | 0.02 |
| Hercules, l.s. | Idaho. | 1,000,000 | 1 | 3,650,000 | July | '11 | 0.06 |
| Homestake, g. | S. D. | 218,400 | 100 | 33,695,309 | Oct. | '13 | 0.65 |
| Horn Silver, l.s.z. | Utah. | 400,000 | 25 | 5,662,000 | Sept. | '07 | 0.05 |
| Iowa, g.s.l. | Colo. | 1,666,667 | 1 | 216,832 | July | '13 | 0.00½ |
| Iowa-Tiger Leasing g.s. | Colo. | 12,655 | 1 | 13,921 | Jan. | '12 | 0.10 |
| Iron Blossom, s.l.g. | Utah. | 1,000 000 | 0 10 | 1,770,000 | Oct. | '13 | 0.10 |
| Iron Silver, s.l.g. | Colo. | 500,000 | 20 | 4,700,000 | Apr. | '13 | 0.10 |
| Jamison, g. | Cal. | 390,000 | 10 | 378,300 | Jan. | '11 | 0.02 |
| Jerry Johnson, g. | Colo. | 2,500,000 | 0 10 | 150,000 | Aug. | '11 | 0.01 |
| Kendall, g. | Mont. | 500,000 | 5 | 1,475,000 | Nov. | '12 | 0.02½ |
| Kennedy, g. | Cal. | 100,000 | 100 | 1,831,001 | Apr. | '10 | 0.03½ |
| King of Arizona, g. | Ariz. | 200,000 | 1 | 396,000 | Aug. | '09 | 0.12 |
| Klar Piquette, z.l. | Wis. | 20,000 | 1 | 162,500 | Dec. | '12 | 0.50 |
| Knob Hill, g. | Wash. | 1,000,000 | 1 | 45,000 | May | '12 | 0.00½ |
| Liberty Bell, g. | Colo | 130,551 | 5 | 522,093 | Oct. | '10 | 1.00 |
| Little Bell, l.s. | Utah. | 300,000 | 1 | 75,000 | Mar. | '11 | 0.05 |
| Little Florence, g. | Nev. | 1,000,000 | 1 | 430,000 | Jan. | '08 | 0.03 |
| Mammoth, g.s.c. | Utah. | 400,000 | 25 | 2,300,000 | July | '13 | 0.05 |
| Mary McKinney, g. | Colo. | 1,309,252 | 1 | 1,077,558 | Oct. | '13 | 0.02 |
| May Day, g.s.l. | Utah. | 800,000 | 0 25 | 148,000 | Feb. | '13 | 0.03 |
| Mexican, g.s. | Nev. | 201,600 | 2.50 | 20,160 | Aug. | '11 | 0.10 |
| Miami, c. | Ariz. | 664,993 | 5 | 2,216,708 | Aug. | '13 | 0 50 |
| Modoc, g.s. | Colo. | 500,000 | 1 | 275,000 | Dec. | '11 | 0.01 |
| Mohawk, c. | Mich. | 100,000 | 25 | 3,175,000 | Aug. | '13 | 2 00 |
| Monarch-Mad'a, g.s.l. | Colo | 1,000,000 | 1 | 40,000 | May | '11 | 0 01 |
| Montana-Tonop., s.g. | Nev. | 921,865 | 1 | 530,000 | Dec. | '12 | 0.10 |
| Mountain, c. | Cal | 250,000 | 25 | 4,216,250 | May | '08 | 0.44 |
| National, g. | Nev. | 750,000 | 1 | 570,000 | May | '11 | 0 10 |
| Nevada Con., c. | Nev. | 1,999,394 | 5 | 12,987,776 | Sept. | '13 | 0 37½ |
| New Century, z.l. | Mo. | 330,000 | 1 | 237,600 | Oct. | '09 | 0.01 |
| New Idria, q. | Cal. | 100,000 | 5 | 1,720,000 | Sept. | '13 | 0.10 |
| North Butte, c. | Mont. | 410,000 | 15 | 11,275,000 | Oct. | '13 | 0.50 |
| North Star, g. | Cal | 250,000 | 10 | 3,936,989 | Sept. | '13 | 0.20 |
| Old Domin'n, M. & Sm. | Ariz. | 162,000 | 25 | 3,361,000 | Oct. | '13 | 1 25 |
| Ophir, s.g. | Nev. | 201,600 | 3 | 2,068,360 | Jan. | '12 | 0.10 |
| Opohongo, g.s.l. | Utah. | 898,978 | 0 25 | 80,907 | Jan | '13 | 0.02 |
| Oroville Dredging. | Cal | 700,000 | 5 | 1,383,036 | Dec. | '09 | 0.12½ |
| Osceola, c. | Mich. | 96,150 | 25 | 11,891,225 | Oct. | '13 | 2.00 |
| Parrot, c. | Mont. | 229,850 | 10 | 7,255,750 | May | '13 | 0.15 |
| Pearl Con., g. | Wash. | 1,909,711 | 0 05 | 181,422 | Dec. | 10 | 0 02 |
| Pharmacist, g. | Colo. | 1,500,000 | 1 | 87,500 | Feb. | '10 | 0 00½ |
| Pioneer, g. | Alas. | 5,000,000 | 1 | 4,041,526 | Oct. | '11 | 0.03 |
| Pittsburgh-Idaho, l. | Ida. | 803,000 | 1 | 216,810 | Oct. | '12 | 0.04 |
| Pittsburgh Silver Peak, g | Nev. | 2,790,000 | 1 | 667,600 | Sept. | '13 | 0.02 |
| Portland, g. | Colo | 3,000,000 | 1 | 9,337,080 | Aug. | '13 | 0.02 |
| Quilp | Wash. | 1,500,000 | 1 | 67,500 | Feb. | '13 | 0.01 |
| Quincy, c | Mich. | 110,000 | 25 | 20,842,500 | Sept. | '13 | 1.25 |
| Republic, g | Wash. | 1,000,000 | 1 | 85,000 | Dec. | '10 | 0.01½ |
| Rochester, l.z. | Mo. | 4,900 | 100 | 188,396 | Dec. | '10 | 0.50 |
| Round Mountain, g. | Nev. | 866,426 | 1 | 363,365 | Aug. | '13 | 0.04 |

## Mining Companies—United States—(*Continued*)

| Name of Company and Situation | | Shares | | Dividends | | | |
|---|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | | Amt |
| Seven Troughs Coal., g. | Nev. | 1,500,000 | $ 1 | $ 37,500 | July | '12 | $0.02½ |
| St. Joseph, l. | Mo. | 1,000,000 | 10 | 8,960,357 | Sept. | '13 | 0.10 |
| Shannon, c. | Ariz. | 300,000 | 10 | 750,000 | Jan. | '13 | 0.50 |
| Shattuck-Arizona, c. | Ariz. | 350,000 | 10 | 1,575,000 | Oct. | '13 | 0.50 |
| Silver King Coal, l.s. | Utah. | 1,250,000 | 5 | 2,159,885 | Apr. | '13 | 0.15 |
| Sioux Con., s.l.g. | Utah. | 745,389 | 1 | 872,097 | July | '11 | 0.04 |
| Skidoo, g. | Cal | 1,000,000 | 5 | 275,000 | May | '12 | 0.02½ |
| Smuggler, l.s.z. | Colo. | 1,000,000 | 1 | 2,235,000 | Nov. | '06 | 0.03 |
| Snowstorm, c.g. | Ida. | 1,500,000 | 1 | 1,192,103 | Oct. | '13 | 0.02 |
| South Eureka, g. | Calif. | 299,981 | 1 | 366,881 | Apr. | '12 | 0.07 |
| Standard Con , g.s. | Cal | 178,394 | 10 | 5,229,809 | Jan. | '12 | 0.10 |
| Stratton's Ind., g. | Colo | 1,000,000 | 0.60 | 486,000 | May | '13 | 0.06 |
| Success, z. | Ida | 1,500,000 | 1 | 925,000 | May | '13 | 0.02 |
| Superior & Pitts , c | Ariz. | 1,499,793 | 10 | 5,369,262 | Sept. | '13 | 0.38 |
| Tamarack, c | Mich. | 60,000 | 25 | 9,420,000 | July | '07 | 4.00 |
| Tennessee, c. | Tenn. | 200,000 | 25 | 3,631,520 | Sept. | '13 | 0.75 |
| Tomboy, g.s. | Colo | 300,000 | 4.85 | 3,069,090 | June | '13 | 0.48 |
| Tom Reed, g. | Ariz. | 909,555 | 1 | 1,537,012 | Oct. | '13 | 0.06 |
| Tonopah Belm't, s.g. | Nev. | 1,500,000 | 1 | 5,093,000 | Oct. | '13 | 0.25 |
| Tonopah Ext., g.s. | Nev. | 943,433 | 1 | 424,529 | Oct. | '13 | 0.05 |
| Tonopah of Nev., s.g. | Nev. | 1,000,000 | 1 | 11,100,000 | Sept. | '13 | 0.25 |
| Tri-Mountain, c. | Mich. | 100,000 | 25 | 1,250,000 | Dec. | '12 | 3.00 |
| Tuolumne, c | Mont. | 800,000 | 1 | 520,000 | May | '13 | 0.10 |
| Uncle Sam, g s l | Utah | 500,000 | 1 | 495,000 | Sept. | '11 | 0.05 |
| United Cop. Min., c. | Wash | 1,000,000 | 1 | 120,000 | July | '13 | 0.01 |
| United (Crip. Ck.) g | Colo | 4,000,100 | 1 | 440,435 | Jan. | '10 | 0.04 |
| United Globe, c. | Ariz. | 23,000 | 10 | 1,530,000 | Oct. | '13 | 7.50 |
| United Verde, c. | Ariz. | 300,000 | 10 | 32,797,000 | Oct. | '13 | 0.75 |
| Utah, s.l. | Utah | 100,000 | 10 | 325,000 | Dec. | '10 | 0.02 |
| Utah, c. | Utah. | 1,562,599 | 10 | 19,803,111 | Sept. | '13 | 0.75 |
| Utah Con., c. | Utah. | 300,000 | 5 | 7,950,000 | Oct. | '13 | 0.50 |
| Valley View, g. | Colo | 1,000,000 | 1 | 210,000 | Dec. | '10 | 0.04 |
| Victoria, g.s.l. | Utah. | 250,000 | 1 | 207,500 | Mar. | '10 | 0.04 |
| Vindicator Con., g. | Colo | 1,500,000 | 1 | 2,767,000 | Oct. | '13 | 0.03 |
| Wasp No. 2, g. | S. D. | 500,000 | 1 | 436,965 | Oct. | '13 | 0.02 |
| Wellington Mines, g | Colo | 10,000,000 | 1 | 260,000 | July | '13 | 0.00½ |
| Wolverine, c. | Mich. | 60,000 | 25 | 7,940,000 | Apr. | '13 | 5.00 |
| Work, g. | Colo. | 1,500,000 | 1 | 172,500 | July | '08 | 0.00½ |
| Yak, s.l. | Colo. | 1,000,000 | 1 | 1,727,655 | July | '13 | 0.02 |
| Yankee Con., g.s. | Utah. | 1,000,000 | 1 | 167,500 | Jan. | '13 | 0.01 |
| Yellow Aster, g. | Cal. | 100,000 | 10 | 1,171,789 | Oct. | '13 | 0.05 |
| Yellow Pine, l.z.s. | Nev. | 950,000 | 1 | 304,008 | Oct. | '13 | 0.02 |
| Yukon Gold, g | Alas. | 3,500,000 | 5 | 5,250,000 | Sept. | '13 | 0.07½ |

## Iron, Industrial and Holding Companies

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Amalgamated, c. | [illegible] | 1,538,879 | $100 | $78,968,110 | Aug. | '13 | $1.50 |
| Am. Sm. & Ref., com | S. | 500,000 | 100 | 24,833,333 | Sept. | '13 | 1.00 |
| Am. Sm. & Ref., pf. | S. | 500,000 | 100 | 45,481,333 | Sept. | '13 | 1.75 |
| Am. Smelters, pf. A. | U. S. | 170,000 | 100 | 8,130,000 | Oct. | '13 | 1.50 |
| Am. Smelters, pf. B. | U. S. | 300,000 | 100 | 12,357,000 | Oct. | '13 | 1.25 |
| Cambria Steel | Penn. | 900,000 | 50 | 17,897,500 | Aug. | '13 | 0.62½ |
| Greene Cananea | U. S. | 2,471,314 | 25 | 2,426,877 | Mar. | '13 | 0.25 |
| Guggenheim Expl. | U. S. | 831,732 | 25 | 17,601,047 | Oct. | '13 | 0.62½ |
| Inter'l Nickel, com. | U. S. | 115,826 | 100 | 10,089,316 | Sept. | '13 | 3.00 |
| Inter'l Nickel, pfd. | U. S. | 89,126 | 100 | 4,140,503 | Aug. | '13 | 1.50 |
| Inter'l Sm. & Ref. | U. S. | 100,000 | 100 | 3,300,000 | Aug. | '13 | 2.00 |
| National Lead, com. | N. Y. | 206,554 | 100 | 7,540,308 | Sept. | '13 | 0.75 |
| National Lead, pf. | N. Y. | 243,676 | 100 | 27,560,940 | Sept. | '13 | 1.75 |
| Old Dominion, c. | Ariz. | 293,245 | 25 | 4,682,700 | Oct. | '13 | 1.25 |
| Phelps, Dodge & Co. | U. S. | 450,000 | 100 | 28,309,304 | Sept. | '13 | 4.50 |
| U. S. Steel Corp , com. | U. S. | 5,083,025 | 100 | 194,403,851 | Sept. | '13 | 1.25 |
| U. S. Steel Corp , pf | U. S. | 3,602,811 | 100 | 338,768,739 | Aug. | '13 | 1.75 |
| U. S. S., R. & M., com. | U.S.-Mex. | 486,320 | 50 | 5,572,183 | Oct. | '13 | 0.75 |
| U. S. S., R. & M., pf. | U.S.-Mex. | 351,105 | 50 | 12,965,225 | Oct. | '13 | 0.87½ |

## Canadian, Mexican and Central American Companies

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ajuchitlan, g.s. | Mex. | 50,000 | $ [illegible] | $ 200,000 | Oct. | '12 | $0.25 |
| Amparo, g.s. | Mex. | 2,000,000 | 1 | 1,166,884 | Aug. | '13 | 0.04 |
| B. C. Copper | B. C. | 591,709 | [illegible] | 615,398 | Jan. | '13 | 0.15 |
| Beaver Con., s. | Ont. | 1,996,490 | 1 | 409,879 | Dec. | '12 | 0.03 |
| Buffalo, s. | Ont. | 1,000,000 | 1 | 3,107,009 | Oct. | '13 | 0.03 |
| Cobalt Townsite, s. | Ont. | 1,000,000 | 1 | 450,000 | Aug. | '13 | 0.24 |
| Coniagas, s | Ont. | 800,000 | [illegible] | 5,000,000 | Aug. | '13 | 0.45 |
| Con. M. & S. Co. of Can | B. C. | 58,052 | 100 | 1,226,269 | Oct. | '13 | 2.00 |
| Crown Reserve, s. | Ont. | 1,768,814 | 1 | 5,377,196 | Oct. | '13 | 0.02 |
| Crow's Nest Pass C. Co. | B. C. | 248,506 | 25 | 2,182,864 | Mar. | '11 | 0.25 |
| Dominion Coal, com. | N. S. | 150,000 | 100 | 5,550,000 | Jan. | '13 | 1.00 |
| Dominion Coal, pf. | N. S | 50,000 | 100 | 4,915,000 | Aug. | '12 | 3.50 |
| Dos Estrellas, g.s. | Mex. | 300,000 | 0.50 | 14,580,000 | Sept. | '13 | 1.25 |
| El Oro, g.s. | Mex. | 1,147,500 | 4.85 | 8,947,261 | July | '13 | 0.24 |
| Esperanza, s.g. | Mex. | 455,000 | 4.85 | 11,330,455 | July | '13 | 0.36 |
| Granby, s.l.c | B C. | 148,496 | 100 | 5,364,794 | Sept. | '13 | 1.50 |
| Greene Con , c | Mex. | 1,000,000 | 10 | 8,044,400 | Feb. | '13 | 0.45 |
| Guanajuato D., pf., s. | Mex. | 10,000 | 1000 | 274,356 | Jan. | '11 | 3.00 |
| Hedley Gold. | B. C. | 120,000 | 10 | 1,044,000 | Sept. | '13 | 0.50 |
| Hollinger, g. | Ont. | 600,000 | 5 | 1,170,000 | Oct. | '13 | 0.15 |
| Kerr Lake s | Ont. | 600,000 | 5 | 4,770,000 | Sept. | '13 | 0.25 |
| La Rose Con , s | Ont | 1,498,407 | 5 | 4,637,803 | Oct. | '13 | 0.25 |
| Le Roi No. 2, g | B. C. | 120,000 | 24.30 | 1,471,580 | Jan. | '13 | 0.36 |
| Lucky Tiger Com , g. | Mex. | 715,337 | 10 | 1,968,632 | Oct. | '13 | 0.05 |
| McK.-Dar. Sav. s. | Ont. | 2,247,692 | 1 | 3,798,026 | Oct. | '13 | 0.10 |
| Mines Co. of Am. (new) | Mex | 1,700,000 | 10 | *1,215,000 | July | '13 | 0.12½ |
| N. Y. & Hond. Ros | C. A | 150,000 | 10 | 3,192,500 | Sept. | '13 | 0.20 |
| Nipissing, s. | Ont | 1,200,000 | 5 | 10,890,000 | Oct. | '13 | 0.37½ |
| Peñoles, s.l.g. | Mex. | 80,000 | 25 | 6,551,688 | Sept. | '13 | 1.25 |
| Peregrina M. & M., pf. | Mex | 10,000 | 100 | 328,656 | Sept. | '10 | 3.50 |
| Pinguico, pf., s. | Mex | 20,000 | 100 | 600,000 | Oct. | '11 | 3.00 |
| Right of Way Mns†s. | Ont | 1,685,500 | 1 | 202,260 | Dec. | '11 | 0.02 |
| Rio Plata, s. | Mex | 373,437 | 5 | 345,714 | Feb. | '13 | 0.05 |
| San Rafael, g.s. | Mex. | 2,400 | 25 | 1,441,180 | Oct. | '13 | 0.50 |
| San Toy, g.s. | Mex. | 6,000,000 | 1 | 540,000 | July | '13 | 0.01 |
| Sopresa, g.s. | Mex | 19,200 | 20 | 1,517,438 | Jan. | '11 | 34.00 |
| Stand'd Silver-Lead. | B. C. | 2,000,000 | 1 | 925,000 | Oct. | '13 | 0.02½ |
| Timiskaming, s | Ont | 2,500,000 | 1 | 1,534,155 | Apr. | '13 | 0.06 |
| Tem. & Hud Bay, s | Ont | 7,761 | 1 | 1,823,835 | Aug. | '13 | 3.00 |
| Trethewey, s. | Ont | 1,000,000 | 1 | 961,998 | Jan. | '13 | 0.10 |
| Wettlaufer-Lorrain, s. | Ont | 1,416,590 | 1 | 637,465 | Oct. | '13 | 0.05 |

*Previous to reorganization, $5,258,881.

†Previous to January, 1910, $324,644.

## Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Alameda, Ida | Oct. 21 | Nov. 20 | 0 0015 |
| Atlanta, Ida | Nov. 3 | Dec. 2 | 0 0005 |
| Beaver Copper, Utah | Nov. 12 | Dec. 2 | 0 005 |
| Bismarck, S. D. | ... | ... | 0 01 |
| Carbonate, Ida | Nov. 3 | Nov. 22 | 0 001 |
| Cedar Extension, Utah | Oct. 30 | Nov. 17 | 0 005 |
| Comet, Ida | Oct. 20 | Nov. 20 | 0 0005 |
| Dennemora, Ida | Oct. 20 | Nov. 20 | 0 0025 |
| Empire, Ida | Oct. 20 | Dec 1 | 0 005 |
| Globe Cons., Utah | Nov 6 | Nov. 28 | 0 001 |
| Gold Bond, Utah | Nov. 10 | Nov. 24 | 0 001 |
| Lead-Bullion, Utah | Nov. 5 | Nov. 26 | 0 004 |
| Lehi Tintic, Utah | Nov. 5 | Nov. 29 | 0 0025 |
| Lewis & Clark, Ida | Oct 15 | Nov. 18 | 0.0075 |
| Little North Fork, Ida | Oct. 8 | Dec. 1 | 0 001 |
| Mountain Queen, Ida | Oct. 17 | Nov. 17 | 0 0005 |
| North Star, Ida | Nov. 10 | Nov. 29 | 0 00½ |
| Oriole, Wash. | ...... | ....... | 0 002 |
| Payson-Eldorado, Utah | Oct. 31 | Nov. 21 | 0.0005 |
| Rarus, Utah | Nov. 8 | Nov. 24 | 0 00½ |
| Revenue Cons., Utah | Oct. 29 | Nov. 19 | 0.005 |
| Rhode Island, Ida | Sept. 26 | Nov. 28 | 0 0005 |
| Rochester, Utah | Nov. 7 | Nov. 29 | 0 0025 |
| Sunset, Nev. (postpon'd) | | Nov. 17 | |
| Tonopah, Gypsy Queen | Oct 20 | Nov. 24 | 0 01 |
| Utah United, Utah | Oct. 1 | Oct. 30 | 0 01 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56 260 | 62.938 | 24 865 | 25.887 | 28 983 |
| February | 52.222 | 59 043 | 61 642 | 24.081 | 27.190 | 28 357 |
| March | 52.745 | 58.375 | 57.870 | 24 324 | 26.875 | 26 669 |
| April | 53.325 | 59.207 | 59.490 | 24 595 | 27.284 | 27 416 |
| May | 53.308 | 60.880 | 60 361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52 171 | 61.606 | 59.293 | 24.082 | 28.375 | 27 335 |
| September | 52 440 | 63 078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53 340 | 63.471 | 60.793 | 24.594 | 29.299 | 28 083 |
| November | 55 719 | 62 792 | ...... | 25.649 | 29.012 | ...... |
| December | 54 905 | 63 365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53 304 | 60 835 | .... | 24.592 | 28.042 | |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14 094 | 16 488 | 14 337 | 16.767 | 62 760 | 71.741 |
| February | 14 084 | 14 971 | 14.329 | 15 253 | 62 893 | 65 519 |
| March | 14.698 | 14 713 | 14.868 | 14 930 | 65 884 | 65.329 |
| April | 15.741 | 15 291 | 15.930 | 15 565 | 70 294 | 68 111 |
| May | 16 031 | 15 436 | 16 245 | 15 738 | 72 352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14 871 | 78 259 | 67 140 |
| July | 17.190 | 14 190 | 17.353 | 14.563 | 76 636 | 64 166 |
| August | 17 498 | 15.400 | 17.644 | 15.904 | 78 670 | 69 200 |
| September | 17 508 | 16.328 | 17.698 | 16.799 | 78 762 | 73 125 |
| October | 17.314 | 16.337 | 17.661 | 16 913 | 76 389 | 73.383 |
| November | 17 326 | . | 17.617 | | 76 890 | . |
| December | 17 376 | | 17 600 | | 75 516 | . . |
| Year | 16 341 | | 16 560 | | 72 942 | |

New York, cents per pound. London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50 298 | 191 519 | 238.273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 110 | 223 762 | 193 074 |
| October | 50 077 | 40 462 | 228 353 | 184 837 |
| November | 49 891 | | 227 619 | |
| December | 49 815 | | 226 875 | |
| Av. year | 46 096 | | 209 322 | .. |

New York in cents per pound; London in pounds sterling per long ton.

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4 435 | 4 321 | 4.327 | 4 171 | 15 597 | 17 114 |
| February | 4 026 | 4 325 | 3 946 | 4 175 | 15.738 | 16.550 |
| March | 4 073 | 4 327 | 4 046 | 4.177 | 15.997 | 15 977 |
| April | 4 200 | 4.381 | 4.118 | 4 242 | 16.331 | 17 597 |
| May | 4 194 | 4 342 | 4.072 | 4 226 | 16 509 | 18 923 |
| June | 4.392 | 4.325 | 4 321 | 4 190 | 17.588 | 20 226 |
| July | 4 720 | 4 353 | 4.603 | 4 223 | 18 544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | 4 698 | 4 924 | 4 579 | 22.292 | 20 648 |
| October | 5 071 | 4.402 | 4 894 | 4 253 | 20 630 | 20 302 |
| November | 4 615 | | 4 463 | | 18 193 | |
| December | 4.303 | | 4 152 | | 18 069 | .. |
| Year | 4 471 | | 4 360 | | 17 929 | .. |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6 442 | 6 931 | 6 292 | 6.854 | 26.642 | 26.114 |
| February | 6 499 | 6.239 | 6 349 | 6 089 | 26.661 | 25 338 |
| March | 6.626 | 6 078 | 6 476 | 5 926 | 26.048 | 24 605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25 644 | 25.313 |
| May | 6 679 | 5 406 | 6 529 | 5.256 | 25.790 | 24 583 |
| June | 6 877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7 454 | 5 694 | 7 313 | 5 544 | 27.048 | 21.148 |
| October | 7.426 | 5 340 | 7.276 | 5 188 | 27 543 | 20.614 |
| November | 7.371 | . | 7.221 | . . | 26 804 | . |
| December | 7.162 | | 7 081 | . | 26 494 | |
| Year | 6 943 | | 6 799 | | 26 421 | |

New York and St. Louis, cents per pound. London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15 12 | $18.15 | $13.32 | $17.35 | $14.00 | $18 59 |
| February | 15 03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14 10 | 17 53 |
| April | 15 13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15 80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15 10 |
| July | 15 15 | 16.31 | 14 38 | 15 13 | 14.38 | 14.74 |
| August | 15 43 | 16.63 | 14 90 | 15 00 | 14 85 | 14 88 |
| September | 16 86 | 16.65 | 16 03 | 15.04 | 15.63 | 14 93 |
| October | 17.90 | 16.60 | 17 18 | 14.61 | 17.22 | 14 80 |
| November | 18 07 | ... | 17.09 | . . | 18 00 | |
| December | 18.15 | . | 17 45 | . . | 18 73 | . |
| Year | $16.01 | .. | $14 93 | . . . | $15.28 | . . . |

# STOCK QUOTATIONS

| COLO. SPRINGS Nov. 11 | |
|---|---|
| Name of Comp. | Bid |
| Acacia | 03 |
| Cripple Cr'k Con | 01 |
| C. K. & N | 08 |
| Doctor Jack Pot | 06 |
| Elkton Con | 51 |
| El Paso | 2 90 |
| Findlay | 02 |
| Gold Dollar | 07 |
| Gold Sovereign | 02 |
| Isabella | 09 |
| Jack Pot | 04 |
| Jennie Sample | 04 |
| Jerry Johnson | 03 |
| Lexington | 003 |
| Moon Anchor | ‡ 006 |
| Old Gold | 01 |
| Mary McKinney | 55½ |
| Pharmacist | 01 |
| Portland | 96 |
| Vindicator | 80 |

| SALT LAKE Nov. 11 | |
|---|---|
| Name of Comp. | Bid. |
| Beck Tunnel | 03½ |
| Black Jack | 08 |
| Cedar Talisman | 00¼ |
| Colorado Mining | 09¼ |
| Columbus Con | ‡ 01 |
| Crown Point | 00½ |
| Daly-Judge | 5 00 |
| Grand Central | 50 |
| Iron Blossom | 1 12½ |
| Little Bell | ‡ 10 |
| Lower Mammoth | 00½ |
| Mason Valley | 3 75 |
| May Day | 04 |
| Nevada Hills | 55 |
| New York | ‡ 02½ |
| Prince Con | 24 |
| Silver King Coal'n | 3 50 |
| Sioux Con | 01 |
| Uncle Sam | ‡ 03½ |
| Yankee | 07 |

### TORONTO Nov 11

| Name of Comp | Bid | Name of Comp | Bid |
|---|---|---|---|
| Bailey | 07 | Foley O'Brien | 16 |
| Coniagas | 7 15 | Hollinger | 18 00 |
| T. & Hudson Bay | ‡70 00 | Imperial | ‡ 02 |
| Timiskaming | 12 | Jupiter | 08 |
| Wettlaufer-Lor | 07½ | Pearl Lake | 11 |
| Apex | ‡ 01 | Porcu Gold | 10 |
| Big Dome | 9 75 | Preston E. D. | 03 |
| Crown Chartered | ‡ 00¼ | Rea | 10 |
| Doble | ‡.10 | Swastika | 03 |
| Dome Exten | .05 | West Dome | .05 |

### SAN FRANCISCO Nov. 11

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | .08 | Belmont | 7.00 |
| Belcher | .34 | Jim Butler | .65 |
| Best & Belcher | 06 | MacNamara | .10 |
| Caledonia | 1 70 | Midway | .38 |
| Challenge Con. | 11 | Mont.-Tonopah | 1.00 |
| Chollar | 04 | North Star | .41 |
| Confidence | 42 | West End Con. | 1.22½ |
| Con. Virginia | 15 | Atlanta | .10 |
| Crown Point | 29 | Booth | .02 |
| Gould & Curry | 03 | C.O.D. Con. | .03 |
| Hale & Norcross. | 09 | Comb. Frac. | .03 |
| Mexican | 1 40 | Jumbo Extension | .08 |
| Occidental. | 70 | Pitts.-Silver Peak | .35 |
| Ophir | 24 | Round Mountain | .38 |
| Overman | 38 | Sandstorm Kendall | .02 |
| Potosi | 03 | Silver Pick | .02 |
| Savage | 13 | Argonaut. | 3.25 |
| Sierra Nevada. | 11 | Bunker Hill | 1.50 |
| Union Con | 19 | Central Eureka | .23 |
| Yellow Jacket | 36 | So. Eureka | ‡2.00 |

| N. Y. EXCH. Nov. 11 | |
|---|---|
| Name of Comp. | Clg. |
| Amalgamated | 69¾ |
| Am. Agri Chem | 42 |
| Am.Sm.&Ref.,com | 61¼ |
| Am Sm. & Ref., pf | 99½ |
| Am. Sm. Sec., pf. B | 81 |
| Anaconda | 33⅜ |
| Batopilas Min | ‡1 |
| Bethlehem Steel,pf. | 70 |
| Chino | 37¾ |
| Federal M. & S., pf. | 37 |
| GreatNor.,ore.,ctf. | 31 |
| Guggen. Exp. | 44½ |
| Homestake | 108 |
| Inspiration Con. | 14¾ |
| Miami Copper | 22 |
| Nat'l Lead, com | 42½ |
| National Lead, pf. | 101¼ |
| Nev. Consol | 14¼ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 88 |
| Quicksilver, pf. | 3 |
| Ray Con. | 18 |
| Republic I&S,com. | 18½ |
| Republic I&S, pf. | 78 |
| SlossSheffi'd,com. | 26 |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper | 28¼ |
| Utah Copper | 48½ |
| U. S. Steel, com | 54⅞ |
| U. S. Steel, pf. | 105 |
| Va.Car.Chem.,pf. | 93 |

| BOSTON EXCH Nov. 11 | |
|---|---|
| Name of Comp. | Clg. |
| Adventure | 1½ |
| Ahmeek | 273 |
| Alaska Gold M. | 20¾ |
| Algomah | 1 |
| Allouez | 33½ |
| Am. Zinc | 17½ |
| Ariz. Com., ctfs. | 4¾ |
| Bonanza | .39 |
| Boston & Corbin | .60 |
| Butte & Balak | 4¾ |
| Calumet & Ariz. | 62 |
| Calumet & Hecla | 405 |
| Centennial | 12½ |
| Cliff | 1 |
| Copper Range | 36½ |
| Daly West | 2½ |
| East Butte | 10¾ |
| Franklin | 3 |
| Granby | 68½ |
| Hancock | 14½ |
| Hedley Gold | 30 |
| Helvetia | 30 |
| Indiana | 3 |
| Island Cr'k, com | 47¼ |
| Island Cr'k, pfd | 82 |
| Isle Royale | 17 |
| Keweenaw | 2$\frac{1}{16}$ |
| Lake | 7 |
| La Salle | 3½ |
| Mass | 2¼ |
| Michigan | 1 |
| Mohawk | 40½ |
| New Arcadian | 1½ |
| New Idria Quick. | 2¼ |
| North Butte | 23 |
| North Lake | 1 |
| Ojibway | .50 |
| Old Dominion | 47 |
| Osceola | 73½ |
| Quincy | 55 |
| Shannon | 6¾ |
| Shattuck-Ariz. | 26 |
| Superior | 21¾ |
| Superior & Bost. | 2½ |
| Tamarack | 27 |
| Trinity | 4½ |
| Tuolumne | .70 |
| U. S. Smelting | 36½ |
| U. S. Smelt'g, pf. | 46½ |
| Utah Apex | 1¾ |
| Utah Con | 8 |
| Victoria | 1¾ |
| Winona | 1¾ |
| Wolverine | 41 |
| Wyandot | .50 |

| N. Y. CURB Nov. 11 | |
|---|---|
| Name of Comp. | Clg. |
| Ariz. Belmont | 07 |
| Barnes King | 1½ |
| Beaver Con | .34 |
| Big Four | 15 |
| Braden Copper | 6¾ |
| B. C. Copper | 2¾ |
| Buffalo Mines | 1½ |
| Can. G & S | .18 |
| Caribou | .61 |
| Con Ariz Sm | 25 |
| Coppermines Cons | 3 |
| Davis-Daly | 1½ |
| Diam'field-Daisy | 04 |
| Ely Con | 05 |
| Florence | 24 |
| Gold Hill Con. | ⅜ |
| Goldfield Con | 1$\frac{7}{16}$ |
| Greene Cananea | 31½ |
| Greenwater | 05 |
| Internat S & R | ‡115 |
| Kerr Lake | 4$\frac{7}{16}$ |
| La Rose | 1½ |
| McKinley-Dar-Sa. | 1¾ |
| Min Co of A new | 2¼ |
| New Utah Bingham | 50 |
| Nipissing Mines | 7¾ |
| Ohio Copper | 50 |
| Pacific Sm. & M | ‡¼ |
| Puebla S & R | 2$\frac{1}{16}$ |
| South Utah M&S | $\frac{1}{16}$ |
| Stand'd Oil of N J | 375 |
| Stewart | 1$\frac{5}{16}$ |
| Tonopah | 4½ |
| Tonopah Ex. | 1$\frac{9}{16}$ |
| Tonopah Merger | 56 |
| Tri-Bullion | ¼ |
| Tularosa | ¾ |
| Union Mines | 08 |
| United Cop., pfd | ‡3 |
| Yukon Gold | 2 |

| LONDON Nov | |
|---|---|
| Name of Comp | Clg |
| Camp Bird | £0 14s 6d |
| El Oro | 0 14 6 |
| Esperanza | 0 16 3 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 7 3 |
| Santa Gert'dis | 0 17 6 |
| Stratton's | 0 1 0 |
| Tomboy | 1 6 3 |

| BOSTON CURB Nov. 11 | |
|---|---|
| Name of Comp. | Bid |
| Bingham Mines | 5½ |
| Boston Ely. | .45 |
| Butte&Lon'nDev | .30 |
| Cactus | .02 |
| Calaveras | 1½ |
| Chief Cons | 1¾ |
| Corbin | 20 |
| Cortez | 20 |
| Crown Reserve | 1¾ |
| Eagle & Blue Bell | .90 |
| First Nat. Cop. | 2¾ |
| Houghton Copper | 2¾ |
| Majestic | 26 |
| Mexican Metals | 36 |
| Moneta Porc | ‡ 07 |
| Nevada-Douglas | 1¾ |
| New Baltic | 50 |
| Oneco | 80 |
| Raven Copper | .10 |
| Rhode Island Coal | ‡ 01 |
| Smokey Dev | 75 |
| So Lake | 3¾ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | 25 |
| Trethewey | .25 |
| United Verde Ext. | .45 |

‡Last Quotation.

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# Witherbee-Sherman No. 3 Magnetic Mill

By S. L. Nason*

*SYNOPSIS—This concentrating mill handles a magnetite ore running 40 to 50% iron. Dry crushing and magnetic separators used. Three types of latter: Drum machines, pulley machines and belt machines. A 2-in. concentrate product made on cobbing drums and a 2-in. tailing rejected by pulley machines. Mill driven in two sections by separate motors, so that either half may be run alone.*

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Witherbee, Sherman & Co.'s No. 3 mill is located between shafts "A" and "B" of the Harmony mine, at Mineville, N. Y. The building is 156 ft. long by 54 ft. wide by 50 ft. high, built of concrete and steel. The walls are laid with concrete blocks 20x10x8 in., of the company's own make; the aggregate is the tailings from the mills from $\frac{1}{4}$ in. down, making an excellent concrete.

No. 3. Separator. Note Conveyor House from "B" Shaft on Left, with Cylindrical Storage Bin and Concentrates Bin on Right. Courtesy of "General Electric Review"

### Conveyors and Bins

The ore sent to the mill is of 40 to 50% magnetic iron, occurring in a hard gneiss rock composed of feldspar and quartz and of more or less hornblende. The mill makes a 97% recovery on this ore. The mine ore, running from 18 in. to 16-mesh, passes through preliminary breakers at the shaft houses. At "A" shaft a No. 8 gyratory crusher is used, and at "B" shaft, a Blake 18x36-in. jaw crusher; both machines break to about a 4-in. size. From each crusher the ore is conveyed to the storage bin at one end of the mill by 20-in. Robbins conveyors that form "B" shaft, being about 330 ft. long, that form "A" shaft, 222 ft. The ore is weighed as it passes on the conveyors by Merrick weightometers.

The mill storage bin has a capacity of 1000 long tons; it is cylindrical, 25 ft. in diameter by 50 ft. high, built of concrete with vertical and horizontal reinforcing of 1$\frac{1}{8}$-in. discarded hoisting rope. The mill will handle about 100 tons per hr., starting with 400 to 500 tons in the bin and cleaning up in nine hours' run the bin and the mine product for that shift, the latter being about 400 to 500 tons.

From the bottom of the storage bin the ore is drawn through an adjustable feed gate by a shaking feeder, consisting of a pan 9 ft. long by 3 ft. wide with 18-in. sides

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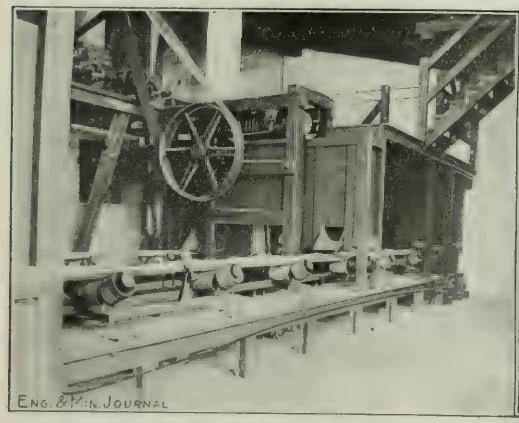
*Mill superintendent, Witherbee, Sherman & Co., Inc., Mineville, N. Y.

The feeder is slung from overhead by two suspension rods on the back end, and on two rocker-arms in front, and is driven by an eccentric with a 2-in. throw. The feeder discharges into a 30-in. belt elevator using 30-in. buckets bolted to a 32-in. eight-ply belt. The elevator is 61 ft. center to center and inclined 71° from the horizontal.

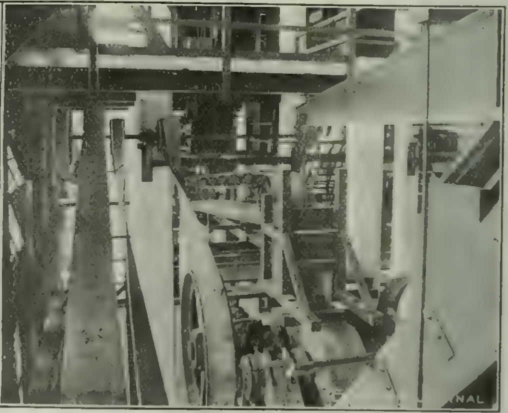
The bucket belt has a speed of 240 ft. per min., giving the elevator a maximum capacity of 564 tons per hour. From the elevator the ore is discharged into two screens 40 in. in diameter by 15 ft. long, of the heavy-trommel type. The screen plate is in three 5-ft. sections ⅜ in. thick with 2-in. perforations. The material passing over these screens falls through chutes into two No. 6 gyratory crushers running at 325 r.p.m. These crushers are located one each side and above the shaking feeder, so that the material crushed runs directly into the shaking feeder and is taken back to the screens with the main feed.

### THE COBBING DRUMS

The material which passes through the screens falls through box chutes to two Norton cobbing drums, 30 in. in diameter by 18-in. face and running at 56 r.p.m. These machines are used as preliminary separators to keep the free iron from being ground finer and overloading the machines throughout the mill. The two machines pick iron from 16-mesh to through 2 in. in size and throw off from 20 to 30 tons per hr., which is sent directly to the concentrate shipping bin. The concentrates analyze from 60 to 63% iron and 9% silicon.



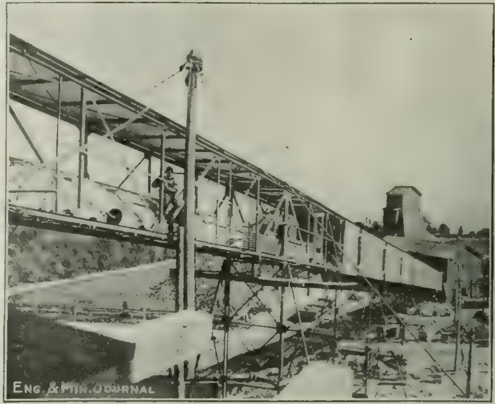
BELT SEPARATOR IN TWO BANKS WITH CONCENTRATES AND TAILINGS CONVEYORS



MILL INTERIOR SHOWING CONCRETE PILLARS AND STEEL FLOOR BEAMS

The drum machines are simply cylindrical brass drums with a rubber-covered protecting face revolving about a stationary yoke to which the magnets, sixteen in number, are attached. The magnets are connected eight in series and two in parallel in each series which gives a sifting movement to the ore in passing over the drum, tending to drop the middlings and tailings from the richer ore. A division board is set in such a manner that a suitable separation is made and the yoke is placed so that the concentrates are lifted above the division board and as they pass from the influence of the magnets fall to one side, while the middlings fall on the opposite side of the board.

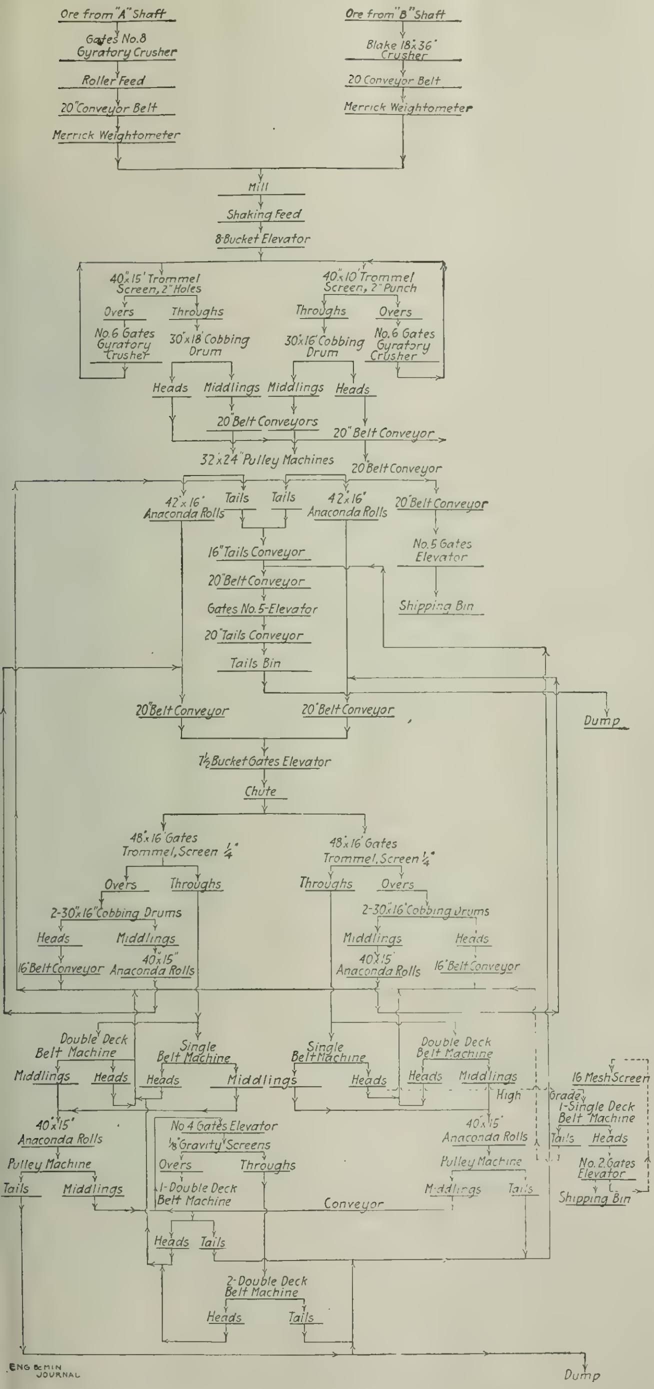
Considerable range in the grade of concentrates is made by raising or lowering the current through the magnets, four amperes being used on these machines at the head end of the mill and seven amperes on similar machines in the further course of separation.



CONVEYOR HOUSE FROM "B" SHAFT TO MILL

### PULLEY MACHINES

The middlings or rejects from these machines drop through a chute to a 20-in. conveyor belt, the head pulley of which is an electro-magnet of the pulley-machine type. This also is a drum with an inside yoke to which are fastened 24 magnets, but these, instead of being stationary, revolve with the shaft. These machines carry 25 amp. and are run at 50 r.p.m., giving a belt speed of about 319 ft. per min. They make tailings of a 2-in. size, which run about 8% in iron; it proves economical to throw out this material before it reaches the rolls. The middlings from these machines are held on the magnets until the conveyor belt pulls them from their influence; it then drops them into two sets of 42x16-in. spring rolls, where they are crushed to 1 in. and less.



FLOW SHEET OF WITHERBEE-SHERMAN NO. 3 MILL

The product from the rolls is conveyed to No. 2 elevator, which uses 24-in. buckets, bolted to a 26-in. eight-ply belt. This, like the first elevator, is 61 ft. center to center of head and tail pulleys, and is also inclined 71°. This elevator has a belt speed of 230 ft. per min., and a capacity of 330 tons per hr. From the elevator, the feed passes into two 40-in. by 16-ft. trommel screens of ⅜-in. punched-steel plate, 1-in. perforations, circumscribed with jackets of 3/16-in. punched-steel plate, having ⅛-in. perforations. The oversize from the 1-in. screen passes through a chute to two 40x15-in. rolls, crushing to ¼ in. and runs from these back to the No. 2 elevator.

The product through 1 in. passes over cobber drums, four in number, similar to those described above but carrying seven amperes on the magnets. The concentrates pass to the shipping bin with the concentrates from the two cobber drums at the head end of the mill; the rejects pass through the two sets of 40x15-in. rolls handling the oversize from the 1-in. screen; the oversize from the ¼-in. jackets joins the throughs from the 1-in. screen and passes over the cobbers. The throughs from the ¼-in. dust jackets furnish the feed for the first belt machines in the mill, this feed running from about ⅛ in. maximum size down to through 16-mesh.

### THE BELT MACHINES

The belt machines are built double on 5x5-in. Georgia-pine frames one machine above the other; each consisting of a 26-in. feed roll, 10 in. in diameter, running at 20 r.p.m., delivering to a feed belt, 26 in. wide, running at 196 ft. per min. Directly over the feed belt is the take-off belt of the same width as the feed belt, but running at 361 ft. per min. The magnets, 12 in number, are suspended between the advance and return of the take-off belts and carry from 5 to 10 amp., according to the quality of concentrates desired. They are connected so that six magnets are positive and six are negative poles, or every other pole is negative, giving a sifting action to the particles as they fly up from the feed belt to the take-off belt and thus separating the middlings from the pure ore. The belts are simply two short nontroughing conveyor belts 26 in. wide and about 1 ft. long. The tails from the first six of these belt machines are sent through two 40x15-in. choke-feed spring rolls and ground to ⅛ in. and under, elevated and passed over a

⅛-in. gravity screen, the throughs being treated by four belt machines, the overs by two belt machines. The tailings go directly to the tailings pile and the concentrates to the shipping bin.

### Summarized Equipment and Power

The total crushing equipment is one Blake jaw crusher 18x36 in., one No. 8 gyratory, two No. 6 gyratories, two sets of 42x16-in. rolls and four sets of 40x15-in. rolls. The separating equipment is six Ball & Norton single-drum machines, four Norton pulley machines and 12 Ball & Norton belt machines.

The power is belt-and-shaft transmitted from two 150-hp. alternating-current motors; the direct current for separators and lights is obtained from a 50-hp. motor-generator set. The drives are so laid out that one side of the mill may be run independently of the other. A glance at the accompanying flow sheet will give a good idea of the layout of the machinery.

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## Copper Leaching

We have mentioned several times, the great interest at present exhibited in the hydrometallurgy of copper and the large amount of experimental work that is going on. Some of this has, indeed, advanced so far that constructions of commercial plants are in progress. This article is intended to be merely a catalog, probably incomplete, of what is being done.

*Arizona Copper Co.*—This company has, for many years, used a leaching process, consisting of sulphuric-acid lixiviation and precipitation by scrap iron, for the treatment of some of its ore. Experiments on the treatment of the slime from the concentrating mills are now being conducted. Nothing has yet been published respecting their nature. The important feature in the old process is understood to be precipitation from neutral solution.

*Anaconda*—Frederick Laist, superintendent of the Washoe works, has developed a process, which is now being tried out in a plant of 80-tons daily capacity.

The plant consists of a 20-ft. MacDougal roaster; two leaching tanks, 32 ft. in diameter, by 12 ft. deep, and the necessary auxiliary apparatus. The process, designed chiefly to treat tailings, roasts the ore, after which 1% of salt is added and a chloridizing roast given.

Leaching will be done with sulphuric acid, to be made eventually from the roast gases. Precipitation at first will be on scrap iron, but experiments will also be conducted with iron sponge, produced by the reduction of iron ore, and with electrolytic and hydrogen-sulphide precipitation.

*Braden*—The concentrates are roasted in such a manner as to eliminate practically all the sulphur and at the same time oxidize all iron to the ferric state. The roasted product is then leached with dilute sulphuric acid in two stages—a neutralizing leaching, and an acid leaching. The solution from the neutralizing leaching is electrolized directly, and that from the acid solution is neutralized by the following batch of calcines. The development of this process, and also the Chuquicamata process (to be referred to subsequently) has been done under the direction of E. A. Cappelen Smith.

*Bradley*—Charles S. Bradley, backed by A. C. Burrage and Thomas W. Lawson, erected a plant at Anaconda, Mont., to treat the slime from the Washoe concentrator by the ingenious Bradley process, which consists in sulphate-roasting, leaching with calcium-chloride solution, and precipitation of copper from chloride solution by means of calcium oxide, regenerating calcium chloride which is used as lixiviant. When tried at Bayonne, N. J., this process is said to have worked well, but at Anaconda difficulties were experienced, and after a large sum of money had been expended and only a few hundred tons of ore had been treated the plant was closed. However, Mr. Bradley has great confidence in his process and hopes to resume work at Anaconda.

*Butte & Duluth*—This company has a deposit of decomposed granite mineralized with oxidized copper, close to Butte, Mont. The ore is being leached with dilute sulphuric acid and copper deposited from the solution by electrolysis in the main, but foul solutions are switched off for precipitation by means of scrap iron. The plant is of something like 100 tons daily capacity and is being run on commercial basis. Its arrangements are rather crude, but the ore appears to give a fairly good extraction even when leached in relatively coarse condition in V-shaped vats. According to newspaper reports the capacity of the plant is to be increased.

*Bullwhacker*—This company, at Butte, has ore similar to that of the Butte & Duluth company, and is treating it in a similar way. This also is a commercial plant, operating on a small scale.

*Chuquicamata*—The ore is a brochantite ore, crushed to from ¼- to ½-in. mesh, leaching with dilute sulphuric acid in large open tanks, draining the leached solution, electrolyzing with insoluble anodes, and returning the electrolyzed solution for further leaching. Owing to the $SO_3$ in the brochantite, there is a gain in sulphuric acid in the process.

*Copper Queen*—Experimental work is being conducted at Douglas, Ariz., by G. D. Van Arsdale, on the treatment of the low-grade porphyry ore of the Copper Queen mines. He roasts the ore, leaches with dilute sulphuric acid, and electrolyzes the copper solution, injecting sulphurous acid into the electrolyte for its regeneration and for reduction of the electric energy required.

*Cornelia*—The Calumet & Arizona company recently acquired the Cornelia mine, in the Ajo Mountains, southwestern Arizona, which has a large body of oxidized ore. Stuart R. Croasdale and Utley Wedge, inventor of the Wedge furnace, are conducting experiments. They are said to mix some pyrites with the ore, roast, leach with sulphuric acid and electrolyze the solution. It is reported that a plant of 250 tons daily capacity is shortly to be erected. The present idea seems to be to precipitate with iron.

*Henderson*—The Pennsylvania Salt Manufacturing Co., at its works at Greenwich Point (Philadelphia), and at Natrona (near Pittsburgh), for upward of a quarter of a century has been treating Rio Tinto pyrites by the beautiful Henderson process. This process is especially adapted for the extraction of copper from burned pyrites. It is minutely described in "The Mineral Industry," Vols VIII and IX. The process remains practically unchanged today, except that Wedge muffle furnaces have been substituted for the old straight-line, hand-rabbled furnaces and the single-hearth, circular, mechanical furnace. The Wedge furnace is, of course, a substantial improvement. Both at Greenwich Point and at Natrona the copper is precipitated by means of scrap iron. The cement copper is shipped to electrolytic refiners.

*Inspiration*—Professors Duncan and Bacon, of the University of Pittsburgh, are conducting experiments for this company, which has ore of character similar to that of the Keystone mine, which has part of the same orebody. The nature of their experiments has not yet been disclosed.

*Keystone*—At Miami, Ariz., R. C. Canby is working with an experimental plant of about 20 tons daily capacity on the mixed sulphide-carbonate ore of the Keystone mine. The main lines of his work are similar to those of Mr. Van Arsdale, at Douglas.

*Shannon*—J. W. Bennie, the manager of this company, at Clifton, Ariz., has been working upon a leaching process for a couple of years or more, assisted by F. S. Schimerka. The process consists in roasting the oxidized ores, which are extremely basic, with pyrite, in order to sulphatize the copper. The spent liquor from the precipitation plant is also poured over the roast heap to assist in this. The leaching is by water and the copper precipitated from solution on scrap iron.

*Snowstorm*—This company, near Mullan, Idaho, for several years (about 1907 and later) operated a leaching mill for the treatment of some of its ores. Extraction of copper was effected by sulphuric acid and precipitation by means of scrap iron. Lately the plant has been idle.

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## Rhyolite and Virginia

A writer in the *Saturday Evening Post* tells some reminiscences that are more true to life than such contributions usually are: Here are some excerpts: When the bottom dropped out of the market the bottom dropped out of the banks too. And there was another reason: the country, in the language of a wise old desert-rat friend of mine, was "ripe for a trimming."

"They been a-flyin' too high, doc," said he. "They're due to come down; so get from under. The stuff ain't in the ground, I tell you; and when the old high-grade ain't in the bowels of the earth you can't pump it in with hot air or shoot it in with printer's ink. Play her for a bust, doc. This country is ripe for a trimming!"

The bubble, having reached its limit, did not explode at once; it began to dwindle in size and lose its bright coloring. Then the ingrown and incurable optimism of the inhabitants asserted itself.

"A bank or two has failed," said they; "why sure! What of that? Don't banks fail everywhere? This is nothing but a temporary setback—a slight depression. It'll be all right in a few days."

Rhyolite, they announced with a great deal of heat, was going to be another Tonopah—yes, even greater than Tonopah—and all the power of earth and air could not stop her. The slight depression they mentioned might resemble the bottomless pit to an outsider; but the darker the outlook the louder rose the boosting chorus. If expressions of confidence could have saved the camp it would have been saved a thousand times over. Those men were so thoroughly impregnated with the boosting spirit that they could not or would not recognize disaster.

About this time there rose a loud noise to the north of us. The camp of Rawhide was celebrating the first flush—we called it the fourflush—of its boom. The gamblers packed their paraphernalia and left us—and that was a bad sign, for the professional gambler always follows the money center.

Little by little the population of Rhyolite began to slip away. Men would not admit they were leaving the camp. They said they wanted to see what was doing at Rawhide—they made all sorts of excuses; but they did not come back.

I had some business that took me north and on the way I stopped at Rawhide. There were the same frame buildings, the same tents, the same crowds in the street, the same gamblers, the same brokers' offices, and the same blind eagerness to invest in anything that bore the name of a mine—it was Rhyolite in 1906 all over again.

The next day I reached Virginia City, and there I saw the other side of the picture. Virginia, as they call it in Nevada, was once the greatest silver camp the world has ever known. Out of the miles of workings underneath her steep streets came the millions that saved the credit of the nation during the Civil War. Dozens of the large fortunes of the present day were founded on the Comstock Lode.

The silver kings of the '60s built their city as if for all time, hauling in the materials by mule train. I was directed to a hotel; but there was no clerk behind the desk, no bellboy to take my satchel. I found myself alone in a spacious lobby where the furniture was hand-carved walnut or mahogany. The mirrors in their heavy frames reached halfway to the frescoed ceiling, from which hung tarnished chandeliers.

Everything about the place was massive, old-fashioned, and eloquent of the days when money was the commonest thing on the slope of Mount Davidson.

I was lost in the midst of this dusty magnificence until I heard a tapping, which seemed to proceed from the hotel office. At first I thought a woodpecker had taken possession of the premises; but on investigation I discovered an aged cobbler, who had turned the office into a shop. He was mending miners' boots, and the tap-tap-tap of his hammer rang hollowly in that lonesome place.

The cobbler pushed back his glasses and blinked at me curiously.

"Is it safe to leave my satchel here?" I asked.

"Safe enough," he said. "Nobody comes round here much. Jim will be back pretty soon and he'll take care of you."

The atmosphere of a vanished generation was depressing; so I went out and walked through the streets. On all sides were boarded windows, locked doors and dust-covered steps. It reminded me of Fifth Avenue in New York in the summertime; but I knew as I looked that the men who had locked these doors would not return for the winter—or any other season.

At dusk I came on three old men sitting on the edge of the sidewalk.

"How does the camp look?" I asked.

"Well," said one old fellow, "she's picking up a little—yes, sir, she shore is! Been pretty quiet for a long spell, but she'll get over that—give her time. She's picking up some—ain't she, boys?"

Thus appealed to, the others wagged their gray heads and nodded assent.

"She was a humdinger once!" said the spokesman. "Yes, sir; she was a looloo bird with a long tail, and she will be again when silver gets back to the right mark. If Dick Bland had lived—Well, she's picking up right along anyhow."

So there I found it again—the hopeless, ingrown optimism of the mining country, where no depression is more than temporary and no decline is cureless.

I went back to the hotel and was guided upstairs by a decrepit Chinaman, who seemed childishly pleased to see a strange face. Perhaps that was why he asked me only a dollar for the use of a suite of rooms that, judging from the richness of their fittings, must have been reserved for bridal couples or the princes of the silver age.

I looked at the big four-poster bed, the marble-topped tables, and the thick, faded Brussels carpet. Surely here was the permanent camp if ever there was one; and there came to me a realization that stone and solid timbers do not make prosperity—nor can they hold it once it begins to slip away. The soul of Virginia City had been the men in it—and they were gone.

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## Wages in the Michigan Copper District

The following table of wages paid in the Michigan copper country was made up by the strike investigating committee from the payrolls of the various mines:

SHIFTS WORKED AND EARNINGS OF MINERS AND TRAMMERS AT COPPER COUNTRY MINES, JAN. 1 TO JUNE 30, 1913

| | Miners | | | Trammers | | |
|---|---|---|---|---|---|---|
| Mine | Days | Amount | Av. Wages | Days | Amount | Av. Wages |
| A | 19,447 | $69,224.78 | $3.56 | 17,769 | $50,581.02 | $2.85 |
| B | 13,473 | 48,533.81 | 3.60 | 15,844 | 43,208.28 | 2.73 |
| C | 33,367 | 115,380.62 | 3.46 | 29,029 | 92,001.39 | 3.17 |
| D | 72,241 | 264,984.87 | 3.67 | 52,790 | 153,216.35 | 2.90 |
| E | 1,450 | 4,639.94 | 3.20 | 1,045 | 2,610.98 | 2.50 |
| F | 4,767 | 16,615.39 | 3.49 | 4,504 | 12,181.10 | 2.70 |
| G | 367 | 933.53 | 2.54 | 169 | 429.01 | 2.54 |
| H | 30,059 | 94,003.75 | 3.13 | 20,099 | 51,394.70 | 2.57 |
| I | 106 | 425.10 | 3.98 | 237 | 582.72 | 2.46 |
| J | 873 | 2,846.42 | 3.26 | 238 | 587.94 | 2.46 |
| K | 17,104 | 61,319.73 | 3.59 | 20,311 | 51,645.06 | 2.54 |
| L | 12,032 | 36,420.82 | 3.03 | 13,403 | 34,095.84 | 2.54 |
| M | 11,502 | 39,520.34 | 3.44 | 10,924 | 27,762.13 | 2.54 |
| N | 1,692 | 5,773.81 | 3.42 | 665 | 1,539.23 | 2.31 |
| O | 6,701 | 23,798.71 | 3.55 | 4,642 | 14,564.15 | 3.14 |
| P | 17,417 | 58,617.22 | 3.37 | 14,692 | 40,614.45 | 2.76 |
| Q | 886 | 4,549.13 | 5.13 | 1,514 | 3,818.44 | 2.52 |
| R | 39,591 | 115,881.59 | 2.93 | 19,337 | 44,580.55 | 2.31 |
| S | 52,129 | 151,623.65 | 2.91 | 21,643 | 49,932.45 | 2.31 |
| T | 26,298 | 77,140.80 | 2.93 | 11,041 | 25,617.35 | 2.32 |
| U | 16,139 | 44,629.67 | 2.77 | 10,558 | 23,690.84 | 2.24 |
| V | 6,843 | 19,890.40 | 2.91 | 3,761 | 8,544.00 | 2.27 |
| W | 1,150 | 3,574.00 | 3.11 | 1,213 | 2,807.91 | 2.31 |
| X | 35,779 | 108,981.59 | 3.05 | 24,653 | 62,770.28 | 2.55 |
| Y | 1,796 | 5,088.55 | 2.83 | 618 | 1,458.90 | 2.36 |
| Z | 89,508 | 270,825.03 | 3.03 | 30,400 | 76,211.25 | 2.51 |
| AA | 14,072 | 43,869.77 | 3.12 | 13,709 | 32,694.05 | 2.38 |
| BB | 15,064 | 46,688.05 | 3.10 | 14,391 | 35,769.00 | 2.49 |
| Total | 541,860 | $1,735,786.07 | 3.20 | 359,210 | $944,909.38 | $2.63 |

The conditions under which trammers work in the various mines differ greatly. In some mines where a large amount of rock is to be taken out from one level, it has been possible to install electric tramming, which means that the work of the trammer consists in loading the cars, which are then hauled to the shaft by electric motors. In other mines, where only a limited amount of rock is taken out at each level, it has been impracticable to establish power tramming and the cars are pushed to the shaft by the trammers. The problem of lightening the work of loading and pushing tram cars has been one that has caused considerable trouble. The average car trammed by two men holds 2½ tons of rock. The distance which it is required that trammers push the car varies, at different levels in the various mines, from 50 ft. to distances of 1500 or 1600 ft. The cars are of various types and trammers can be found who insist that each particular kind of car is the best. All the cars run on steel rails and the levels and the tracks are graded with a down grade toward the shaft in favor of the loaded car. The tonnage of cars required to be taken out by men who work on day's pay varies with the varying conditions and the distance to be trammed.

Loading conditions also vary. In some cases the tram cars are loaded by shoveling from the floor of the drift, in some places they are loaded from chutes, and wherever possible a loading platform or sollar is constructed level with the top of the car so that the work of loading is minimized. In some instances the men push the cars a short distance, from which point the cars are hauled by electric or cable haulage. The tramming is done in many cases by contract and a comparison of the pay made by trammers working on day's pay with those working on contract shows that contract trammers make by far the biggest wages. At the same time they accomplish more work, and it has been found that the contract trammer who makes the biggest pay is also the best man for the operator. Contract trammers in the mines from which the committee has been able to obtain statistics tram on an average of 21 tons, while trammers working on company account or day's pay average from 12 to 14 tons.

In the Calumet & Hecla mine and its subsidiaries contract tramming is encouraged, as it is claimed that it results in higher wages, cheaper tramming and a much better class of trammers. As an illustration, at the Calumet & Hecla amygdaloid mine, where the tramming is entirely done by contract, the trammers' wages for the month of June, 1913, averaged $3.34 per shift as compared to $2.56 paid to trammers on day's pay.

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## Charters Towers Deep Sinking

The application of Thomas Mills, of Charters Towers, Queensland, for a subsidy of £60,000, to sink a shaft 4000 ft. on Charters Towers, has had the consideration of the government, and the following board has been appointed to conduct an investigation and make a report on the proposal; John G. Linedale, warden, Charters Towers (chairman); W. H. Rands, consulting geologist to the Queensland government; and C. F. V. Jackson, chief inspector of mines. The board has been appointed to inquire into and report upon: (1) The proposal of Thomas Mills to sink 4000 ft. for the purpose of thoroughly exploring deep ground, carrying on the development on lodes, and making connections with Mills' United, Brilliant Deeps and other mines. (2) The probable cost of the shaft, equipment, exploration and connections of the undertaking. (3) The appropriateness of the method proposed. (4) The capital which would ensure completion of the proposal. (5) The probability of obtaining payable ore in sufficient quantities to yield a reward commensurate to the cost. (6) The advantages likely to be gained from (a) improved ventilation; (b) profitable working of large bodies of ore now unpayable; (c) more economic handling of heavy water, and (d) opening up a large tract of new country. (7) The probable date of completion of the various stages of the proposed work, and the time likely to elapse before the other mines will derive the advantages expected to result.

There is reason to hope that much of the old glory of Charters Towers as one of the gold-mining centers of the world will be revived.

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**That Graphite Does Not Precipitate Gold from** cyanide solution has been proved by Morris Green. "Trans. I. M. M.," 109, 1913. On the contrary, it accelerates dissolution.

# Zinc Smelting in the Electric Furnace

By Woolsey McA. Johnson*

*SYNOPSIS—A discussion of the differences between electric zinc smelting and the present fire-smelting process, and also between electric-furnace slags and slags made in the ordinary retorts. Emphasis is placed on commercial points of electric-furnace superiority. Attention is given to both the scientific and the practical aspect of the subject.*

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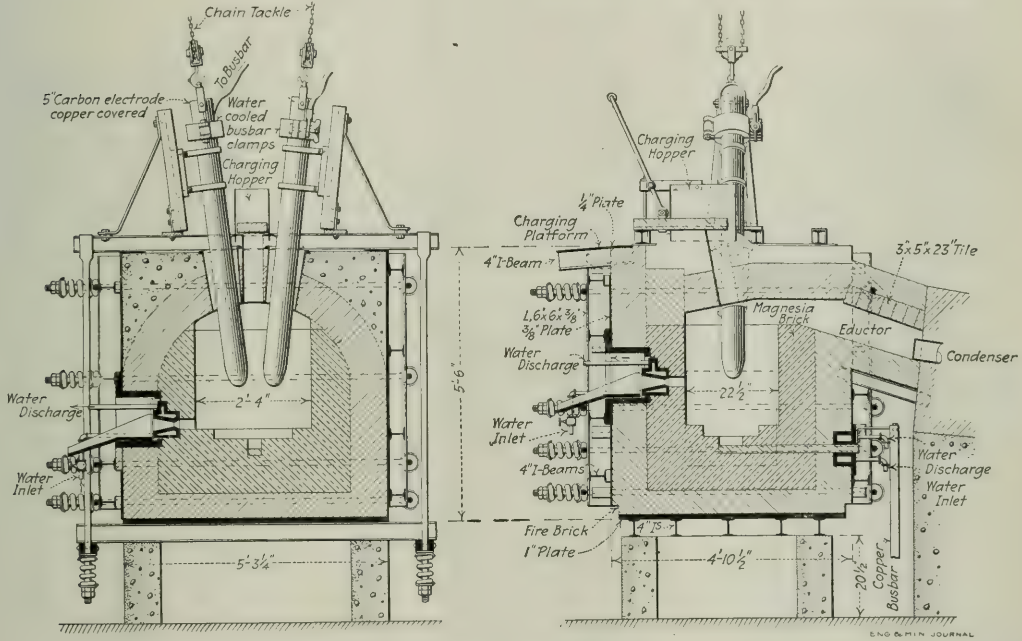
The Johnson electric zinc furnace produces in one operation spelter, a fusible slag, copper matte and base-lead-bullion, whereas the retort plant produces spelter and an infusible residue or clinker. For success the Johnson furnace must produce a slag of maximum fluidity, but the retort furnace must produce a residue of maximum infusibility. Electric-furnace methods, when the use of electric current is properly understood, allow of any temperature or of any possible desired chemical condition.



Johnson Continuous Electric Zinc Furnace

In the retort process any slag-making material is a bugbear. When I was metallurgist of the Lanyon Zinc Co., I used to divide the ores into two mixes, one "acid" and one "basic." I had the coals used for reducing materials analyzed so as to see that no coal with a fusible ash came into the works, as I did not care to have my retorts "gummed up."

At the Hartford demonstrating plant of the Continuous Zinc Furnace Co. we have turned from the retort plant and are moving in a metallurgical direction as far away as is the West from the East. The Continuous Zinc Furnace Co. mixes so as to make a slag as liquid as water. Instead of decrying lime in the ore, it desires lime in the zinc ores. Instead of penalizing iron in the ore, it needs iron in the ore. Instead of refusing to purchase ore with fluorspar in it, it wants fluorspar in zinc ore, for often it purchases gravel fluorspar to add to its zinc mix. Slag is not a bugbear, but a welcome friend to our process.

### Electric Smelting Allows Wide Slag Variation

In the electric steel furnace, the slag plays a different commercial role. This is a refining process. The Johnson process is a smelting process. The Heroult furnace is intermittent. The Johnson furnace is continuous. In the Heroult furnace, aided by three powerful 500-kw. arcs, they smelt a slag containing from 60% to 70% lime. This is so high in lime as to wash the steel practically free from sulphur and phosphorous. This high lime slag would not be possible to melt commercially save in an electric furnace. In the work in California, Norway and Sweden in iron-ore smelting, we see that the metallurgist can use a wide range of slags at his will, some high in lime, some high in magnesia, some high in silica.

If one will examine electric-furnace methods such as used by the General Electric Co., or at Niagara Falls, one will be amazed at the potentialities. One will see definitely that any slag desired can be made; that it is not a question of chemistry but of business. We can make any slag we wish. What slag will make us the most money? This is all especially true of making ferrovanadium, ferrochrome, ferromanganese and ferrosilicon in the electric furnace.

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*Continuous Zinc Furnace Co., Hartford, Conn.

### Limits of Zinc Slags

In the Hartford electric zinc furnace there has been made a variety of slags. These slags are all tested in the Johnson slag tester for fluidity.[1]. The adjustment of electrodes as to slope, height, voltage, amperage, and the feeding of the charge all are a matter of careful science and practical metallurgy. I know that it is possible to reduce the percentage of zinc in the slag and to hold it there, or to raise it up again.

We have made and tested practically, say on one ton or more, or less, about one hundred different slags. These have had a wide range of analyses. Our laboratory and furnace records show a maximum and minimum.

| | Maximum | Minimum |
|---|---|---|
| $SiO_2$ | 58.0% | 18.2% |
| CaO | 36.5% | 3.5% |
| MgO | 13.5 | 1.0 |
| FeO | 33.3 | 3.3 |
| Zn | 24.0 | 0.9 |
| $Al_2O_3$ | 19.1 | 5.9 |

We even made one slag containing 6% chlorine.

We can "knock out" the last percentages or traces of zinc if we please. The point is, "Will it pay to do it?" It is impossible to knock out the last traces of zinc in a retort furnace for the retorts would be butchered if this were attempted. In a retort plant, it is impossible to squeeze out the last part of the zinc so as to give a high recovery without spoiling the furnace.

In the Hartford furnace, affairs are quite different, for with the help from some of the best known metallurgists in the world, we have a lining and a furnace that, in my opinion, will stand any slag at a temperature of 3300° F., under the conditions peculiar to our operation. We operate our furnace at a temperature range of from 2300 to 2500° F.

The Continuous Zinc Furnace Co. is now building its latest electric zinc furnace for making in one operation spelter, slag, copper, matte, and lead-base bullion, the last two mentioned carrying the gold and silver contained, of a minimum capacity of three tons of roasted ore per 24 hours and a maximum capacity of five tons of roasted ore per 24 hours. It plans to build later a furnace of much larger capacity, say of 25 tons of roasted ore per 24 hours.

Suppose we treat in this a low-grade ore containing 28% zinc and make 40% slag. It is estimated that it will cost 70c. to tap the furnace with a modern water-cooled bronze slag monkey and that we will tap slag twice every 24 hours. This cost with amount of other charges will be about as follows:

COST OF GETTING SLAG FROM FURNACE TO DUMP PER TON ROASTED ORE

| | |
|---|---|
| 5-ton furnace, 2 tons slag | $0.40 |
| 10-ton furnace, 4 tons slag | 0.30 |
| 25-ton furnace, 10 tons slag | 0.25 |
| 50-ton furnace, 20 tons slag | 0.22 |

In a retort furnace handling eight tons of roasted ore, the cost of removing residues is about as follows, a blow-out man, a bumper and a chiseler being needed. (As these all work together, it is hard to make an accurate distribution of costs, but the following is substantially accurate.)

RENEWAL OF RETORT RESIDUES, RETORTS TO DUMP

| | |
|---|---|
| Three-men days @ $2.00 | $6.00 |
| Cleaning residues out of cellars...... | 2.25 |
| Total cost | $8.25 |
| Cost per ton of roasted ore | 1.03 |

A careful estimate of losses contained in the residues of a retort plant per ton of roasted ore gives 60 lb. zinc. This is based on residues analyzing 5% zinc and on residues amounting to 60% of weight of roasted ore, which, with spelter at 5c. per lb. equals $3.

Commercial slags in the Johnson process have a probable maximum zinc percentage of 3%, and probable minimum value of 1% Zn with a probable average of 2% Zn. Making slag weighing 40% of weight of roasted ore we have a zinc loss in slag per ton of roasted ore of 16 lb., or a money loss of 80c., with spelter at 5 cents.

### Electric Smelting Greatly Reduces Reduction Fuel

Another advantage in the continuous zinc process is the decreased amount of coal used. In the continuous zinc furnace making spelter, slag, copper matte and lead base-bullion in one operation, only enough carbon is added to reduce properly the oxides desired to be reduced. In the retorting operation making spelter and residues a large excess is usually added. A retort plant uses 60% coal, coke, anthracite or soft coal. Enough has to be added to furnish sufficient carbon to make the charge active and at the end of the intermittent operation to hold up the fusible impurities so that "pots will blow out clean." The Hartford demonstrating plant uses 15% soft coal. Assuming the cost of coal to be the same in each process, $3 per short ton:

60% coal at $3 is $1.80
15% coal at $3 is 0.45

In a slagging operation the production of copper matte and base lead bullion is at once unavoidable and desirable. This gives the plant having a continuous electric zinc furnace two important byproducts directly salable to a lead-ore smelting plant or to a copper-ore smelting plant.

J. E. Johnson, Jr., consulting engineer and metallurgist, visited our plant during a run. In a report, among other things, he said: "The feature which impressed me most in connection with this plant was the absolute control under which it ran and the extreme steadiness of operation and freedom from interruption of all kinds.

"My understanding is that the presence of zinc in lead or copper ores is a serious detriment to their successful smelting, and that the presence of zinc is penalized by the buyers of such ores; also, that the presence of lead, copper, iron and lime are highly objectionable in zinc ores for use in a standard retort process.

"The working of the furnace when I was there convinced me that there was no technical difficulty in producing spelter and, simultaneously, slag, matte and metallic lead, which could be tapped from the hearth of the furnace as desired. This matter, like all other industrial matters, is purely a commercial one, and it would seem to me not difficult to demonstrate by tests that ores now useless or of low value on account of their complex nature can be so handled in your continuous electric furnace as to recover a large part of the value of all ingredients, thus giving you virtually the sum of their metallic values rather than the difference of the same, as is customary with present smelting methods."

This gives the point of difference exactly. In a properly developed electric zinc furnace, it is metallurgical addition, not subtraction.

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[1] "Electrochem. and Met. Ind." Vol. IV, p. 262

Another point in the favor of slagging against the dry-residue proposition of the retort is that it takes less heat because of the fact that the final temperature is less and because the quantity of material to be heated is much less.

A rather remarkable feature is the phenomenonally low percentage of copper, silver, lead and gold in the Hartford slags. Analyses have been checked by chemists of three large metallurgical companies, the General Electric Co. and the Massachusetts Institute of Technology.

Slag analyzing as low as 0.01% copper, 0.005% lead, 0.05 oz. silver per short ton are not uncommon. In fact, they have been so low that a report copper "trace," lead, "none," has been made several times.

From June 1 to 30, 1913, 16.9 short tons of slag were made. An average (not, however, a weighted average) sample analyzed by us, gave Cu, 0.065%, electrolytic assay on 5-gram sample; Pb, 0.05%, wet assay on 5-gram sample; Zn, 5.25%; Ag, 0.50 oz. per short ton on 2 a.t. sample; Au, 0.01 oz. per short ton on 1 a.t. sample.

This includes several taps in which poor settling occurred.

It can, therefore, be concluded that the Johnson electric zinc-furnace losses in values of copper, lead, gold and silver passing off into slag will be less than in lead-smelting plants and much less than the 15% to 25% in the combined treatment or thereabouts in a retort plant.

It is, therefore, believed that in the respect of making a slag instead of a residue the zinc furnace has many points of advantage. Those that are directly seen are as follows:

| | | |
|---|---|---|
| Removing residue | $1.03 | |
| Removing slag | 0.30 | |
| Saving | $0.73 | $0.73 |
| Zinc loss in retort plant | $3.00 | |
| Zinc loss in electric plant | 0.80 | |
| | $2.20 | 2.20 |
| Coal in retort plant | $1.80 | |
| Electric smelting | 0.45 | |
| | $1.35 | 1.35 |
| Total net differential advantage in slagging over retorting per ton of roasted ore | | $4.28 |

The increased saving of byproduct values such as gold, silver, copper and lead is greater than the above, but the indicated saving of $4.38 through specific advantages of electric zinc smelting is attractively large.

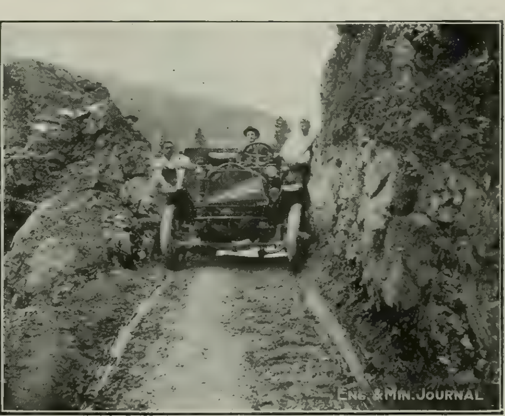
# Reopening the Almeda Mine, Oregon

Special Correspondence

The Almeda mine is situated in the Siskiyou Mountains, Josephine County, Oregon. It is quite near the Rogue River, one of the famous streams of Oregon, and has been for some years deserted as it had seemed impossible to operate it with any profit.

The mine has lately been examined by John Ross, Jr., who reported favorably as regards quantity and quality of ore, and believed that if transportation problems could be solved the mine could be worked at a profit. It is 17 miles from Merlin, the nearest railroad station, over a country which has extremely poor roads, when they can be dignified by even that name. Freighting charges amounted to $10 per ton from mine to railroad, and the inefficiency of such transportation would not permit of a large enough mine output to operate at a profit.

Motor Truck Crossing Rogue River



Stuck in the Rocks at Windy Gap

A truck manufacturer was consulted, and a transportation expert made a report which was so satisfactory that one 5-ton truck was sent to Merlin by rail, whence it was to haul coke and supplies to Almeda, and return with matte from Almeda to Merlin. The difficulties of the truck in going over this practically untraveled road were numerous. One bridge flattened out with it altogether, but the truck succeeded in climbing out on the other side without any serious trouble.

In crossing the Rogue River, the bridge for transportation not having been completed, the truck was compelled to cross on an old ferry boat, which it succeeded in doing without mishap. The most difficult point to pass was Windy Gap, where the roads passed through a rock cut which was very narrow, in fact, just too narrow to allow the truck to go through. As the path is on top of an eminence, a running start was taken to help the machine through, but it stuck in the rocks, and some work had to be done on the side to allow its passage.

It is claimed that the problem of profit and loss has been solved by the use of motor trucks between Merlin and Almeda, and that a large force of them will be put to work. Meanwhile work is going on full force at the mine, where the smelting plant is already installed.

## New Mine & Metallurgical Construction

*Magma Copper Co.*, Superior, Ariz., will build a 150-ton concentrator.

*International Smelting & Refining Co.*, 42 Broadway, New York, is breaking ground for a smelting plant in the Globe-Miami district, Arizona.

*North Fork Mine*, Forest City, Calif., will build a 20-stamp mill early in the spring.

*Golden Center of Grass Valley Mining Co.*, Grass Valley, Calif., is building a 10-stamp mill.

*Midas Mine*, Harrison Gulch, Calif., is building a 100-ton cyanide plant to treat current and accumulated tailings.

*Field Smelting Plant*, Redding, Calif., has installed a three-table roasting furnace, for experimental and demonstration purposes of the Field method of treating fume.

*London Mine*, Central City, Colo., has completed a mill at Twelve Mile.

*Abel Guion*, Empire, Colo., is building an amalgamation and concentration mill of 35 to 40 tons capacity.

*Otto Mears and A. R. Wilfley*, Silverton, Colo., are building a 500-ton mill to treat the tailings dump of the old Silver Lake mill.

*Lakeland Phosphate Co.*, Lakeland, Fla., is installing a phosphate mining plant of 100,000 tons annual capacity.

*H. E. M. Mine*, Wallace, Idaho, will be equipped with a 100-ton mill, which will be the first of several units to be built later.

*Lawton Mining Co.*, Lawton, Kan., is building a concentrator.

*John Hall Co.*, Lawton, Kan., has nearly completed a concentrator.

*Larkin Mining Co.*, Lawton, Kan., has a concentrator nearly completed.

*Oakes & Church*, Lawton, Kan., are making preparations for building a concentrator.

*Portland Lead & Zinc Co.*, Joplin, Mo., has recently completed a 400-ton concentrator.

*Athletic Mining Co.*, Webb City, Mo., will rebuild the mill destroyed by fire Sept. 1.

*A. B. C. Mining Co.*, Joplin, Mo., will remove the 200-ton mill, known as the John Jackson mill, to the south shaft on the lease of the A. B. C. Mining Co., which had been completed when a fire destroyed the mill about 500 ft. south of the old millsite.

*Timber Butte Milling Co.*, Butte, Mont., is building a 500-ton zinc concentrator.

*King & Queen Mining Co.*, Keystone, via Superior, Mont., is operating an experimental mill of 75 tons daily capacity; will build a larger mill as soon as water supply arrangements, now underway, are completed.

*Anaconda Copper Mining Co.*, Butte, Mont., is reconstructing the Washoe mill, and will add thereto a slime concentrator, of 2500 tons capacity, at a cost of $650,000; the plant comprises 20 of the 20-deck round tables. The smelting works at Great Falls is being rebuilt.

*Howard Mines Co.*, Goodsprings, Nev., has just completed a 50-ton concentrator.

*Hill City Mining & Development Co.*, Hill City, S. D., will build a gold mill.

*Otho Mine*, Keystone, S. D., is building a 150-ton concentrator.

*Rattlesnake Jack Co.*, Galena, S. D., is building a 50-ton cyanide plant.

*Mount Morgan Gold Mining Co.*, Mount Morgan, Queensland, Australia, will build a 500-ton concentrator and is reconstructing its furnaces for pyrite smelting.

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## Sir George Paish's Views

Sir George Paish, editor of the *Statist*, in an interview with the New York *Sun* on Nov. 11 predicted a reduction in the cost of living, his reasons being as follows:

> The people of the East and West have not had the same degree of good fortune. The big rise in prices a few years ago was a cause of grat good fortune to the farmers, but was not equally beneficial on the whole to other clases of wage earners. The great increase in the cost of living was due to the great rise in the cost of food stuffs, raw textiles and other natural products; so that the prosperity of the farmer meant the detriment of wage earners in industrial lines.
>
> These classes of wage earners are now due for a share of good fortune. A measurable reduction in the cost of living is due. The rise in the cost of living came from the remarkably good credit the world enjoyed in the past ten years and the greatly increased consumption of nations that were able to borrow more than they had ever been able to borrow before. In fact, the world's demand got to a point where it greatly exceeded the supply. That situation has now been modified.
>
> Many countries are experiencing great difficulty in satisfying their need for capital and very little new work is being undertaken anywhere in the world. This means that for a time, at any rate, the demand for goods and the consumption of many countries will be reduced, and there is a probability that the supply of goods will be in excess of the demand. The price of commodities will fall therefore.
>
> How soon this condition of things will become apparent cannot be predicted with certainty, as new demands for capital which must be satisfied may arise. For example, if the Mexican situation were to develop and trouble were to arise between the United States and Mexico large orders would have to be placed, for clothing, munitions of war and other things needed by a great army and a fresh stimulus would be given in this country to trade and consumption.
>
> But, failing such conditions, the restoration of peace in Europe and the economies of young countries which have borrowed so heavily in recent years cannot fail to bring reduced consumption. And reduced consumption will bring in its train lower prices of commodities and reduced cost of living.
>
> As far as this country is concerned such conditions would not be to the disadvantage of the East as much as to the West, as the latter has derived greater benefit in proportion than the former from the rise of prices in the last ten to fifteen years.
>
> Of course the East would in some degree suffer from a reduced demand for manufactured goods, but on the other hand the incomes from interest, services and even from the manufacture of goods would give the East a greater relative consuming power. It is, however, highly improbable that prices will fall to anything like the level they reached in the '90s.
>
> As far as can be seen the reaction in the world's trade will be a moderate one, and the great accumulation of gold which will probably result will soon tend to restore confidence and make for expansion in trade and consumption after a relatively short period of rest and recuperation.

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**Output of Radio-Active Ores** in Colorado is on the increase this year, and it is estimated that a gain of 30% will be made over the output of 1912. In transporting carnotite ore from Paradox Valley mines to Placerville, the shipping point in the San Miguel district, 50 six-horse teams are engaged and returns have been received of $6658 for one carload shipped from the Long Park mine by W. R. Turner. This mine has been purchased by the Colorado Carnotite Co. In Gilpin County, in the Calhoun mine, in Leavenworth gulch, there are large bodies of pitchblende occurring with gold-bearing smelting ores. The shoots are said to be 40 ft. in length, with an average width of 3 ft. and ranging in value from $100 per ton to $600. The German, Wood and Bechter mines in the same district are also producing pitchblende ore, and, as already stated in the "Journal," these last have been purchased by Alfred Dupont, of Wilmington, Del., for philanthropic purposes.

# The Assessment of Mines

*SYNOPSIS—A discussion of the relative merits of valuing a mine for taxation on ore in sight and assumed reserves, or on its annual output. The suggestion that it be on Stock Exchange value is believed to be entirely inequitable.*

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The question arises, how shall we determine the true cash value of various mines so that the values arrived at will be equitable not only to the state, but as between the mines themselves, as we may without doubt dismiss from our minds the solution of the problem that the true cash value can be determined by oracularly standing at the mouth of the shaft and looking down it, as one can stand in the center of a farm and look around its fields, or can stand at the intersection of two streets and see the building on the corner lot.

The result in Arizona is that there are two schools; the first demanding the physical valuation of mines by a careful study of them by a competent engineer or board of engineers. In the case of the porphyry mines this would be relatively simple. One would know the life of the mine to be 15, 20 or 25 years, one could assume an average selling price for copper, the costs are well known, and it could be easily calculated that the mine could produce so much net profit for, say 20 years. Then by the use of actuary tables the present values of all of the annual dividends could be calculated and the sum of them would be the present value of the mine. This has been worked out quite carefully by H. C. Hoover in his classical work, "The Principles of Mining."

If the same engineer should examine one of the vertical mines which was yielding the same annual profit, and could find but two or three years of ore in sight, he would be forced to one of two conclusions; either to fix the present value of this mine, based upon the two or three years' ore in sight, or else to make a guess far into the future, and say that this or that mine in his estimation would last five, 10, 15 or 20 years. This it is impossible to do, and the owner of a mine, if he chose to be technical, could without doubt upset such an assumption as being arbitrary in the extreme.

The other school claims that the value of a mine should be based by taking as the primary facts its annual production, and the profits arising from that production, and that the value of any property in its ultimate analysis really is based upon the profit that it can make. It, therefore, demands that the mines shall be assessed using these figures as a basis. If a mine lasts for five years, then it pays taxes for five years, if it lasts 20 years, then it pays taxes for 20 years, and the state loses nothing by the transaction.

The claim is made that inasmuch as taxes are paid annually the question of valuing a mine for the purpose of taxation is radically different from that of valuing it for the purpose of sale or purchase, or consolidation with other mining properties. It is, of course, assumed that if two mines are to be consolidated, each making the same annual net profit, one of which it is fair to assume has a five-year life, and the other a 10-year life, that the second mine should be given greater value in the consolidation, but for the purpose of taxation the factor of probable life may be omitted because the taxes are not paid in a lump sum in the beginning as would be the purchase price, but are paid year after year.

### Objections to Valuing on Ore in Sight

If the value of the mine were to be based upon the tonnage of ore in sight it would be an incentive to the mine owner to retard his development, which eventually would be a detriment to the state, as unquestionably development ahead in a mine tends to prolong its life, as it carries a man over those periods of poor showings in a mine when he might be tempted to abandon it.

The present mine-valuation law in Arizona, which was passed in the early part of 1913, provides that mines shall be assessed by adding together one-eighth of the gross production for the previous year, four times the net profit for the previous year, and the value of the improvements. This then represents "the full cash value of the mine," and in most cases amounts to about five times the net annual profit. In other words, the mines are put on approximately a 20% basis, of which it may be considered that 10% is income (which is not considered high in Arizona considering interest rates and the risks in mining), and the other 10% is to return the capital invested, because it must be borne in mind that a mine is in a constant state of liquidation from the day that it starts and that when the ore is exhausted the surface plant and reduction works, no matter how much they may have cost, are of no value. Hoover, in his "Principles of Mining," in determining the present value of a mine does not consider the plant or reduction works as one of the factors to be added in. In Arizona this point was seriously discussed, and while a number of the advocates of the second school strenuously held out for a nonassessment of plant, the legislature considered this too radical a change and therefore declined to omit it. Many of the advocates of the latter system would have preferred to have used a greater factor in multiplying the net profit and not have had the plant considered in the assessment. This is a point which should be given careful attention, as it seems unfortunate to penalize the low-grade mine, which of necessity must have a more expensive plant per pound of annual production. Under the present law, the porphyry mines with all of their ore developed are put on practically the same basis as the vertical-vein mines, in which the life is unknown but is surmised to be in many cases as great as that of the porphyry mines. This, therefore, results in the state very likely getting more revenue than it would had the physical method of valuation been decided upon.

### The Finlay System

The advocates of the physical method of valuation lay great stress upon the method developed in Michigan, upon what is known as the "Finlay system." In this case the state tax commission employed J. R. Finlay, of New York, one of the most distinguished mining engineers in America, if not in the English-speaking world, to examine all of the copper and iron mines in Michigan and report to the commission his opinion as to their

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Note—Excerpts from a paper by P. J. Miller, member of the Arizona State Tax Commission, read at the conference of the National Tax Association, at Buffalo, N. Y., Oct. 25, 1913.

value. The time given Mr. Finlay to make this examination and report was short, but he quickly organized a staff of assistants and the results, as a whole, were satisfactory to the commission, though later on cases of inequality developed which the tax commission and the local assessors have been attempting to straighten out.

It should here be borne in mind that the valuation of the mines as determined by Mr. Finlay were by no means the valuations which were placed upon the assessment books of the various counties. The tax commission, for example, might from its study of assessments conclude that one of the counties in the upper peninsula should be assessed at $50,000,000. From the information which it had it might have assumed that the mines were worth $40,000,000 and the other property in the county $10,000,000. It thereupon certified to the county board of supervisors that the county assessment must total $50,000,000. It was then left entirely to the board of supervisors as to how that money should be divided, and if they in their judgment thought that $25,000,000 was enough for the mines, then the balance of the property in the county had to come in for the other $25,000,000. I am informed and believe that practically this state of affairs exists in Houghton County today, this being the county in which the famous Calumet & Hecla mines lie.

In determining the value of the copper mines in Michigan Mr. Finlay had a comparatively simple problem, as all of these mines are comparatively narrow beds, averaging, say 14 ft. wide, and dipping at a regular angle to the northwest. Some of these mines were only 1000 ft. deep, but one of them was at least 8000 ft., measured on the slope, another one was 5000 ft., and several were 3000 ft. The lodes as a whole are pretty uniform, so that after a mine had been worked down 1000 ft. and the relative proportion of pay and poor ground determined, it was easy to assume a life of the mine, estimating that the ultimate depth of the mine would be in the neighborhood of 7000 ft. Taking then an average price of copper, and taking the costs of producing this copper, and figuring in the life of the mine, Mr. Finlay arrived at a certain valuation for the various copper mines of the upper peninsula. He did not have the problem, as in Arizona, of two radically different types of mines, but had a problem which might be considered a compromise between the two, that is, the steeply dipping vein whose future life could be fairly well predicted.

When, however, Mr. Finlay took up the iron mines of the state, he was up against an entirely different problem, for here the ore occurs in most irregularly shaped masses, development in many cases was not carried far ahead, and in my opinion the valuation put by him on the iron mines was too low and against the interests of the state simply for the reason that Mr. Finlay was unable to, and from the nature of things could not, determine the ultimate life of the iron mines, assuming that he was fairly correct in determining the value of the copper mines. Had the value of both the iron and the copper mines in Michigan been based upon the annual profit, I believe that the revenue of the state would have been greater and that a large amount of dissatisfaction would have been avoided.

## Workings of the Michigan Law

The present arrangement in Michigan is almost ludicrous in its results. A ledger is to be kept and an account is to be opened with each mine. It is to be charged up with the new ore developed during the year, and it is to be credited with the ore shipped. An immense amount of office work is to be carried on, a corps of mining engineers is to be employed, and when they get all through they are no better off than if they assessed the mine each year on the basis of what it had produced for the year before.

This is supposed to be an era of conservation, and yet if you will proceed to assess and to tax mineral resources, which in the ordinary demand of the country should not be taken out for 20 years to come, are you not putting a premium on the early exploitation of its natural resources, and are you not inducing the owner to get it out and sacrifice it, rather than to hold it in reserve for a later generation? It is, of course, admitted that we must not deprive ourselves of necessities, or even a moderate amount of luxuries, for the unborn generation, but certainly we do not wish to repeat in our mineral industry what we have done in the past in our timber industry. Along this line of argument it is to be noted that Pennsylvania has made an arrangement by which cut-over lands which are reforested are taxed but a nominal amount until such time as the timber is developed and is ready to be cut and sold.

Whether the percentages adopted in Arizona are sufficiently high, it is not for me to say; in fact, the legislature has made the present law only operative for two years, so that we may have an opportunity of seeing how it works out, and what relation the total assessed value of the mineral industry of the state bears to the agricultural, cattle and other industries.

There is another school which thinks that the value of the various mining stocks, as quoted on the various exchanges of the country, should be the measure of the value of the mine for the purpose of assessment, but it appears evident that these daily quotations of a few hundred or a few thousand shares can be either unduly advanced or depressed by purely local circumstances and by conditions of ownership, and do not reflect the real value of the property. In several cases the names backing a mining company have such a good reputation that stocks which they control are quoted higher, or, in other words, pay lower rates of interest than those of other people. This simply indicates that the investor banks upon their honesty. Therefore, the quotation of a stock covers two things, the value of the mine, and the good name or will of the management.

## Some of the Outside Factors Influencing Mine Value

It is interesting to note that within a few years the question of the valuation of the Franklin Furnace mine in New Jersey was up before the courts. This mine is peculiar, the ore being a complex mixture of iron, manganese and zinc. It was examined by a number of prominent engineers, and if my memory serves me correctly, the value placed upon the property varied all the way from $1,000,000 to $20,000,000. In this case the value of the mine was complicated by the question of the Wetherill magnetic-separation process. Without this process it was claimed that the ore could not be profitably treated, and, therefore, part of the value of the property, together with its magnetic mill, was eventually given to the Wetherill patents.

In the case of the sulphur mines of the Union Sulphur Co., of Louisiana, in which the ore is mined by blowing down superheated steam and compressed air through pipes, it was eventually decided by the court that one-half of the value of the property was in the deposit of sulphur and the other half in the Frasch patent covering this method of extracting it.

These two cases are quoted to show that the stock value of a mining property by no means covers only physical value of the property and its improvements.

For my own part, as a member of the tax commission, I must say that I prefer the method adopted by Arizona. Whether the net profits should be multiplied by four, or five, or even 10, I am not yet prepared to say, but I firmly believe that the method which we have tentatively adopted is the one which in the long run will redound to the best interest of the state.

## Current Events on the Iron Ranges

MARQUETTE CORRESPONDENCE

Curtailments in working forces have been made lately on the Marquette, Menominee and Gogebic ranges, in Michigan. A few mines have been closed. While there is no doubt that the iron-mining men of the Lake Superior region are working cautiously, while they are ascertaining the course of events in the business world following the enaction of the new tariff, curtailments at this time of year are seasonable. It is a usual thing when the rush of the water shipments draws to a close to reduce forces somewhat against the coming of winter. The producing properties are, as a rule, being operated on a normal basis, and the outlook is not at this time serious.

It is not believed at present that 1914 will be a runaway season in the ore business, for there are various disquieting factors that will have a tendency to hold it back. It will be rather surprising if prices hold up to the figures for the present season, and just now it is the expectation that contracts will not be closed until considerably later than usual. Any appreciable reduction in ore prices would, it is believed, have a corresponding effect on lake freights.

### EFFECTS OF FREE PIG-IRON TARIFF

One of the elements in the situation which is causing the iron men concern is the provision in the new tariff law placing pig iron on the free list. If it should develop that this is to mean a notable increase in the importations of pig, the mines of the Lake Superior region would be ultimately affected, the degree depending on the extent to which the demand for domestic ores was decreased by the iron produced abroad.

Operations have been permanently suspended at the Milwaukee-Davis mine, at Negaunee, and there has been a practical suspension at the Washington mine, at Humboldt, where a force of 130 men employed for several months has been reduced to about 30, who will be engaged on exploratory work. Both of these properties are on the Marquette range and are members of the group controlled by Edward N. Breitung. Just when operations will be resumed with the usual force at the Washington, it is now impossible to say. The Milwaukee-Davis will, however, be abandoned for all time, as soon as the ore that can be readily removed is taken out, and the workings will be allowed to fill with water. The machinery will be removed. The Milwaukee-Davis has been mined in a small way and explored for the last two years or so. The company has arrived at the conclusion that it does not warrant further attention. In addition to the suspension of production at the Washington, the Breitung interests have reduced their forces at the Mary Charlotte and Breitung Hematite mines, at Negaunee, by about 100 men, but with these reductions the properties of the group are on a winter footing and there will, it is said, be no further curtailment of forces. Excellent progress has been made with cleaning out the stockpiles at the company's Negaunee mines and by the close of navigation the properties will be in good order for the winter's work.

The Cleveland-Cliffs Iron Co. is preparing to mine the ore contained in the area that formerly was the cemetery at Negaunee, Marquette range. The old highway extending from the city to the tract has been fenced off and the ground will be permitted to cave. It was necessary for the company to provide a new cemetery, as well as a road leading to it, and this work, together with the removal of the bodies and the tombstones, cost approximately $250,000. Rains in the Marquette country lately have relieved the Cleveland-Cliffs officials of the anxiety that it would be necessary to operate some of the mining plants with steam, the water in Carp River having been lower than at any time since the corporation's big hydroelectric plant on that stream went into commission. Unusually heavy precipitation filled the storage dams to a level that is believed to assure an ample supply of water during the fall and winter.

### CLOSING OF THE GROVELAND MINE

In consequence of the litigation in which the stockholders of the Groveland Mining Co. have become involved, resulting in the appointment of a receiver, the Groveland mine has been closed. About 20 men are out of employment as a result. The property is in the Randville district of the Menominee range. Pickands, Mather & Co., of Cleveland, who have been operating the Vivian mine, at Quinnesec, Menominee range, ever since it was opened in 1902, have decided to abandon the property. The machinery has been dismantled and shipped to Iron River. During the present season the ore in stock on surface and that broken underground was shipped. The Vivian has been operated irregularly and its total production is about 500,000 tons. The largest season's shipment was 122,500 tons in 1906. The ore is low grade. The deposit is a large one, but Pickands, Mather & Co. have bodies elsewhere that can be mined at lower cost.

After shipping a small amount of ore, the Spring Valley company's Zimmerman mine, in the Iron River district of the Menominee, again suspended work and the property is once more all but deserted. While 200 men were affected when the Cleveland-Cliffs Iron Co. recently put its furnace at Gladstone, Mich., out of blast, none who desired work has been thrown out of employment. The company operates large camps at which wood for its chemical plants is cut, and all men willing to work as choppers have been sent to the forests. The Cambria Steel Co. has added to its Upper Michigan timber holdings 240 acres in the Witch Lake district of Dickinson County. The purchase price was $3500. The timber is for the Republic mine, Marquette range, but probably will not be cut for several years.

Anderson & Burrell, of Minneapolis, railroad contractors, are putting in four tracks at the Schlesinger company's Palms mine, at Bessemer, Gogebic range, for the Chicago & Northwestern as well as an approach to the coal dock at the Anvil mine shaft. It is expected the work will be completed by Dec. 1.

The matter of stripping the Balkan property of Pickands, Mather & Co., having been held in abeyance pending further drill work, bids on the contract for removing the overburden have again been asked. It is figured now that, instead of 1,800,000, only 1,200,000 cu.yd. of surface material will have to be removed to create the proposed open pit. The Balkan is in the Mastodon district of the Menominee range, its deposit forming part of the big orebody discovered by the Longyear-Pillsbury-Bennett interests. The drilling operations carried out by Pickands, Mather & Co. unexpectedly revealed the existence of a horse of rock, one so considerable, in fact, that on examination of the new records the state tax commission reduced by $400,000 the tentative valuation placed upon the property. At that part of the Mastodon tract retained by the Longyear interests, and which has been named the Judson, a big shaft is being sunk at an angle of 45°. The quicksand overburden has thus been avoided, as has an immense amount of water. In time there will be sunk a second shaft to mine the deeper ore. It is probable the Judson will be in a position to ship before the end of another season. The work is being pushed as rapidly as possible and men are being added as fast as room can be made for them. The mine is being superbly equipped.

### Dissatisfaction with Tax Valuations

The U. S. Steel Corporation is shipping 25,000 tons of ore from its stockpile at the Michigan mine in the Amasa field, north of Crystal Falls, Menominee range. The great bulk of the pile, or approximately 125,000 tons, will be carried over until next year. The mine is not now in operation. With reference to the assessment of these stockpiles, an official of the Michigan state tax commission is authority for the statement that the commission recognizes there is much justice in the contention of the mining companies that the property has been overvalued and that it will take steps to establish an equitable rule for assessing in the future. It will apply a rule that will be fair alike to the companies and the general public. The commissioners themselves are not satisfied with the present valuations, but the questions involved in the stockpile problem were brought up so late it was impossible to change the whole basis of these valuations this year.

For the purpose of treating siderite ores, the Lake Superior corporation is installing a battery of five ovens at its Magpie mine, in northern Ontario. An oven of the same kind is already in service, having been employed in extensive experiments, the results of which are reported to have been highly gratifying. It is claimed that by the new process the siderite ore will be brought up to 54% iron, compared with but 36% in its raw state, and that because of its porous nature after treatment it will be most desirable for use in the furnace stack. Experiments have been in progress for several years, and now that $250,000 has been appropriated for building the plant, it is considered that the company is at last satisfied it has evolved a process by which the low grade ores of Algoma can be utilized profitably. The corporation has already [illegible],000,000 tons of siderite ores in sight, with the probability that the deposits are much greater. The output of the six ovens will be 840 tons daily.

## Comstock Affairs

Special Correspondence

Until lately, both sides in the Comstock controversy have been resting on their guns. The Mexican company took out all the ore standing above the 2500 level, and then closed down the mine. That was last May. After that the mill was run on Mexican ore that had been accumulated on the dump, and on Monte Cristo ore. The latter comes from the Monte Cristo mine, owned by Charles Butters & Co., Ltd., about one mile east from the Mexican mill. The Mexican company constructed a tramway to it, and since finishing its own ore, has been milling about 100 tons a day from the Monte Cristo. This ore is of low grade, about $6 to $9 per ton.

Not long ago the Mexican company was asked to make a proposition setting forth the conditions upon which it would resume payments to the Pumping Association. The Mexican management replied that it would do so, provided a definite plan of unwatering the mines were adopted, together with a definite plan for ventilation and exploration, and the signing of a positive agreement by which the several companies would be legally bound to make their contributions. In the past, any company that did not feel like paying the association its share simply did not do so. At one time this resulted in the Mexican being the only company that did not owe money to the association. The Mexican management also insisted that the Pumping Association must be in neutral hands.

There is some prospect that something of this kind may be brought about. W. C. Ralston, of San Francisco, was recently elected president of the Pumping Association, and in order to promote plans for harmony, he has visited Virginia to talk over the situation with the respective superintendents, and is trying to formulate some pumping plan that all will agree to.

Nearly all of the companies of the Comstock Lode, except the Slosson companies, are heavily in debt, and some people think that the assessment game is about dead. If it were not for the talk of harmony and of new pumping plans, it probably would be hard for most of the companies to collect more than one more assessment. The Pumping Association itself, at last report, owed $84,000, mostly to the electric power company and to the Virginia & Gold Hill Water Co. Mr. Ralston, the new president, is a broad-gage man, unaffiliated with the old ring.

The water, thus far, has been held by the Association at the 2500 level, and it is preparing to lower it 200 ft. more by means of Starret pumps. The latter is a type of compressed-air displacement pump, in which air is also blown into the discharge column.

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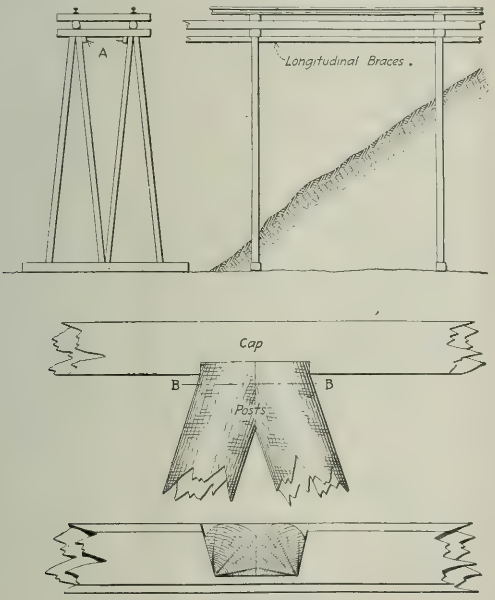
## Cowles Electric Furnace Litigation

The U. S. Supreme Court on Nov. 10 denied the application of the Carborundum Company for a writ of *a certiorari* in the case of the Electric Smelting & Aluminum Co., which had previously been decided in favor of the latter by the Circuit Court of Appeals. This, we understand, terminates the litigation on the electric-furnace patents of Alfred H. and Eugene H. Cowles and legally establishes that they were the pioneers in electric smelting. Their patents expired several years ago but the Carborundum Company is now obliged to pay for their use up to the time of their expiration.

# DETAILS OF PRACTICAL MINING

## Post and Cap Joint for Dumping Trestle

The material stripped from the Mesabi open pits is disposed of in great dumps, which are built out and up from a single trestle extending the length of the projected sump. This trestle is of light construction, serving only to start operations and is finally buried and left. The method of construction is shown in Fig. 1. The first material stripped is dumped in and around the trestle so as to make it a fill. Dumping begins at the end of the trestle near the pit. The train approaches the dump with the engine behind; when the first car is at the end of the filled part of the trestle, it is dumped, pushed ahead on the trestle and the next car dumped. In this way the light trestle has to support empty cars only. There is always an inclined face or toe to the fill which exerts a considerable pressure on the posts of the bents which it surrounds, as seen in Fig. 1. The tendency is to push the posts out from under the caps. To prevent this, longitudinal braces are usually set between the posts under the stringers. At the Leonard mine in a recent trestle, these braces were omitted and the posts framed into the caps for an inch or two in a sort of box, the joint *A* of Fig. 1 being made as shown in Fig. 2. This evidently prevents the posts from being pushed through, and in practice has proved satisfactory. It saves the entire cost of the braces and also the labor of setting them, while the labor of framing in this manner is little more than for the former method.



Post and Cap Joint for Trestle

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## Substitution of Air for Water in Diamond Drilling

Diamond drilling in some kinds of unstable rock, as the copper-bearing schists of Miami, Ariz., is made difficult and expensive by caving of the sides of the hole, according to Ralph Wilcox, in a paper read at the Butte meeting of the A. I. M. E. As this caving is much increased by the use of water, it occurred to him to use air instead of water.

After some experiments it was found perfectly practicable to use air, forcing it down the hollow rotating rods as is done with water, the air passing around the bit, which is thus cooled, and ascending on the outside of the rods to the collar of the hole, carrying the borings as satisfactorily as had been done by water, but without the accompanying destruction or caving of the sides of the drill holes.

When water was encountered, it was forced up to the collar just as when water is used, but with the decreased flow there was relatively less washing or caving.

The only change necessary in the arrangement of the drill is that a cross instead of a tee is used at the collar of the hole. A tightly woven jute bag is attached to one arm of the cross, for collecting and filtering the sample; and when drilling in dry ground a jet of water is attached to the opposite arm of the cross, to collect the dust and wash down the sample into the bag. The rods rotate through a stuffing box attached to the upper opening of the cross. The distention of jute bag by the issuing air indicates the operating conditions as sufficiently as did the flow of water when using water in the drill hole.

The small percentage of core recovery rendered it necessary to rely almost entirely upon sludge samples. Great care was taken in recovering these samples, which were all weighed to detect the presence of caving. A winze has lately been completed which was sunk on one of the drill holes for the purpose of checking the sludge samples; the samples from the winze and the samples obtained in the drill hole checked accurately.

The experience at Miami in the use of air has extended over six months and has shown that the refrigerating action of the air in expanding around the bit is effective in cooling the bit and the diamond consumption has not increased; it has not been found necessary to decrease the speed of rotation of the bit. The difficulties of operating in the friable copper-bearing schist have been decreased fully 75% by the use of air, and the sample weights and the results of sampling checked perfectly. There is no indication as to whether one would be limited as to depth in dry holes; here the greatest required depth was about 300 feet.

Tests as to amount of air used showed a maximum consumption of 83 cu.ft. of free air per minute, while the least with which operating was practicable was 23 cu.ft. of free air per minute. The average used during the several tests was 47 cu.ft. of free air per minute, at 75 lb. pressure.

Apart from affording much relief in diamond drilling of friable rock, such as above referred to, there arises the possibility of drilling in regions where a scarcity of water would otherwise prevent operating. Drilling in these regions could be accomplished by the use of a portable compressor driven by a gasoline engine, which is another not inconsiderable advantage.

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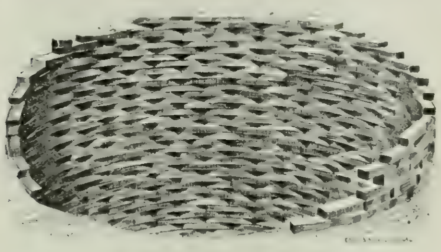
## Block Lining for Round Shaft

In the Southern Appalachian kaolin mines, both open cut and shaft mining are practiced, according to the U. S. Bureau of Mines. The deposits are never deep, and when shafts are sunk, they are made of circular section, rather large and are lined with a block cribbing. The timber used is yellow pine or oak, cut in blocks 4x6x30 in. and beveled at the ends, so as to key together when set. Successive rings of these blocks are laid with the joints staggered, as illustrated. Operations are begun by excavating the shaft for 4 ft. and then placing the timbering from the bottom up. The ground is friable and will not stand long alone. Every fourth rung is spiked to the next lower to counteract any tendency to twist. When the timber is placed to the collar, the shaft is extended 4 ft., the material below the timbering being left in place. Timbering is then begun at the bottom of the new lift, the ring of material under the old timber having been removed and the old timber supported by props. In completing a ring, the material back of the last block is removed sufficiently to permit the insertion of this block from behind. The opening is then packed to give a tight bearing to the block. When the old timbering is reached, this method is impossible and in such case the last block is cut 4 in. short and a piece of 4x4-in. timber driven in and spiked tight. In the illustration, the uneven nature of the ground accounts for the difference in height of the cribbing. Hoisting is performed with a derrick and bucket.



Block Lining in Shaft

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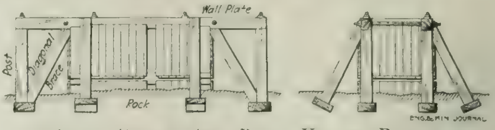
## Collar Sets at Butte

In erecting a collar set at Butte, Mont., its height above the ground is determined by the amount of room available for dumping waste rock from the sinking operations. In a level place this height might be up to 20 ft. (A. I. M. E. Bulletin, August, 1913.) In the accompanying illustration is shown a typical collar set for a two-compartment shaft; this, however, being much less than 20 ft. in height. The wall plates are usually made 10 ft. longer than the shaft sets, thus projecting 5 ft. at each end. Posts resting on blocks are stood under each end and diagonal braces are then placed around the shaft to carry part of the weight and prevent the sets from moving. The set bears the weight of the shaft sets below and usually that of the headframe also.



Shaft Collar Sets Built Up and Braced

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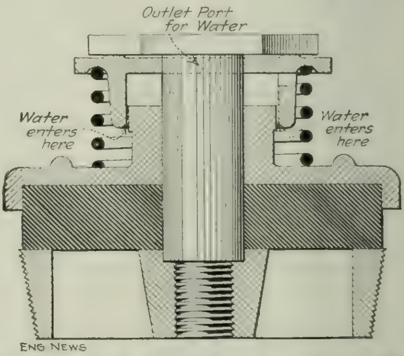
## A Rotating Pump Valve

A new valve seat for pumping-engine valves has recently been developed, which is claimed to effect a saving in life, slippage and friction of the rubber valve, states *Engineering News.* With the common, straight-port seat, the water passes through the port vertically, striking the valve at right angles, producing considerable friction. As the valve closes on the same spot at each stroke of the pump the pressure soon indents the rubber with the ports of the seat, and results in leaks.



Cross-Section of Pump Valve and Valve Seat

The new valve with its seat consists of six parts, as shown in the accompanying cross-section. The lowest element in the drawing is the seat with ports so formed as to give the water a spiral twist in passing through. The rubber valve rests upon this seat; above the valve is a guard plate of the same material as the seat, and fitted with a plunger which works within a spring collar. The latter is just below the hexagonal portion of the stem, and separated from the guard-plate by a spring.

Because of the spiral inclination of the passages through the seat, the water strikes the valve at an acute angle, tending to rotate it. When the valve leaves the seat, the plunger enters the spring collar, forcing the water within the cylinder of the spring collar out through angular ports and beneath the lower surface of the stem. This water forms a film between the stem and the collar, when the speed is normal, reducing the friction and allowing the valve to rotate. Therefore, with each stroke of the piston, the valve rotates a fractional amount between two films of water, but sufficiently to result in the uniform wear of the valve, and also a tight seat. The rotation of the valve at each opening is the basic principle of the valve. The device is the invention of the late John Robotham, and is manufactured by James Boyd & Bro., Philadelphia, Penn.

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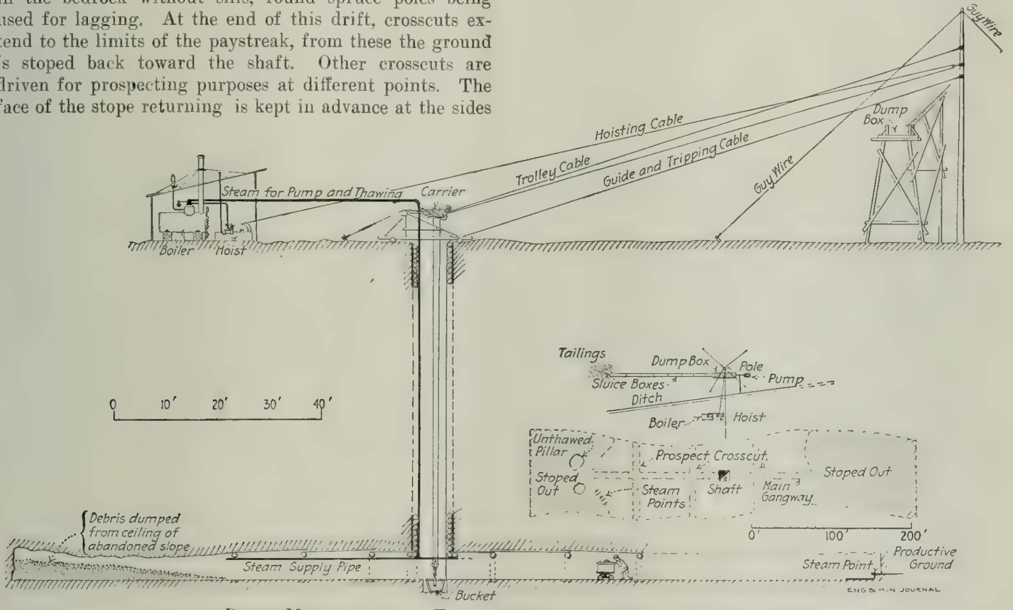
## Drift Mining Fairbanks Frozen Placers

A typical mining operation on deeply frozen placer ground in the Fairbanks district is described by F. S. Katz in Bulletin No. 525 of the U. S. Geological Survey. In the middle of a 500-ft. block of paystreak averaging 100 ft. wide, a shaft 6 ft. square in the clear, cribbed with spruce poles chinked with moss, is sunk 182 ft. to bedrock, several feet being removed from the rock so as to provide a sump. From the shaft, about the center of the paystreak, the main level is driven up and down stream, timbered with sets of undressed spruce posts and caps set in the bedrock without sills, round spruce poles being used for lagging. At the end of this drift, crosscuts extend to the limits of the paystreak, from these the ground is stoped back toward the shaft. Other crosscuts are driven for prospecting purposes at different points. The face of the stope returning is kept in advance at the sides of the paystreak and somewhat behind at the main drift, so that when the shaft is reached, a rhomboidal pillar of ground remains. The auriferous gravel is about 30 in. thick. Since the bedrock surface is uneven, it has to be taken out in places to preserve grade. The drifts are about 5½ ft. high. The solidly frozen ground is thawed with steam points driven just above the bedrock and 2½ to 3 ft. apart, depending upon the amount of moisture in the gravel. Thawing and extraction take place on alternate days, operations being transferred from one end of the drift to the other. In this way, the ground is given time to cool before it is broken down. The broken material is shoveled into wheelbarrows, dumped from platforms into cars at the end of the gangways and the cars trammed to the shaft bottom. They are there dumped into the bucket, which has been lowered into the sump so that its rim is flush with the floor. It takes between five and six wheelbarrows to fill a car and a car fills the bucket. Operations are timed so that the loaded car is ready to dump as soon as the bucket has been lowered into the sump. The hoisting capacity of the plant thus determines the amount of work which is carried on underground. Working two 10-hr. shifts and employing 17 men, comprising a foreman, engineer, point-man and a gang of shovelers on each shift, there was hoisted about 250 buckets, equivalent to 80 cu.yd. of gravel per day, thus cleaning about 400 sq.ft. of bedrock. The bucket itself is not a simple mine bucket, but is combined with a trolley carrier so that after hoisting is completed, the bucket is run up an incline cable to a gin pole at the head of the sluicing arrangement. The bucket is provided with a guide yoke of wire cable or chain which travels on the guide wires as shown in the illustration. This keeps the bucket from spinning in the shaft and provides a device for tripping it into the dump box. The gold-saving apparatus consists, as in other mines, of a dump box and a string of sluice boxes. A 40-hp. boiler is used for hoisting and for pumping. The cost of the plant installed on the ground is said to be about $50,000, and the net cost of operation after all preparatory work was done was 50c. per bedrock sq.ft. The operation consumed 10 months. It is thus evident that the ground must run about $7.50 per cu.yd. to prove profitable.



Drift Mining on the Fairbanks, Alaska, Frozen Placers

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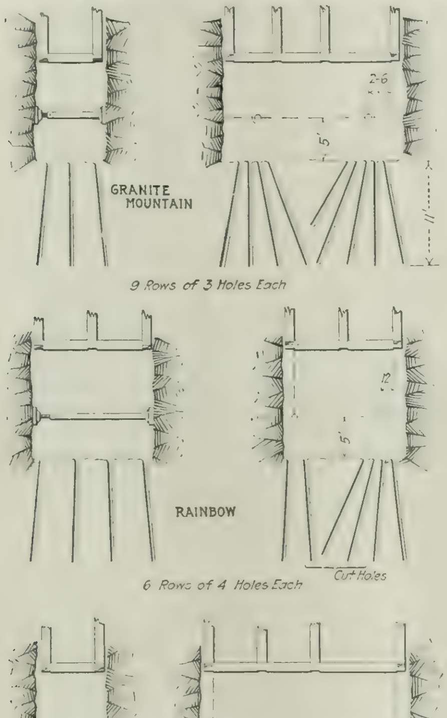
**Flat, Tapered, Fiber Hoisting Ropes** are used at the Grand Hornu coal mines in Belgium. The ropes are made of aloe (Agave Americana) fiber, and taper both in width and thickness. They are used in hoisting from a depth of 3280 ft., and at the large end measure 12½ in. wide and are 2 in. thick. At the cage end the ropes are 8½ in. wide and 1¼ in. thick. The weight ranges from 9.8 to 4.75 lb. per ft. The weight of each rope is 10½ tons. Each of the cages has six decks, and weighs 4800 lb., weight of the six cars is 2778 lb., the loads of coal total 6000 lb., making a total weight of 13,570 lb., not including the weight of the rope. The wind is made in 144 sec. actual winding time.

## Butte Shaft Rounds

The piston machine is still the usual drill used for shaft sinking in Butte. Typical arrangements of the holes are given in the A. I. M. E. Bulletin, August, 1913. A 10-ft. hole is usual. In some shafts the whole round is blasted at once, but generally the cut holes in one or two rows on either side are blasted first, thus making sure that the round will do its work. The cuts are sometimes mucked clear to bottom and the bottom of the cuts blasted with the rest of the round. At other places it is customary to muck down far enough to see that all of the holes are gone and then shoot the rest of the round. The men in this way are twice on top of a fresh muck pile and only pick bottom once for each 10-ft. round. Both 40% and 60% gelatin are used, the latter usually in the cut holes only. There is no ironclad rule governing the placing of the holes, but if the round is breaking out too far on one side, the holes are drawn in or one row omitted altogether. It is generally arranged that each machine shall drill the same number of holes and thus rivalry between the different runners is stimulated.



VARIOUS METHODS OF ARRANGING HOLES IN SINKING BUTTE SHAFTS

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## Machine-Driven Auger for Soft Ground

At the Barrows mine, near Brainerd, Minn., on the south range of the Cuyuna, W. J. Nicholas, the mine superintendent, has installed an ingenious drilling combination, consisting of a Jackhamer machine fitted with an auger bit. Soft ground has been usually considered unsuitable for the Jackhamer plugger type of machine, inasmuch as it tended to bury itself. It is evident that with an auger bit the difficulty is avoided, since the action of the twisted steel is that of a screw conveyor, rapidly clearing the hole of all cuttings. The rotation of the machine has a certain amount of drilling effect, but the speed of drilling is greatly increased by the hammering of the piston on the steel. A further advantage lies in the fact that when a hard rib is encountered, the regulation rose-bitted hollow steel can be substituted for the auger until the soft material comes in again. The regular air pressure of 75 lb. is used with the machine.

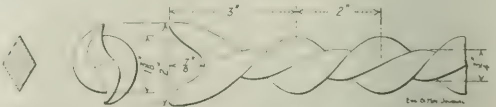


FIG. 1. FIG. 2

MACHINE-DRIVEN AUGER FOR SOFT GROUND

The steel of which the bits are made is not twisted in the shop as in the case of hand augers, but comes twisted from the manufacturer. The original bar would seem to have a cross-section similar to that shown in Fig. 1. It is twisted so as to give one complete turn per 4 in., as shown in Fig. 2. The character of the bit forged by the blacksmith is also shown approximately. What may be called the greatest diameter of the twisted bar is about $1\frac{3}{8}$ in. The bit of the starter has an overall diameter of 2 in. The other pieces of the set decrease about $\frac{1}{4}$ in. in gage and increase about 18 in. in length. The shank end is welded on in the shop; it is hexagonal and has a small collar to facilitate removal of the steel from the hole. It would seem to be important to ascertain before purchase that the steel had a direction of twist to correspond o the direction of the machine.

The performance of the machine is truly remarkable. It has made a record of six holes, averaging 4 ft. 8 in. each, drilled in 30 minutes, including changing steel and all incidental operations. This amount of work with the piston machine formerly used would have required at least half a shift. One man now does all the drilling for the mine, taking his outfit around to seven or eight places each day and still getting in from 100 to 150 ft. of holes per shift.

⁂

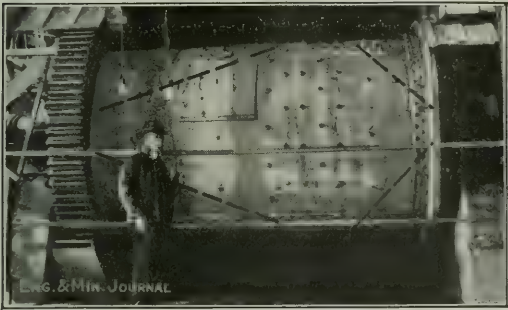
**The Toximeter,** a new French device, gives warning of the presence of carbon monoxide in mines through an alarm controlled by a thermocouple, which is affected by the heat produced by the oxidation of the CO inside a mass of spongy platinum.

# DETAILS OF METALLURGICAL PRACTICE

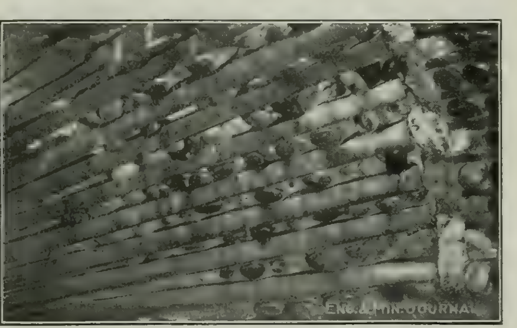
## Changing a Tube into a Cone Mill

It is of particular interest that a 7x12-ft. tube mill, which was installed at the Morning mill of the Federal Mining & Smelting Co., Idaho, was so changed as to make it into a conical mill. The circumstances were that Hardinge mills were found to do better work than the cylindrical tube mills and they were installed, the tube mill being laid aside. Later, having need for more capacity, the tube mill was reclaimed and made into a cone mill.

Transition was effected by bolting heavy timbers inside the tube mill, forming a cone as shown by the dotted lines in the illustration. Over the timbers, steel rails were spiked or bolted to form a lining which resembles the El Oro ribbed type. Pebbles pack in the interstices between the rails, as with the El Oro lining, taking up most of the wear. The illustration shows the appearance of this lining after some use.



The Tube Mill as Changed into a Cone



Rail Lining in the Mill

Efficiency of the mill is shown in the accompanying table of screen classification of feed and product both before and after the change. The capacity of the mill before the change was 98.64 tons per day, while afterward it was 88.2 tons, a reduction of about 10.5%. The horsepower required before the change was 75.6, and afterward, 65, a saving of about 14%. It is probable, however, that the power stated as required before the change is underestimated. The revolutions of the mill were not changed, remaining at 22¼ r.p.m. in each case. Moisture in feed before the transition was 58.9%, and after it, 57.7%.

CLASSIFICATION OF WORK OF TUBE AND CONE MILLS

| Before Change | | | After Change | | |
|---|---|---|---|---|---|
| Screen | Feed % | Product % | Screen | Feed | Product |
| +10 | 29.5 | .... | +8 | 19.10 | ... |
| +20 | 45.5 | .... | +10 | 22.05 | . |
| +30 | 12.0 | 0.5 | +14 | 17.05 | .. |
| +40 | 6.0 | 0.5 | +20 | 14.50 | 0.10 |
| +60 | 4.0 | 2.5 | +28 | 11.80 | 0.45 |
| +80 | 1.5 | 5.0 | +35 | 7.05 | 2.25 |
| +100 | 1.5 | 8.0 | +48 | 4.20 | 4.50 |
| +150 | .... | 5.5 | +65 | 1.90 | 7.65 |
| +200 | .... | 20.5 | +100 | 1.05 | 10.50 |
| —200 | .... | 57.5 | +150 | 0.60 | 17.20 |
| .. | .... | .... | +200 | 0.20 | 16.00 |
| .... | .... | .... | —200 | 0.35 | 41.20 |

The change made by transforming this machine into a conical mill would probably infringe the Hardinge rights, but the controllers of the latter issued a special license to cover the case, a procedure which they offer to follow, within certain conditions, wherever mill owners desire to make a similar change.

⁂

## Payne Pneumatic Concentrator

Under No. 1,688,162, Clarence Q. Payne, of New York, has been granted U. S. patent upon a pneumatic concentrating table for handling dry pulverized ore. The machine consists of a table, much like other concentrating tables, rectangular for about half its length, and from that point reducing in width until it finally reaches about one-third of that with which it began. The table has the usual head motion, but differs in that it is rectangular, as has been explained, and has an inclination toward its discharge end. Transversely the table is level. The inclination is only sufficient to allow the ore to slide over the table and be discharged at the lower end.

The table top is made of porous silica plates which allow the passage of air through it. Underneath the table is a reservoir, constructed of sheet iron, into which air under pressure is admitted, this pressure passing up through the porous silica table top. At the end of the table, in the narrow portion, where discharge takes place, there are two splitting plates, the object of which is to divide the discharge into three portions.

It will be understood that by giving the table a shaking motion and passing a light current of air through the porous top, the content of the table will be stratified, leaving the heaviest portions next to the table, the middle portions lying upon that, and the lightest portion on top. At the discharge point, the splitting plates, which are simply flat sheets of metal, split the bed of pulverized ore into three portions, a lower portion, which constitutes the concentrates, the middle portion which contains middlings, partly concentrates and partly waste material, and a top portion, which is tailings. The tailings are discharged separately and run to waste, the middlings reconcentrated and the concentrates retained. By reason of the different lengths of these splitting plates, it is easy to discharge the three different products into three different receptacles.

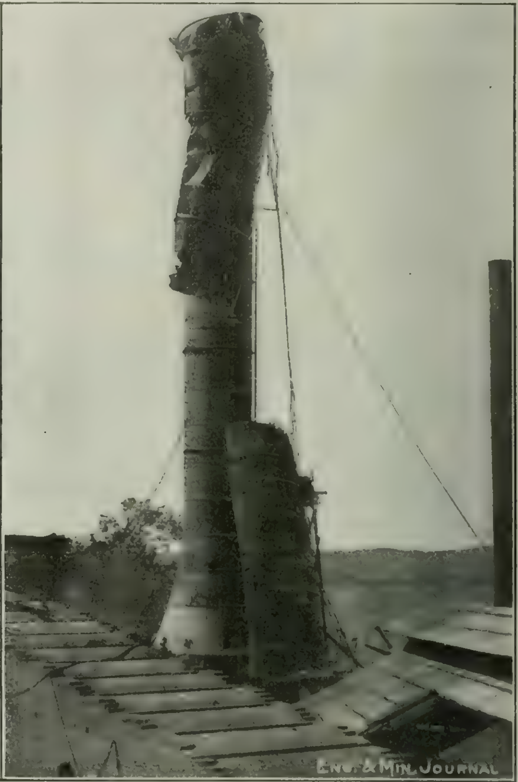
⁂

## Replacing a Steel Stack with One of Concrete and Brick

The accompanying photographs illustrate the erection of a brick-lined concrete furnace stack for the Mountain Copper Co., Ltd., Martinez, Calif. It had been evident for some time that the capacity of the old steel stack was too small for the furnace and converter installation. Furthermore, the stack had previously seen service at Keswick, Shasta County, where the company formerly conducted its smelting operations, and a large portion was soon going to need reconstruction. The directors therefore decided to erect a concrete stack.

The stack was designed and built by the General Construction Co., Chicago, from company specifications prepared by Robert M. Schorr, of San Francisco. It is 223 ft. in height and its foundation is 75 ft. above sea level.

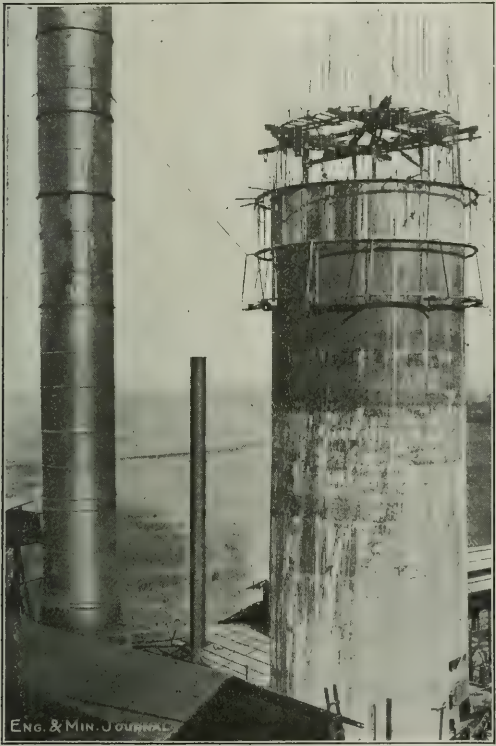
The Old Stack Seen from the Top of the New; Three Oil-Fired Reverberatories and Converters in Operation



Old Stack Broken and Buckled as the Result of a Windstorm

General View of the Plant

The foundation is octagonal, 35 ft. in diameter and sunk 5 ft. 6 in. below grade; it is heavily reinforced by two mats of twisted steel; the vertical reinforcement of the stack is embedded in this foundation and every second bar is bent under the lower mat. The vertical steel is surrounded from top to bottom with heavy woven-wire fabric tied to the steel bars and the entire reinforcement is calculated to absorb all strains resulting from a wind velocity of 125 miles per hr. on a basis of 16,000 lb. per sq.in. working stress. The reinforcement can be seen in one of the photographs. The concrete wall is 15 in. thick at the bottom and 5 in. at the top; the outside diameters are 19 ft. 4 in. and 13 ft. 10 in., giving an outside taper of 3 in. per 10 ft. The brick lining is a vertical barrel of hard-burned red brick, 12 ft. inside diameter, 8½ in. thick for 140 ft. and 4 in. thick for the rest of its height; this barrel is strengthened by six 185-ft. pilasters built into it and clearing the concrete by about 1 in. The bricks are laid up in an acid-proof cement consisting of amorphous silica and finely ground quartzite sand, tempered with silicate of soda solution diluted with water. This cement the company has demonstrated to be entirely free from the sulphatizing action which furnace gases have on other mortars; it also sets quickly and completely and makes a strong bond.



New Stack in Process of Erection; 11 Sections, 55 Ft., Cast with the Forms Holding the Top Section

Steel forms were used in pouring the concrete and were raised by means of chain-blocks supported from scaffold timbers which were run up on the inside of the stack; the green concrete thus had nothing but its own weight to support. These forms made a section 5 ft. high, and after the first few days one section was poured each day. The forms were set for the first course on Mar. 16, and the last course was poured on May 5; the stack was completed May 24. The mixture was portland cement, sand and furnace slag crushed to about 1-in. ring size, in the ratio of 1 : 2½ : 3.

While the steel stack should have stood up for some time, an exceedingly high wind on May 26 accentuated a slight buckle about 75 ft. from the top and this section worked around on the buckle until it collapsed; the top section in falling pulled down another 40 ft. with it, bending this latter over the standing portion of the stack and bottling the works completely. Starting up three days later, it was found possible to cut in furnaces and converters on different dates and so heat up the stack gradually, until on June 11, operations were in full swing again, and under greatly improved conditions. The greater capacity of the stack makes it possible to admit considerable false air, thus cooling and diluting the gases. So far, there is no noticeable effect from the passage of the hot gases, which have a temperature of about 350° C. at the base of the stack and have an $SO_2$ content of between 0.3% and 0.4%.

The view of the old stack from above while in operation and of the same stack after its collapse are of rather unusual interest. For the photographs and the description of the operation the Journal is indebted to Thomas B. Swift, works superintendent, and William F. Kett, general manager of the company.

## Basic-Lined Copper Converting

According to E. P. Mathewson ("Bull. A. I. M. E.," June, 1913), the first successful introduction of basic linings for copper converters on a large scale occurred at the American Smelting & Refining Co.'s plants at Perth Amboy and Omaha, as a result of the experiments, at Baltimore, of E. A. C. Smith and William H. Peirce, of the latter city. At about the same time, magnesite lining was introduced at the Anaconda company's Washoe and Great Falls plants; at present, practically all the bessemerizing of copper matte in the United States is done in basic-lined converters. The main points to be observed for successful operation of basic converters are: (1) Not to exceed a temperature of 2100 deg. F. (2) Not to use tuyeres smaller than 1¼ in. in diameter, 1½ in. being preferred. (3) To drive in punching rods, the full size of the tuyere opening immediately after pouring copper. (4) To maintain in the converter as large a mass of matte and slag as possible, to prevent sudden changes of temperature and overheating of the lining. (5) To employ a slag containing preferably about 25% silica.

To ascertain whether the cutting action of slag on magnesite linings was affected by the proportion of silica in the former, analyses were made on 13 slags from basic converters, ranging in silica from 22.4 to 37.8%; in copper from 1.80 to 4.60%; in FeO from 46.3 to 58.3%; and in lime from 0.9 to 1.4%. The magnesia in these slags ranged from 0.4 to 0.8%, the percentage bearing no apparent relation to that of the silica nor of any of the other ingredients.

# THE COST OF DOING THINGS

## Storage Battery Haulage Costs

A description of the storage-battery haulage system in use at the Big Five tunnel at Idaho Springs was published in the JOURNAL, December 30, 1911. The accompanying tables of cost, giving a comparison with horse haulage, are of interest.

The power cost from March to September, inclusive, as given in Table I, was a minimum, based on the maximum demand, and was in excess of the actual consumption at kilowatt rate. There costs also include the cost of current for two arc lights and for 12 incandescent lamps during winter evenings.

TABLE I. POWER COST FROM DECEMBER, 1911, TO SEPTEMBER, 1912

| | Power consumption in kilowatts | Ton-miles | Power cost |
|---|---|---|---|
| December | 2,677 | 4,451.5 | $32.21 |
| January | 2,390 | 4,490.6 | 55.60 |
| February | 2,690 | 4,832.0 | 58.30 |
| March | 1,080 | 2,072.0 | 48.90 |
| April | 800 | 1,632.3 | 44.50 |
| May | 880 | 1,435.2 | 42.20 |
| June | 1,160 | 1,838.3 | 42.20 |
| July | 900 | 1,307.2 | 42.20 |
| August | 870 | 710.2 | 42.20 |
| September | 630 | 657.0 | 40.90 |

In Table II, the cost of superintendence and of discount to patrons is not included. The cost of material and repairs for the locomotive is excessive, owing to the fact that much difficulty was experienced with the carbon lights used, moisture in the tunnel making frequent short circuits and burning out lamps and sockets. The costs for April and May would be an average. Probably a fairer comparison of relative costs would be the figures for July, September and October for horses, and for December, January and February with locomotives, making an arbitrary figure of $15 per month for repairs and material, including the sand used.

TABLE II. COST OF HORSE HAULAGE

| Month | Labor | Teams | Total | Ton-miles | Cents per ton-mile |
|---|---|---|---|---|---|
| May, 1911 | $172.00 | $96.08 | $268.08 | 2147 | 12.5 |
| June | 222.45 | 136.87 | 359.32 | 3515 | 10.2 |
| July | 291.20 | 199.60 | 490.80 | 4290 | 11.4 |
| August | 399.75 | 213.48 | 613.23 | 5901 | 10.4 |
| September | 299.10 | 181.45 | 480.55 | 4621 | 10.4 |
| October | 326.95 | 143.80 | 470.75 | 4921 | 9.6 |
| Totals | $1711.45 | $971.28 | $2682.73 | 25,395 | 10.6 |

COST OF STORAGE-BATTERY LOCOMOTIVE HAULAGE

| Month | Labor | Material | Repair | Power | Total | Ton-miles | Cents per ton-mi. |
|---|---|---|---|---|---|---|---|
| Dec., 1911 | $200.50 | $27.56 | $6.62 | $56.21 | $290.89 | 4452 | 6.5 |
| Jan., 1912 | 192.25 | 41.36 | 12.78 | 55.60 | 301.99 | 4491 | 6.7 |
| Feb. | 259.75 | 21.40 | 10.96 | 58.30 | 350.41 | 4832 | 7.3 |
| Mar. | 190.00 | 10.15 | ..... | 48.90 | 249.05 | 2072 | 12.0 |
| Apr. | 143.84 | 4.36 | 6.14 | 44.50 | 198.84 | 1632 | 12.2 |
| May | 111.67 | 8.50 | 1.75 | 42.20 | 164.12 | 1435 | 11.4 |
| Totals | $1098.01 | $113.33 | $38.25 | $305.71 | $1555.30 | 18,914 | 8.2 |

⁂

## Costs on Steam-Shovel Work

An example of the value of cost keeping on steam-shovel work is shown in a small contract carried out by the Northaw Construction Co., of Boston, says the *Engineering Record.* About 8000 cu.yd. of dry gravel, with a small percentage of boulders, were removed from a sidehill to make room for a building foundation. A ⅔-yd. Thew steam shovel was used for the work, the spoil being loaded into dump cars pushed by hand back and forth on a standard contractors' track 500 ft. long, carried on a trestle 10 ft. high. The average haul was 400 ft.

Although it is estimated by the contractor that this method saved 8c. per cu.yd., as compared with hand work, the cost was nevertheless 37½c. per cu.yd., the item of labor alone on the shovel work proper being practically 23c. The itemized unit cost was as follows:

EXCAVATION WITH STEAM SHOVEL

| | Cents |
|---|---|
| Labor around shovel, pushing cars, unloading and spreading at the dump | 22.9 |
| Rental of shovel ($345) and repairs ($18.58) | 4.5 |
| Labor on track, including trestle | 3.5 |
| Labor for unloading, placing, etc., at the job | 3.1 |
| Rental of track | 1.4 |
| Labor at Boston end (including riggers' bill) | 1.25 |
| Freight on shovel and parts (both ways) | 0.85 |
| Total | 37.5 |

⁂

## Cost of Sinking Brakpan Shafts

At the Brakpan mine on the Witwatersrand two large rectangular shafts were sunk for hoisting and ventilating purposes. A description of the operation given by Charles B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture) includes the summary of costs presented in the accompanying tables. Shaft No. 1 begun Sept. 26, 1905, and reached the reef at a depth of 3098 ft., Sept. 30, 1907.

TABLE I. COST OF TEMPORARY PLANT

| | |
|---|---|
| Boiler house | $2,189.00 |
| Engine house | 2,590.00 |
| Boilers, etc., including erection | 20,921.00 |
| Engines, etc., including erection | 22,523.00 |
| Sundry offices and sheds | 635.00 |
| Change houses | 3,695.00 |
| Headframe, including foundations | 5,598.00 |
| Signals | 208.00 |
| Pulleys | 2,416.00 |
| Ropes for whole period of sinking | 6,435.00 |
| Doors, safety and flap doors | 291.00 |
| Kibbles and bailing tanks | 1,745.00 |
| Crossheads for whole period of sinking | 1,139.00 |
| General fittings | 400.00 |
| Painting | 114.00 |
| Chutes | 264.00 |
| Dismantling | 699.00 |
| Total | $71,862.00 |

TABLE II COMPLETE COST OF SHAFTS

| | No. 1 shaft 3,098 ft. to reef. (3,129 ft. total depth.) | No. 2 shaft, 3,696 ft. to reef. (3,777 ft. total depth.) |
|---|---|---|
| Sinking | $258,930.00 | $278,207.00 |
| Hoisting | 36,570.00 | 57,121.00 |
| Timber, including bratticing and guides | 175,075.00 | 210,191.00 |
| Surface handling | 20,488.00 | 27,717.00 |
| Pumping and bailing | 18,465.00 | 29,325.00 |
| Total | $509,528.00 | $602,561.00 |

This gives an average sinking rate of 126 ft. per month over the entire period. Shaft No. 2 proceeded slowly to the depth of 1113 ft. on account of a scarcity of labor and delays in delivering sinking equipment. From this point, until the reef was reached at a depth of 3724 ft., an average rate of 152 ft. per month was maintained.

Drilling was done by hand and buckets were used. The shaft contained seven compartments and broke a rock section of 9x43 ft. Timber sets were placed, the wall plates being 9x9 in. and the other members of corresponding dimensions. The equipment included two 15x30-in. double-drum geared hoists for shaft No. 1, and two 16½x33-in. similar hoists for shaft No. 2. Each boiler plant at first included three 125-hp. fire-tube boilers, with a later addition of a 250-hp. water-tube boiler. The water flow was not heavy, but to handle what water was encountered, reciprocating-pumps actuated by compressed air discharged into rings built at suitable intervals in the shaft timbering.

TABLE III. COMPARISON OF COST OF SINKING FOR ONE MONTH IN GOOD AND HARD GROUND

| | | Footage | Explosives | Drill steel and tools | Guides | Timber | White and native wages | Steam power | Drill sharpening | General | Total | Cost per foot |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Good Ground | Sinking | 204 | $1,372.00 | $300.00 | ...... | ...... | $10,131.00 | $847.00 | $166.00 | $1,576.00 | $14,392.00 | $70.50 |
| | Timbering | 210 | ...... | 18.00 | $2,680.00 | $3,951.00 | 1,899.00 | ...... | ...... | 99.00 | 8,647.00 | 41.08 |
| | Total | | $1,372.00 | $318.00 | $2,680.00 | $3,951.00 | $12,030.00 | $847.00 | $166.00 | $1,675.00 | $23,039.00 | $111.58 |
| Hard Ground | Sinking | 120 | $851.00 | $340.00 | ...... | ...... | $9,203.00 | $1,262.00 | $247.00 | $875.00 | $12,513.00 | $104.27 |
| | Timbering | 127 | ........ | ...... | $1,801.00 | $2,523.00 | 1,173.00 | ...... | ..... | 126.00 | 5,623.00 | 44.28 |
| | Total | | $851.00 | $340.00 | $1,801.00 | $2,523.00 | $10,376.00 | $1,262.00 | $247.00 | $1,001.00 | $18,136.00 | $148.55 |

TABLE IV. SUPPLIES CONSUMED IN SINKING NO. 1 SHAFT

| Miscellaneous | Quantity | Value |
|---|---|---|
| Gelatin | 103,000 lb. | $21,760.00 |
| Detonators | 114,000 | 658.00 |
| Fuse | 59,167 coils | 6,677.00 |
| Drill steel | 65,834 lb. | 4,613.00 |
| Shovels | 648 | 482.00 |
| Picks | 367 | 200.00 |
| Hammers | 796 | 341.00 |
| Sundry tools | ...... | 896.00 |
| Illuminants: | | |
| Carbide | 133 cwt. | 986.00 |
| Kerosene | 1,805 gal. | 520.00 |
| Sundries, lamps, electric globes, etc | ...... | 737.00 |
| Timber: | | |
| Shaft sets | 44,000 cu.ft. | 55,956.00 |
| Blocks, lagging wedges | 20,628 | 16,267.00 |
| Bratticing | 24,961 running ft. | 2,701.00 |
| Steel and Iron: | | |
| Guides | 826 | 32.50 |
| Hanging bolts | 452 sets | 6.05 |
| Steel and iron | 32,473 lb. | 81.00 |
| Sundries | ...... | 11.35 |
| Total | | 112,924.90 |

⁂

# El Oro Mining & Railway Co.

According to the annual report of the El Oro Mining & Ry. Co., El Oro, Mexico, for year ended June 30, 1913, the mills treated 433,708 tons consisting of 253,434 tons of ore and 180,274 tons of tailings. The average assay value of the ore treated was: Gold, $5.81; silver, $1.39; tailings retreated, gold, $2.55; silver, $1.04; total, gold, $4.46, and silver, $1.25. The total value of the bullion realized was $2188.724, and the extraction was as follows: Theoretical, gold, 86.38%; silver, 72.28%; total, 83.29%; actual recovery of assay value by bullion: Gold, 90.67%; silver, 80.24%; total, 88.39%. The total cost of production is summarized in the following table:

EL ORO COSTS PER TON 1913

| | | |
|---|---|---|
| Mining, per ton mined | | $2.09 |
| Development, per ton mined | | 1.42 |
| Milling, per ton treated | | 0.18 |
| Cyaniding, per ton treated | | 0.78 |
| Water supply, per ton treated | | 0.02 |
| General expenses, per ton treated | | 0.20 |
| Taxes, per ton treated | | 0.21 |
| Total working cost | | $4.90 |
| Sundry expense, per ton treated | | 0.042 |
| Construction, per ton treated | | 0.024 |
| London expenses, per ton treated | | 0.024 |
| Directors fees, per ton treated | | 0.031 |
| Exchange loss, per ton treated | | 0.025 |
| Total expenditure, per ton mined and treated | | $5.046 |
| Credits: | | |
| From railroad, per ton treated | $0.326 | |
| Interest, dividends, etc | 0.095 | |
| Total credits, per ton treated | | 0.421 |
| Net expenditure per ton mined and treated | | $4.625 |
| Depreciation charged, per ton treated | | 0.280 |
| Total charge, per ton mined and treated | | $4.90 |
| Total charge, per ton treated | | $3.42 |
| Total charge in 1911, per ton treated (no tailings handled) | | $4.18 |

The average hoisting depth 1912–1913 was approximately 650 ft.

The ore reserves were estimated to contain 448,053 tons of ore averaging $8.11 per ton in gold and 3 oz. silver. It was estimated that the tailings dump contained 198,005 tons of tailings for retreatment. The following additions to the plant were made: A new 500-gal. electric pumping plant on the 1600-ft. level; a second electric-power line from the substation to the deep levels was completed; a fan at the ventilating shaft; a conveyor belt for tailings to the mill, nine classifiers for cyanide plant; 14 precipitation boxes; near ventilating shaft, a new change house was added, a new cottage was built, and a drinking-water plant was erected.

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# Efficiency of Rand Labor

The efficiency of the employees of the Witwatersrand mines is apparently increasing, according to figures published in the annual report for 1912 of the Mines Department of the Union of South Africa. Thus in the year 1904-1905 there were employed per 1000 tons milled, 1.25 white men, and 9.7 colored men, including Chinese, giving a total of 10.95. In 1912, these figures had been reduced to 0.9 white men, 7.43 colored, giving a total of 8.24. Reversing these figures, the number of tons milled per year per man employed were, in 1904-1905, 801.9 per white man, 103.1 per colored man, and 91.3 per each employee. In 1912 the corresponding figures are 106.1, 136.3 and 121.3. Probably a large part of this increase is due to the introduction of machine drills and other mechanical appliances, rather to any increase in the ability or discipline of the working force itself. In fact it is commonly stated and believed that the quality of the Rand miners is deteriorating.

In connection with these figures, some of the typical wage rates are interesting. The shift bosses received 23s. 8d. per day at the end of 1912, and timbermen, 20s.; miners stoping with machines on contract got 28s. 1d., and on day's pay, 19s. 9d.; for hand stoping on contract they got 26s. 6d., and on day's pay, 18s. 11d. Development work paid rather better; the miners on machine contract work in developing received 36s. 2d., and on day's pay, 19s. 8d., while for hand work the rates were 27s. 2d. on contract and 20s. 2d. on day's pay. As might be expected, shaft sinking was the most remunerative employment, the rate for contract work averaging 44s. 6d., and for day's pay, 28s. 1d. Engine drivers received 21s. 7d. It will be noted that these wages are high; thus the day's pay rate for shaft work, $7, is far above the average in this country.

⁂

**The Scott Quicksilver Furnace** is estimated to cost $1000 per ton of daily capacity ("Mineral Resources of the United States," 1912). A 12-pipe furnace costs $1000 to $1500 and will treat about 1800 lb. daily. The pipes themselves cost $25 to $35 each.

# Blast-Hole Drilling, Nevada Consolidated

*SYNOPSIS—Description of the churn-drill methods used in drilling the overburden and ore for blasting at Copper Flat, Nev. Machines, equipment, disposition of holes, setting up, drilling, moving speed, supplies, repairs and quantities of explosives are covered. It is often expedient to move the churn drills on flat cars, using a locomotive crane for handling.*

⁂

During 1912, a total of 3,981,221 cu.yd. of ore and waste were excavated by the Nevada Consolidated steam shovels. Practically all of this material had to be blasted.

On account of the height of the banks and the volume of material handled, either gopher holes or blast holes must be used in order to blast the ground.

Gopher holes are tunnels driven into the base of a bank with a crosscut on each side at the face, forming a "T." The explosives are placed in the crosscuts, tamped and exploded. A gopher hole is expensive to drive and cannot be efficiently tamped, thus necessitating the use of additional explosives. Blast holes are put down vertically through the bank and are about 6 in. in diameter. These are chambered at the bottom with explosives so as to admit a charge sufficient to break the ground. Blast holes are quickly and cheaply drilled, and can be well tamped. To blast the material excavated in 1912, 2306 holes, having a total footage of 64,846, were drilled in ore, and 2226 holes, aggregating 83,263 feet, were drilled in stripping. Of these holes, only two, amounting to 110 ft., could not be used.

### Drills and Equipment

All blast holes are drilled with eight No. 5 and one No. 3 Keystone churn drills. These are all traction, coghoist drills. The drills have been remodeled slightly to suit local conditions. Jars are seldom required, consequently the string of tools is shorter than ordinarily. For this reason a shorter mast is used, thereby lowering the center of gravity. When moving from one hole to drill another the mast is left up and the lower center of gravity makes the drill less liable to tip on rough ground. All operating rods have been changed to levers and are put upon the inside of the bed instead of outside. The walking beams have been reinforced, and the spudding wheels on the beam are attached to steel I-beams. The material in several other parts is cast steel instead of cast iron, to withstand the rough usage to which they are at times subjected. Probably many of the alterations would be unnecessary if more experienced drillers were employed. Many of the men have not run a drill more than six or eight months, yet they drill as fast as some who have drilled for years.

Each drill has the following equipment:

200 ft. of 2-in. manila drill cable.
150 to 160 ft. of ⅜-in. wire sand line.
One standard Keystone rope socket.
One 4-in. or 4¼-in. by 20-ft. drill stem.
One 5⅝-in. No. 100 Mother Hubbard bit.
One 12-ft. sand pump (made from 4¼-in. casing at the shops at Copper Flat).
One 10-in. Keystone steam-driven blower.
One forge, consisting of a pipe 2x36 in. and a wood box 32x36 in.
One right-hand tool wrench for 3½-in. squares.
One left-hand tool wrench for 3½-in. squares.
One single-acting floor jack and circle.
Two No. 6 Barrett lever hoisting jacks.
One spectacle.
One anvil billet and block (a piece of 75-lb. rail, 1 ft. long, spiked to a 2x12-in. plank).
Three to seven 50-gal. barrels (three in summer and seven in winter).
Two gasoline torches.
Two 16-lb. sledge hammers.
One set small tools, such as machinists' hammers, wrenches, files, etc.
Small repair parts also usually kept on hand, such as extra water glasses, gaskets and pipe fittings.

The best length of drilling cable to use is 200 ft. At least 125 ft. are needed if the mast is to be lowered or raised. The rope will wear most where it is in contact with the spudding pulleys and sheave pulley, and in time must be spliced. Three splices will shorten the rope about 40 ft. After a rope has been worn out there is about 60 ft. of good rope left on the drum. Generally this 60 ft. can be spliced to a rope having three or four splices, making a practically new rope for that drill. The other drill receives a new cable. By careful manipulation much rope can be saved in this way, and 200-ft. lengths are best suited for this purpose.

Bituminous coal is used under the boilers, and water is delivered to the drills by pipe lines from springs eight miles distant. The crew consists of one driller and one tool dresser. A coal boy supplies two drills with coal from piles placed about every 100 ft. along the bench, and he also shovels the coal from standard coal cars to make new piles. The drills are operated for two shifts of 10½ hr. each day in every 24 hours. The day shift starts to work at 7 a.m. and at noon stops for lunch. Work is resumed at 12.30, and continues until 6. The night shift starts at 7 p.m., and follows the same schedule as the day shift.

### Hole Spacing

All blast holes are drilled to a depth of from 3 to 5 ft. below grade, i.e., a hole of 55 ft. in depth is drilled for a bank 50 ft. in height. This removes all danger of the steam shovels encountering unbroken rock. The holes are spaced about two-thirds of their depth apart. The slopes of the banks average 45°, thus the edge is back from the toe below, a distance equal to the height of the bank. Holes for a bank 50 ft. in height are drilled to a depth of 55 ft., are spaced about 37 ft. apart, and are put as close to the upper edge as they can be conveniently drilled; generally about 10 ft. from the edge, or 60 ft. back from the base.

### Setting Up Drill

After a drill has completed a hole and moved to the next spot, the rear wheels are made as nearly level transversely as possible; one wheel being run up on blocking if necessary. Usually blocking is not needed, but occasionally a rough piece of ground is encountered. The wheels are then blocked to prevent the drill from moving and the traction pin is removed. Two track jacks are placed beneath the front end of the bed, and are used to relieve the front wheels of the weight they usually support, as well as to level the front end of the drill trans-

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Note—Excerpts from an article by W. R. Brown, reprinted by the "Colorado School of Mines Magazine" from the "Keystone Drill Magazine."

versely. Transverse leveling is imperative in order to keep the belt on the pulleys while the machine is running. If it is possible to drill at all, no attention is paid to longitudinal leveling. Drills are sometimes operated with the tools hanging almost to the end of the A-frame tool-guide, and, again, with scarcely any room between them and the front of the machine. It is well, however, to have at least 2½ ft. between the front of the drill and the tools. It is well to remember, in blast-hole drilling, that much valuable time may be lost in attempting to level a drill longitudinally.

### Drilling Methods

A 4-ft. piece of 7⅝-in. casing is used to guide the tools when drilling is started. This has two coils of old 2-in. drilling cable wrapped about it to prevent it from sinking into a hole, also to furnish a hold in removing it after the hole is finished. This short piece of casing is locally known as a "conductor." As mentioned above, the ground is blasted from 3 to 5 ft. below grade, so, for a few feet, the holes are drilled in broken ground. The "conductor" keeps this broken ground from falling into the hole. Until the hole is 4 or 5 ft. deep the drill must be run relatively slowly, but, below this depth, it is run at a speed of about 58 drops per min. The hole is bailed out every 2½ or 3 ft. and the sludge is allowed to run down the bank below. After the hole is completed, the tools are pulled up as far as possible, and are tied to the bed of the machine in order to prevent them from swinging while the drill is moving. The dart of the bailer is tied to the rope on the conductor and the conductor is pulled out of the hole. The bailer, or sand pump, is hauled up into the A-frame, which prevents it from swinging enough to do any damage. The track jacks are removed, the traction pin is put in place, the blocks removed from the wheels and the drill is moved to the next spot.

### Moving the Drill

When it is necessary to move a drill from one bench to another a considerable distance or to enter or leave a place difficult of access, a locomotive crane of 30 tons capacity is used. Three chains of proper length are used to take a hold on the drill; one is attached just above the front axle and the other two are attached to the two rear wheels. The mast is not lowered, nor are the tools taken off the machine; the fire is not drawn and the boiler is not blown out. In fact, the machine is ready for work as it is loaded upon a flat car. A barrel of water is put in the bed of the drill and all other equipment is put upon the flat car. When the drill is unloaded it simply moves to its place and starts drilling. The barrel of water is used until a pipe line is laid to the drill, so that no time is lost after the drill is placed upon the ground.

Formerly, all moving was done by preparing roads and running the drill on its own power. The advantages of moving a machine with the crane are that much time is saved in moving and that three men besides the driller and tool dresser, can move the drill with the crane, whereas at least 10 men are required otherwise, to make roads and move equipment. Frequently, also, when moving a drill under its own power, the drill has to travel a considerable distance along a track, and the rear wheels split many of the ties in so doing. The machine is jolted and strained appreciably, and the track is also tied up, thereby tying up a steam shovel. If it is absolutely necessary to move a drill by its power, the tools are tied underneath the drill and dragged along the ground. A barrel of water is put in the bed of the machine, and the rest of the equipment is generally moved on a push car.

### Speed, Supplies and Repairs

The average drilling for a shift of 10½ hr. is 60 ft. William Gibson now holds the local record of seven holes, 25 ft. in depth, drilled in one shift. This was done in midwinter, with the thermometer well below zero. During the month of August, 1912, a series of holes 15 ft. deep were drilled by one drill, which aggregated 2745 feet.

A working steam pressure of 100 lb. per sq.in. is used on all drills. The consumption of coal amounts to 600 lb. per shift. Twelve 50-gal. barrels of water will supply the boiler and the drill hole for one shift. The following lubricants are required: ½ pint engine oil, 1 pint valve oil, $^5/_7$ lb. cup grease per shift; ½ gal. of gasoline per night shift.

The drills receive harder usage than that for which they are designed, and more or less repairs and renewals are necessary on that account. The use of the crane in moving has materially cut down repairs. By carefully noting the parts which break most frequently, and either changing the material of which they are made or increasing their size, renewals have been reduced to a great extent. Repairs are made in the field until the drill loses its efficiency. It is then taken to a well equipped machine shop, entirely dismantled and rebuilt. This allows all defective pieces to be noted and replaced properly.

### Explosives

To those not familiar with blasting large quantities of ground, a few words concerning that phase of the work may be appropriate. The friability of the ground is the chief factor. No set rules can be given for the most efficient use of explosives; the amount and kind must be determined by much experimenting. However, the following may be used as a basis upon which to start experiments: For holes 45 ft. in depth, use 10 sticks of 60% Semi-Gelatin Red Cross powder to start chambering; triple the amount for each succeeding chambering charge, i.e., first 10 sticks, then 30 sticks, then 90 sticks, etc., until the chamber is large enough to receive the blasting charge; for the blasting charge use 25 lb. of black powder for every foot of hole; for holes 90 ft. in depth in solid hard rock, start chambering with 25 lb., 60% Red Cross powder, and triple each succeeding charge; tamp the first charge with 20 gal. of water and triple the tamping with each succeeding charge. The blasting charge is again 25 lb. black powder per foot of hole. A blast hole will break the ground in back of it about one-quarter the distance it breaks in front. By the front is meant the side offering the least resistance. All blasting and chambering should be done by electricity, using electric detonators recommended by the powder manufacturers.

The following explosives are in use at Copper Flat:

F F black powder for blast holes.

Stick Trojan No. 2, for blast holes in hard rock and for bulldozing.

**Bag Trojan for blast holes.**

**Sixty per cent. Red Cross powder for chambering**

**Forty per cent. Hercules powder for chambering in soft ground.**

During the year 1912 the following quantities and kinds of explosives were used:

| | Lb. per ton ore | Lb. per cu.yd. stripping |
|---|---|---|
| Hercules, 40% | 0.0824 | 0.0910 |
| Black F. F. | 0.0762 | 0.2732 |
| Stick Trojan | 0.0689 | 0.1780 |
| Bag Trojan | 0.0439 | 0.1568 |
| Gelatin, 60% | 0.0019 | 0.0037 |
| Red Cross 40% nitroglycerin | 0.0059 | 0.0032 |
| Red Cross 60% gelatin | 0.0038 | 0.0031 |
| Giant ammonia, 40% | 0.0025 | 0.0015 |
| Total | 0.2855 | 0.7105 |

2.16 tons ore = 1 cu.yd.

These quantities include explosives used in "bulldozing," but in spite of that they show clearly the efficiency of blast holes.

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# Homestake Improvements and Lead Notes

### Special Correspondence

By the end of the year improvements costing nearly $250,000 will have been made by the Homestake Mining Co., and for the coming year the projected plans call for an expenditure fully as great. The big work this year has been on what is to be called "Recreation Hall." This building, located just beyond the business part of Lead, on one of the main streets, will include reading rooms, library, billiard rooms, bowling alleys, baths, etc., all of the privileges of which will be free to Homestake employees. In addition a wing is being built for an opera house, which will, when completed, be one of the finest in South Dakota. The building is modern in every particular, is built of stone, brick and steel, and would be an ornament to a city many times the size of Lead. The walls are practically complete, and probably by the time this is in print the roof will be on, and then there will be no danger of bad weather interfering with completion of the interior. Another large undertaking of this year was the construction of a commodious change-house at the Ellison hoist. This building was built of concrete blocks, and is a model structure in convenience and arrangements.

### Steam-Driven Auxiliary Electric Plant

Work has already been begun on clearing the site and preparing for the erection at Lead of a steam-driven electric plant, to be used as an auxiliary of the Spearfish hydro-electric plant. The boiler house will be located near the Star mill, just north of the Homestake barns, and will contain boilers of a total capacity of 2000 hp. Just across the street and adjoining the transformer house and substation, will be erected a building to house the turbo-generators and other equipment. Steam from the boiler plant will also be used to operate the new Old Abe hoist, and to a limited extent in the mills in the neighborhood, for heating and other minor purposes. With this auxiliary generating plant in operation shutdowns due to a shortage of electric power will be minimized.

Another important piece of work will be the erection of a new hoisting plant at the Old Abe shaft. This plant will be the finest on the Homestake property, and capable of hoisting from any depth to which the workings may be driven in many years to come. It is expected that work on the new hoist will start about Apr. 1, 1914, as the machinery has already been designed and specifications for the new plant are in the hands of the contractors. There will be no delay once it is under way.

Lawrence County has received $4056, its share of the timber sales from national forests within the county during the last fiscal year. Of this amount $406 goes to the school fund and $3650 to the road fund. This payment was made in compliance with the new Federal law which provides that 10% of the proceeds of the sales of timber from national forests shall be paid into the treasury of the county where the timber is cut.

### Suit against the Lead Union

There has lately been an interesting suit in the local courts involving the title of the Lead miners' union building, the plaintiff being the Western Federation of Miners through its president, C. H. Moyer. Title to the property is claimed by virtue of the terms of the Federation charter which provides for the forfeiture of all property of the local union on its dissolution. The suit is an aftermath of the labor struggle of several years ago in the Black Hills, at which time, according to testimony introduced in the case, the Western Federation paid out in benefits to its members in this district, a little over $40,000. The decision of the court was that the Lead miners' union was the sole owner of the property; that the Moyer deed was in law a mortgage only against the property, and for $8100; that this mortgage was subject to a prior mortgage for $25,000, given the Butte, Mont., union in 1911; that the Butte union, through the Federation, had forwarded to Lead, as relief, $25,000, the consideration for the giving of its mortgage; that no application having been made to the court to foreclose these claims against the property, the court had nothing further to do than to declare the effect of these instruments. The Lead union admitted an indebtedness of $13,100 to the Butte union, and will probably appeal from those parts of the judgment holding it liable for further sums.

Splendid progress is being made by the Mogul Mining Co. in the erection of its new mill near Terry, and, according to Constructing Engineer Woods, the mill will be ready by the middle of January. The building is nearly inclosed, and a few more days of good weather will see everything under shelter. About 25 men are employed on the construction.

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# Secretary Wilson's Address in Seattle

### Washington Correspondence

What is regarded here as a statement of the policy of the government here has been laid down by Secretary of Labor William D. Wilson, in his address to the American Federation of Labor, at Seattle, Washington, in which he asserted that the duty of the Department of Labor according to his view of the matter is that of mediation between employers and employees as part of a process of coöperating with the trades-union movement, inasmuch as "there can be no mediation, there can be no conciliation between employers and employees that does not presuppose collective bargaining, and there cannot be collective bargaining that does not presuppose trades unionism."

Secretary Wilson's announcement is regarded as notice of an intent on the part of the Department of Labor to undertake drastic action regarding the labor difficulties in the Michigan copper-mining regions. It has proved impossible to induce members of the administration to offer any open criticism of Secretary Wilson's ideas as thus expressed.

# Tin Mining in South Africa

Johannesburg Correspondence

A small production of alluvial tin is still being made from the Kuilo River district near Capetown, Cape Colony. The Swaziland deposits are now being prospected by Empire drills and the deposits worked by modern methods. E. M. Weston was the first to introduce hydraulic elevators into that country and to sluice tin ore on a large scale. Several are now at work and electric elevators are being introduced to economize water power in elevating tailings. The Swaziland Tin, Ltd., is now producing about 40 tons per month with a profit of $4000. The deposits are unfortunately not really extensive and have had their richest portions worked for a total yield of about £300,000.

To the north of Pretoria, Waterberg tin fields continue to make large returns. The Zaaiplaats mine, working irregular pipe deposits and impregnations along fissures, is returning about 100 tons of concentrates per month at present and proves a favorite gambling counter, as little ore can be developed and the orebodies are most irregular; one deposit has been followed for 1500 ft. on incline. The neighboring Groenfontein mine has run out of rich ore in all its pipes and practically ceased production. In the felsite area bordering the granite, the South African tin mines have been producing 2% ore and running a 10-stamp mill with indifferent results. The ore occurs in fissure veins and disseminated. The Welquarden mine has developed 20,226 tons of 2.7% tin ore and is erecting a small mill. Some of this ore is as fine as flour and the $SnO_2$ is a light-yellow color.

In the quartzite area, the Rooiberg mine produced 70 to 90 tons of concentrates per month and is making large profits; developments are apparently satisfactory. The probable ore and developed ore was recently estimated at about 90,000 tons. The neighboring farm of Leeuwpoort was prospected by several syndicates without result, but the present company holding it has over 120,000 tons of 2.29% metallic tin developed. This ore is valued at from £300,000 to £400,000. An incline on the Spirit vein is down 652 ft. and shows a vein assaying 13% Sn over 7½ in. at the bottom. Old workings characterize this district. One of the lodes discovered was looked for only because of the discovery of a piece of isolated rich float.

The prospector persevered, though no trace of any further ore could be found. He sank a shaft eight feet through overburden and suddenly came on old workings which were extensive and deep. These had been worked from two shafts and all trace had been carefully closed up and filled in. Who these ancient workers were is a greater puzzle than those in Rhodesia. They smelted tin at Wooiberg and some ingot has been found. It is estimated that on this property there is an alluvial deposit of 2½ million cubic yards, valued at 2s. 2d. per cu.yd., which may be treated later. A mill to treat 4500 tons of ore per month is under construction.

Some further promising discoveries have recently been made on the Olefants River in the Cow Country of the Eastern Transvaal.

# California Oil in September

The net production of petroleum in all California fields in September was 8,256,710 bbl., a decrease from August of 154,694 bbl. The daily average production for 30 days in September was 275,224, an increase in daily average over August of 3879 bbl. The total shipments and losses in September amounted to 7,314,358, a decrease from the total outgo in August of 351,683. The total stocks at the end of September were 49,865,908 bbl. There were small increases in production in McKittrick, Belridge, Whittier and Newhall, and an increase of nearly 100,000 bbl. in Midway. The remainder of the fields all showed a decrease except Los Angeles, which remained stationary.

Field operations in September showed 35 new rigs, 41 completed wells, 321 wells drilling, 373 wells on which drilling was suspended, 5950 wells producing, 1203 wells capable of producing but idle, eight wells abandoned.

SEPTEMBER CALIFORNIA OIL PRODUCTION BY FIELDS

| District. | Bbl. |
|---|---|
| Fresno County— | |
| Coalinga | 1,511,374 |
| Kern County— | |
| Midway | 3,178,672 |
| Kern River | 724,552 |
| Maricopa | 465,048 |
| McKittrick | 341,885 |
| Lost Hills | 279,786 |
| Belridge | 189,294 |
| Total Kern County | 5,179,237 |
| Santa Barbara County— | |
| Santa Maria | 393,165 |
| Summerland | 4,350 |
| Total Santa Barbara County | 397,515 |
| Southern fields— | |
| Fullerton | 514,575 |
| Coyote-La Habra | 287,771 |
| Salt Lake | 205,882 |
| Ventura | 68,365 |
| Whittier | 53,703 |
| Los Angeles | 26,905 |
| Newhall | 11,383 |
| Total Southern fields | 1,168,584 |
| Total all fields | 8,256,710 |

# Major R. G. Leckie

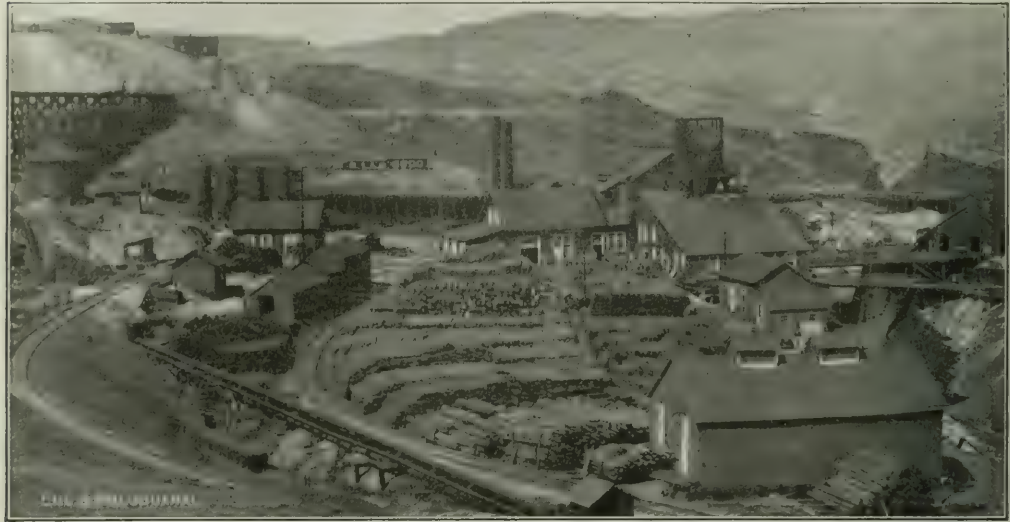
Major R. J. Leckie, dean of Canadian mining engineers, died at Sudbury, Ont., Nov. 6, aged 80 years. He was born in Scotland, but had been a resident of Canada since he was 23 years old. He had been prominently identified with the mining industry in many highly responsible positions, such as managing director of the Orford Nickel & Copper Co., managing director of the Cumberland Coal & Iron Co., general manager of the Londonderry Iron Co. and others. He was one of the founders and first president of the old Federated Mining Institute. He has been vice-president of the American Institute of Mining Engineers and a prominent and valued member of the Canadian Mining Institute.

We expect to publish a fuller account of his life and services in our next issue.

# The M. M. S. A. Medal

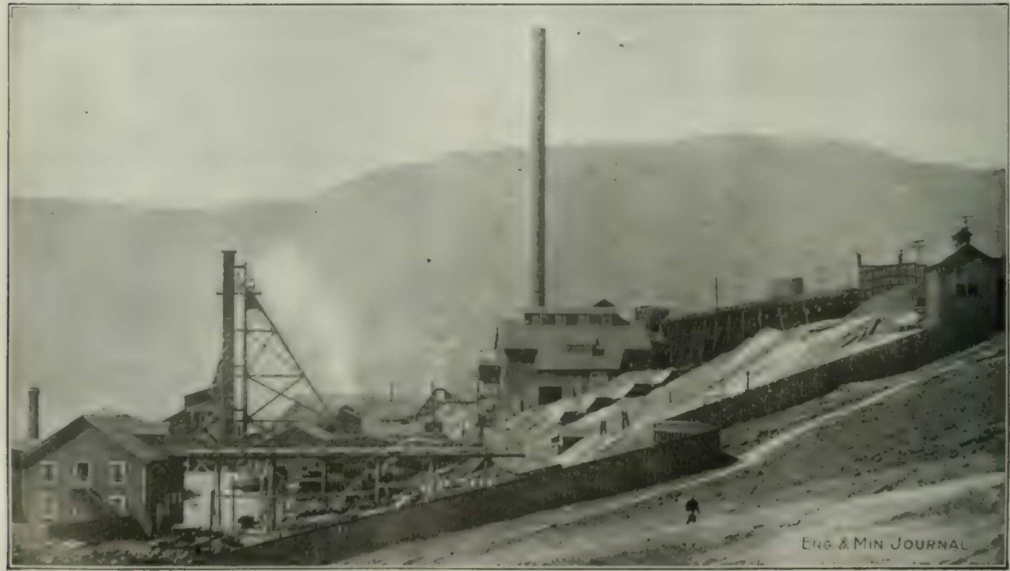
The Mining and Metallurgical Society of America has awarded its gold medal for 1913 to Herbert C. Hoover and Lou Henry Hoover, in recognition of their distinguished contributions to the literature of mining. The presentation will take place in January next.

# PHOTOGRAPHS FROM THE FIELD



West Colusa Mine at Butte, Property of Anaconda Copper Mining Co.

Levels are 100 ft. apart to depth of 1200 ft., thence 200 ft. apart. Three-compartment shaft was retimbered in 1910, false sets being used to obviate squeezing. Connections have been made with Mountain View, and Leonard mines. Fire from the Minnie Healy has caused trouble in the West Colusa; in February the fire reached the 600-ft. level and extended over an area equal to two city blocks, necessitating closing of the mine. The vein is 400 ft. wide in some places.



Another Anaconda Property at Butte, the Pennsylvania Mine

The main shaft has been sunk, three compartments wide, to the 2200-ft. level where stations have been cut on north and south sides. Water is raised to the 1200-ft. level and transported by a flume through a crosscut to the Mountain View mine, thence through a long drift to the Leonard mine, three-quarters of a mile away. It goes to a precipitating plant. Ore lies nearer surface than in most Butte mines.

HAULING A TRAIN OF DREDGE BUCKETS

BIG WHEELS FOR HAULING HEAVY MACHINERY

At Hammonton, Calif., caterpillar trucks do heavy hauling

TOP OF LONGFELLOW INCLINE, MORENCI, ARIZ.

Electric haulage yards at one of the Arizona Copper Co.'s mines.

CORONADO INCLINE AT METCALF

The haulage rope broke this summer and a number of men were killed.

WEST STEWART MINE AT BUTTE

An Anaconda mine over 2100 ft. deep.

HUMBOLDT MINE, MORENCI, ARIZ.

Property of Arizona Copper Co.

# CORRESPONDENCE AND DISCUSSION

## Mining Enterprises in Peru

Some time ago the JOURNAL published the following from an American residing in Peru: "Mining enterprises, according to Peruvian ideas, consist of spending five soles in a denouncement and then waiting for a *gringo* to come along, who will pay out a fortune for a show on which the owners will not even go to the expense of perfecting their titles."

Though partly true, this statement tends to impart a wrong idea as to the reason why Peruvians content themselves with denouncing mining claims and then waiting for a purchaser. Neither are the Peruvians nor the conditions prevailing in Peru to blame for this way of doing business. On the contrary, the foreign investors are responsible.

In the past, when the Peruvians obtained mining concessions, the mines were opened at once and operations begun, so that it was an easy matter for an eventual purchaser to make a thorough examination of any properties he intended purchasing. But it happened, not only in Peru, but also in other countries, that mine owners who offered their mines for sale did so because they were lacking capital for operating the mines, as they generally had put the entire capital at their disposal into the preliminary work, so that when they could not sell these mines soon to some rich syndicate they found themselves without any means of subsistence. Then they had the only alternative to sell their mines at a price far below their real value or to starve. The investors were well aware of this fact and when mines were offered they would drag on the negotiations until the would-be seller saw no other way but that of selling at a low price.

I know of cases of the kind, in which the owners of rich mines, with titles in perfect order, came to the United States to put them on the market. The first thing the men who were approached with an idea of sale did was to get information as to the means of these mine owners. Once enlightened on this point, negotiations were initiated but were kept hanging until the day came when the vendors' funds were exhausted and they were forced to sell at any price.

Just now there is such a case pending. The mine in question is a rich copper mine, of an acknowledged value of $500,000. The Americans who pretended to be inclined to purchase the property dragged the negotiations along for eight months, and then suddenly broke them off because meanwhile they had learned that the means of the owner were limited and that in a short time he would have to accept their own terms. This kind of business is known as "Freezing out." In the specific instance mentioned the Peruvian mine owner has lost eight months and spent $4000. This practice is no longer unfamiliar to Peruvian mine owners. The result is that now the Peruvians content themselves with denouncing claims, paying the tax, and then waiting for a purchaser willing to share in the expense of perfecting title to the property and of the preliminary work.

The American who describes South America as the land of mañana must also be pleased to have his own country referred to in South America as the land of next week. This is due to the fact that so often in the past when a business proposition was presented to an American his reply would be, "Call again some day next week." The reputed quickness of Americans to close deals is no longer accepted as a fact in Peru.

The American in Peru would have done well to search for the reasons which have induced the Peruvians to alter their way of dealing in mines, and he would have found out that he has been confounding the cause with the effect, as is generally done when criticism is unjust. At all events, it is as easy to do business in Peru as it is in any other country, but prevailing customs of the country must always be considered. Another general mistake of Americans is to entrust the carrying out of a business in Peru to someone who knows neither the language nor the habits and customs of the country, and takes months to initiate negotiations which another with better linguistic gifts and knowledge of the country would have done in so many weeks.

O. SPERBER.

New York, Nov. 1, 1913.

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## Capital and Prospects

Recent years have produced a condition in the mining industry that threatens to become acute. It would, perhaps, be unjust to term it one of pessimism, but its influence on the business is as enervating as though capital had determined to take nothing but a gloomy view of all unproved properties.

One reads, from time to time, in the periodicals devoted to the mining profession, tabulated accounts prepared by exploration companies and others, giving the number of properties submitted for their consideration. This is followed by a statement of the number deemed worthy of a preliminary examination. The next item sets forth those that meet the requirements necessary to warrant a more detailed study of their possibilities. Finally the list is rounded out with a figure representing those that are taken over on some basis for further development. Where the initial number of properties submitted is apt to reach a total well over 500, the final figure in the list is quite likely to be extremely small or to vanish altogether.

Since there is a reason for all things there must be one for this. It does not seem possible that the gigantic strides made by mining in the last 20 years are altogether responsible for the dearth of desirable properties. One admits, of course, that the great growth of the industry has had its effect, since ore deposits are not the product of a season like a farmers' crop, and hence must ultimately become exhausted both as units and as an aggregate, but of equal importance to this exhaustion of resources as a preventive to the discovery of new mines is the attitude of capital. Overlooking the probable magnitude of the returns upon its investment, should its mining venture prove a success, it demands at the outset a factor of safety that is excessive. It seeks, in a measure, to protect itself as it would in a bond investment, with this difference, however; it expects not only a high rate of interest, but a comparative lack of risk.

This demand is reasonable and right when not carried to an extreme. But the tendency today seems to be to overdo it. While willing and eager to reap large dividends, capital hesitates to gamble. Yet to make a success of mining a certain amount of gambling instinct is not only desirable but necessary. I am not speaking now of investments in developed properties where ore reserves permit, to a certain extent, the calculation of future dividends, but of properties in the prospect stage.

Would the Tamarack shaft have been sunk approximately a mile if those interested had not gambled that the lode at that depth would not be impoverished and would still carry copper in amounts to make their venture justifiable? Would any property in Tonopah outside of the Tonopah Mining Co. have become a producer as early as it did unless it had "taken a chance" and gambled on finding ore below the capping that covers the greater part of the Tonopah area?

Of course, capital immediately replies that the Tamarack was reasonably sure of intersecting ore at the depth of a mile by reason of development done on neighboring property, and that the Tonopah operators based their work and hopes on what had been accomplished by the more fortunate Tonopah Mining Co. on whose ground occurred, with but one or two exceptions, the only croppings of ore in the camp.

This is true in a measure, but in addition to the information gained by previous work, the Tamarack and Tonopah operators were actuated by a belief or hope of success that is almost as important as the technical ability to interpret those signs they had access to in neighboring development.

To be perfectly just we will admit that the failures far outnumber the successes, in a ratio that is not pleasant to contemplate. But even here we can get some comfort by admitting, as we must, that all these failures are not due to a lack of merit in the properties. Mismanagement, inaccessibility, market conditions, all three temporary and possible of rectification, have caused their share of shutdowns.

Up to this point we have established, I think, two reasons why capital hesitates to tackle the prospect. First, its demand for a comparatively low risk and high returns immediately eliminates any property not more or less developed. Second, its lack of a proper amount of willingness to "take a chance" bars it from the pioneer stage of mining, which is, ultimately, the one yielding the greatest returns for the smallest expenditure.

In a way capital has some excuse for its attitude of hesitancy, since in the past it has been severely handled by the fakers of the mining profession. Highly trained men who have not only the ability to advise, but the integrity to advise honestly are as plentiful in mining as in other engineering branches. They should be the tools with which capital attempts to make successful ventures.

It is to be regretted that more of the successful operating companies approaching the exhaustion of their present resources do not include in their efforts to obtain new holdings the plan of opening up prospects that appear to have merit. The value of many such properties could be proved or disproved with the money spent in the search for a developed mine.

The finding of the latter seems to be almost hopeless. This is to be expected, for there are but few conditions that would throw such a property on the market. Moreover, the purchase price is usually high for the reason that those features of the developed mine which make it attractive to the prospective buyer, are also assets to the owner. Should the price be moderate or low, having regard for the gross value of the ore developed, it may safely be argued that some condition exists, either as regards the cost of operation of the mine or the treatment of the ore that will be as inimical to the buyer as to the present owner. There are exceptions to this but they are extremely few.

On the other hand, prospects as a general thing, are no longer held at the ridiculous figures they have been in the past. Their owners, usually men of little financial strength, will normally make great concessions in order to have their ground developed. Money down is no longer demanded as it was. A few hundred dollars at the most to tide the prospector over a lean season, and capital can usually gain an option. The final purchase price is usually small when compared to the returns the ground will make if it proves to be the locus of a mine. As a general thing payments on the property may be so strung out as to give those taking the option ample time to form their own conclusion as to the desirability of going through with the deal before they have paid much more than their operating expenses. The net result is that capital would be doing some actual work with the money it is spending. It is "taking a chance" on finding a mine and should it be found, the price it would have to pay would not be much more than the interest on the sum it would have to expend for a developed property, should it be fortunate enough to discover one on the market.

Mining is crtainly a business. As much so as any other that contemplates the making of a profit by the sale or exchange of products. Business methods are as applicable in this profession as in any other. But conditions inherent in mining would warrant a different attitude toward it from that necessary in most others. Without the willingness to risk a comparatively small sum many times in the hope of developing a mine worth many times the aggregate of these small sums, it would seem that capital is bound to overlook some good investments.

JOHN M. FOX.

Tonopah, Nev., Sept. 2, 1913.

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## Measurement of Crushing Efficiency

In the issue of the JOURNAL for Sept. 27, you print under the above caption a letter from Algernon Del Mar, suggesting that mine or mill managers send to the JOURNAL data on crushing operations. I would suggest that the screen analyses be given on the basis of aperture sizes rather than ordinary meshes. I am convinced that the finer sizes are of great importance in making calculations of efficiencies, and only when they are given accurately can they help us to determine what is going on in the minus 200-mesh material. I have plotted a good many crushing-surface diagrams from data given in the technical press and elsewhere within the last three years, but I am not sure of their comparative value for the reason that I cannot readily determine the reciprocals of the diameters.

I am of the opinion that the solution of the problem of the proper basis of crushing efficiency is for the laboratory, and that the crushing constants of the rocks experimented upon will have a great deal to do with calculated efficiencies of machines. The determination of crushing constants of rocks is not an easy matter, I am finding out. While I can show an enormous discrepancy between the number of Stadler's Energy Units per foot-pound applied for coarse and fine crushing, yet values of 30 to 90 mesh-grams per foot-pound (my unit if you please) are not very convincing, even when I explain that the difference all comes in the minus 200-mesh products.

A. O. Gates.

Purdue University, LaFayette, Ind., Sept. 29, 1913.

## Experience with Storage-Battery Haulage Underground

The publication of an article on internal-combustion mine locomotives in the Journal, Aug. 23, 1913, renders of interest the following letter descriptive of another method of underground haulage. The storage battery motor seems destined to fill a certain field satisfactorily. Or it may be that a combination storage-battery and trolley locomotive may be the efficient survivor.—Editor.

Our experience of less than one year with a storage-battery motor, does not enable us to state even approximately what the wear and tear and depreciation of these locomotives is going to be. Any excessive cost from this source will be because of deterioration in the batteries themselves. There are no indications that these will be short lived or wear out rapidly, since with the low voltage used, the commutators, brushes and rotors give less trouble than on the trolley system, where 500 volts is universally the practice. Also on this account there is less delay because of repairs. It is seldom that any of the storage-battery locomotives are reported in bad order and consequently there is no time lost, most of the adjustments are made at regular inspection intervals without a shut-down in the middle of the shift, as often happens because of commutator, brush or other troubles with the trolley locomotive.

The chief consideration in installing storage-battery locomotives here was that of safety. The menace of overhead trolley wires, dangerous no matter how closely boxed in, is by this means entirely removed. The storage-battery locomotive is most available for work on the sill floors of stopes, where the tracks are more or less crooked, switches are frequent and there are many chutes and manways to pass. Whenever there are any changes or repairs to be made in tracks, chutes, manways or timbering, the first requirement, when the trolley system is used, is an electrician to shift trolley wires out of the way.

The loss of time coming in and going back out of the mine to do this job and the general inconvenience of the whole matter make it costly. In running drifts, it is impossible to keep the trolley wire up to within several hundred feed of the face, because of the danger of a blast. Storage-battery locomotives can follow up to the face just as fast as the track is laid. No bonding is required, thus avoiding the first cost and troublesome attendance necessary to keep the bonds in repair and preserve a good conductor. In this connection the danger of electrolysis, from the return trolley current getting into the mine pumps and water pipes and possibly into power-house machinery, is avoided. The locomotive runners prefer them greatly to the trolley locomotives. Aside from their being so much safer they have no clumsy trolley pole to manipulate and their operation is "softer"; the weight of the battery gives a good tractive effort and by the use of intelligence and judgment no trouble is had in handling the batteries, and in keeping them charged up to full working conditions.

For haulage in our main tunnel level, where maximum trips are about 14,000 ft. each way, we are still using the trolley system, and will continue to do so. For all other work and for hauls up to say 2500 ft., storage-battery locomotives will be used. A motor-generator set placed underground operates on a 2300-volt. alternating current, and delivers from its generator a 110-volt. direct current for the batteries. This set is placed at the underground hoist and is stopped and started by the hoisting engineer at the telephoned request of the different operators, whenever current is needed for charging purposes.

Stanley A. Easton, Manager,
Bunker Hill & Sullivan Mining & Concentrating Co.
Kellogg, Idaho, Oct. 7, 1913.

## No Malaria in Johannesburg

In an editorial in the Journal of Nov. 1, entitled "Colonel Gorgas at Johannesburg," I note the following: "Although at an elevation of 6000 ft. above sea level, Johannesburg has been the center of one of the world's most renowned malarial districts. But of almost as evil reputation is the prevalence of pulmonary diseases," etc. As a one-time resident on the Witwatersrand, I should like to remark that malaria is unknown in Johannesburg and over the entire land.

From the time the early Dutch settlers came into the country down to the present, malaria has never been heard of, unless we cite those cases of individuals with fever in their system leaving the low veldt and becoming residents in or around Johannesburg, part of the high veldt land of the Transvaal. Malaria is only common in the low-lying districts of the country. The only real malarial districts of the Transvaal are to be far north along the Limpopo or Crocodile River, and east along the Portugese East African boundary. Mosquitoes are common during the summer months around Johannesburg, but the "fever carrier" is unknown.

The climatic conditions of the Rand are as good as any in the world. Men living in close proximity to mine dumps, the injurious effects of dust and the question of underground workers and pulmonary disease is quite a different matter and is of the most vital importance to the welfare of both white and colored workers and consequently to the mining industry of the country.

R. Knox Paton.

Copper Cliff, Ontario, Nov. 5, 1913.

# EDITORIALS

## Blister Copper in Transit

The quarterly reports of the porphyry copper companies afford some interesting information, respecting the quantity of crude copper that is normally carried by such producers. In recent months they have had to carry but little or no refined copper. In some cases the companies say specifically that they were carrying no copper in that form. The smallness of the aggregate stock of electrolytic copper removes any doubts respecting the position of the porphyry companies in that respect. Consequently, it may be assumed that about all of the stock reported by them was in the form of concentrates or blister copper, the latter either at the smeltery, in transit, or at the refinery.

The aggregate stock reported by the Chino, Nevada, Ray and Utah companies, at the end of the third quarter of 1913, was 88,213,000 lb., compared to 87,414,000 lb. at the end of the second quarter. The slight increase in the third quarter was too small to be of any significance.

We do not understand why Nevada Consolidated should be carrying so much copper. At the end of each quarter it had on hand about 22,000,000 lb., which is just four times its average monthly production of 5,500,000 lb. Excluding Nevada Consolidated, the other three companies had on hand at the end of each quarter a little over 60,000,000 lb., or about three times their average monthly production. In other words, these companies have on hand normally about three months' production of copper. This gives an idea of the extent to which a Western copper producing company must provide itself with working capital. A company producing 1,000,000 lb. of copper per month at a cost of 10c. per lb., must have $300,000 to start in with, or else will have to borrow money against its shipments, which comes to the same thing in so far as cost is concerned.

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## Secretary Wilson on the Profits of Mining

Secretary of Labor William B. Wilson, addressing the American Federation of Labor at Seattle, Wash., on Nov. 12, strongly condemned the attitude of Michigan copper mining companies and warned them that a new conception of titles to property was in process of formation. He declared he would make public not only the wages paid to the miners, the hours they worked, and the labor conditions, but also the enormous profits of the mine owners.

Mr. Wilson, who addressed the delegates as "Fellow Unionists," remarked, moreover, that heretofore it had been the custom of the Department of Labor to investigate only wages, hours, and conditions of labor, and report. This time, he said, it had been determined to go a step further and investigate the earnings of the corporations involved. Then he added:

> And the little bit of confidence that I am going to give to you, is an advance statement of one of the items in that situation—that the largest corporation engaged in the production of copper in the Michigan district was organized in 1870 under the laws of the State of Michigan; that the face value of its capital stock is $2,500,000. The shares are $25 each. They were purchased at $12 each, so that the actual investment is $1,250,000.
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> From that time until one year ago, the last fiscal report that we had—a period of 42 years—that corporation declared in dividends $121,000,000, and made reinvestments out of its earnings of $25,000,000. Nearly $200,000,000 of actual net profits in a period of 42 years on an investment of $1,250,000, and then not only protest against meeting committees of their workmen, but refuse to accept the good offices of the Department of Labor in negotiating the difficulty.
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> They say their property is their own; that they have the right to do with it as they please. Maybe they have, but those who take that position have a false conception of the titles to property.

The Secretary said every title was law-created and law-protected, and that, deprived of those laws, the property involved would be at the mercy of the first strong and cunning man who desired it; and then talked some more piffle.

According to the newspaper dispatches, Secretary Wilson's audience was astounded by the nature of his disclosures. We do not wonder. We, also, are astounded.

The figures of the production of the Calumet & Hecla mines, and the amount of money originally invested in those mines, have been well known to everybody acquainted with the mining industry. A committee of the Copper Country Commercial Club recently investigated the conditions of the employment of labor in the copper mines of Michigan, and reported its findings, which have been published. This report went fully into the profits and losses of the mines, the wages paid to the miners, and many other details. Secretary Wilson cannot have anything to tell about those things that is not already known by the reading public. When, therefore, he threatens to make "disclosures" he is simply talking buncombe.

Something over 70 mining companies had operated in the Lake Superior copper region from 1849 to 1910. Of the entire list, only 14 mines have paid back the money invested in them. The dividends paid by all mines up to the end of 1910 were about $194,000,000; the assessments levied were about $79,500,000. The Calumet & Hecla company alone paid $112,500,000 in dividends. If that company be taken from the list, the remainder of the mines have just about paid back the money invested in them.

However, this has not much to do with the case anyway. The Calumet & Hecla was one of the phenomenal mines in the history of the world. It yielded to its developers great fortunes, just as did the Big Bonanza of the Comstock Lode. Their developers took long chances and were lucky. They were the exceptional favorites of fortune. The great majority of those who take long chances lose their money. Out of the host of adventurers in mines to few is it given to be successful.

The Calumet & Hecla mines have passed their zenith. The life of the company now depends upon the mining of low-grade ore, and from great depths. This can be done only by reducing the cost of production. It has not been attempted to do that by reducing wages, but rather by the introduction of improved methods of mining, improved tools, etc. The matter of wages is determined by economic conditions. If an employer is unwilling to pay the market price for labor, he will not get the supply of it that he needs.

The cost of producing copper in Michigan is, on the whole, higher than the cost in Arizona and some other great mining regions. The Calumet & Hecla company is still able to pay large dividends, inasmuch as its ore still continues to be relatively rich as ore goes in the Lake Superior region, but other mining companies in that region do not find it easy sailing.

If a mining company is to be pronounced by the U. S. Department of Labor to be an enemy of society because it pays large dividends, and if it be a crime to risk money and discover a bonanza, then the outlook for the mining industry is bad. Such remarks as those of Secretary Wilson, phrased to inflame ignorant persons and to excite reckless passions are nothing short of scandalous in coming from a responsible cabinet minister. Most persons will agree with Mr. McNaughton in his remark that the good judgment of the companies in declining Hon. Mr. Wilson's services as mediator must now be apparent. If the report of our Washington correspondent be correct, viz., that Secretary Wilson's statements have passed in Washington without either apology or repudiation, and that he is in fact regarded as expounding the policy of the Administration, there is indeed ground for alarm.

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## Modern Roasting Furnaces

In the metallurgy of copper, out of the long list of roasting furnaces of the past, the McDougal type has emerged triumphant, and nowadays scarcely anything else is to be found in use in American works. The usage is further limited to three varieties of this type, viz., the Evans-Klepetko, the new Herreshoff and the Wedge. Referring to recent installations: The Hayden works was equipped with Evans-Klepetko, the new Calumet & Arizona and Clifton works with Herreshoff, and the El Paso works (remodeled) with Wedge furnaces. The new plant of the United Verde Copper Co. is also to have Wedge furnaces. Thus all three have found representation in smelting plants of the first magnitude and of about contemporaneous erection.

In the metallurgy of lead the Dwight-Lloyd sinterer now stands preëminent, but the Huntington-Heberlein pots still find extensive use, and in certain particulars they are considered by some metallurgists still to have advantages. The introduction of blast roasting into the metallurgy of lead, as represented by these two exponents of the process, was one of the greatest developments of all time in the history of that art. A new feature in the metallurgy of lead has been the successful use of the Wedge furnace, at Herculaneum, Mo., and at Midvale, Utah, for the roasting of lead matte, a feat that heretofore has been troublesome to accomplish with a mechanically raked furnace.

In the metallurgy of zinc, the Hegeler furnace is the only thing in the modern plants. This furnace dates back to about 1882, since when it has been improved in dimensions and in details, but not otherwise to any very important extent. The survival of this old furnace, which is only semi-mechanical, indicates poverty of invention, or slothfulness in experimentation, or both.

In the sulphuric-acid industry, and for miscellaneous roasting, the Herreshoff and Wedge furnaces are commonly employed. Wedge furnaces are now being installed in two places for the sulphating of zinkiferous sulphides. Also it has been tried with favorable results in the roasting of low-grade copper ore preliminary to leaching. The Evans-Klepetko furnace also has been used for similar purposes.

Each of these furnaces has its particular points of merit. One or the other of them is to be found in nearly every large smelting works, and nowadays scarcely anything else is to be found except here and there something that survives as a relic of the past.

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## Enriching the Blast

We have frequently referred to the excellent work done by James Gayley in his experiments on drying the air used in blast furnaces. The advantages of this process, although clearly demonstrated, have not received the attention which they deserve, and the process has not been adopted in this country to as great an extent as might be expected, while abroad it met with some active opposition. One large company, however, not only adopted the process, but has been conducting some interesting experiments in the addition of oxygen to the blast, thereby enriching it before its introduction into the furnace.

These experiments have been made by Ougree-Marihaye Co., at its furnaces in Belgium, one of the stacks being used for that purpose. Speaking very briefly, the process consists in supplying to the dried air an addition of oxygen, raising the proportion of oxygen in the blast from 20.8, the ordinary content of the air, to somewhat over 23%. The oxygen was obtained by liquifying the air, allowing the nitrogen and other more volatile gases to pass off, and finally compressing the oxygen into holders, from which it was fed, as desired. The process, as described by Gustave Transenster at the Brussels meeting of the Iron & Steel Institute, is not a very difficult or costly one, and the results obtained in increasing the product of the furnace with a smaller consumption of fuel was so encouraging that it is proposed to continue the experiments on a larger scale and it is even suggested that a blast composed of almost pure oxygen may be obtained. There is little doubt that this development of the Gayley process is a promising one.

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We are often asked by our readers to give the quotation for some metal during a current week. This we are unable to do. Although we report the daily market in the cases of the important metals, we canvass the market but once a week, at which time we review the transactions of the five days of business previous. The labor and attention that is involved by our methods do not permit of anything more frequent, the only exception that we make being when a month terminates in the early part of our week. Our week ends on Wednesday, on which day we go to press. The paper is out on the Friday following and is dated Saturday. In view of this delay, which results from our system of printing, we are glad to communicate our market quotations in advance to those who ask for them.

## BY THE WAY

We find that an article on the Nosciniscato placers, Peru, which appeared in the Journal of Oct. 18, 1913, with credit to the *West Coast Leader* as the original authority, was in fact first published in the *Mining and Scientific Press*, as to which no indication was given by the *West Coast Leader*. It is important in the interest of accuracy that the real source of data be always established.

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According to newspaper reports, the Minerals Separation Co. wants $1.25 per ton royalty from the Butte & Superior company, for use of the oil-flotation process, in which use it is claimed that the Butte & Superior is infringing the Minerals Separation patents, although the Butte & Superior company denies that it is infringing. Apparently the case between Minerals Separation and James M. Hyde was only a preliminary skirmish, and the real fight is to come in the trial of the present case. Judge Bourquin, on Nov. 14, decided against the Butte & Superior company, but refused to enjoin it from use of the process, considering that the higher court might reverse his decision On the 5th of each month the Butte & Superior is required to file a complete statement of its output.

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The Eastman Kodak Co. says that it is the largest consumer of silver bullion in the United States, and moreover that it purchases more than any concern other than the U. S. Mint. The Eastman company manufactures its own silver nitrate and uses from six to seven tons of silver per month. This is a lot of silver and the producers thereof are duly grateful for such an absorption of their commodity. However, we should imagine that some of the silversmiths or silver-platers might be even larger consumers than the Kodak company.

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Francis E. Nipher, professor of physics at Washington University, has discovered what he says is a new law in physics, which he thinks is likely to lead to great changes in the principles of construction of power machinery, says the New York *Sun*. The alleged discovery is that on an incline of from 45 to 60° more power is required to propel an object on the surface than would be required to lift it outright. The explanation is that at an incline between the degrees mentioned the frictional resistance makes the load heavier than its dead weight. Recalling the velocity with which our dead weight alone has propelled us down 45° pine boards, we feel confident that there was a mixup in transmission.

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Referring to Secretary Wilson's speech in Seattle, Mr. McNaughton, general manager of the Calumet & Hecla company, is quoted as saying: "Mr. Wilson, through representatives of his department, made a thorough investigation of strike conditions. Upward of 20 of the mining companies answered a series of 110 questions each. Mr. Wilson's criticism of the mines of this district is based on the reply of one company to two of these questions, those pertaining to capitalization and to dividends. Evidently, Mr. Wilson could find no fault with the answer to the other 108 questions asked the Calumet & Hecla Mining Co., or to the 110 questions asked each of the other companies. He selected for the purpose of his confidential advance statement, answers to two questions which had no bearing whatever on the controversy."

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The remarkable effect of a carnotite deposit on the men working on it is thus described by the Salt Lake *Tribune*. "One peculiar effect of the presence of uranium oxide is observed in the men who work on the ground. The very air appears to be radio-active to a great degree. No man working on the ground has been known to have had rheumatism, even though he had been previously subject to it in greater or less degree. The ore and atmosphere combined seem also to have a beneficial effect on the stomach and associated organs. Evidently there is so much of radio-active content in the sandstone and petrified streak that its force is projected above the surface. The effect has been noted by all the men who have worked on the ground." It will not be long before the quacks are advertising "bottled carnotite," or something equally good.

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At the 12th Allegemeine Deutsche Bergmannstag (concluded Sept. 5, 1913), Dr. Leinbach, of Göttingen, read a paper on electrical ore finding, with special reference to the principles established by Dr. H. Löwy. Even in the embryonic condition of this new science, the author points out, the results of boring operations and of general geological exploration can be usefully supplemented by the electro-dynamic methods at present recognized by scientists, and many other spheres of utility are open to them. Much, however, remains to be done in order to fulfill the expectations placed in some quarters on those methods. In this connection it is interesting to hear that the mining authorities in German South-West Africa are at present employing the method, experimentally as well as in practical work, for the discovery of minerals and water in the protectorate. The importance attached in Germany to the question of the divining rod is evidenced by the fact that a very influential association has been formed there for its elucidation, says the *Mining Journal*. The first general meeting of this association took place on Sept. 18 to 20 last at Halle, in Prussian Saxony. One hundred and twenty members from all parts of Germany and a few foreigners were present, among them the president of the province, two prominent professors of the University of Halle, Professor Dr. Krusch, the well known geological expert, as representative of the Prussian geological department, and delegates of several influential scientific associations. About 20 professional divining-rod men, half of them qualified boring engineers and well sinkers, were also present. Five special commissions of members of the association had been appointed for the purpose of examining and testing the execution of special tasks set to certain divining-rod performers, among them the determination of some subterranean cavities, of brown-coal deposits, and of water conduits containing partly ground water, partly filtered river water, and partly brine —all in the vicinity of Halle. However, the time at the disposal of the commissions proved too short for obtaining definite results, and a permanent local committee was appointed for concluding the work initiated by the commissions. These Germans certainly do take it seriously.

## PERSONALS

Corey C. Brayton has returned from Nome, Alaska, to San Francisco. He was engaged during the summer in gold dredging in the Solomon district.

George A. Packard intends to make his Boston office, 50 Congress St., his headquarters for a time rather than at Butte, Mont., as in the recent past.

Newton W. Pilger, of Butte, Mont., is now superintendent at the Iron Mask mine, near Kamloops, B. C. The property is owned by a Duluth, Minn., company.

Sir Alfred Mond recently inspected the nickel mines at Sudbury, Ont., and established a new town at Coniston, where the works of the Mond Nickel Co. are.

E. H. Nutter, of San Francisco, chief engineer for the Minerals Separation American Syndicate, Ltd., was in Slocan district, British Columbia, at the end of October.

Lawrence Addicks, Percy E. Barbour, Samuel J. Gormley and Ralph B. Williams have been elected to membership in the Mining and Metallurgical Society of America.

I. L. Merrill, president of the Hedley Gold Mining Co., recently visited that company's Nickel Plate group and 40-stamp mill in Similkameen district, British Columbia.

L. D. Davenport has resigned his position at the Ernestine mine, in the Mogollons, New Mexico, and is again connected with the Oliver Iron Mining Co., at Eveleth, Minnesota.

J. V. N. Dorr will spend a great deal of his time in New York this winter attending to the business of the Dorr Cyanide Machinery Co., which has opened an office at 50 Church St.

W. E. Finch has returned to Spokane, Wash., for the winter. He is manager for a syndicate engaged in development, under option of purchase, of mining properties in Slocan district, British Columbia.

Wilber D. Greenough, manager for the Atlas Mining Co., has returned to Whitehorse copper camp, southern Yukon, after having spent a month at Spokane and other parts of the northwest states.

L. F. S. Holland has returned to Telluride, Colo., after examining mines in Beaver County, Utah, and Park County, Colo. He is arranging to make his headquarters in Los Angeles, Calif., during the coming winter.

Howard W. DuBois was in Victoria last month, after having spent some time investigating mineral resources in the eastern part of the Caribou district of British Columbia, and thence over the Rocky Mountains in Alberta.

W. M. Brewer has returned to Victoria, B. C., after having traveled more than 1000 miles on horseback investigating conditions in several mining districts of British Columbia to report on same to the Provincial Department of Mines.

H. W. Hardinge is at present on an extended tour through the Northwest, including British Columbia, to inspect recent large installations of Hardinge mills in that district. Mr. Hardinge expects to be gone between six and eight weeks

Andrew Clark, superintendent of the openhearth department of the Carnegie Steel Co., at Farrell, Penn., has resigned and Ford Corill will succeed him. L. M. Tittsler has been appointed superintendent of the openhearth department at the company's Sharon works.

Otto Wartenweiler has left Pearce, Ariz., where he had charge of the mechanical design and construction of the milling and cyanide plant of the Commonwealth Mining and Milling Co., and has opened an office in Los Angeles as manager for Otto Wartenweiler & Co., engineers and contractors.

George F Waddell, superintendent of the concentrating mill of the Nevada Consolidated Copper Co., at McGill, Nev., has resigned that position in order to become manager of the Ohio Copper Co., in Utah Albert Frank, who retires from the management of the Ohio Copper Co., will continue to act as its consulting engineer.

S. S. Sorensen, who has been in charge of the reduction works of the Nevada Consolidated Copper Co., at McGill, Nev., since that plant went into operation, previous to which time he was its chief engineer of construction, has retired from that position in order to become general manager of the Braden Copper Co., in Chile R. T White, former manager at Braden is now on his way home to the United States Mr. Sorensen's successor at the Steptoe Valley works has not yet been appointed

## OBITUARY

Mrs. Alexander E. Hamilton, mother of F. McN. Hamilton, state mineralogist of California, died suddenly of heart failure at San Francisco, on Nov. 3. Mr. Hamilton was returning from a professional visit to the oil fields and other mining districts in southern California at the time, and could not be informed of the death of his mother until he reached San Francisco. Mrs. Hamilton was 67 years old, born in New Brunswick, and with her husband, now deceased, went to California in 1868.

John W. Cox, a pioneer California miner, killed himself at Forbestown, Butte County, Calif., on Nov. 8. Cox went to California across the plains in 1849. He killed himself with the gun he had carried for protection from Indians, a muzzle-loading rifle. He had been a resident of Forbestown since the days of rich placer mining in that district. Recently he had been ill with dropsy and relatives wished to place him in a sanitarium, but he preferred death at his own hands to leaving the cabin he had occupied as home for 25 years.

## SOCIETIES

**Mining & Metallurgical Society**—The New York section met on Tuesday, Nov. 18. About 25 members were present. The subject of discussion was the flotation process of ore separation, in which there was general participation.

**Society of Chemical Industry**—The regular meeting of the New York Section was to be held Nov. 21. The program for the evening included papers on: "The Corrosion of Metals and Alloys in Contact," by Richard H. Gaines; "The Relation of Composition of Ash in Coal to its Fusion Temperature," by Oscar W. Palmenberg; "A Peculiar Dust Explosion," by William M. Grosvenor.

**American Institute of Mining Engineers**—The first regular meeting of the Colorado Section was held at the Brown Palace Hotel, Denver, on Friday, Nov. 7, at 7 p.m. After dinner had been served, a discussion was opened on "The Effect of Present Methods of Taxing Mines on the Mining Industry of Colorado." William J. Cox, chairman of the Colorado Section, presided at the meeting. The discussion was highly educational and brought out many interesting and important phases of mine taxation. Among the speakers were William J. Cox, W. V. Hodges, H. A. Webb, Thomas B. Stearns, Philip Argall, Richard A. Parker, E. N. Hawkins, Ernest Le Neve Foster, D. W. Brunton, Charles J. Moore and Mr. Hammond. Attention was called to the unjust burden of taxation borne by the mining industry, due to the comparatively low valuation placed upon real estate and industries other than mining, which by unjustly reducing the proportion of the taxes paid by these industries caused a corresponding unfair increase in the taxes on mining property. The question of taxation will be further discussed at a future meeting.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ORE TREATMENT—Process of Treating Ores Containing Silver. Erich Langguth, Neerpelt, Belgium. (U. S. No. 1,078,-360; Nov. 11, 1913.)

GAS REMOVAL—Apparatus for Treating Molten Metals, Alloys, and Steel. Louis Marie Victor Hippolyte Baraduc-Muller, Paris, France. (U. S No. 1,077,925, Nov. 4, 1913.)

IRON-ORE TREATMENT Process for the Extraction of Gold and Silver Remaining in Iron Ores which Have Already Been Treated for the Removal of Sulphur, Copper or Other Metals. H. M. Leslie, Glasgow, Scotland (Brit. No 22,909 of 1912 )

OPENHEARTH FURNACES Improvements in or Relating to Regenerative Openhearth Furnaces for Metallurgical Purposes. Kurt Albert, Amoneburg, Germany. (Brit. No. 28,960 of 1912.)

LEAD REFINING—Apparatus for Refining Lead. Joseph Franklin Beattie, Hammond, Ind. (U. S. No. 1,078,408; Nov. 11, 1913 )

MANGANESE Method of Extracting Manganese from Its Ores Friedrich Heusler, Dillenburg, Germany. (U. S No. 1,078,199 Nov 11, 1913 )

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Nov. 12

**An Early November Rainfall** extended throughout the northern part of California, continuing intermittently for several days from Nov. 1. Precipitation in the mining districts was general and of great value in providing water for hydraulic mining and for milling in the drier counties. The dry season has been longer this year than usual and a large number of the smaller mines were compelled to shut down late in the summer, especially those that use water for power.

**Purchases of State Highway Bonds** to the extent of $50,000 are to be made by the Siskiyou County supervisors in accordance with an agreement with the state highway commission to route the Siskiyou County portion of the highway through the town of Yreka, the county seat, instead of through Montague. The two Yreka banks have agreed to purchase a like amount of these bonds. Siskiyou is the first county north of Sacramento to make liberal subscriptions to the bond issue.

**An International Engineering Congress** is to be arranged for by the Panama Pacific International Exposition at San Francisco. The week beginning Sept. 20, 1915, has been tentatively set apart for the session. It is understood that Col. George W. Goethals, chief engineer of the Panama Canal Commission, has consented to act as honorary president of the congress, which will be held under the auspices of the American Institute of Mining Engineers and other engineering societies.

### DENVER—Nov. 15

**Strike Situation Is Worse,** for on Nov. 7 three mine guards and their automobile driver were ambushed and killed by seven strikers near La Veta. Charles Richards, vice-president of the La Veta union, is said to have been the ringleader. The murderers have been captured by the militia and have confessed. It was then found that the force of militia is entirely inadequate to maintain order and restrain violence over the wide area affected by the strike, and Governor Ammons threatened to call for United States troops from Fort Douglas. Later it was published that no Federal aid was available within 1000 miles, and then the agitators grew bolder. The Delagua mines were attacked the night of Nov. 10 and many shots were fired. The Baldwin mines in Gunnison County, owned by the Rocky Mountain Fuel Co., were closed and 50 miners walked out. The Leyden miners will also go out and are erecting tents for the colony of strikers. What has more than all accentuated the situation and emboldened the strikers is the fact that State Auditor Kenehan has refused to issue certificates to pay the militia. At midnight Nov. 10 the Hecla mine at Louisville in the northern field was attacked by strikers and 300 shots were fired, the boarding house and cottages being riddled by bullets, the miners and their families hiding in cellars and behind coal cars and concrete ashpits until the mine guards could be gathered, when the shooting stopped. There is now fear of a series of outbreaks in the northern fields similar to those in the south. Governor Ammons in an informal statement, Nov. 11, is said to have declared that the blame for prolonging the strike is due to Auditor Kenehan's assurance to strike leaders that he would refuse to allow the state to advance money to send troops to the strike fields. Otherwise the strikers would have compromised Oct. 26 and peace would have been assured. The operators have practically conceded everything asked for, except recognition of the union; they will take back any of the strikers except those convicted of lawlessness, but they adhere to the open-shop policy and right to employ non-union men. The heads of the Colorado Fuel & Iron Co., the Victor American, Fruth and Autrey companies, also offer to give a coal mine to the city or state for the cost of the equipment in order to enable the government mining theory to be tested. The governor appealed to the patriotism of the business men to carry militia accounts until the courts could mandamus the state auditor. This was accomplished Nov. 13, the supreme court issuing an alternative writ of mandamus against Auditor Kenehan and his deputy, Nelson Ballou, ordering them, or one of them, to appear in court Nov. 14 and show cause why they should not be compelled to issue certificates of indebtedness for the expense of maintaining the militia in the coal-strike district. On the same day a meeting of state editors was held at the Brown Palace Hotel to hear the basic causes of the strike, so that they might be able to tell the public the whole truth of the matter. The governor and about 60 men were present, representing organizations of members of nearly every industry and profession in the state. The mine operators, mine owners and miners were equally prominent at the conference. All sat side by side as they listened to the story of the strike from the lips of the chief executive and the men who are parties to it. The United Mine Workers have a paid advertisement in the papers of which the heading is as follows: "All the miners ask is a living wage and the enforcement of the state laws." A living wage they certainly get, as evidenced by the following which the operators publish from the company payrolls: "The average wage at the Rouse mine in August was $4.41 per day, at the Bowen mine, $4.27; at the Primero mine for October $4.98; at the Sopris mine for October $4.67; and at the Gray Creek Mine for October $4.90. As to the state laws, the operators have signed an agreement with the governor to comply with these fully in every respect. At a meeting of a committee of the chamber of commerce a resolution was passed as follows: "In our opinion conditions at the mines did not justify the present strike and the campaign of terrorism inaugurated by the strikers was for the sole purpose of preventing the miners, through fear, from returning to work. Without the bloodshed and lawlessness that has prevailed a majority of the men would probably have returned to work and we have reason to believe that with assured protection for the miners operations will be quickly resumed." This is the situation up to date.

### BUTTE—Nov. 12

**The "Smoke Lawsuit,"** which was instituted by Montana farmers to get relief from the fumes from the Anaconda company's reduction works was dismissed Nov. 14, by the supreme court of the United States. The suit has been pending for more than five years and has been a disturbing factor to thousands of people. A granting of the plaintiff's demand would have involved the suspension of important mining activities in Butte, the closing of the Washoe works at Anaconda and the crippling of many other dependent industries in Butte and Anaconda. The announcement that the supreme court has put an end to the old lawsuit came as welcome news to the residents of the entire state of Montana.

**The Minerals Separation Case** against the Butte & Superior company is in the hands of the judge of the Federal court. During the days of the hearing experts were present from New York and Chicago and there were practical demonstrations in the court room of the working of the process in use at the Butte & Superior mill, witnessed by many prominent mining men. One of the arguments put forward by the Minerals Separation company was to the effect that in consequence of the use of the process by the Butte & Superior company it was prevented from closing deals for the sale of the patent to other mining companies and that others have even refused to treat with them and have broken off possible deals altogether and they have suffered great financial losses. The demonstrations were made by Frank Janney, of Salt Lake City. Judge Bourquin did not take much stock in the affidavits submitted and plainly told the attorneys so, remarking that he wished to observe the actual working of the system rather than consider information gained from statements contained in affidavits. O. Wiser, a chemist of the Ray Consolidated mill, at Hayden, Ariz., assisted in a number of experiments and told of the methods used in getting exhaustive data on the subject of oil agitation. [Judge Bourquin on Nov. 14 rendered a decision in favor of the Minerals Separation Co. —Editor.]

### SALT LAKE CITY—Nov. 13

**An Enlarged Homestead Act,** copies of which have been received by the U. S. Land Office of this city, names 7000 acres of Utah land which are to be opened to entry Nov. 20, 1913. Exception will be made for timbered and mineral lands.

**Three Mines Paid Dividends** amounting to $295,000 in October. These were the Daly-Judge, in Park City, with $45,000, the Iron Blossom, of Tintic, with $100,000, and the Utah Consolidated, of Bingham, with $150,000.

### CALUMET—Nov. 15

**Organization of the Citizens' Alliance** and the withdrawal of practically all the remaining militia, excepting the local soldiers on duty, were the most important developments of the week with regard to the strike situation. The arrival of several hundred additional workingmen and the establishment of "cost" stores by the Western Federation of Miners likewise were incidents of some comment, as was the conviction of "Big Annie," a spectacular Amazon, who has been leading the early morning parades and posing for pictures with an American flag background for the use of the socialistic magazines engaged in so called uplift work and for newspapermen who found her a great subject for so called human-interest stories. Big Annie headed the strikers' parades, carrying a big flag. She broke a supreme court injunction every morning before breakfast and enjoyed it. She forgot to appear in circuit court when her trial was called and she was wanted as a witness in her own defense. She enjoyed the publicity and the pose. It was a kind of heroism business that was different from the boarding-house employment that kept Annie busy before the strike. Militant socialism was heaps of fun for Annie. But in the course of time, after Annie had been arrested half a dozen times, she was tried and the plain, business-like jury lost little time in finding Annie guilty of assault and battery. The complainant was a little miner, who insisted on going to work whether Annie and her American flag blocked the way or not. Then the Western Federation lawyers appealed the case to circuit court. There was another trial and the jury brought in a verdict of guilty. In face of the facts that Annie is a rather good-looking woman, that she assaulted a man, that there are other influences that frighten juries and witnesses, this conviction indicates a little something of the trend of the public mind in the copper country relative to the strike. The jury refused to make a heroine out of this assaulter. And the jury had plenty of time to consider the evidence. The formation of the Citizen's Alliance seems to be a spontaneous action to rid the community of the Western Federation of Miners. For 50 years this district got along without any serious labor trouble. Four months ago the Western Federation called a strike and disorder has prevailed ever since. The Alliance has one object in view. That is, the elimination of the Western Federation from the Michigan copper country. There is something of mystery about its formation and as far as can be learned it has no officials. Just what the total membership is likewise something of a quandary. It purposes, in addition to driving out the Western Federation, to give moral and physical backing, if necessary, to the men who are working.

### DEADWOOD—Nov. 11

**The Mine Inspector's Annual Report** for the year ended Oct. 31, shows that during that period the bullion product of the Black Hills mines was $7,497,100, of which only $2000 came from placer mining; that there are 2960 men employed in the mines of the district; that there were during the year 9 fatal and 8 non-fatal accidents. In addition to the precious metal output, there was produced during the year mica worth $6950; gypsum products, $61,735; tungsten ore, $2000; lithia ore, $19,500; building stone, $106,000; coal, $12,000 and miscellaneous, $40,000, a total of $248,135. Following are the figures of bullion production and tonnage as given in the report: Homestake, $6,250,000, 1,533,000 tons; Golden Reward, $423,840, 53,712. Wasp No. 2, $286,930, 163,380; Trojan, $280,518, 68,106; Bismarck, $50,000, 31,980, New Reliance, $73,323, 27,100; Mogul, $44,117, 5593; Placer, estimated, $2000; Miscellaneous, $86,372, 10,600; Totals, $7,497,100, 1,893,471 tons.

**Compliance with the New "Blue-Sky" Law** which the legislature, of South Dakota enacted last winter, and which is now in force, has not been found an easy matter by those companies which have attempted it. The law which is patterned after the famous Kansas statute, makes innumerable requirements, such as the furnishing the state securities commission, which is headed by the state bank examiner, with such information as a list of directors and officers, with their known financial worth, the amount of stock held by each, and the price or compensation paid by each, for his holdings, a complete list of stockholders of the corporation, with the price or compensation paid by each for his holdings; a copy of all contracts or agreements in force; a statement as to the work or business to be undertaken, a balance sheet of the corporation, etc. The usual course then seems to be, according to those who have attempted to secure permission to sell stock in the state, that the official in charge of the office requests the company making application to forward to him $50 to cover the costs of a visit to the property "to view the assets." Inasmuch as the man sent out knows practically nothing of mining, and not a great deal about business, this part of the law is regarded in the mining districts of the state as a huge joke. But finally the commission will issue authority to sell the lot of stock or bonds asked for, specifying the price at which it shall be sold, and it cannot be sold for any other price. If that allotment should be placed and a change of price decided upon by the directors or those in control of the company, permission to do so must be secured from the commission. It may be mentioned that this second permission is easier secured than the first.

### VALDEZ—Nov. 7

**The Kasna Creek Group** of nine claims was sold three years ago by Schlabin, Brown & Walker to New York and Boston men and the purchasers are now patenting their ground. Kasna Creek flows into Konteshebna Lake and is 120 miles from Seward via Iliamna Lake. The claims are 3000 ft. above sea level. The ore occurs in altered limestone and dips at an angle of 80° and strikes north. It has a length of over 5000 ft. and a width of 500 to 1000 ft., broken by horses of garnet rock. Three tunnels have been driven in doing the work necessary to securing patents, an 80-ft. and a 50-ft. tunnel being in ore and a 120-ft. tunnel which was not driven in ore because of danger from snowslides. The ore is chalcopyrite associated with hematite and 50 samples show an average of 1.7% copper with a little gold. The rocks inclosing the ore are shales and quartzites, while granite, mica schist and volcanic tuffs are found in proximity to it. Small diorite dikes cross the ore. A smelter site has been secured at the mouth of Kasna Creek and also a site for a power plant eight miles distant at the outlet of Konteshebna Lake. The present owners propose to spend $200,000 or more in diamond drilling the property and if the results are satisfactory a railroad 120 miles in length will be built to give access to it. Machinery for drilling will be put on the ground next season. The district in which the Kasna Creek group is located presents some interesting geological features. There are no less than three extinct volcanoes near the property and facing on Konteshebna Lake.

### SUDBURY, ONTARIO—Nov. 17

**Mond Nickel Co. Purchased** last week all the properties owned by Messrs. Stobie, Rinaldo McConnell and R. J. Tough, comprising three of the seven properties known as the Levack group, situated on the west side of the nickel belt. The three properties were sold for $550,000. During April of this year drilling operations were commenced on what is known as No. 1 property. Since then eight diamond drills have been in operation. It has been learned on good authority that between 3,000,000 and 4,000,000 tons of ore have been proved by diamond drills on No. 1 property alone, which is situated on lot seven, concession two, Levack Township. No. 2 property is situated on lot six, concession two, Levack Township, and is yet to be drilled. No. 3 property is situated on lot two, concession four, Levack Township. Lying between these properties are other lands containing valuable outcrops of nickel-copper ore and owned by men most of whom live in Sudbury. Canadian Pacific engineers are on the ground; a contract has been let for building a four-mile spur into the property from the main line of the Canadian Pacific Ry. at Old Onaping or what is to be known as Levack. This spur is to be finished in the shortest possible time. It is anticipated that ore will be shipped from the properties next March. Preparations are being made to carry on mining operations on what is known as No. 2 property, the ore on which can be taken out from open cuts. The ore on No. 1 property lies beneath a swamp or marsh and can be mined from a shaft only. Diamond drilling in Levack has disclosed new geological conditions which were not before known to exist on the nickel range and may have a marked effect on drilling operations for nickel ore.

### TORONTO— Nov. 17

**A Sample of Calgary Oil** has been received by the Canadian Geological Survey. The oil came from the recently struck No. 1 well of the Calgary Petroleum Products Co. at Black Diamond, 16 miles west of Okotoks, Alta. This oil, which was struck at a depth of about 1560 ft., is what is technically known as a "white oil," being transparent and of an amber color. It is phenomenally light for a natural mineral oil, having a specific gravity of about 62 Baumé and evidently consists largely of gasoline. "White oils" are rarely found in quantity and appear to be the result of filtration through clay strata, under pressure of the lighter portions of ordinary petroleum. That this has occurred in the present instance is rendered probable by the fact that at a higher horizon in the well a flow of gas of 2,000,000 cu.ft. per day was struck. "White oils" are usually found only in the vicinity of large bodies of ordinary petroleum.

# THE MINING NEWS

## ALASKA

A RECENT STRIKE IN NELCHINA DISTRICT, 80 miles from Valdez, is causing much excitement. Reports state that bedrock is found at from 5 to 10 ft. Prospectors are going in.

CLIFF—Company is making preparations for extending tunnel to payshoot.

RAMSAY-RUTHERFORD (Valdez)—Company is planning to equip mine with stamps and other machinery.

ALASKA UNITED (Douglas)—In September, 19,054 tons of ore crushed in Ready Bullion mill yielded $45,737 or $2.42 per ton; profit $15,829. In 700 Claim mill, 18,060 tons yielded $43,649 or $2.44 per ton; profit $15,427.

## ARIZONA

### Cochise County

GOLD MINING & MILLING CO. (Cochise)—Syndicate of Denver men has taken lease on property. Large tonnage of $4 ore blocked out. Under terms of lease new operators are to build a mill of not less than 150 tons capacity before end of two years.

### Gila County

INSPIRATION CONSOLIDATED (Globe)—Operating of the new test mill will probably begin Dec. 1. However, this depends greatly upon two things; electric power and water. An 8-in. pipe line has been laid from Wog's ranch to mill, but no water as yet has been turned on. Power is dependent upon Roosevelt-Miami-Superior transmission line, now in course of construction, and it is not certain that wires will be at Inspiration plant at required time. Mill will have a daily capacity of 600 tons and will contain two 20-in. conveyor belts, one automatic weighing machine, two 48-in. fine disk crushers, one 36-in. disk crusher, one 48-in. roller mill, four Hardinge mills, one of the mills being 10 ft. in diameter, the largest manufactured; four drag classifiers, three No. 6 Wilfley tables, two Deister multiple-deck tables, one No. 4 Deister table, two No. 2 Deister tables, two double-deck slimers and one improved slimer, two elevators and flotation equipment. Mill will be so constructed that method of treatment may be changed as often as desired with little trouble, purpose of mill being to test various methods of treating ores. Work is progressing rapidly at excavating for air compressors and transformer building and within few days concrete pouring will be in progress at that point. Crushing plant at Scorpion shaft has been completed and is ready for operation. American Bridge Co. has four gangs busy riveting ore bins. One span of conveyor housing between bins and coarse-crushing plant is now in place and 95-ft. boom on locomotive frame will be increased to 185 ft. Boom will have to be of that extreme length to erect headframes of Main East and West shafts, Main East being 185 ft. and Main West 165 ft. high. This will be the longest boom ever put on a crane by this company, next greatest being at Panama, which is 150 ft. long.

### Maricopa County

MAX-DELTA (Phœnix)—Mine has resumed work. There is talk of building a mill later.

R. F. SCHAFER (Peoria)—A small mill may be built soon on gold claims near Vulture mine.

SUNFLOWER CINNABAR MINING CO. (Phœnix)—A four-ton pipe retort was recently installed and a flask of quicksilver was exhibited at state fair recently held at Phœnix. Shipments of quicksilver will be made from time to time.

### Mohave County.

BOUNDARY CONE (Oatman)—Plans are being made for a mill.

PITTSBURGH (Gold Road)—The headframe on this property has been completed and sinking of the shaft is in progress. It is now over 50 ft. in depth.

DISTAFF (Chloride)—Lessees have installed a crushing plant at lower end of dump and are concentrating low-grade ores. Concrete high in zinc, carrying $200 in silver, is obtained.

LEXINGTON (Oatman)—At 200 ft. depth on Lexington vein, 24 ft. of ore has been opened through a crosscut; 8 ft. shows gold ore of good grade. Shaft on Big Johnny vein is to be equipped with new hoist and shaft sunk 100 ft. deeper; pumping 70,000 gal. daily.

COPPER GIANT (Hackberry)—One carload of ore per week is now being shipped to United Verde smelting plant. As soon as arrangements at mine for handling ore have been perfected and new siding is in commission shipments will be increased to one car per day.

### Pinal County

CLIPPER (Kelvin)—Negotiations are underway for early resumption of work on shaft. Property was examined lately by Eastern engineers.

RAY-ARIZONA (Kelvin)—Second churn-drill hole has reached depth of over 400 ft. Preparations are being made to sink large working shaft.

KELVIN-SULTANA (Kelvin)—Two carloads of shaft timbers and auxiliary hoist have been received. Work on Westfall shaft will be commenced before end of month. Winze on No. 1 vein from 300-ft. level is being sunk in 6-ft. shoot of disseminated ore which carries 4% copper.

### Yavapai County

CLARKDALE SMELTING WORKS is rapidly being completed, and track is being laid on spur which has been built from new works up to 7000-ft. tunnel, to connect smelter and mine with railroad. All operations with new smelter will be carried on through the 7000-ft. tunnel, which taps the United Verde mine on the 1000 level.

PITTSBURGH-JEROME (Jerome)—Mine is idle at present. It is not known when work will be resumed.

HAYNES COPPER CO. (Jerome)—Sinking continues. It is expected that 1200-ft. level will be reached by Dec. 1. Diamond drills will then be used.

FORTUNE (Poland)—Company has purchased mill on old Annie mine and will move it to Wizard claim of their property, where it will be overhauled and improved. Six months will be spent in developing lower levels by which time it is expected that mill will be ready for use.

CALUMET & JEROME (Jerome)—The long tunnel is nearly completed. It was driven in at depth of 500 ft. to cut ore under apex of mountain. Ore of good grade was found while sinking a shaft near apex. This shaft is 140 ft. deep. Tunnel is about 625 ft. long at present, and in last few feet heavy mineralization and a change in formation appear.

## CALIFORNIA

ACCIDENT at Zelia mine, when a miner was injured by striking a pick into a missed hole, resulted fatally. Besides losing eyes miner's breast, face and arms were torn and he was injured internally, dying Oct. 16.

BUNKER HILL (Amador City)—Usual monthly dividend, 2½c. per share, was paid Oct. 15. Cleanup for October is reported to be much larger than for several months.

SOUTH EUREKA-ONEIDA (Sutter Creek)—October dividend, 7c. per share, has been disbursed, approximating total of $21,000, bringing total for 10 months of 1913 to $109,991. Both mills are running on good ore, South Eureka mill dropping 80 and Oneida 20 stamps. Connection between the two mines has been made.

### Butte County

STEIFER MINING CO. (Magalia)—Reinforced-concrete dam across west branch of Feather River is completed. Work has been started on flume, one mile long, to connect power house to old dam. New dam is 10 ft. high, 8 ft. thick at the base and 4 ft. at crown. Situation necessitated lowering materials with gasoline hoist.

BUTTE CREEK CONSOLIDATED GOLD DREDGING CO. (Chico)—Judgment of $4000 has been awarded company against Laura F. Olney, of Washington D. C., who had failed to establish title to 20 acres of ground sold by her. Litigation stopped operation of company's dredge for some time. Dredge had been repaired and new bucket line installed a short time before litigation interfered.

### Humboldt County

ORLEANS BAR DISTRICT, one of the early placer districts of state, is developing in lode mining. George Wilder and Antonio Lyons recently purchased the Portland, formerly known as Pioneer. A large amount of ore has been worked in arrastre, which will be displaced by a stamp mill if development warrants. The Hdnter on Ten Eyck Creek is reported to be in profitable operation. Ore is cyanided. Red Cap mine, which has attracted much attention recently, is said to be in profitable operation. Opening of wagon road from Eureka to Orleans has been of great benefit to mining in the district.

HORSE MOUNTAIN (Eureka)—A purchase option has been taken by E. B. Harper, of San Jose; 25 tons of ore was recently shipped to Tacoma.

CORONA DEL ORO (Eureka)—Concentrators are being installed to work sand tailings from hydraulic plant. It is reported that Englishmen have asked for option.

### Kern County

NEW BORAX DEPOSITS 25 miles south of Randsburg near San Bernardino county line, are reported to have been recently purchased by F. M. ("Borax") Smith.

MAMMOTH CONSOLIDATED (Caliente)—It is reported that preparations are being made for driving 1100-ft. tunnel that will give a vertical depth of 700 ft. on Eureka vein. Installation of six-drill compressor and 70-hp. gasoline engine is contemplated.

### Mariposa County

BOWER CAVE (Mariposa)—Property has been bonded to T. G. Mudgett, of San Francisco, and development has been started.

### Nevada County

VICTORY MINES CO. (Grass Valley)—A new drain tunnel is being driven in Buckeye mine to be used for draining lower workings. Tunnel will be 350 ft. long and will tap vein. Thorough development is contemplated.

### Plumas County

ROSE (Quincy)—New 5-stamp mill was put in commission first week in October.

CHANNEL PEAK (Quincy)—Work has been suspended for the season. Large flow of water was recently struck in tunnel, indicating proximity to channel.

### Shasta County

UNION MINING & POWER CO. (Redding)—The dam on Clear Creek will be repaired.

GLADSTONE (French Gulch)—The retimbering of the shaft is about completed and the installation of the electric hoist will proceed immediately upon arrival at the mine. Two carloads of the machinery have been received at Redding, the nearest railroad station. The three other cars are expected soon. The hauling to the mine will be by teams. The new hoist will be one of the largest in California.

### Siskiyou County

ELIZA (Yreka)—Erection of a reduction plant is contemplated. Development has been in progress for three years and much ore has been blocked out.

SHASTA VALLEY COAL CO. (Ager)—There is large local demand for coal from this property, 12 miles northeast of Yreka. The coal is used for domestic purposes at Yreka, Montague, Hornbrook and other towns. New ground is being explored with power drills.

### Tuolumne County

CHEROKEE (Jamestown)—Preparations are being made for advancing long tunnel to tap pay gravel at a lower point than was reached in early days when Cherokee was a large producer.

### Trinity County

HEADLIGHT (Carrville)—Development is in progress and it is reported that milling will be resumed early in 1914.

## COLORADO

### Clear Creek County

LOST TREASURE—New capital has been secured for development of this property on Columbia Mountain. Adit will be advanced several hundred feet and a winze will be sunk from adit level at a point 200 ft. from portal where a promising streak of smelting ore is exposed.

COMBINATION MILL (Idaho Springs)—Increase in tonnage delivered to this custom mill has necessitated a night shift. Plant is now receiving ore from Idaho Bride Mining Co., Specie Payment, and Golden Edge properties. Electric power has been substituted for water power during winter months, on account of difficulties due to low water and ice.

McCLELLAN—A rich discovery has been made in this mine on Leavenworth Mountain which has been developed by lessees during last year. A 14-in. streak of ore assays 1100 oz. silver per ton, and rest of vein, which had a total width of 32 in., assays 230 oz. silver per ton. Discovery was made in Martine level 450 ft. from portal of tunnel and 185 ft. below surface.

### Eagle County

NORTH DAKOTA (Eagle)—It is reported that a discovery has been made of a vein 5 ft. wide which yields ore assaying 460 oz. silver per ton through its entire width. Mine is under lease to Marion Henry Mining Co. and adjoins the Lady Belle, which is shipping a carload of ore every other day.

### El Paso County

DOUGLAS RANCH (Colorado City)—A report said to be confirmed by freight agent of Denver & Rio Grande R.R. is to effect that three carloads or from 80 to 100 tons of copper ore worth from $75 to $80 per ton have been going out weekly from discovery on this ranch, north of Gleneyre, owned by Palmer estate. It goes to Omaha. Mine was discovered by W. E. Weeks, of Colorado City who kept find secret for some time. Ore is said to be siliceous and contains from 25 to 30% copper.

### Lake County

SILVER BOW (Leadville)—In this mine which took over property of Big Four on Breece Hill, there has been opened a vein of gold-copper ore 1 ft. wide from which several carloads have been shipped returning from $250 to $300 per ton. It is now reported that ore 3 in. wide has come in on foot wall, from which 300 lb. of ore has been sacked which assays as high as 1000 oz. gold to the ton.

### San Juan Region

ORE SHIPMENTS FROM SILVERTON for October totaled 149 carloads or 1984 tons of concentrates and 1220 tons of crude ore.

### Summit County

IN MONTEZUMA AND SNAKE RIVER DISTRICTS more men are now employed than for several years and new orebodies have been discovered in old properties. A shoot of good-grade silver-lead ore, said to be 10 to 14 ft. wide, has just been opened in New Pennsylvania Mines Co.'s property

### Teller County

ELKTON CONSOLIDATED GOLD MINING CO. (Cripple Creek)—Fourth dividend of current year, of 2c. per share will be paid Nov. 21, amounting to $50,000 making total paid in dividends $3,270,000.

FOREST QUEEN—In this mine on Ironclad Hill, lessees Cox & Co. have opened an ore shoot from 4 to 5 ft. wide, and 100 tons have been shipped which it is estimated will yield about $30 per ton

## IDAHO

### Boise County

DEWEY (Thunder Mountain)—C. N. Murphy, an old prospector associated with C. W. Dewey in operating a lease on the old mine, has, with one helper, just made a cleanup of [illegible] in less than six days. Since latter part of April the two men took out $1800 by sluicing, and work was confined to old dump abandoned by owners of mine, when quartz mining stopped here about 10 years ago.

### Cœur d'Alene District

AURORA SAMPSON (Burke)—Property consists of 14 claims. Work is being done on lower tunnel 2200 ft. long. Surface tunnels show oreshoot about 25 ft. long by 3 ft. wide. Ore is said to assay about 10% lead. New buildings have just been completed at lower workings.

## MICHIGAN

### Iron

SOO LINE SHIPMENTS of iron ore from Gogebic Range have suffered slight decrease for 1913. The 1913 tonnage to Oct. 28 was 789,800 against 878,740 tons last year. This decrease is due to closing down of Ashland and Harmony mines for considerable portions of present season, former being closed down for repairs and latter as result of water troubles.

ERNST (Commonwealth)—Orders were received lately to cut down working force at this Florence Iron Co. mine, leaving only 50 miners. At present there is only one other property working in Florence district, the Buckeye.

NEWPORT (Ironwood)—Management of this, the largest underground mine on any of the iron ranges, laid off 175 men a few days ago, owing to fact that Algoma Steel Co., of Canadian Soo, was obliged to cancel an order for about 75,000 tons of ore.

## MINNESOTA

### Cuyuna Range

COMPANIES ARE CURTAILING PRODUCTION on the Cuyuna Range for winter season; 75 men having been laid off at Armour No. 2 and Kennedy mines, and other mines are gradually reducing forces to winter basis. Barrows and Cuyuna-Mille Lacs are only two shafts now shipping their entire production, all other mines now stockpiling their product. Cuyuna-Mille Lacs will continue to ship throughout winter, product going all-rail to South Bethlehem, Penn., and other distant points. This is only mine on Cuyuna or Mesabi ranges to ship throughout year.

ORE SHIPMENTS to Nov. 1 exceed those of 1912 by 2,348,118 tons. Total for present year, to Nov. 1, is 37,942,412 tons. Complete summary for the month and season, comparing 1912 and 1913, is as follows:

| Dock | Oct., 1913 | Oct., 1912 | Season to Nov. 1, '13 | Season to Nov. 1, '12 |
|---|---|---|---|---|
| D. M. & N. (Duluth) . . | 1,689,427 | 1,686,324 | 11,520,153 | 9,415,511 |
| Great Northern (Superior) | 1,954,291 | 1,942,563 | 12,166,741 | 12,838,900 |
| D. & I. R. (Duluth) . . . . . | 1,311,661 | 1,393,764 | 9,506,399 | 8,703,959 |
| Soo (Superior) . . . . . . . . . . | 82,272 | 61,108 | 680,213 | 261,047 |
| C. & N. W. (Ashland) . . . | 380,998 | 640,608 | 3,258,167 | 3,494,097 |
| Soo (Ashland) . . . . . . . . . . . | 116,954 | 219,108 | 798,587 | 880,780 |
| N. P. (Superior) . . . . . . . . . | 4,219 | . . . . . . | 12,152 | . . . . . . |
| Totals. . . . . . . . . . . . . . . . | 5,539,832 | 5,843,475 | 37,042,412 | 35,594,294 |

CUYUNA-MILLE LACS IRON CO. (Crosby)—Arrangements are underway for doubling output. Full force of 120 men will be employed throughout winter.

ARMOUR NO. 1 (Crosby)—It is announced that mine will not be stripped, as has heretofore been belief. Pennington pit adjoins property and orebody is stripped to a point on boundary between properties.

PENNINGTON (Crosby)—Management has instructions to ship a trainload of 33% ore. Such material is ordinarily unmerchantable, but Pennington pit has a seam of this lean ore, mixed with free quartz, which operators believe it would be cheaper to ship than to waste.

CUYUNA-DULUTH IRON CO. (Ironton)—Officials have announced that Ironton shaft will be sunk 100 ft. deeper to 300 level, so as to enable shipments from two levels next season. Shipments have ceased for present season, but mine will operate continuously throughout winter, product being

DELL DEVELOPMENT CO. (Aitkin)—Construction on vertical "step process" furnace has suddenly ceased, and company has given up its options on manganiferous iron orebodies on Cuyuna range. Process was to be an adaptation of John T. Jones' furnace, and it was stated that manganese could be profitably removed from low-grade manganiferous iron ores such as abound on Cuyuna range. Officials of company will not state whether cessation of operations means an abandonment of idea or not.

### Vermilion Range

LUCKY BOY-ANDERSON (Ely)—Good headway is being made straightening out shaft. A drift was driven in on 210-ft. level under vertical part of shaft and behind that portion which is inclined. A raise will now be lifted 20 ft. to connect with vertical part of shaft. This will give a vertical shaft for entire depth. Sinking will then be done on another level and drifts driven to ore.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

G & E (Joplin, Mo.)—Car of zinc ore was recently shipped. Operations are conducted at depth of 145 feet.

HERMOSA (Carthage, Mo.)—Good zinc ore is being opened up and operators believe heavy weekly productions will result.

COON (Joplin, Mo.)—Zinc ore has been found at 91-ft. level, proving up drill records. Three drill holes showed ore from 91 to 105 feet.

MAYS & CO. (Thoms Station, Mo.)—Both lead and zinc are being hoisted from drifts extending from 150-ft. level. A concentrator formerly owned by High Tariff company is to be used

NOWATA (Porto Rico, Mo.)—McCreight & Co. have taken lease on this old producer and are prospecting at 190-ft. level, with indications of developing another good run. Mine is in sheet ground district

KEYS & JAMISON (Galena, Kan.)—Company is developing what is expected to be one of the best producers of camp. Operations are through an old shaft and ore that runs 10% is being hoisted. A large body has been blocked out. Mine is on Southside ground

DOANE LAND (Joplin, Mo.)—Several small companies are operating successfully here. D. G. Doane & Son are prospecting a zinc orebody at 120 ft. White Swan and Grey Squirrel recently have opened good calamine deposits. Morgan and associates, on a nearby tract, are producing a heavy weekly tonnage of calamine and lead

## MONTANA

### Butte District

NETTIE (Butte)—The Anaconda company has begun erection of surface buildings preparatory to sinking a deep shaft. Mine was closed a number of years ago after producing a large amount of silver, but was not developed below 450-ft. level.

TUOLUMNE (Butte)—Development work has opened up a new shoot of ore on 800 level that is most promising. It has a width of 12 ft. and assays over 4% copper. About 200 men are now working in mine, and shaft sinking is being continued to 2600 level, crosscuts to be run from stations at 2400 and 2600 levels.

BULLWHACKER (Butte)—Construction of large building for new generator which has been purchased has been started and every effort is being made to complete it early. New generator will afford ample current to precipitate 4400 lb. of copper daily. Bullwhacker leaching plant is now turning out several hundred pounds of copper daily.

BUTTE & ZENITH CITY (Butte)—All electrical equipment has arrived and work of installing new hoist has been commenced. Manager Newton says that he expects to be ready to resume sinking operations about Dec. 1. Shaft is now down a little over 500 ft. and intention is to sink to 1000 ft. before doing any crosscutting.

BUTTE & PENSACOLA COPPER MINING CO. (Butte)—This company, controlled principally by Butte men, is operating upon a group of 20 claims near the head of Logging Creek in the Little Belt mountains. Upon the Excelsior claim an opencut recently exposed a body of lead-carbonate ore carrying silver. A wagon road has been completed to the property and a tunnel started which is expected to tap the vein at good depth in a length of 1700 feet.

DAVIS DALY (Butte)—Annual report, dated Oct. 15, shows encouraging conditions, chief among them, fact that mine is now and has been for a period of four months, upon a paying basis. Hesperus is looking particularly good; rich ore is being taken from Colorado shaft; work is going on in various levels from 1000 to 1900 and lately announcement was made that Belmont vein from which still better things are expected, will be cut by Dec. 1. About 200 men are employed with a payroll of from $20,000 to $25,000 per month. Output is between 200 and 300 tons per day.

CORBIN COPPER CO. (Butte)—A suit for $3000 damages may be but the start of several of similar character. Company in opening up Gambrinus claim, located in a residential part of city erected a hoist and installed machinery and it is claimed that noise of blasting and operating of hoist has damaged all property in locality. Attorney M. J. Cavanaugh's home is within a short distance of shaft and he has started suit against company, claiming that his house has been damaged to amount claimed. It is stated by others that they also propose to bring suits, but it is probable that no more will be commenced until this one is decided.

ELM ORLU (Butte)—W. A. Clark has confirmed report to effect that he has entered into a contract with Minerals Separation company for use of its process in his new concentrator. Clark investigated through experiments made with ore from his Elm Orlu mine working of process and satisfied himself that it was best he could possibly secure. During recent hearing of injunction sought by Minerals Separation company against Butte & Superior company, W. A. Clark, Jr., who is associated with his father, attended different sessions of court and watched with closest interest demonstrations given by experts from Utah and other places of use of oil process.

NORTH BUTTE—Preparations are underway to erect a new hoisting plant at Granite Mountain shaft, which will eventually become principal hoisting shaft. Hoist is to be of Ward Leonard type with motor-generator, flywheel set. Hoist proper will be run by direct-current motor of 6000 hp., direct connected to hoisting drums. Mechanical part of hoist will be furnished by Wellman-Seaver-Morgan company, and electrical part by Westinghouse company. Close to 40.000 tons of ore was mined at North Butte mines during month, producing nearly 2,500,000 lb. of copper. Between 900 and 1000 men are employed at Speculator where monthly payroll is $110,000.

## NEVADA

### Clark County

ARROWHEAD PLASTER CO. (Moapa)—Name of Moapa Gyp Co. has been changed to Arrowhead Plaster Co. Plant is near Moapa, and office is in Los Angeles, Calif.

### Douglas County

BUCKEYE PLACER (Gardnerville)—It is stated that a dredge will be installed on this ground. Expense of obtaining sufficient water has prevented earlier working.

### Humboldt County

ALMA (Seven Troughs)—This group of five claims adjoining Badger Hills on north was sold recently. Development work will begin at once.

### Lyon County

OIL INDICATIONS have been found near Buckskin.

BLUE JAY (Yerington)—The air line from New Yerington compressor plant is completed and machine drills are in operation. Development on the 200- and 400-ft. levels is being continued.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for week ended Nov. 6, 1913, were as follows: From Mason Valley mine, 2106 tons; from Nevada-Douglas, 1279 tons; from other mines, 756 tons; total, 4141 or a daily average of 592 tons. During same week six cars of matte were shipped.

### Mineral County

TWO PERCENT. MERCURY ORE has been found in the cinnabar district east of Mina.

McNAMARA (Juniper)—Ore is being milled in two-stamp mill at Athens. Stamps are of special, rapid return, spring design.

### Nye County

BIG PINE (Manhattan)—Test run on surface and 200-ft. level ore gave $12 per ton.

MANHATTAN AMALGAMATED (Manhattan)—Change in hoisting plant at Wilson lease caused a shutdown for a week.

MANHATTAN MILLING & ORE CO. (Manhattan)—The 10-stamp mill will be increased to 35, the 25-stamp mill of Bullfrog-Homestake having been purchased.

NEVADA CINNABAR CO. (Ione)—The 50-ton furnace is nearing completion, after which two months must be allowed for drying. It is expected to have furnace in operation shortly after first of year. Company is largest producer of mercury in state of Nevada.

### Storey County

WASHINGTON & NEVADA DEVELOPMENT CO. (West Comstock)—A complete 10-stamp mill, equipped for concentration and cyanidation, will be installed. Property is five miles west of Virginia City.

UNITED COMSTOCK PUMPING ASSOCIATION (Virginia City)—Progress is being made on Starrett pump installation in the old Consolidated Virginia winze on 2500-ft. level of C. & C. shaft. On the surface wiring for compressor is being installed.

STURGIS GROUP (Gold Hill)—Two Byron Jackson sinking pumps will be installed in joint incline of Crown Point and Belcher to unwater Yellow Jacket, Crown Point and Belcher below 1400-ft. level. Discharge pipe to Sutro tunnel drain is completed; 100 gal. per minute is being pumped from Jacket incline. Yellow Jacket mill was started recently after being thoroughly overhauled and repaired. Yellow Jacket dump rock and Belcher ore are being treated. Good-grade ore is being developed on 1300-ft. level of Belcher.

### White Pine County

CONSOLIDATED COPPERMINES CO. (Ely)—About 2,000,000 tons of porphyry ore running about 1.7% copper have been added to reserves. Ore was opened up by Nevada Consolidated, which, in seeking an outlet from its Liberty pit over Giroux ground, uncovered the find. Temporarily, at least, Giroux has abandoned underground mining as a result of this porphyry development and since Aug. 20 all shipments have been from steam-shovel operations in this territory. To date about 180 cars of this ore have been shipped to Steptoe plant for treatment and until existing contract between Nevada Consolidated and Giroux for handling latter's ores expires next June by request of shipping company, production will continue to come from this portion of the Giroux property. Nevada Consolidated will do actual mining but Giroux company furnishes steam shovel. In Morris workings, formerly operated through the Morris shaft, stripping has been done over an area 900 ft. long by 600 ft. wide. To a depth of 255 ft. this plot is estimated to contain 4,000,000 tons, of 1.8% copper ore.

## NEW MEXICO

### Grant County

AT PHELPS-DODGE PROPERTIES in the Burro mountains it was lately stated by men in charge that about 5000 ft. of the 7000-ft. tunnel between the No. 2 and No. 3 shaft, had been driven. Within a month the tunnel should be completed. Work was started this week on pumping water from No. 3 shaft.

J. A. PETERSON & CO. (Pinos Altos)—Milling machinery is being shipped from old Comanche mill at Silver City to the plant under construction at Pinos Altos. It is thought operations will begin about Dec. 15.

### Socorro County

SOCORRO MINING & MILLING CO. (Mogollon)—Old shaft, leading to first stopes, has been converted into a waste chute and rock from present workings is dumped into it.

PACIFIC MINES CO. (Mogollon)—Foundations for electric hoist and compresser have just been completed and air pipe laid in mine. New hoist is directly behind gasoline hoist and latter will be kept in position for use in emergencies.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—Work enlarging station over winze for accommodation of new gasoline hoist and compressor has been completed and everything is in readiness for machinery's installation on its arrival.

### Union County

CROZIER & CORDOZA (Hayden)—A shipment of ore has just been made from these claims. From a shipment of about 20 tons it is reported owners netted $400. Ore ran about $18 per ton in gold with some silver.

## OREGON

### Baker County

STRIKE ON THE SUMPTER VALLEY R.R., which taps a number of mining camps in the county, was to take effect Nov. 5, because of dismissal of Guy L. Anderson, general manager of the road.

BELMONT (Greenhorn)—A strike of a rich oreshoot in this mine has stirred up much interest. Mine has been in operation for about 12 years and is owned by Gilkey & Kershaw. Early in its history some rich deposits were opened. Samples taken at this strike run from $1000 to $2000 per ton in gold. These samples were taken from a new shaft that is being sunk. Low-grade ore runs from $40 to $60 per ton.

### Josephine County

GRAND PRIZE PLACER (Sucker Creek)—Thomas ("Dry Wash") Wilson, one of the best known mining men of Nevada, has bought this rich placer mine, paying for it $100,000. T. M. Anderson, owner and discoverer, secured a good payment down and new owner will equip mine and pay balance out of earnings. Anderson discovered this mine last February, it is in a dry gulch and he had to pack gravel a mile on burros to water, where it was washed and yielded as high as $25 per yard. Deposit of pay is extensive, plans have been made and pipe is now on ground to equip mine and make it one of the leading placers of the county. Water will be piped three miles to get the desired head.

## SOUTH DAKOTA

### Lawrence County

TITANIC—Three new Ingersoll-Rand air drills have been delivered, two being "jackhamers," other a piston machine. Small drills will be used in sinking Combination shaft, which is now 140 ft. deep, and piston machine for lateral work on 100-ft. level. Workings are being kept dry by removing water from Iron Hill shaft, a short distance away. Using a 300-gal. skip about 1½ hr. daily in this shaft keeps Combination workings free from water. Commissioners of Lawrence County have agreed to advance $100 to repair wagon road from Trojan to Carbonate, which will partially pay for work required. Such a road would make considerable saving in expense of hauling fuel and supplies to property.

### Pennington County

HILL CITY MINING & DEVELOPMENT CO. (Hill City)—This company a few days ago secured permission from state securities commission to sell its stock in the state, proceeds to be used in equipment and development of property. Steam mining plant is being installed.

## UTAH

### Beaver County

LEONORA (Milford)—A shaft is being sunk to depth of 300 ft. Ore has been produced from surface workings.

SHEEP ROCK—A 5-stamp mill is being operated. It is stated that there is ore enough developed to supply this mill for two years.

MOSCOW (Moscow)—October shipments amounted to 11 cars or about 550 tons. Sinking is in progress, and shaft is down 110 ft.; about three feet a day is made. Most of the ore is being mined on 700- and 800-ft. levels, and a strike on latter level is reported. It has not yet been proved whether this is a new vein or a continuation of shoot opened from surface to 700. Company has been shipping regularly since 1905, and in last three years has paid about $40,000 in dividends.

### Juab County

TINTIC SHIPMENTS FOR OCTOBER amounted to 551 cars; those for the week ended Nov. 7 to 142 cars.

### Salt Lake County

BINGHAM-NEW HAVEN (Bingham)—Dividend of 10c. per share, amounting to $22,500, has been declared.

### Summit County

PARK CITY SHIPMENTS FOR OCTOBER amounted to 5755 tons, by Silver King Coalition, Daly West, Daly-Judge, Ontario, Thompson-Quincy, American Flag and John The Revelator. Shipments from the camp for the week ended Nov. 8 amounted to 1573 tons.

SILVER KING COALITION (Park City)—During October, company shipped 2181 tons of ore and concentrates. About 100 tons of ore daily has been mined, greater part being of shipping grade. Milling ore concentrates about six into one. New equipment has been installed, and conditions are generally promising. A 15c. dividend is expected before Christmas.

SILVER KING CONSOLIDATED (Park City)—James Duffy, superintendent, has resigned, and Joseph Kemp, formerly in charge of Little Bell mine, will take his place. Development is being done to reach cut near 1480-ft. level. Two drifts are being driven on the 1500. A part of the work has been in ore, which is being sorted and saved for shipment. Further development will be necessary, before production on a larger scale is undertaken.

### Tooele County

MAYFLOWER (Grantsville)—Work is being done from bottom of 200-ft. inclined shaft. Rock mineralized with copper and silver has been cut.

BULLION COALITION MINES CO. (Stockton)—Company has taken over old Honerine property, and is using water from workings to develop agricultural land. This is bringing good returns.

MICHIGAN-UTAH (Bingham)—Work has been resumed to connect Utah Mines Coalition side of property in Big Cottonwood with the City Rocks workings on Alta side. This will take several weeks, and when completed, will allow of more economical handling of ore. Vertical distance between main levels is 312 ft. Ore from Big Cottonwood side is to be hoisted to upper level, and sent down over five-mile tramway on Alta side. This will cut out hauling down Big Cottonwood by team

## WASHINGTON

### Stevens County

HECLA (Chewelah)—Work is to continue throughout winter under direction of J. C. Argall.

UNITED COPPER (Chewelah)—Scale of operations has been incresed by addition of 12 stamps, and over 100 tons of ore is now going through mill daily

## WISCONSIN

### Platteville District

NEW HOPE (Platteville)—A good run of lead ore has been uncovered on Segelke land just east of old Acme shaft

BELOIT-ELMO (Platteville)—This mine, four miles south of Platteville, is again active, shipments of lead ore are being made from top run

GREAT WESTERN (Galena)—This company has purchased [illegible] mill which will be moved to Pittsburgh leasehold four miles south of Galena.

WEIGEL (Linden)—Pollard & Saxe are making weekly shipments of one to three cars of lead and zinc ore from old Platteville-Linden mine recently acquired by them

ROSS LAND (Rewey)—A shaft has been started on Ross Land at Crow Branch, two miles west of Rewey. Eight drill holes [illegible] 15 ft. of rich jack. This territory, formerly lead produ[illegible] has not been developed heretofore for zinc ore.

## CANADA

### British Columbia

CHANGE IN TARIFF rate for shipments of ore to Trail smelting works went into effect Nov. 12. Previous rate of 20c. per ton has been raised to 30c. per ton on ore shipped from Rossland to Trail, when the shipment is less than 10 cars to the train.

NOBLE FIVE (Slocan)—Development will be commenced this month by beginning to drive a 2000-ft. tunnel.

COPPER QUEEN (Vananda, Texada Island)—Granby Consolidated company is commencing work under option of purchase.

SURPRISE (Sandon)—From 100 to 120 tons of high-grade ore are being mined monthly. Mine has ore in all drifts from raise, and new oreshoots are being uncovered as development work progresses.

IRON MASK (Kamloops)—Ore is being shipped to Trail from Erin claim of Iron Mask group. Induction motors and other electric machinery is being installed preliminary to resuming work in main workings.

JEWEL (Greenwood)—Mine and 15-stamp mill are being operated after long period of non-productiveness. Ore is gold-quartz; it has been opened to a depth of 330 ft. and reserves are sufficient to supply mill for considerable time.

### Ontario

KERR LAKE (Cobalt)—Quarterly dividend of 5% will be paid Dec. 15.

CARIBOU (Cobalt)—It is announced that company will declare a dividend of 2½%.

BEAVER (Cobalt)—After having passed several quarterly dividends, directors have declared 3% payable in December.

MAPES JOHNSTON (Cobalt)—A majority interest in this property has been sold to Brantford syndicate, which has been carrying on work.

BURNSIDE (Swastika)—It is stated that C. A. Foster has made a deal with an English syndicate for sale of Burnside and Tough-Oakes properties.

PETERSON LAKE (Cobalt)—Boundary dispute with Nipissing has finally been settled and there is now no fear of another expensive lawsuit over this matter.

VIPOND (Schumacher)—Property is being pumped out to permit of an examination by Crown Reserve Mining Co. Crown Reserve also has North Thompson claim under option.

COBALT TOWNSITE (Cobalt)—Company has now taken over Northern Customs concentrator. Tramway to property in Cobalt will shortly be completed and mill will treat nothing but Townsite and City of Cobalt ore.

## MEXICO

### Sonora

EXPORTS FOR OCTOBER, through Port of Agua Prieta, are as follows: Nacozari, 13,185 tons; El Tigre, 329; El Gallo, 413; Santa Margarita, 421; La Republica, 21; San José, 38; San Ygnacio, 21; Estrella, 316; La Blanca, 33; La Ventana, 28; La Bellota, 19; El Padazo, 42; La Cartera, 29; Alemana, 29; La Sonora, 101; Alicia, 29; Agua Buena, 21; Matilde, 14; Panama, 33; total, 288 cars, or 15,127 tons. El Tigre also shipped 69 bars of gold and silver bullion weighing 9651 lb. Estimated values, Mexican, are copper, 2,173,600 pesos; silver, 985,700 pesos; gold 596,500 pesos or 3,755,800 pesos total value of ore exports for October.

CONSOLIDATED VIRGINIA (Moctezuma)—An examination is being made by S. M. Soupcoff for Colorado men.

AGUA BUENA (Nacozari)—J. A. Judah, who is one of the principal owners, is operating mine for company and expects to ship about two cars per month of silver-lead-copper ore.

MONTE CRISTO (Moctezuma)—Sale of mine has just been completed in El Paso and new company will proceed with the work at once. The day sale was made a rich shoot of silver glance was encountered on fifth level.

EL TEMBLOR (Esqueda)—A cross vein has been encountered, ore in which is richer than old vein and shipments of mine have been doubled. Mill is running steadily and making a concentrate that contains 250 oz. silver and 3 oz. gold per ton.

LA UNION (Fronteras)—Two cars of 20% copper ore are now on the way to smelters at Douglas and shipments will be increased to one car per week next month. Present vein is from 2 to 10 ft. wide and about one-half mile long. A cut has been made along top of vein exposing many tons of ore.

NACOZARI CONSOLIDATED COPPER CO. (Nacozari)—First car of machinery for new concentrator has arrived and erection has commenced. One car of crude ore of shipping grade is out and will be shipped to El Paso for trial and if satisfactory other shipments of crude ore will follow and only low-grade ore will be milled. Three shifts are now employed in mine working 40 men.

## BRITISH GUIANA

GOLD EXPORTS for the nine months ended Sept. 30 were 48,093 oz. fine, valued at $994,092; an increase of $418,793 over last year. Exports of diamonds were 4785 carats, valued at $46,085; an increase of $26,246 over last year.

## BELGIAN CONGO

UNION MINIERE (Katanga)—This company, according to a U. S. consular report, has added new equipment at the Lubumbashi smelting plant which will now be able to produce 800 to 1000 tons of copper monthly.

## INDIA

KOLAR GOLDFIELD—The total production in October was 49,824 oz., being 685 oz. more than in September. For the 10 months ended Oct. 31 the total was 482,883 oz. in 1912, and 489,134 oz.—or $13,110,409—in 1913; an increase of 6251 oz. this year.

## CHOSEN

ORIENTAL CONSOLIDATED—September production was $125,952, net profit $33,110

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Nov. 19

In line with our policy to quote the market for only one kind of each metal, and that the kind that is most important as a commodity, we shall at the end of this year discontinue a regular quotation for casting copper, and shall quote it only occasionally, when its conditions may vary from those of the main copper market. We shall continue regularly to quote Lake copper because of the long record of this metal, but it will then be the only distinction that we make in the cases of any of the nonferrous metals. In copper, electrolytic is, of course, the governing kind of metal and the one that is truly representative of market conditions.

MONTHLY INDEX NUMBERS

| Month | 1912 | 1913 | Month | 1912 | 1913 | Month | 1912 | 1913 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 111 | 126 | May. | 118 | 126 | Sept. | 127 | 118 |
| Feb. | 109 | 125 | June. | 117 | 117 | Oct. | 133 | 114 |
| March. | 111 | 125 | July. | 114 | 110 | Nov. | 129 | ... |
| April. | 115 | 124 | Aug. | 120 | 116 | Dec. | 129 | ... |

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115

Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

### Copper, Tin, Lead and Zinc

**Copper**—During the last week the copper market experienced a further decline and was weak throughout. Consumers held off and sellers endeavored to find a level at which buyers would be interested. Some sales were made on Nov. 13 at 15⅝@15¼c., delivered, but after that offers to sell at 15⅜c. that were made right along failed to command business, and such as was done was at 15¼c., delivered. On Nov. 17 there were some considerable sales at 15c. cash, New York.

The several agencies, with a single exception, engaged in active competition for such business as appeared in sight. On Nov. 19 the largest agency, which previously was standing aloof, was reported out with a price around 15⅜@15½c., delivered, but this was still above the market and was considered to be more a new basis to figure from than anything else.

The market of the last week is rated as quiet, though sales amounted to some millions of pounds. Their aggregate was more than in the previous week. Almost everything was for shipment to Europe. Sales to domestic consumers were insignificant.

The situation in Lake copper remained unchanged. No new price by the Calumet & Hecla has been reported.

The accumulation of casting copper increased further during the week, and this metal was further pressed for sale.

The European statistics for the first half of November again showed a decrease and the visible supply is very low. On the other hand, the consumption of copper, in this country without doubt and Europe perhaps, shows a falling off, and the question at the present moment is, whether, irrespective of the stocks, production is not proceeding at a larger rate than consumption.

Electrolytic in cakes, wirebars or ingots, at the close is quoted 15@15.05c. We quote casting copper nominally at 14⅝@14¾c. as an average for the week.

The London standard market was £68 for spot and £67 7s. 6d. for three months on Nov. 13 and 14, declined on Nov. 17 to £67 15s. for spot and £66 15s. for three months. On Nov. 18 the scarcity of near-by copper made itself felt and spot moved to £69 10s., while three months advanced to only £67. On Nov. 19 the market closed at £68 7s. 6d. for spot and £66 17s. 6d. for three months. In general, the standard market has been very dull.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¼@17¾c., carload lots at mill.

**Lead**—The market is quiet and the metal is being offered at lower prices, 4.12½@4.17½c. St. Louis, and 4.27½@4.32½c., New York.

The London market has been somewhat easier. Spanish lead is quoted £19 2s. 6d.; English lead 5s. higher.

**Tin**—The market continued to display considerable strength. Consumption in this country seems to be improving, and orders from this side were plentiful. These imparted a good tone to the London market, finding expression in heavy purchases of three months tin, which is selling at over £1 above spot. The market closes firm at £181 15s. for spot and £182 15s. for three months, and about 40¼c. for December tin here.

**Spelter**—The market is quiet. Consumers are thought to be not well covered, but they are holding off, and on the other hand, there has been some pressure by smelters to sell. In consequence the price has gone off somewhat, and at the close St. Louis is quoted 5@5.05c., and New York 5.15@5.20 cents.

The London market is slightly better than last week, good ordinaries being quoted £20 15s.; specials, £21 8s. 9d. per ton.

Base price of sheet zinc in carload lots is $7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

DAILY PRICES OF METALS

NEW YORK

| Nov. | Sterling Exchange | Silver | Copper<br>Lake, Cts. per lb. | Copper<br>Electrolytic, Cts. per lb. | Tin<br>Cts. per lb. | Lead<br>New York, Cts. per lb | Lead<br>St. Louis, Cts. per lb. | Zinc<br>New York, Cts. per lb. | Zinc<br>St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 13 | 4.8515 | 59½ | *15½<br>@16½ | 15.05<br>@15.15 | 40 | 4.27½<br>@4.32½ | 4.12½<br>@4.17½ | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 14 | 4.8515 | 59½ | *15½<br>@16½ | 15.05<br>@15.10 | 40 | 4.27½<br>@4.32½ | 4.12½<br>@4.17½ | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 15 | 4.8540 | 59⅜ | *15½<br>@16½ | 15.05<br>@15.10 | 40 | 4.27½<br>@4.32½ | 4.12½<br>@4.17½ | 5.15<br>@5.20 | 5.00<br>@5.05 |
| 17 | 4.8535 | 59 | *15½<br>@16 | 15.00<br>@15.05 | 39¾ | 4.27½<br>@4.32½ | 4.12½<br>@4.17½ | 5.15<br>@5.20 | 5.00<br>@5.05 |
| 18 | 4.8440 | 59¼ | *15½<br>@16 | 15.00<br>@15.05 | 40¼ | 4.27½<br>@4.32½ | 4.12½<br>@4.17½ | 5.15<br>@5.20 | 5.00<br>@5.05 |
| 19 | 4.8540 | 59 | *15½<br>@16 | 15.00<br>@15.05 | 40¼ | 4.27½<br>@4.32½ | 4.12½<br>@4.17½ | 5.15<br>@5.20 | 5.00<br>@5.05 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Nov. | Silver | Copper<br>Spot<br>£ per Ton | Copper<br>Spot<br>Cts. per Lb. | Copper<br>3 Mos. | Copper<br>Best Sel'td | Tin<br>Spot | Tin<br>3 Mos | Lead<br>£ per Ton | Lead<br>Cts. per Lb. | Zinc<br>£ per Ton | Zinc<br>Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 27½ | 68 | 14 78 | 67⅜ | 74 | 181½ | 182½ | 19¼ | 4.18 | 20⅝ | 4.48 |
| 14 | 27½ | 68 | 14 78 | 67⅜ | 74 | 181⅛ | 182⅜ | 19 | 4.13 | 20⅝ | 4.48 |
| 15 | $27\frac{7}{16}$ | ... | . | | | | | | | ... | ..... |
| 17 | 27¼ | 67¾ | 14.72 | 66¾ | 73¾ | 180 | 181¼ | 19 | 4 13 | 20⅝ | 4 48 |
| 18 | 27⅜ | 69½ | 15.10 | 67 | 73½ | 181¼ | 183 | 19⅛ | 4 16 | 20⅝ | 4 48 |
| 19 | 27¼ | 68⅜ | 14 86 | 66⅞ | 73½ | 181¾ | 182¾ | 19⅛ | 4.16 | 20¾ | 4.51 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—Current demand continues light and the market is dull. Not much improvement is expected until there is some turn in the automobile business. Quotations are a little uncertain, the range being about 19¼@19¾c. for No. 1 ingots, New York.

**Antimony**—The market is rather quieter than it has been lately. Quotations are a trifle easier. Cookson's is 7.60@7.75c. per lb., and Hallett's 7.25@7.40c.; while 6.35@6.50c. per lb. for Chinese, Hungarian and other outside brands.

**Quicksilver**—Business has been rather quiet, but the market is steady, and there is no material change in prices. The New York quotation is $38.50 per flask of 75 lb. with 56@57c. per lb. for retail lots. San Francisco price is $38.50 per flask, with special terms for export business. The London price is £7 5s. per flask, with £7 quoted from second hands.

**Cadmium**—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

**Nickel**—Quotations for ordinary forms, shot, blocks, or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted: while $5 per lb. is paid for retail orders.

## Gold, Silver and Platinum

**Gold**—The price on the open market in London was unchanged at the Bank level—77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was some talk of purchases for New York account, but none were made.

Imports of gold into France, eight months ended Aug. 31, were 404,607,000 fr.; exports, 50,103,000 fr.; net imports, 354,504,000 fr., against 151,450,000 fr. last year.

**Iridium**—The market is unchanged, sales being made at $80@81 per oz., New York. Supplies are a little larger than they were.

**Platinum**—Business is improving slightly, but quotations are still rather easy, at $43@44 per oz. for refined platinum. Hard metal is rather lower, $48@50 per oz. being named.

**Silver**—The market has fallen ¼d. in London the past week owing rather to want of buying orders than to large offerings. The market closes at 27¼d, quiet with general tendency very uncertain.

Shipments of silver from London to the East, Jan. 1 to Nov. 6, as reported by Messrs. Pixley & Abell.

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £9,089,500 | £9,001,500 | D. 88,000 |
| China | 1,327,000 | 752,000 | D. 575,000 |
| **Total** | £10,416,500 | £9,753,500 | D. £663,000 |

Messrs. Samuel Montagu & Co. write from London: "Shanghai reports a stock of £6,225,000 compared with £6,250,000 last week. It appears to be well known that between £1,500,000 and £2,000,000 of this stock is deposited with the banks, foreign and native, mainly with a view to safe custody. A reabsorption of this amount for trade purposes would reduce the present stock to about £4,225,000, at which it would not look quite so unwieldy. Now that unrest in China has simmered down, there is a possibility of such a reduction taking place."

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Nov. 15

The high price of zinc blende is $46, the base per ton of 60% zinc ranging from $42.50 to $43.50—one of those rare weeks when the margin of extreme narrows almost to a level for all grades of ore. There was light buying early in the week, buyers expecting to cover orders at last week's quotation or lower, but spirited buying on Friday and Saturday ran the low base up $1 and high base 50c. per ton. Calamine is unchanged and firm on a base of $21@23 per ton of 40% zinc. The average price of all grades of zinc is $41.12 per ton. The highest price reported paid for lead was $54.50, the base per ton of 80% metal content is $52 and the average of all grades $51.96 per ton.

SHIPMENTS WEEK ENDED NOV. 15

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 10,591,850 | 744,730 | [illegible] | $2[illegible]895 |
| Totals 46 weeks | 504,385,410 | 38,169,110 | [illegible] | $13,732,129 |

Blende value, the week, $223,480; 46 weeks, $11,[illegible].

Calamine value, the week, $9665; 46 weeks, $[illegible].

Lead value, the week, $47,750; 46 weeks, $2,228,269.

### PLATTEVILLE, WIS.—Nov. 15

The base price paid this week for 60% zinc ore was $41@43 per ton. The base price paid for 80% lead ore was $53 per ton.

SHIPMENTS WEEK ENDED NOV. 15

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,235,660 | 165,300 | 829,960 |
| Year to date | 129,852,370 | 6,020,850 | 50,88[illegible],860 |

Shipped during week to separating plants, 2,713,380 lb. zinc ore.

# IRON TRADE REVIEW

### NEW YORK—Nov. 19

While new orders are still reported slow, there are several points which indicate that business is not coming to a standstill yet. Railroads continue to make some purchases; pipe of all kinds is in heavy demand; wire, tinplate and some other kinds of small materials are selling freely.

Structural steel is likely to be in demand for some time yet. Apart from large building operations on private account, New York will need some 80,000 tons of steel for subway work, and the contracts are now being let, or will be let soon.

Sales of foreign material do not seem to be made, though some brokers are offering German steel. Business abroad is improving a little, and no large transactions here are likely. The possibility of imports, however, may exercise some restraining influence on prices. Probably it has already done so in the case of billets.

Pig iron is slow, and prices rather weak. Business in seaboard territory is better than in the West. Prices are not especially strong.

**Foreign Trade of the United States** in iron and steel and machinery, nine months ended Sept. 30, is valued as below by the Bureau of Statistics of the Department of Commerce:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Exports | $213,699,572 | $226,481,976 | I. $12,782,404 |
| Imports | 21,111,860 | 25,716,377 | I. 4,604,517 |
| Excess, exports | $192,587,712 | $200,765,599 | I. $ 8,177,887 |

Actual tonnage of iron and steel, so far as reported was this year 2,108,079 tons; imported, 244,156 tons. In some important lines only values are given.

### PITTSBURGH, PENN.

Orders for pig iron and finished steel products have continued to decrease. New bookings in finished steel are considerably less than 50% of the full capacity, but there is some old business still to be filled, and the mills are running at close to 60% of the full finishing capacity. Pig-iron production shows a higher percentage between 75 and 80%, but further blowing out of furnaces will occur before the close of the month.

Pittsburgh was visited by a small flood at the beginning of the week, a rare event in November, and a few plants were closed for two days.

Steel prices show hardly as much sagging tendency as they did last month. Plates, shapes and bars are still generally quotable at 1.30c., Pittsburgh, but it is not difficult to shade the price with attractive plate orders. Bars have sold at considerable cuts, in the case of Atlantic seaboard delivery.

The opinion is growing that there will be an early revival in demand, though there are few who expect full operations in the steel industry in less than six months.

**Pig Iron**—Only eight of the 17 merchant furnaces in the Mahoning and Shenango valleys are in blast, and these are running chiefly on old contracts. The large curtailment in output has not steadied the market as expected, since Cleveland furnaces are prepared to compete for Pittsburgh trade with the Valleys. Transactions have been light the past week, and there are reports that pig iron can be secured at less than previously quoted prices. We quote: Bessemer, $15.25; basic, $13.25; No. 2 foundry, $13.50; forge, $13.25, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market continues very quiet. Prices are unchanged at $50, Baltimore, for English and $49.50, for German.

**Steel**—The market continues stagnant as to actual transactions, and is not quotably lower, at $20.50 for billets, $21.50 for sheet bars and $26 for rods, f.o.b. maker's mill, Pittsburgh or Youngstown.

### IRON ORE

Imports and exports of iron ore in the United States, nine months ended Sept. 30, in long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Imports | 1,539,452 | 1,916,733 | I. 377,281 |
| Exports | 893,924 | 826,584 | D. 67,340 |

Imports of ore this year included 1,177,665 tons from Cuba, 277,129 from London, 162,148 from Newfoundland, 132,832 from Canada; the balance coming from other countries. Exports were chiefly to Canada.

Imports of manganese ore for the nine months were 181,629 tons in 1912, and 258,074 in 1913; increase, 76,445 tons.

### COKE

The Connellsville coke market has been irregular and prices have a lower tendency. Contracts for furnace coke are rather slow, and those closed do not cover long periods. Both producers and consumers are not anxiious to go far ahead. Production is fair, though a little off from the highest point.

**Exports and Imports of Fuel in the United States** nine months ended Sept. 30, long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Anthracite | 2,601,631 | 3,173,002 | 1,030 | 836 |
| Bituminous | 10,983,293 | 13,793,963 | 1,185,064 | 1,035,887 |
| Coke | 618,450 | 662,863 | 69,572 | 58,838 |
| Bunker coal | 5,495,719 | 5,687,644 | . . | . . . |
| Totals | 19,699,093 | 23,317,472 | 1,255,666 | 1,095,561 |

The bunker coal or coal furnished to steamships in foreign trade is practically all bituminous. The larger part of the trade, both exports and imports, is with Canada. The totals show an increase of 3,618,379 tons, or 18.4%, in exports; and a decrease of 160,105 tons, or 12.7% in imports.

## CHEMICALS

### NEW YORK—Nov. 19

The general market remains rather quiet with only a moderate amount of business forward.

**Arsenic**—The market remains featureless, with small demand and good supplies. Prices are unchanged, about $3 per 100 lb. being asked.

**Copper Sulphate**—Business has been fair. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market has not yet recovered from the recent break, and business is slow. Prices are unchanged, at 2.25c. per lb. for spot, 2.30c. for December and 2.35c. for January-May deliveries.

**Potash Salts**—Exports of potash salts from Germany for the nine months ended Sept. 30, were, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Crude salts | 920,171 | 1,106,842 | I. 186,671 |
| Potassium chloride | 216,322 | 264,133 | I. 47,811 |
| Potassium sulphate | 61,040 | 92,404 | I. 31,364 |
| Pot.-magnesium sulphate | 41,597 | 47,273 | I. 5,676 |
| Totals. | 1,239,130 | 1,510,652 | I. 271,522 |

Of the total exports this year 761,613 tons, or 54% went to the United States.

**Sulphur**—Messers. Parsons & Pettit, New York, send us the following figures for Sicilian sulphur for the period of 14 months from July 1 to Aug. 31, of the next year, in metric tons:

| | 1911-12 | 1912-13 | Changes |
|---|---|---|---|
| Stocks, July 1 | 525,563 | 444,381 | D 81,182 |
| Production | 366,456 | 349,602 | D. 16,854 |
| Total | 892,019 | 793,983 | D. 98,036 |
| Exports | 447,638 | 434,473 | D. 13,165 |
| Stocks, Aug. 31 | 444,381 | 359,510 | D. 84,871 |

F. Baller & Co., Messina-Catania, write of these figures "The decrease in production is due to various factors: First, several mines had to be, and are still closed down owing to explosions, fires, etc.; secondly to the dearth of labor consequent on the great emigration, and thirdly, that some mines are becoming exhausted or have to be worked at such depths that their exploitation is becoming unprofitable. Should emigration continue in its present proportions, a further reduction in the production is not impossible. The Consorzio has already disposed of its actual stocks and also part of the future production for delivery up to 1918, and at present, it refuses to entertain any business for delivery exceeding 15 days hence. The finer qualities are very much reduced, those existing in large quantities being the lower grades, especially current thirds, the sale of which abroad is not easy. The increase in salaries, cost of coal, wood, etc., has placed the producers in a critical position, and a strong agitation has been started to obtain an increase in the selling price. It seems that some of the members of the Consorzio board are not opposed to an increase, and it is therefore not unlikely that it will be voted."

### PETROLEUM

A report from U. S. Consul, L. A. Davis, at Batum, Russia, says that the Transcaucasian State Ry., after negotiating unsuccessfully with Rumanian producers, has contracted for 2,500,000 poods (301,200 bbl.) of crude oil from a Mexican firm at 40 kopeks per pood ($1.72 per bbl.) delivered at Batum. A further contract for 15,000,000 poods is under negotiation. The closing of the first contract brought the price of fuel oil at Batum down from 65 to 43 kopeks per pood.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | June | July | August | September | October |
|---|---|---|---|---|---|
| Alaska shipments | 2,203,191 | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 |
| Anaconda | 21,500,000 | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 |
| Arizona, Ltd. | 2,600,000 | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 |
| Copper Queen | 7,477,936 | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 |
| Calumet & Ariz. | 4,000,000 | 3,800,000 | 4,500,000 | 4,000,000 | 4,500,000 |
| Chino | 3,682,706 | 4,831,185 | 6,050,867 | 4,308,296 | 4,196,296 |
| Detroit | 1,750,601 | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 |
| East Butte | 1,055,646 | 1,060,257 | 1,162,007 | 1,233,018 | . . . . . . |
| Giroux | 598,240 | 584,546 | 524,953 | 198,178 | . . . . . |
| Mason Valley | 1,097,014 | 908,892 | 867,060 | 918,000 | 1,052,000 |
| Miami | 2,612,000 | . . . . . . . . | . . . . . . . . | . . . | . . . . |
| Mammoth | 1,750,000 | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 |
| Nevada Con. | 6,344,863 | 5,403,919 | 5,989,973 | 4,441,671 | . . . . . . . |
| Ohio | 537,400 | 601,700 | 689,000 | 685,900 | . . . . |
| Old Dominion | 2,511,000 | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 |
| Ray | 4,392,612 | 4,097,000 | 4,269,519 | 4,336,434 | . . . . |
| Shannon | 924,000 | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 |
| South Utah | 185,000 | 140,000 | 223,498 | 241,843 | . . . . . |
| Tennessee | 1,379,220 | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 |
| United Verde* | 2,900,000 | 3,000,000 | 3,000,000 | 3,000,000 | . . . . |
| Utah Copper Co. | 11,637,949 | 9,849,043 | 10,302,251 | 11,463,905 | 9,929,478 |
| Lake Superior* | 16,500,000 | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 |
| Non-rep. mines* | 6,000,000 | 6,200,000 | 6,200,000 | 6,000,000 | . . . . . . |
| Total prod. | 104,051,138 | 101,758,167 | 96,769,607 | 91,947,075 | . . . . . . . . |
| Imp., bars, etc. | 18,255.267 | 29,029,990 | 22,474,471 | 35,703,660 | . . . . . . . . |
| Total blister | 122,306,405 | 130,788,157 | 119,244,077 | 127,650,735 | . . . . . . . . |
| Imp. ore & matte | 7,497,002 | 8,527,046 | 9,171,351 | 10,800,162 | . . . . . . . . |
| Total Amer. | 129,803,407 | 139,315,203 | 128,415,428 | 138,450,897 | . . . . . |
| Miami† | . . . . . . | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 |
| Shattuck-Arizona | 1,059,625 | 1,019,388 | 1,001,634 | 1,163,237 | 993,224 |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 634,238 | 618,379 | 647,905 | 621,120 | . . . . . |
| Granby | 1,789,000 | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 |
| Mexican Cos.: | | | | | |
| Boleo† | 1,984,640 | 2,240,720 | 2,264,640 | 2,369,920 | . . . . |
| Cananea | 2,908,000 | 3,328,000 | 3,186,000 | 3,148,000 | 3,682,000 |
| Moctezuma | 3,438,793 | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,804,000 | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 |
| Cape Cop., S. Af. | 414,400 | . . . . . . . | . . . . . . . | 607,040 | 712,320 |
| Kyshtim, Russia. | 1,000,000 | 2,500,000 | 1,585,000 | . . . . . . . . | . . . . |
| Spassky, Russia. | 835,520 | 660,800 | 1,048,320 | 1,025,920 | . . |
| Exports from | | | | | |
| Chile | 5,824,000 | 9,856,000 | 8,736,000 | 5,600,000 | 6,160,000 |
| Australia. | 7,616,000 | 10,304,000 | 7,720,000 | 6,944,000 | 7,728,000 |
| Arrivals–Europe‡ | 5,277,440 | 11,728,640 | 14,624,960 | 9,661,120 | 18,040,960 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| X, '12 | 145,405,453 | 84,104,734 | 47,621,342 | 63,065,587 | 107,408,000 | 170,473,587 |
| XI. | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII. | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | . . . . . . | . . . . . . . . | . . . . . . . |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV. | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V. | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI. | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX. | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X. | 139,070,481 | 68,173,720 | 68,123,473 | 29,793,094 | 53,625,600 | 83,418,694 |
| XI. | . . . . . . . . . . . | . . . . . . . . . . | . . . . . . . . . . | 32,566,382 | 48,787,200 | 81,353,582 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Atlantic, Ida | Nov. 3 | Dec. 2 | 0.0005 |
| Beaver Copper, Utah | Nov. 12 | Dec. 2 | 0.005 |
| Belcher, Nev. | Nov. 12 | Dec. 4 | 0.10 |
| Coeur d'Alene Invest., Ida | Nov. 7 | Dec. 8 | 0.003 |
| Colusa, Ida | Nov. 10 | Dec. 2 | 0.005 |
| Copper Chief, Ida | Nov. 10 | Dec. 6 | 0.0025 |
| Deer Trail, Utah | Nov. 3 | Dec. 3 | 0.0075 |
| Eagle Mountain, Ida | Nov. 18 | Dec. 6 | 0.0005 |
| Empire, Ida | Oct. 20 | Dec. 1 | 0.005 |
| Giant, Ida. | Nov. 1 | Dec. 4 | 0.003 |
| Globe Cons., Utah | Nov. 6 | Nov. 28 | 0.001 |
| Gold Bond, Utah | Nov. 10 | Nov. 24 | 0.001 |
| Hider-Nevada, Nev | Nov. 17 | Dec. 6 | 0.02 |
| Lead-Bullion, Utah | Nov. 5 | Nov. 26 | 0.004 |
| Lehi Tintic, Utah | Nov. 5 | Nov. 29 | 0.0025 |
| Little North Fork, Ida | Oct. 8 | Dec. 1 | 0.001 |
| North Star, Ida. | Nov. 10 | Nov. 29 | 0.00½ |
| Rarus, Utah | Nov. 8 | Nov. 24 | 0.00¼ |
| Rhode Island, Ida | Sept. 26 | Nov. 28 | 0.0005 |
| Rochester, Utah | Nov. 7 | Nov. 29 | 0.0025 |
| Ruby Hill, Utah | Nov. 1 | Dec. 6 | 0.005 |
| St. Mary's, Utah | Oct. 20 | Nov. 20 | 0.02 |
| Tonopah, Gypsy Queen | Oct. 20 | Nov. 24 | 0.01 |
| Utah First National, Utah | Nov. 17 | Dec. 3 | 0.001 |
| Utopia Quicksilver, Calif | ....... | ....... | 0.015 |
| Wonder of Pine Creek, Ida. | Nov. 3 | Dec. 3 | 0.001 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53.340 | 63.471 | 60.793 | 24.594 | 29.299 | 28.083 |
| November | 55.719 | 62.792 | ...... | 25.649 | 29.012 | ..... |
| December | 54.905 | 63.365 | ...... | 25.349 | 29.320 | ...... |
| Year | 53.304 | 60.835 | ...... | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | 16.328 | 17.698 | 16.799 | 78.762 | 73.125 |
| October | 17.314 | 16.337 | 17.661 | 16.913 | 76.389 | 73.383 |
| November | 17.326 | ...... | 17.617 | ..... | 76.890 | ..... |
| December | 17.376 | .... | 17.600 | ..... | 75.516 | ..... |
| Year | 16.341 | | 16.560 | ... | 72.942 | |

New York, cents per pound, London, pounds sterling per long ton of standard copper.

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.140 |
| March | 42.577 | 46.832 | 192.619 | 213.615 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | 42.410 | 223.762 | 193.074 |
| October | 50.077 | 40.462 | 228.353 | 184.837 |
| November | 49.891 | . | 227.619 | |
| December | 49.815 | . | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton.

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | 4.698 | 4.924 | 4.579 | 22.292 | 20.648 |
| October | 5.071 | 4.402 | 4.894 | 4.253 | 20.630 | 20.302 |
| November | 4.615 | ..... | 4.463 | ...... | 18.193 | ..... |
| December | 4.303 | ..... | 4.152 | ...... | 18.069 | ..... |
| Year | 4.471 | ..... | 4.360 | ...... | 17.929 | ...... |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.[illegible] | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7.426 | 5.340 | 7.276 | 5.188 | 27.543 | 20.614 |
| November | 7.371 | ..... | 7.221 | ...... | 26.804 | ...... |
| December | 7.162 | .... | 7.081 | ...... | 26.494 | ...... |
| Year | 6.943 | ...... | 6.799 | ...... | 26.421 | ..... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.65 | 16.03 | 15.04 | 15.63 | 14.93 |
| October | 17.90 | 16.60 | 17.18 | 14.61 | 17.22 | 14.80 |
| November | 18.07 | ...... | 17.09 | ...... | 18.00 | .. |
| December | 18.15 | .... | 17.45 | ...... | 18.73 | .. |
| Year | $16.01 | ...... | $14.93 | ...... | $15.28 | ..... |

## STOCK QUOTATIONS

| COLO. SPRINGS Nov. 18 | |
|---|---|
| Name of Comp. | Bid. |
| Acacia | .02½ |
| Cripple Cr'k Con. | .01 |
| C. K. & N. | .08½ |
| Doctor Jack Pot | .05½ |
| Elkton Con. | .51½ |
| El Paso | 2.75 |
| Findlay | .02 |
| Gold Dollar | .07½ |
| Gold Sovereign | .02½ |
| Golden Cycle | 2.00 |
| Isabella | .08 |
| Jack Pot | .04 |
| Jennie Sample | .04 |
| Jerry Johnson | .03 |
| Lexington | .03 |
| Old Gold | .01¼ |
| Mary McKinney | .55½ |
| Pharmacist | .01 |
| Portland | .95 |
| Vindicator | .77 |

| SALT LAKE Nov. 18 | |
|---|---|
| Name of Comp. | Bid. |
| Beck Tunnel | .04 |
| Black Jack | .07 |
| Cedar Talisman | .00¼ |
| Colorado Mining | .10 |
| Columbus Con. | ‡.01 |
| Crown Point | .00½ |
| Daly-Judge | 5.05 |
| Grand Central | .49 |
| Iron Blossom | 1.12½ |
| Little Bell | .15 |
| Lower Mammoth | .01¼ |
| Mason Valley | 3.50 |
| May Day | .01½ |
| Nevada Hills | .15 |
| New York | ‡.02½ |
| Prince Con. | .24 |
| Silver King Coal'n | 3.50 |
| Sioux Con. | .01 |
| Uncle Sam | ‡.03½ |
| Yankee | .06 |

| TORONTO Nov. 18 | | | |
|---|---|---|---|
| Name of Comp. | Bid | Name of Comp. | Bid |
| Bailey | .06½ | Foley O'Brien | .16 |
| Coniagas | 7.15 | Hollinger | 17.87½ |
| T. & Hudson Bay | 64.00 | Imperial | ‡.02 |
| Timiskaming | .13½ | Jupiter | .08 |
| Wettlaufer-Lor | .07½ | Pearl Lake | .10 |
| Apex | ‡.01 | Porcu. Gold | .09 |
| Big Dome | 10.00 | Preston E. D. | .03 |
| Crown Chartered | ‡.00½ | Rea | .10 |
| Doble | ‡.10 | Swastika | .02 |
| Dome Exten | .07½ | West Dome | .05 |

| SAN FRANCISCO Nov. 18 | | | |
|---|---|---|---|
| Name of Comp. | Bid | Name of Comp. | Bid |
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | .06 | Belmont | 7.50 |
| Belcher | .30 | Jim Butler | .73 |
| Best & Belcher | .04 | MacNamara | .09 |
| Caledonia | 1.75 | Midway | .38 |
| Challenge Con. | .11 | Mont.-Tonopah | .90 |
| Chollar | .04 | North Star | .45 |
| Confidence | .35 | West End Con. | 1.27½ |
| Con. Virginia | .12 | Atlanta | .10 |
| Crown Point | .26 | Booth | .02 |
| Gould & Curry | .03 | C.O.D. Con. | .03 |
| Hale & Norcross | .07 | Comb. Frac. | .04 |
| Mexican | 1.30½ | Jumbo Extension | .08 |
| Occidental | .70 | Pitts.-Silver Peak | .38 |
| Ophir | .21 | Round Mountain | .36 |
| Overman | .30 | Sandstorm Kendall | .07 |
| Potosi | .03 | Silver Pick | .03 |
| Savage | .11 | Argonaut | 3.00 |
| Sierra Nevada | .07 | Bunker Hill | 2.00 |
| Union Con. | .12 | Central Eureka | .20 |
| Yellow Jacket | .30 | So. Eureka | ‡2.00 |

| N. Y. EXCH. Nov. 18 | |
|---|---|
| Name of Comp. | Clg. |
| Amalgamated | 70¾ |
| Am. Agri. Chem. | 42 |
| Am.Sm.&Ref.,com. | 63½ |
| Am. Sm. & Ref., pf. | 99½ |
| Am. Sm. Sec., pf. B | 81¼ |
| Anaconda | 34¼ |
| Batopilas Min. | .75 |
| Bethlehem Steel,pf. | 69 |
| Chino | 38½ |
| Federal M. & S., pf. | 37 |
| GreatNor.,ore.,ctf. | 32¼ |
| Guggen. Exp. | 43¾ |
| Homestake | 109½ |
| Inspiration Con. | 14¼ |
| Miami Copper | 21¼ |
| Nat'l Lead, com | 43½ |
| National Lead, pf. | 104½ |
| Nev. Consol. | 14¾ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 87¼ |
| Quicksilver, pf. | 3 |
| Ray Con. | 17¼ |
| Republic I&S,com. | 18¾ |
| Republic I&S, pf. | 79¼ |
| SlossSheffi'd,com. | 27 |
| Sloss Sheffield, pf. | 86 |
| Tennessee Copper | 28¼ |
| Utah Copper | 48¾ |
| U. S. Steel, com. | 55¾ |
| U. S. Steel, pf. | 105¼ |
| Va.Car.Chem.,pf. | 92 |

| N. Y. CURB Nov. 18 | |
|---|---|
| Name of Comp. | Clg. |
| Ariz. Belmont | .04½ |
| Barnes King | 1¼ |
| Beaver Con. | .33 |
| Big Four | .10 |
| Braden Copper | 6¾ |
| B. C. Copper | 2¾ |
| Buffalo Mines | 1¾ |
| Can. G. & S. | 15 |
| Caribou | 60 |
| Con. Ariz. Sm. | 25 |
| Coppermines Cons | 2 7/16 |
| Davis-Daly | 1¼ |
| Diam'field-Daisy | .03 |
| Ely Con. | .02½ |
| Florence | .20 |
| Gold Hill Con. | 3/16 |
| Goldfield Con. | 1 7/16 |
| Greene Cananea | 30 |
| Greenwater | .04 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 4½ |
| La Rose | 1 11/16 |
| McKinley-Dar-Sa | 1¾ |
| Min. Co. of A. new | 2 |
| New Utah Bingham | 50 |
| Nipissing Mines | 8½ |
| Ohio Copper | 7/16 |
| Pacific Sm. & M. | ‡½ |
| Puebla S. & R. | 2½ |
| South Utah M&S | 1/16 |
| Stand'd Oil of N.J. | 379½ |
| Stewart | 1 5/16 |
| Tonopah | 4 11/16 |
| Tonopah Ex | 1 9/16 |
| Tonopah Merger | 59 |
| Tri-Bullion | 1/16 |
| Tularosa | 9/16 |
| Union Mines | ‡.08 |
| United Cop., pfd. | 3 |
| Yukon Gold | 2 1/16 |

| LONDON Nov. 10 | |
|---|---|
| Name of Comp. | Clg. |
| Camp Bird | £0 14s 0d |
| El Oro | 0 14 0 |
| Esperanza | 0 15 0 |
| Mexico Mines | 5 5 0 |
| Oroville | 0 7 3 |
| Santa Gert'dis | 0 17 6 |
| Stratton's | 0 1 0 |
| Tomboy | 1 6 3 |

| BOSTON EXCH Nov. 18 | |
|---|---|
| Name of Comp. | Clg. |
| Adventure | 1¼ |
| Ahmeek | ‡273 |
| Alaska Gold M. | 20¼ |
| Algomah | 1 |
| Allouez | 33 |
| Am. Zinc | 16½ |
| Ariz. Com., ctfs. | 4½ |
| Bonanza | .41 |
| Boston & Corbin | 60 |
| Butte & Balak | 4¼ |
| Calumet & Ariz. | 62½ |
| Calumet & Hecla | 405 |
| Centennial | 12½ |
| Cliff | ‡1 |
| Copper Range | 36½ |
| Daly West | 2¼ |
| East Butte | 10½ |
| Franklin | 3 |
| Granby | 70 |
| Hancock | 13½ |
| Hedley Gold | 30 |
| Helvetia | .25 |
| Indiana | 3 |
| Island Cr'k, com. | 47¼ |
| Island Cr'k, pfd. | 82 |
| Isle Royale | ‡17 |
| Keweenaw | 2½ |
| Lake | 6½ |
| La Salle | 3½ |
| Mass. | 2 |
| Michigan | .75 |
| Mohawk | 40 |
| New Arcadian | 1½ |
| New Idria Quick | 2½ |
| North Butte | 23½ |
| North Lake | 1 |
| Ojibway | .75 |
| Old Dominion | 48½ |
| Osceola | 73½ |
| Quincy | 55½ |
| Shannon | 6½ |
| Shattuck-Ariz. | 26 |
| Superior | 22½ |
| Superior & Bost. | 2½ |
| Tamarack | 27 |
| Trinity | 4½ |
| Tuolumne | .80 |
| U. S. Smelting | 37 |
| U. S. Smelt'g, pf. | 46½ |
| Utah Apex | 1½ |
| Utah Con. | 8 |
| Victoria | 1¼ |
| Winona | 1½ |
| Wolverine | 42 |
| Wyandot | 50 |

| BOSTON CURB Nov. 18 | |
|---|---|
| Name of Comp. | Bid |
| Bingham Mines | 5 |
| Boston Ely | 45 |
| Butte&Lon'nDev | 33 |
| Cactus | .02 |
| Calaveras | 1¼ |
| Chief Cons. | 1 3/16 |
| Corbin | 1 |
| Cortez | 20 |
| Crown Reserve | 1 11/16 |
| Eagle & Blue Bell | 90 |
| First Nat. Cop. | 2 1/16 |
| Houghton Copper | 2½ |
| Majestic | 25 |
| Mexican Metals | 45 |
| Moneta Porc. | ‡.07 |
| Nevada-Douglas | 1½ |
| New Baltic | 50 |
| Oneco | 80 |
| Raven Copper | .19 |
| Rhode Island Coal | .01 |
| Smokey Dev. | .50 |
| So. Lake | 2½ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | .35 |
| Trethewey | .30 |
| United Verde Ext. | .40 |

‡Last Quotation.

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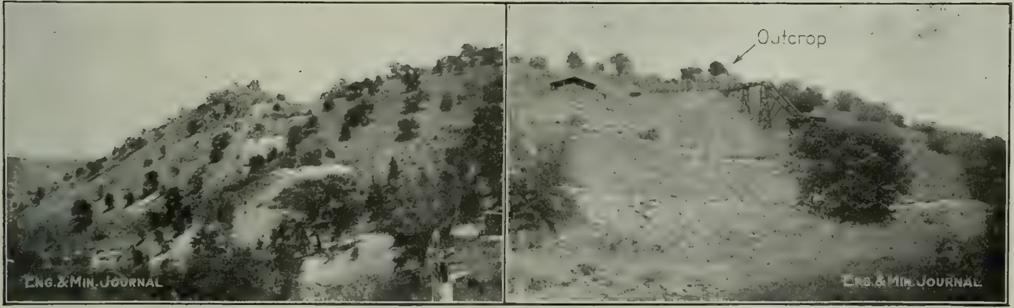
# The Oro Blanco District of Arizona

By Maxwell C. Milton*

*SYNOPSIS—A neglected district originally worked by Spaniards and Indians. Overpromoted by Americans, it lost caste and is only now beginning to be seriously explored. Gold, silver and copper are of importance in the order named.*

⁂

The Oro Blanco mining district is in the western part of Santa Cruz County, Ariz., approximately 70 miles south-southwest from Tucson. The nearest railroad point is Amado, a station on the Nogales branch of the Southern Pacific R.R., about 35 miles from the town of Oro Blanco.



Australitz Hill

Old Glory Mine

In the Oro Blanco District, Arizona

The district was worked to some extent by the Spaniards and Indians before the occupation of Arizona by the Americans, but the placers and rich outcrops early attracted prospectors. During the late '80s and early '90s the district was active, but most of the money was spent on reduction works rather than on underground development. As is usual, this kind of mining met with financial disaster in nearly every case. Until 1912, I believe there was only one shaft in the district over 300 ft. deep, but a ride of a few hours on a horse would take one to the wrecks of eight or nine mills ranging in size from five to 40 stamps. Since 1911 there has been a renewed activity in the camp along more conservative lines, and while these efforts have not been rewarded by large success, the district is still in a fair way to develop some profitable mines.

### Rhyolite and Porphyrite Most Important Rocks

The only sedimentary rock outcropping in the mineralized area is a conglomerate made up of fragments of crystalline igneous rocks. A large portion of these fragments is angular, and in places the rock has the appearance of a volcanic breccia. The age of this rock has not been determined. The most widely distributed rock on the surface is rhyolite, which in many places has a decidedly porphyritic texture. Isolated areas of the rhyolite, sometimes comprising 20 or more acres, have been intensely silicified, and such areas always carry appreciable quantities of gold.

In point of quantity the only other important rock is a quartz-monzonite porphyrite or a quartz-diorite porphyrite, occurring as an intrusion several miles in both length and width. In hand specimens this rock, bluish-gray in color, has a distinct porphyritic texture. Phenocrysts of white feldspar are abundant and well developed, crystals $\frac{1}{4}$ in. long being frequently seen. Small crystals of a ferromagnesian mineral are present in considerable quantities, being characteristically lath-shaped. Quartz is sparsely developed as rounded phenocrysts but is always present. Thin sections, under the microscope, show the feldspar to be plagioclase. The plagioclase has suffered much decomposition, being altered to kaolin, sericite, and in some places almost completely to calcite. The sericitization would indicate that some of the alteration at least was due to deep-seated action rather than weathering. The ferromagnesian mineral is hornblende which has been altered to chlorite. The quartz phenocrysts show some resorption by the groundmass, which is composed of an intimate mixture of quartz and orthoclase.

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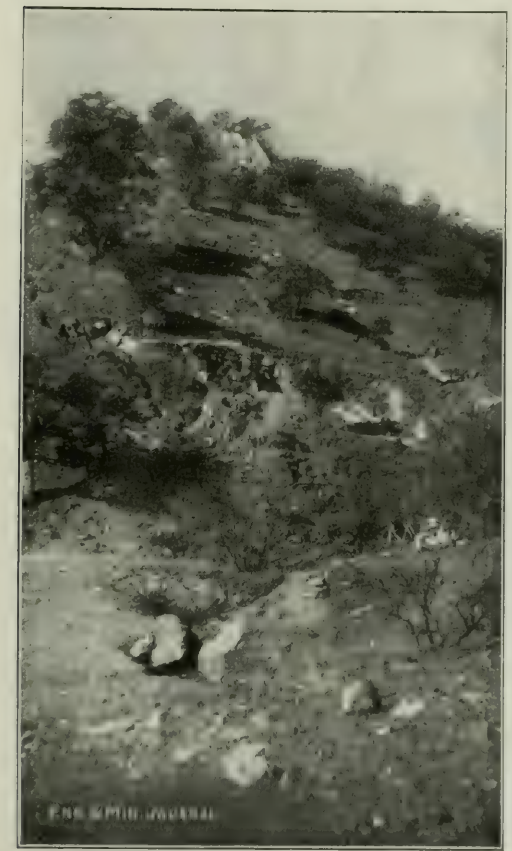
*Fishburn & Milton, mining engineers, Tucson, Ariz

### GOLD AND SILVER THE PRINCIPAL MINERALS

Mineralization has been spread over a large area and has a great range in species. Gold and silver have attracted the most attention and are probably the most widely distributed. Native gold occurs in the placers and in the oxidized outcrops of all the veins. It also occurs free in some of the veins below water level, and, as mentioned, in the silicified rhyolite. Occasional small pieces of native silver have been found. Tellurides have been reported, but I have never seen any. The metallic gold has silver in combination and is about 600 fine. Gold also occurs associated with pyrite and chalcopyrite; in which deposits the copper is a valuable constituent.



EAST OUTCROP OF MONTANA MINE

Silver occurs associated with lead and zinc. In one deposit consisting of an intimate mixture of lead and zinc sulphides, silver is present in the ratio of one ounce to the per cent. of zinc; 50% of the silver is in the zinc. In other lead-zinc deposits the silver goes with the lead. Antimony and arsenic have been reported from one deposit. In general the oxidized zone has but a small vertical extent and sulphide minerals come in at a few feet below the outcrops. Further, the transition from oxidized minerals to primary minerals is sharp; there is no appreciable zone of secondary enrichment deposits.

There are several types of deposits. In the southern part of the district the veins are fractures filled with fragments of the wall rock held together by a soft gouge, in which there is considerable manganese. In these veins the principal value is in free gold, and the absence of silicification is notable. It is possible that development will show a zone of secondary enrichment in these deposits. In the northern part of the district the veins are replacements of country rock by quartz. The mineralization is of two kinds, lead-zinc carrying silver and subordinate amounts of copper, and pyrite-chalcopyrite carrying gold and silver. In the latter class the gold value is in excess of all other constituents. Silicified areas of rhyolite carrying free gold form another type of deposit which might be designated as blankets. The value in this type is very erratically distributed; mill runs have been made on $20 ore but the average value is probably nearer $5 per ton.

Gash veins in the rhyolite are mineralized by gold, silver and minor amounts of galena and pyrite. Quartz-filled fissures are neither numerous nor well mineralized. There has been some faulting in parts of the district but in most cases the displacement is slight.

### SEVERAL PROPERTIES OF SMALL DEVELOPMENT

The property which has received the most recent publicity is the Australitz, which is situated in the northwestern part of the district near the town of Oro Blanco. This deposit is a flat vein 4 to 12 ft. wide carrying gold and silver associated with pyrite and chalcopyrite. The mine is credited with having produced approximately $90,000 from a small ore shoot. It has been developed by about 800 ft. of adit and one shaft 125 ft. off the vein. The property is now idle. The Montana, about three miles east of the Australitz, is the best example of the replacement type of vein. A shear zone, approximately 100 ft. wide, has been more or less replaced by quartz. About 20 ft. on the hanging-wall side of this zone has been well mineralized by an intimate mixture of lead and zinc sulphides carrying silver and minor amounts of copper sulphide. This property has developed a large tonnage and is being worked.

WEST OUTCROP OF MONTANA MINE

To the south of the Montana, the McDonald and Old Glory properties are located on areas of silicified rhyolite. These mines are credited with a production of over half a million dollars. Some development work is being carried on at the McDonald property. South of Old Glory are the Oro Blanco and Tres Amigos mines. The latter is developed by many thousands of feet of adits and shafts but is now idle. Mineralization occurs in both the breccia and silica-replacement types of deposits.

South of the Warsaw is the Grubstake. This mine is the best example of breccia type of vein. The breccia is 4 ft. wide, carrying good values in free gold. The property is being worked and test mill runs indicate that over 75% of the gold can be saved by amalgamation. West of the Grubstake is the Oro mine, where a shaft 340 ft. deep has followed a quartz vein in which gold in pyrite is the principal mineral. It has a small crew of men developing the oreshoot. Southeast of the Grubstake is the Nelson property where a shaft and adits are reported to have developed considerable gold ore. The deposit is of the breccia type. While this list does not include all the properties in the district, it does include most of those on which serious work has been done.

### WORKING CONDITIONS

An exceptionally good class of Mexican labor is available for prospecting purposes. Wood and water are scarce but sufficient exist for preliminary work. Many places afford excellent sites for storage dams; in fact, there are several of these dams in the district now. Transportation is the chief difficulty. In the mineralized area there are no good roads. Freight to and from the railroad varies from $8 to $20 per ton. In a word, the working conditions are those met with in all the outlying districts of the Southwest.

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## Recent Oil Developments in Texas and Louisiana

By W. E. WRATHER*

Oil developments in Texas and Louisiana have been of unusual interest during the past summer. Within a period of four months, three new pools have been discovered, two in the heavy-oil district along the Gulf Coast, and one in the light-oil district of northwestern Louisiana. It is yet too early to do more than guess at their probable extent and productivity, but despite this fact they justify a feeling of optimism, particularly the two heavy-oil discoveries, which have revived the hope that the Gulf Coast region may continue an important producer of fuel oil for some time.

The failure to find new pools of importance, together with the steady decline of old production and the attendant rise in the price of fuel oil had grown alarming. In June, 1908, when the Goose Creek and Markham pools were discovered, the coastal fields were producing between 45,000 and 48,000 bbl. of oil per day. Both developed into small pools, in which it has been impossible to secure and maintain any reliable production. In September, 1910, the Vinton pool in southwestern Louisiana was discovered. It also proved of small extent though very prolific. The producing area of the field covered about 60 acres, which to date has produced approximately 6,250,000 bbl. of oil and is now making about 5000 bbl. daily.

The present total daily output of the nine older heavy-oil pools is about 21,000 bbl. This oil has constantly gained in favor with the refiners as it has become better known, and perhaps half of the total present production is refined. The daily average consumption of the railroads in the Southwest alone is estimated at 26,500 bbl. A large industrial consumption has been built up in this section also, and even though large quantities of residuum are supplied to the fuel-oil trade by the refineries, a deficit arises, to meet which Mexican oil is being imported at Gulf ports at the rate of 800,000 to 1,000,000 bbl. per month. This amount will probably be increased as soon as additional tankers are available, unless home production can be increased to meet the shortage. Despite the importation of Mexican oil, which can be roughly valued laid down at American ports at 75c. per bbl., the price of heavy oil in the coast fields has risen to $1 to $1.25 per bbl. The high sulphur content of Mexican oil, its corrosive properties, disagreeable burning odor, and heavy gravity, militate against its becoming as popular with consumers as the lighter gravity, more fluid fuel produced here, though the railroads are largely turning to it from necessity. The Southern Pacific R.R., through its subsidiary, the East Coast Oil Co., is now a large producer of Mexican oil, and at present is using it exclusively for fuel on its Texas and Louisiana lines.

The two new coastal pools are located, one in extreme southeastern Texas near Orange, the other at Edgerley, about 25 miles further east, in southwestern Louisiana. At Orange, the Rio Brave Oil Co., the fuel department of the Southern Pacific R.R., on Aug. 17, completed a 250-bbl. flowing well at a depth of 3150 ft., the deepest commercial oil yet found along the Gulf Coast with the exception of the 3300-ft. oil north of Humble. A few days earlier, the Gulf Refining Co. finished a 2350-ft. well at Edgerley, which flowed 600 bbl. of jet-black oil, testing 15° (Baumé) gravity, with considerable salt water. Judging from the unusually heavy gravity of the oil, the main pool at Edgerley has probably not been tapped.

Both pools evidently belong to the familiar "salt dome" type, though at neither place has rock salt nor crystalline gypsum yet been found. As no surface elevation is apparent, it is thought that perhaps the salt core will prove to be too deeply buried to be reached in ordinary drilling, as at Batson and Jennings. Pronounced surface-gas seepages at these two localities have attracted attention since the discovery of oil at Spindletop in 1901, and several test walls have been drilled at each place.

The light-oil pool of northwestern Louisiana is at Mansfield, about 45 miles east of south from the Caddo field. On May 10 the Gulf Refining Co. brought in a 1500-bbl. flowing well, which is at present flowing about 500 bbl. daily from a depth of about 2400 ft. The formation encountered is almost identical with that at Caddo, the gravity of the oil is the same (44° Baumé), and it seems extremely probable that the pool will prove to be located on the same, or on a structural fold parallel to that which determines the north-northwest axis of the Caddo field. This supposition cannot be justified, however, by the surface geology as the region is one of slight relief, largely mantled with alluvial soil along Red River, and too few drill records are available to be of service in showing the attitude of the sand. It seems however, that there is a gentle dip eastward into Red River Parish, as well as southward. The shallow gas sand (800 ft.), which has furnished such phenomenal gas wells at Caddo, is here gas-bearing also, but the gas wells seldom exceed 4,000,000 or 5,000,000 cu.ft. per day, and it is unlikely that the gas will prove much of an asset, aside from furnishing fuel for development.

The production of the Electra field in north Texas continues to increase steadily. On Jan. 1, 1913, it averaged 15,000 bbl. daily, and it is now estimated at over

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*Beaumont, Texas.

25,000 bbl. This increase is due in large part to the deep-sand (1900-ft.) wells on the southwest side of the field, which frequently make as much as 400 to 800 bbl. each. They would no doubt be much larger wells if the oil contained a larger amount of gas. A shortage of gas is typical of this entire district outside the Petrolia gas field, which shows as great gas pressures as any gas field in the United States. The deep sand has been proven to extend over about four sections of land, which area, though known to be productive, has been sparsely drilled. It makes a valuable reserve for the field, and may be expected later to swell still further the total production.

The Burkburnett area has proven a disappointment thus far. It now covers equally as much acreage as Electra, but the total daily production will not average more than 1000 bbl. The wells are 1800 ft. deep, and seldom pump more than 25 to 50 bbl. per day. Lately the productive area has been crowded westward where several 150-bbl. wells have been found in shallower sands. In fact, it now seems evident that there will ultimately prove to be a continuous productive area stretching west-southwest from Burkburnett to Electra, 18 miles. Already at six places along this line paying wells have been found at varying depths. Sands of a given depth will likely be local, which is typical of the broken, erratic character of the pay sands in this district; and while this 18-mile stretch will hardly prove to be a continuous, unbroken pool, it appears that there is some hidden structural feature having this general trend, which has governed the accumulation of the oil.

## Michigan Mining Interests in Spitzbergen

Special Correspondence

The Arctic Coal Co., controlled by John M. Longyear, of Marquette, Mich., and associates, has in 1913 shipped 35,000 tons of coal from its mines in Spitzbergen, within the Arctic Circle. The coal has gone to continental ports. The company owns two steamers, one the "Kwasind," of 3800 tons burden, that regularly carries coal in the shipping season, the months of July, August and September, and the "William D. Monroe," a whaler that is used in transporting supplies, but it depends for most of the tonnage it needs on season charters.

It is 10 years since Longyear's attention was first directed to the coal resources of Spitzbergen, and the present stage of the Arctic company's enterprise represents eight years' continuous development, conducted on a constantly increasing scale.

Great sums of money have been spent in the field by Longyear and his associates, and the only returns so far have been the few cargoes sent to civilization. But the region possesses tremendous resources in coal and if all goes well the men interested in the Arctic company will be richly rewarded both for their daring and the persistence of their efforts to have the international status of Spitzbergen satisfactorily determined.

The shipment of 38,000 tons of coal to southern ports this year was more than has been forwarded in any previous season and more, also, than will likely be forwarded next year, for the shipment was incidental to the development of the property. The stage of actual mining on a commercial basis has not yet been reached. However, the preliminary work has been well advanced and Longyear expects that the company's operations will soon be definitely determined. Much equipment will have to be installed before the property is in readiness for production on a large scale. The general manager is Scott Turner.

A deposit of more than 60,000,000 tons has been indicated by the operations to date. The mines are wrought by 250 to 300 men, and, although the shipping season lasts but three months, mining is carried on throughout the year. The geological conditions place no bar on successful mining in the Spitzbergen fields. The beds are uniform to a surprising degree, running about 3½ ft. thick, and the mining problem is simple. The coal is undercut, and drops from the sandstone capping which overlies it. The sandstone makes a stable roof and has to be supported with comparatively little timbering. However, other conditions raise some question as to what part of the coal can be taken out.

The international phase of the matter is one that continues to give concern to the men interested in the company, for Spitzbergen remains No Man's land, and although the Arctic company holds title to its 170 square miles of land by purchase from a Norwegian company, by exploration and by possession, it is regarded as an interloper by the northern nations of Europe, and its rights may not be established without a fight.

In fact, the company's land has already been entered upon by a force of Russians, who have undertaken exploration and who have carried it forward sufficiently so that they have shipped a cargo of coal. What to do about these invaders is only one of the many problems that give concern to the officials of the Arctic company. There is a strong suspicion that they have pursued their course with the knowledge of the Russian government.

Norway has made several attempts to bring together representatives of eight leading nations in a conference in which steps will be taken to determine the status of Spitzbergen, but so far the conference has failed to eventuate. It seems impossible to agree on a time when all the powers are willing to settle down to the task of determining how Spitzbergen shall be governed, or what rights will be respected there.

The officials of the Arctic Coal Co. have met with no more success obtaining satisfactory assurances about the backing it will get from the American state department than Norway has encountered in bringing the powers together to deal with the subject. In one of President Taft's messages reference was made to the anomalous condition existing in Spitzbergen, and the necessity of protecting American interests, but so far there has been no more definite declaration that Americans who have made investments in Spitzbergen will be protected by the Government in the final scramble for land and power.

That this is the case is not due to a lack of representations by officers of the company to the state department, but to the reluctance of the officials of that department to act finally on the matter. Longyear has frequently had the matter before the undersecretaries, and recently discussed it with Solicitor General Folk and other officials. This last interview gave Longyear considerable satisfaction and he is hopeful that steps will soon be taken to define the position of the American government in relation to Spitzbergen. With the Russians aggressively in possession of tracts of the company's land, and showing every evidence of a purpose to go ahead and mine coal, this naturally is a matter of great interest to the men who have staked so heavily on the exploitation of the Spitzbergen coal fields.

## Jones & Laughlin Interests on the Cuyuna

A recent deal in ore lands on the North Cuyuna range is of interest both as illustrating the manner in which the business is conducted and as marking the probable entrance of the Jones & Laughlin interests on the range. Thomas Feigh, of Duluth, owns the fee to a group of four forties forming a square block adjoining the Pennington on the west and southwest. He leased this land to the C. M. Hill Lumber Co., at $0.35 per ton royalty. The company drilled and opened up a good body of ore, thereafter selling the lease to the Northern Pacific for $250,000. The Northern Pacific in turn has given an option to Jones & Laughlin. Whether the royalty remains the same is not stated nor what the minimum tonnage is to be. It is probable that the railroad has, as usual, stipulated haulage over its tracks and will take its profit from the freight charges. It is reported that check drilling is to begin soon.

The deposit indicated by the first drilling, taken as a whole, has a shape something like the half of an egg that has been split lengthwise with the plane surface upward forming the outcrop. In this body the rich ore occurs as a series of inclined lenses, more or less parallel, striking a little north of east, this being the long axis of the deposit. Several of the lenses are larger and of more importance than the others. The dip is rather flat, 40 to 50°. The drilling has pretty well bottomed the ore, although cross-sections show possibilities of downward extension in a few of the lenses. The total tonnage calculated for the holes is 3,250,000. To uncover this will require the stripping of 3,125,000 cu.yd. of drift and 600,000 cu.yd. of rock. The average depth of the overburden is perhaps 80 ft. It is calculated that 100 ft. of the deposit after stripping can be steam shoveled, equivalent to a tonnage of 1,750,000. The remainder of the ore will require milling or underground mining.

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## Mica Deposits in Canada

Concerning the importance of Canada as a mica-producing country, interesting information is given in a report issued by the Department of Mines in a pamphlet by J. McLeish, says the *Canadian Engineer.*

With the exception of Ceylon, Canada is the only country, as far as known, in which phlogopite—or "amber mica"—is known in economic quantities. The mica of commerce is of two kinds—muscovite, or "white mica," and phlogopite, or "amber mica." The former is obtained from both India and the United States, while the latter is secured almost wholly from Canada. Of the two varieties, phlogopite commands rather the higher price, being softer, more flexible and more suitable for use as an insulator, this being the principal use to which mica is now put.

The amber-mica deposits of Canada lie in approximately 1200 square miles in the province of Quebec, and 900 square miles in the province of Ontario. The two districts are separated geographically by the Ottawa River, and geologically by a belt of sedimentary rock about 40 miles wide. The city of Ottawa lies between the two productive areas and is the seat of the mica industry, all the important works engaged in trimming and in otherwise preparing the mineral for the markets being situated there.

Deposits of white mica also occur in Canada, and occurrences of this variety (some few of which have been worked at various times) are known from Labrador in the east to the Rocky Mountains in the west, while several Arctic expeditions have returned with good specimens from the far north.

Though the average dimensions of mica sheets do not much exceed 3x5 in., plates of enormous size are sometimes obtained. Crystals have been found which measured over 4 ft. across and weighed nearly two tons. About 300 mines have been worked for mica at various times in Canada, but at the present day no more than 25 are in active operation. Among the large operators may be named: The General Electric Co., of Schenectady, N. Y.; Webster & Co., Ottawa; Blackburn Bros., Ottawa; Wallingford & Co., Ottawa; O'Brien & Fowler, Ottawa; Kent Bros., Kingston.

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## Single-Track Cableway in Sardinia

### By E. Praetorius*

A cableway of unique design, herewith illustrated, was installed at the Rosas mine in Sardinia. Its novel feature consists in the fact that the two buckets travel on the same rope, provision for passing at the midpoint being made in an ingenious manner. To the carrier of each bucket are attached two arms extending parallel to the track rope, and above it. These arms are pivoted where attached to the carrier and the one on the ascending side is kept elevated above the rope by means of a flat steel spring inserted below it. The tops of these arms form tracks which take the wheels of the other carrier just as the rope does.

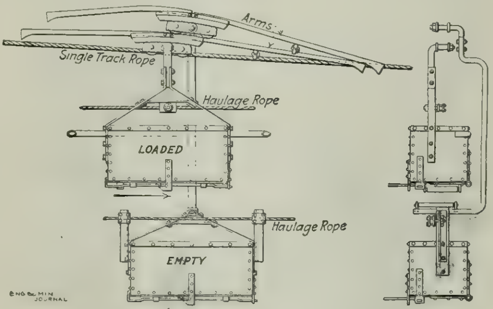

Fig. 1. Single Track Cableway

When the buckets meet, the carrier wheels of the ascending bucket mount the carrier arms of the descending bucket and ride over them. The spring in the upper arm yields under the weight of the ascending bucket, so as to permit the arm to come down on the rope and deliver the carrier wheels to the rope again. The ends of the arms are made fantailed so as to guide them to the rope. As will be seen in Figs. 1 and 2, one bucket is suspended from the carrier by a much longer arm than the other, this arm having an offset portion to permit the passage of the other bucket.

The length of the cableway is 1115 ft. (340 m.) and it overcomes a difference in elevation of 223 ft. (68 m.). The track rope is $\frac{3}{4}$ in. in diameter (19 mm.) and the haulage rope is $\frac{5}{16}$ in. (8 mm.). This haulage rope lies in the same vertical plane as the track rope and passes over vertical sheaves at each terminal. This sheave at the loading station is provided with a rim brake to control the speed. The arrangement at the discharge station is shown in Fig. 2. The weight of each bucket and carrier is 220 lb. (100 kg.) and it carries a load of 660 lb. (300 kg.). The speed of the buckets is such that the 1116 ft. is covered in 65 to 70 seconds.

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*Miniera di Rosas, Rosas, Sardinia.

Whereas the installation does not have carrying capacity equal to that of a system employing two buckets with two track ropes, yet by experiments carried out it is found that there is only a difference of 27% against this system. By using a system of four buckets on two ropes, an advantage of 56% is gained. The construction was done at the mine under unfavorable circumstances. Nevertheless, the cableway has run five months without a single hitch, or without any repair expense whatever and during this time has carried 3000 tons of lead ore.

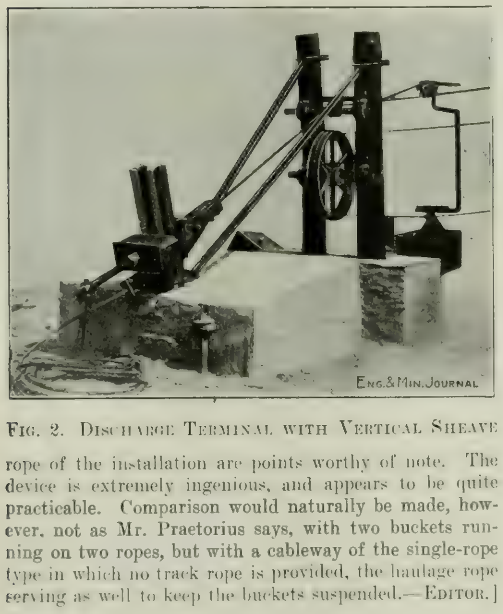

FIG. 2. DISCHARGE TERMINAL WITH VERTICAL SHEAVE

[The great span, high speed and the light weight of rope of the installation are points worthy of note. The device is extremely ingenious, and appears to be quite practicable. Comparison would naturally be made, however, not as Mr. Praetorius says, with two buckets running on two ropes, but with a cableway of the single-rope type in which no track rope is provided, the haulage rope serving as well to keep the buckets suspended.—EDITOR.]

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## Electric Production of Ferrochrome

A new industry has just been started at Trollhattan, Sweden, in which the electric furnace is used for the reduction of ores brought from South Africa and New Caledonia. Two furnaces are now in operation, using 3-phase, 50-cycle current at a voltage varying between 15 and 60, according to *Daily Consular and Trade Reports*. Four grades of metal are being made, containing 5, 6½, 7½ and 9% of chromium. The finished product is exported.

The process is a secret one and entrance into the works, which is owned by the Ferrolegeringar Aktiebolag, is forbidden. The manager, Louis Lucchèse, who is also the inventor, explained that as yet no patents had been applied for, and hence the only protection was secrecy.

The output for the year 1913 will reach about 1200 metric tons. It is stated that the furnace requires 1700 kw.-hr. per ton of metal reduced, and that the results thus far obtained are very satisfactory.

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## Manufacture of Aluminum in France

An interesting summary of the present status of the manufacture of aluminum in France is given in *La Revue Electrique*, of Sept. 5, 1913.

Five French companies produce aluminum. These are: The Société Electrometallurgique Francaise, Compagnie des Produits Chimiques d'Alais et de la Camargue, the Société des Forces Motrices et Usines de l'Arve, the Société des Produits Electrochimiques et Electrometallurgiques des Pyrénées, and the Société d'Electrochimie.

These five companies have formed another company, L'Aluminium Francaise, which acts not only as sales agent, but is also intended to carry out research work on the applications of aluminum, and to devote itself to a propaganda to encourage its greater consumption. This company also manufactures, in its plant at Selzaute, Belgium, and Mennessis, France, considerable quantities of alumina, sulphate of aluminum, etc. It is now erecting at Arrean, in the Pyrenees, an aluminum factory and at Chambery, Savoy, a rolling mill for the manufacture of aluminum sheets, etc. At Kremlin-Bicêtre, near Paris, it has a factory for making tubes, etc. The present status of the five constituent companies is briefly:

Société Electrometallurgique is Dr. Paul Héroult's company formed in 1888, the oldest of the French electrometallurgical companies. Its capital is 15,500,000 francs. In the different plants of the company at Froges, La Praz, Saint-Michel-de-Maurienne, and L'Argentiere 65,000 to 70,000 hp. are available during the greater part of the year. Besides aluminum ingots, bars, wire, cables, tubes, aluminum cooking utensils and pure alumina, the company produces ferro alloys, electric steel (Héroult process) and carbon electrodes. Compagnie des Produits Chimiques d'Alais et de la Camargue was founded in 1855 and its capital is now 10,500,000 francs. Its plant at Salindres was originally intended to manufacture soda by Le Blanc's process, but later was devoted successfully to chlorine manufacture and began, in 1861, to produce aluminum by the purely chemical process of Henri Sainte-Claire Deville. For 30 years it was the sole producer of aluminum. In 1897 it bought the Calypso aluminum plant and later equipped another hydro-electric plant, now producing considerable quantities of aluminum.

Société des Produits Electrochimiques et Electrometallurgiques des Pyrénées was founded in 1906, and has a capital of 6,000,000 francs. Its Auzat plant has a capacity of 16,000 hp., and its output is 6 tons of aluminum, 9 tons of chlorates or perchlorates and 10 tons of calcium carbide or ferro alloys daily.

Société des Forces Motrices et Usines de l'Arve was founded in 1895, and has a capital of 4,100,000 francs. Its Chedde plant has a capacity of 22,000 hp., and its maximum output is 6 tons of aluminum and 20 tons of chlorates and perchlorates per day. The Société d' Electrochimie was founded in 1889 by Gall and de Montlaur for the electrolytic production of potassium and sodium chlorates and has a capital of 10,000,000 francs. In its numerous plants the company produces chlorates, aluminum, calcium and calcium hydride, potassium and sodium cyanides and other chemical products.

# Stoping Methods at the North Star Mine

By L. O. Kellogg

*SYNOPSIS—Because of its flat dip and irregular nature, stoping the North Star vein presented unusual difficulties. Levels driven at 300-ft. intervals. Muck lowered to levels by "go-devil" gravity-plane method. Special type of head-block. Three stages in stope development. Advantages and limitations of system. Costs of preparatory work, breaking ore and mucking.*

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The North Star mine, of Grass Valley, Calif., is so well known as to make any general description of its operations superfluous.[1] It is engaged in mining gold ore under circumstances favorable in some respects, but highly unfavorable in others. The greatest difficulty encountered lies in the characteristics of the deposit. The vein is a narrow one, ranging in width from 6 in. to 5 ft. While persistent on strike and dip, it is erratic in width, dip, strike, thickness and grade. Although it is practically unfaulted in the portion now mined, it splits frequently into two or three narrow parallel veins, separated by areas of country rock up to 10 or 15 ft. thick. While the gold content would make its grade medium or even high for a larger, more uniform deposit; on account of the waste which it is necessary to mine with the vein material to get room for machine stoping, it is in effect a low-grade deposit. The oreshoots, furthermore, are extremely irregular in size and shape.

### General Method of Development

The dip of the vein is about 23°, so far as developed. The first mining was done by an incline shaft in the vein from the outcrop to the 2700-ft. level. Later, at a point some distance in the direction of the dip, a vertical shaft, the Central, was sunk, cutting the vein at a depth of 1630 ft. The workings tributary to this shaft might be described as the North Star Deep, as the term is used in South Africa. At a point slightly above this, a station was cut and the 40 level established, approximately 4000 ft. on the incline below the outcrop. Beginning at this station, the vertical shaft is turned and follows the vein as an inclined shaft from that point to the bottom about 100 ft. below the 53 level, or about 5400 ft. on the incline below the outcrop.

Material below the 40 level is handled by skips in the turned-vertical shaft, these being pulled through the 40 station without transfer. Material from the 40 level is trammed to the 40 station and is picked up there by the skips. Material from the levels above the 40 is lowered through a main raise on a gravity plane by an engine, especially designed for the purpose, is dumped into the 40 bin and is thence hoisted to the surface.

Levels are driven, three to the 1000 ft., measured on the incline. Thus the "deep" levels above the 40 are the 37, 34 and 30. Above the 27, all operations were formerly carried on through the North Star inclined shaft mentioned, but these have been discontinued except for pumping and repair work; all the ore now mined comes from below the 27 and is hoisted through the Central shaft.

### Ore Handling in Stopes on Gravity Planes

The main raise, through which material is lowered, has loading stations at the 37, 34 and 30 levels, spaced something over 300 ft. on the incline. To these bins the ore is trammed from both sides of the raise by mule or by hand, according to the length of the haul and the tonnage handled. The spacing of the levels and the method of delivering the ore to the level were the problems that had to be met. Experiment with various systems led to the one now in use. It is exceedingly neat and efficient and peculiarly adapted to the conditions obtaining.

The ore from the block above is got to each level by means of gravity planes. These are locally and aptly call "go-devils." They are peculiar in the fact that the cars that are used for tramming in the stopes are lowered on the plane by means of a light portable and easily controlled triple-sheave head-block. A typical stope in process of working by the go-devil method is diagrammatically illustrated in Figs. 7, 8, 9 and 10, plans in the plane of the vein.

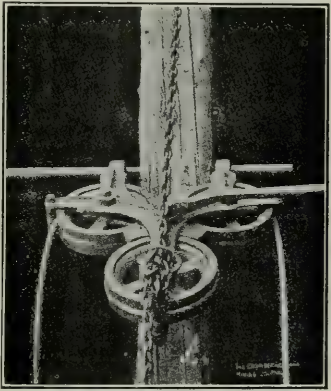

Fig. 1. Go-Devil Head Sheave in Position on Post

### The Go-Devil Head-Block

The go-devil head-block is probably the most interesting feature of the method. It is illustrated in Figs. 1 and 2. The rope passes up on the outside of the outside blocks, down the inside through grooves in the brake block, and around the bottom of the lower sheave. The brake block is triangular, pivots about its center in between the three sheaves and is operated by a handle attached to the square head shown. It is brought to bear on all three sheaves and thus gives a strong braking effect. It can be locked in position by extending the handle with a piece of pipe and connecting the end of this to a lever with a ratchet lock set on a stout post. The two halves of the triangular spider-frame, the three sheaves and the brake block make six castings entering into the device, beside the bolt, nuts and handle. The manner of suspending the block by a bolt through the post and by a chain, is shown in Fig. 1.

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[1] See Eng. and Min. Journ., Nov. 18, 1911.

A ⅝-in. steel-wire rope is used and is attached by means of the safety hook shown in Fig. 3. The cars are in general of two types. That formerly used was built of wood bound with strap iron, and had a vertical front. The door was hinged at the top and was held by a bottom latch, which was tripped by a block beside the track just as the dumping point was reached. These cars were of different sizes, but were rather small, holding about 1000 lb. They have been almost entirely displaced by the car shown in Fig. 4. This car is built rigid throughout and its emptying is facilitated by the inclined end. Its strength is one of its features, as it has to withstand extremely hard usage. Its capacity is about 16 cu.ft.

### Manner of Operation

Whichever type of car is used, it is dumped by partly upsetting at the foot of the incline. This is effected by the device shown in side elevation in Fig. 5. The last 2 ft. of the incline tracks are made steeper and a round timber resting against two inclined posts as shown, is set across the bottom, over the last tie. The wheels of the dumping car rest on this bumper. In the center of each of the tracks is a hook, usually of 1¾-in. grooved steel; one end is hooked over the next to the last track tie, the other projects upward so as to catch the front axle of the descending car. The axle is caught as the front wheels hit the bumper. The inertia of the car and contents causes it to revolve about this axle and to tilt up until the top of the body rests against the crossrail on the inclined posts. In this position the end and bottom of the car are at an angle to permit easy discharge of the contents, aided by the inertia of the descent.

The cycle of operations is as follows: The mucker or trammer fills a car at some point along the lateral tracks; he trams it to the turnsheet and hooks on the loose end of the go-devil rope; he pushes it carefully over the edge on the track and grabs the brake handle, the empty car at the dump is jerked back so that its rear wheels are again on the rail and as the full car descends, the empty one is pulled up. The length of the rope is adjusted so that, as the full car reaches the dump and empties, the empty car is landed on the turnsheet, whence it is trammed out on the lateral tracks for loading again.

The incline plane itself is kept on as uniform a grade as is convenient. It is built of 4x6-in. crossties, about 8 ft. long, spaced 3 ft., these are held apart by studdles of the same material, which are laid on 1x6-in. boards; the boards give no support and are used merely for lining in and getting grade. The ties themselves are supported either on the foot wall or on filling, or on poles across low places. Four 12-lb. rails are spiked to the ties, so as to give a double track from top to bottom with 20-in. gage and 12 in. clearance. The general arrangement is illustrated in Fig. 6.

### Stope and Raise Relations

To return to the general method of developing the vein, the development by levels is augmented by raises on the vein wherever conditions warrant. In putting up these raises, go-devils are used. On starting a raise, the muck is blasted to steel sheets on the level tracks and is shoveled into cars. When enough advance has been gained, a chute is put in. When the face is too far above this chute for rapid shoveling, a go-devil is installed. In a raise, no turnsheet is used and the two cars are always on the rope.

The raises may or may not be in ore. A stope may be started between two raises, extended to each, and may use a go-devil in each raise, it may be started on both sides of a raise and may use a single go-devil in the center, or it may be started in unexplored ground and an entirely new go-devil installed near the middle. In describing the development of a typical stope, we may consider one started on two sides of a raise, which is itself in ore.

### Stope Development

The first operations consist in drilling holes along the face. Usually two stoping points are selected, one on each side of the raise, and each stope carried toward the raise in one direction and to the limits of the oreshoot in the other. The first ore is shot down on plats, usually covered with steel sheets, laid over the level tracks. The stope soon assumes a shape as shown in Fig. 7.

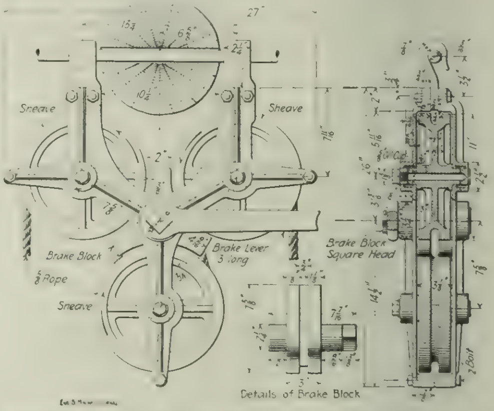


Fig. 2. Triple-Sheave Head Block for Go-Devil Gravity Plane

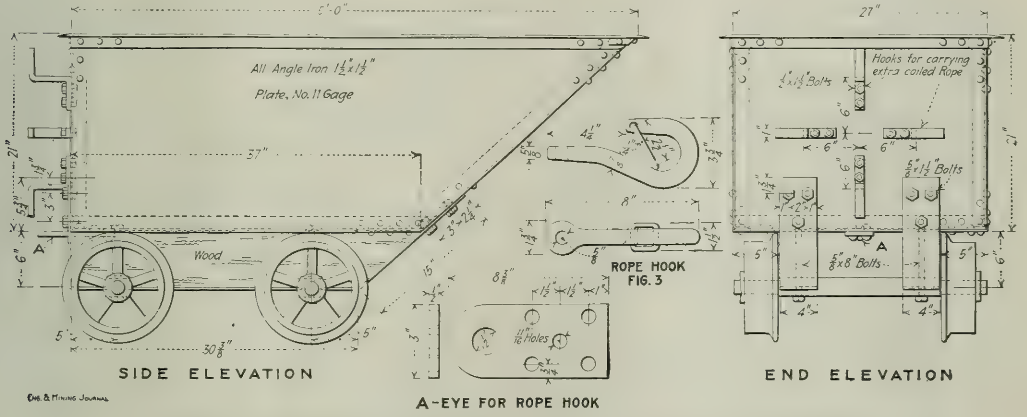
The foot wall of the vein has usually been carried pretty well up on the drift side, so that after two or three cuts have been shot out, a shoveling plat can be erected, the height of a car or higher. Such a plat is illustrated in Fig. 11, consisting in its simplest form of 2-in. planks, covered with steel, set at right angles to the track on a round timber supported by two stulls. In the same way, small chutes or lips can be put in to deliver directly to the cars without shoveling if the vein is steep enough.

In this manner the stope is carried up until its face is somewhat above the top of the raise chute. About 30 ft. on the dip may have been thus mined. It is squared up and the pillars next the chute are removed. Then a row of stulls is placed within about 5 ft. of the stope face and horizontal poles, with a minimum diameter of 6 in., are set against these so as to keep the broken rock on the intermediate level. The face has previously been drilled up for its full length. Stopers are used for nearly all drilling in the stopes. When the stope is thus "poled," it looks as in Fig. 8. The holes are blasted, beginning at the raise and the ore is thrown toward the raise, whence it is shoveled into the chute. When this first cut has been carried so far that shoveling becomes slow, a water Leyner or a "jackhamer" is used to shoot up the foot wall, making a level cut about 5 ft. wide. This foot-wall breaking is done with long "lifters" or with numerous "pops" about at right angles to the foot wall; the "lifters" are also drilled with stoping drills if circumstances permit. On this flat grade, a track is laid both ways from the chute and the broken ore is handled with cars thenceforth. A cross-section of part of the stope, Fig. 12, shows the poling and track.

A number of cuts are started at the raise and carried back until the stoped portion along the raise measures from 25 to 30 ft. The stope may then look somewhat as in Fig. 9. The ore is blasted on steel sheets or on 2-in. planks, laid on the tracks until some distance is gained up the dip, when the raised plats are put in as when stoping along the level.

### Stoping with Go-Devil

The lift is then squared up by carrying back each cut to the limit of the ore; the face is drilled up, and poling again put in. At the same time the Leyner machine is used to break out a place for a turnsheet in the raise foot wall at the level of the new poling and a turnsheet is placed there; a post to carry the go-devil blocks in the raise above the turnsheet is also set and the dumping device at the chute top. The first ore blasted is shoveled into cars fastened to the go-devil rope and then lowered and dumped. Stoping proceeds away from the raise as before and when the track is installed, the cars are handled on the go-devil as previously described. The tracks and ties from the lift below are used.



Figs. 3 and 4. Go-Devil Rigid Car and Safety Hook for Rope Attachment

This operation is repeated until the oreshoot in that block is worked out. Fig. 10 shows the appearance of a stope in which six lifts have been made. The economical length of each lift, measured up the dip, is calculable, being determined by comparing the cost of installing the new poling, track and turnsheet, including loss of time, with the cost of shoveling down from the face. The poling serves to keep the broken ore at or above the track level, and also acts as a partition between ore and waste, the coarse waste being thrown below, where it is available for building dry-wall supports to the roof when desired. It must not be supposed that the stulls of the poling are the only ones set. As a matter of fact, stulls are placed at frequent intervals throughout the stope as needed. Each new lift entails the use of a longer rope.

### Advantages of System

The advantages of the system as a method of handling material in a flat-dipping stope are numerous:

(1) It reduces to a minimum the necessary shoveling. While it is still necessary, as each lift reaches its upward limit, to shovel the ore twice, this is nothing compared with systems where the muck may require shoveling over 100 ft. The shoveling is furthermore made easier by the use of plats where possible.

(2) It eliminates much dead work. Except for the track grading and occasionally some main-level chutes, the work is all in the ore; no long crosscuts are run.

(3) It has great capacity. Three cars in a stope will handle the product of four or five machines. Its capacity is especially noticeable as compared with shaking chutes, which were tried and discarded. About 10 to 15 go-devils supply a daily mine production of 350 tons.

(4) There is no consumption of power, as is the case in hoisting from underhand stopes or from workings down the dip, nor is there any expense for a man on the hoist.

(5) It is cheap in the final results and not so expensive in material as might be at first supposed, inasmuch as cars, ropes, blocks, turnsheets, trucks, ties and poles are used over again until worn out, and are often taken to other stopes.

(6) It involves a minimum rehandling of material except at the level, as compared with systems using a series of chutes down the stope with intermediate tramming.

(7) It reduces the number of main-haulage drifts with a consequent reduction in development cost, first cost of bins and cost of tramming.

(8) Its great advantage is its flexibility. As can be seen, it can take care of a stope of any size or any shape. By sending out the lateral tracks at 30-ft. intervals, the limits of the oreshoot can be outlined exactly. If, in any case, the ore hooks down into the waste as shown at *A*, Fig. 10, it is only necessary to return to one of the lower

levels, when the stope is worked out, and continue it as a small drift so as to tap the offshoot from below.

### LIMITATIONS

There are, however, certain disadvantages and limitations:

(1) Sufficient headroom over the tracks is necessary to allow the car with a projecting rock to clear the roof. To obtain this means considerable expense in cutting out the foot wall. The hanging is left intact as nearly as possible.

(2) It will not operate below a 5° and with difficulty below a 10° dip, and conversely when 35° is reached, its operation becomes difficult and sometimes dangerous.

(3) The slowing down of operations and decrease of output upon cleaning up, beginning a new lift, is a source of trouble and makes it difficult to keep up production if several stopes are "moving" at the same time.

(4) There is some danger of accident. The cars, especially the empty car as it is jerked back to the track, may be derailed. More disastrous are the runaways of one or both cars on the incline. These may happen in several ways. The operator may push over the loaded car without hooking on the rope; the hook occasionally drops off on starting; the rope or hook may break; the lower car may become unhooked, in which case the brake often fails to hold the unbalanced load; the operator may allow the speed to increase until he cannot control it with the brakes; some part of the head block may fail. In any event, the resulting runaway is a merry one. A ton and a half of car and ore on a steep grade, possibly 250 ft. long, will land in the chute with an appreciable impact. Its extraction is an awkward job, calling for an hour's work or more by all hands and the shift boss. Neighboring stopes may be drawn upon for men, and the cost of such an accident in damage, loss of time and in-

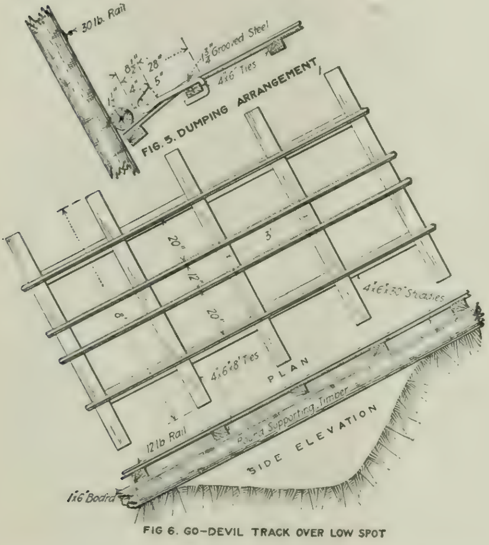


FIG. 5. DUMPING ARRANGEMENT

FIG 6. GO-DEVIL TRACK OVER LOW SPOT

ARRANGEMENT OF GRAVITY PLANE AND DUMPING DEVICE

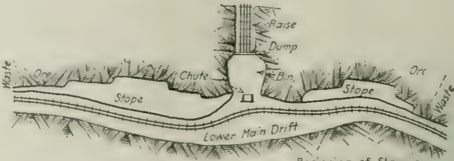


FIG. 7. Beginning of Stoping.

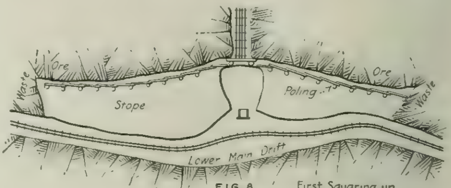


FIG. 8. First Squaring up and Poling.

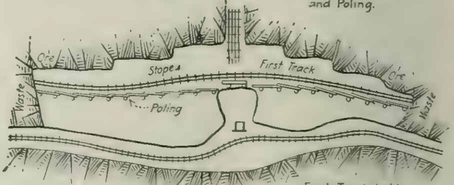


FIG. 9 First Track Laid

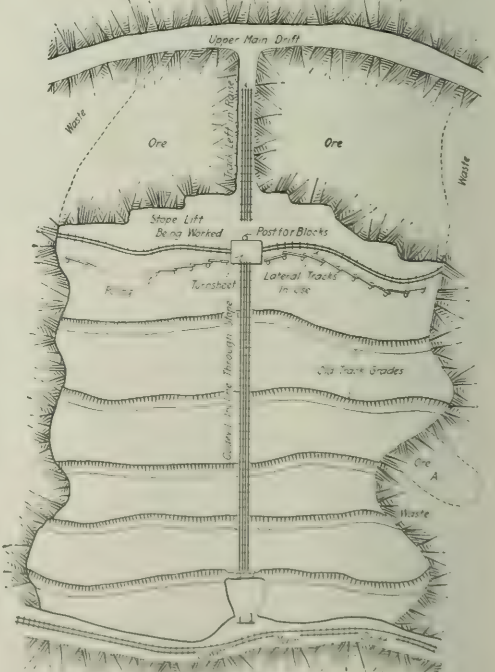


FIG 10 Stope Partly Worked, Showing Successive Lifts

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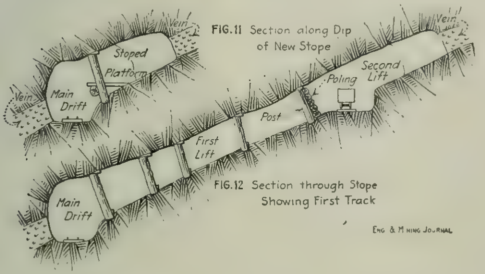
STOPE PLANS, SHOWING PROGRESSIVE DEVELOPMENT terruption of work in the stope, may amount to $25 or $50 in some cases. It should be noted that the applicability of the system is greatly increased by the unusually good hanging wall.

### Preparatory Costs

In regard to costs: Where the stoping operations utilize the go-devil in an old raise, the cost of the go-devil construction is properly charged to the original raising. The installation of successive turnsheets, however, involves breaking and replacing the old inclined track to such an extent that little of it is actually used. The cost of laying go-devil tracks, as with most of the other of these costs, will vary exceedingly, according to the degree of uniformity of dip, accessibility of working, height of hanging wall, etc.; the labor cost varies from $0.60 to $0.80 per lin.ft. The cost of rail and timber for a new go-devil will average from $0.50 to $0.60. The cost of the dump, bin, chute, etc., is similarly usually chargeable against the original raise and when new work must be done for stoping, conditions are so variable as to make figures valueless.

Poling is also subject to considerable variation, depending on the accessibility of the stope and on the width. The stulls are rounded on the foot-wall end and are set in hitches. The timbermen who do this work are paid at the rate of $3.25, the uniform shift being eight hours. Labor will vary from $0.10 to $0.33⅓ per lin.ft. Material cost will vary according to the number of old poles employed. A rough average would be $0.25 per ft. along the stope for all labor of setting stulls and poling.



Stope Sections during Early Operations

Taking up the bottom for track is also variable. A miner using either a Waugh, "jackhamer" or water Leyner will shoot up from 6 to 10 ft. of bottom per shift. The machine costs, such as power, repairs, etc., will be noted when breaking ore is considered. Explosive cost is low, as the holes break to good advantage. Track laying is rapid and cheap. Rails and ties from the lift below are usually used. About $0.10 per ft. would cover the labor of removing track from one lift and laying it on a new grade. The total cost per foot for the intermediate track complete is about $1, and amounts to $0.07 approximately per ton stoped.

### Actual Stoping Costs

These costs mentioned cover preliminary or incidental costs, dead work in a sense. For actual stoping, although costs may vary greatly with conditions in the individual stopes, more constant figures can be given, being obtained from totals of the whole mine over considerable periods of time. About seven tons per drill shift is broken in stopes. The machinemen get $3. Machine costs per drill shift over the whole mine are: Power, $0.40; repairs, $0.40; lubrication, $0.02; and drill-steel sharpening and replacement, $0.75. The amount of powder used per ton is 1.65 lb., with 5.8 ft. of fuse and 0.9 detonators. A stope hole breaks on an average 1¼ tons. The steel consumption using 12 A Waugh stopers is 2¼ lb. per drill shift.

The average shoveling rate in the stopes is about seven tons per man-shift. Two rates are paid for shoveling labor, $2.50 and $2.25, and an average would be about $2.35, giving a shoveling cost of $0.35 per ton. This is the total cost of getting the material into the main-level chutes at the bottom of the stopes, and includes whatever sorting is done underground. The average stoping width of the material sent to the mill is about 4 ft. Lowering is performed at various speeds, depending on the grade, condition of track, skill of opertor, etc. Speeds varying from 200 to 500 ft. per min. have been observed.

Other minor operations are involved in the system of stoping, which add to the cost, such as setting the turnsheet for a new lift, setting the go-devil post and block, etc. It should be noted that the breaking and shoveling costs are referred to the material sent down the go-devil, all of which goes to the mill. A large amount, from 10 to 20% of the material broken, is coarse waste, which must be handled and which is sorted and thrown over the poling in the stope; if included in the tonnage figures, this would boost appreciably the duty per man-shift.

⁂

## Fineness of Fairbanks Gold

Placer gold is generally believed to increase in fineness, the farther it is removed from its source in the vein. The assumption is theoretically sound, and is confirmed by field evidence, although few published facts on the question are to be had. Writing in *Economic Geology*, August, 1913, Philip S. Smith furnishes some data concerning the fineness of the gold in the Fairbanks region, Alaska, obtained from the assayer for the Washington-Alaska Bank of Fairbanks. It appears that the gold does increase in fineness with removal from its source. Increases of 3, 6, 6½, 12½, 13 and 21 points out of a thousand, are noted per linear mile on various creeks of the district. The fact that results are not constant is largely due to the varying relations between the creek and the auriferous veins. A creek running parallel to the vein formation receives continually new accessions of gold which has not been worked over.

⁂

## Fullers Earth in the United States

American production of fullers earth began when the deposit at Quincy, Fla., was discovered in 1893. A previous discovery at Alexander, Ark., in 1891, is recorded, but was not commercially important, according to the U. S. Geological Survey. In 1912, 32,715 tons were produced. Seven states are responsible for the output: Arkansas, California, Colorado, Florida, Georgia, Massachusetts and Texas.

Fullers earth is principally used in this country for bleaching and clarifying fats and oils. Its production in 1912 represents a decrease of 7982 tons, or 19.61%, from that of the previous year.

# Kennedy Extension-Argonaut Apex Testimony Closed

By Lewis H. Eddy*

The evidence in the apex suit of the Kennedy Extension Gold Mining Co. vs. the Argonaut Mining Co., was concluded on Nov. 6, and adjournment was taken to Dec. 8, when the argument of the attorneys will be heard. The trial of the case began on Sept. 15 in the superior court of California for Amador County, at Jackson, before Judge F. V. Wood, sitting without a jury. The evidence adduced was chiefly of expert character by men of wide reputation as mining engineers and geologists and was altogether an interesting procedure that drew the attendance of a large number of practical mining men from various parts of the Mother Lode region, and some of the owners of Mother Lode mining property, whose residences are in San Francisco.

The chief witnesses for the plaintif were Dr. John W. Finch, Prof. R. D. George, state geologist of Colorado, William G. Devereaux, manager of the Melones mine in the Angeles Camp district, in Calaveras County, and Vance C. Osmont. The attorneys for the plaintiff present in court are Solinsky and Wehe and Perry & Dailey, of San Francisco. The chief witnesses for the defendant were Prof. Andrew C. Lawson, of the department of geology, University of California; R. S. Rainsford, general manager of the Argonaut Mining Co.; Fred Searles, Jr., of the Gold Fields Consolidated; Prof. Walter H. Wiley, of Los Angeles.

The attorneys for defendant in court were Judge Curtis H. Lindley and William J. McGee, United States assistant treasurer at San Francisco. The plaintiff company sought to show that the Argonaut workings extending beyond the Argonaut east side line and into the ground beneath the surface of the Kennedy Extension ground had been driven into the vein having its outcrop and apex within the Kennedy Extension ground. The defendant company sought to prove that while the Argonaut vein dips flat in the upper ground and straightens up to about 60° at the point, it is a continuous vein which has its outcrop and apex within the Argonaut ground. While the direct testimony offered by the plaintiff company was devoted to what is called the Muldoon-Jackson vein, rebuttal testimony was offered regarding the Argonaut (Pioneer) vein.

A large part of the testimony of Professor Lawson and Doctor Finch concerned the faulting along which the Argonaut vein is developed, and the general geology of the immediate country; but both witnesses testified as to the workings of the respective mines and as to the continuity of the vein according to their respective theories and opinions. The testimony of Mr. Rainsford was chiefly regarding the practical operation of the Argonaut and a statement of the mining geology and physical features of the mine.

Mr. Searles presented the results of his observation as to the orebodies involved in the controversy and also described the Argonaut vein as to its character and continuity from observations made, for the purposes of this suit, in the varied employments of a working miner and mining geologist. Mr. Searles had spent about three months familiarizing himself with the property and for four or five months in the same year, 1910, worked as a miner for the purposes of this suit. Professor Wiley testified as to the geological and physical features of the Argonaut after spending about 40 days on the surface and underground.

All of the expert witnesses have been engaged at the Argonaut and Kennedy Extension constantly since the trial of the suit began and some of them were there prior to that time. Much of the evidence adduced in the trial was based upon development and exploration carried on by both sides and in both properties during the trial. Both companies have worked together and each had access to the ground of the other during all the time that the suit has been pending. Members of the Kennedy Extension Gold Mining Co., are owners by purchase of 200 shares of Argonaut Mining Co.'s stock, so that the officers and attorneys had access to the office records of the Argonaut Mining Co. Since the filing of the suit in 1909, the Argonaut has been debarred from paying dividends and for that reason has accumulated a large surplus. The money demands of the action, including the ore extracted and the value of alleged damages, will total about $1,000,000. A large amount of money has been expended by each side for lawyers' fees and the fees of expert witnesses and the preparation of maps and models.

⁂

# New York Garnets

The principal garnet mines in the United States are located in Warren and Essex Counties, in the eastern Adirondacks in northeastern New York. A description of the mines of Warren County is given by William J. Miller in Bull. No. 538 of the University of the State of New York. These mines all lie within six or eight miles of the village of North Creek, a terminus of the branch of the Delaware & Hudson. The country rock is entirely pre-Cambrian, consisting of igneous rock together with metamorphosed sediments. The three mines being worked at present are the Rogers, Sanders Bros. and the Hooper, although there are four other localities where mining has been carried on.

At the Rogers mine the size of the garnets is of unusual interest. The matrix is a gray medium-grained nonquartziferous gneiss, through which the numerous, translucent, reddish-brown garnets are well scattered. Those with diameters up to 5 or 6 in. are common and the largest taken out are said to be the size of a bushel basket. The garnet is of the almandite variety, usually badly crushed or coarsely granulated and always without crystal outline. The remarkable feature is the never failing occurrence of a rim or envelope of pure black, medium-grained hornblende crystals completely inclosing each garnet. Occasionally, a $\frac{1}{2}$-in. irregular mass of acid plagioclase or a crystal of biotite may lie between the garnet and the hornblende rim. The width of these rims usually varies with the size of the garnets, some being as much as 2 or 3 in. The reddish-brown garnets completely surrounded by the black hornblende rims, which are in turn embedded in the gray gneiss, present a striking appearance in the walls of the mine pits. The garnet-bearing rock is fully $\frac{3}{4}$ of a mile long with a nearly east-west strike. Several large openings have been made and in the largest, most easterly, pit the width of the deposit is more than 100 ft. The garnet rock is removed by blasting, reduced by sledge hammers and the garnets picked out by hand.

At the Sanders Bros. mine the garnets occur in a mixed gneiss area with granitic syenite and Grenville rock interbedded parallel to the strike of the foliation. These bands are 20 to 40 ft. wide, made up largely of a granular, medium-grained mass of irregular crystals of reddish-brown garnet and a bright-green pyroxene. There are some streaks of nearly pure garnet. The garnet-pyroxene rock is crushed, put into barrels and shipped without sorting.

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*3436 Peralta St., Oakland, Calif.

At the Hooper mine the garnets occur in crystals, often with good boundaries, up to an inch or more in diameter, thickly scattered through a medium to moderately coarse-grained, gray, gneissoid, hornblendic rock with the composition of a basic syenite or an acidic diorite. No rims of hornblende occur here, although in some cases the garnets are nearly surrounded by feldspar. The deposit is extensive and a large pit has been opened. After blasting the rock it is broken with sledges and trammed to the mill, where it is crushed. In the mill, separation is performed by the use of jigs.

## Zinc Sulphite Solutions

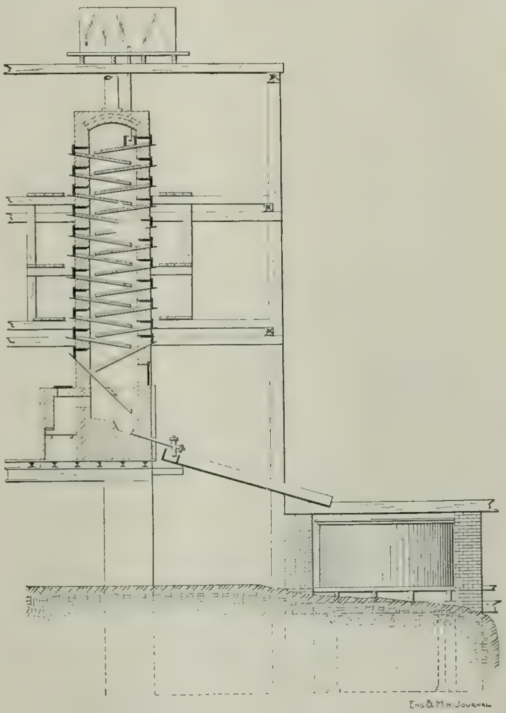
H. L. Sulman and his associates, who are interested in the so called "bisulphite process" of zinc extraction, have done much work in studying the behavior of the compounds of zinc with sulphurous and sulphuric acids. More or less of this is revealed in their patent specifications. The following data are from U. S. patent No. 1,074,203, granted to H. Rees and H. L. Sulman, of date Sept. 30, 1913.

Solutions of bisulphite and sulphate of zinc, such as those resulting from the treatment of roasted complex ores with aqueous sulphurous acid undergo little or no change when heated to a temperature of 80° C., unless the period of heating is prolonged, in which case some sulphur dioxide is expelled from the solution and a small amount of zinc monosulphite may form as a scum on the surface or fall as a slight precipitate, not, however, in a basic condition. The sulphate of zinc contained therein remains quite unaffected and soluble. If, however, a continuous current of liquor be made to flow filmwise over a series of plates or shelves heated either externally or internally, the zinc salts are deposited from the solution more or less completely, frequently in a more basic condition.

The apparatus used by Rees and Sulman for this purpose is shown in the accompanying engraving, which is self-explanatory. In its operation sulphur dioxide is evolved from the liquor, and after the saturation limit of the colder inlet liquor by sulphur dioxide is reached, the excess of this gas continually evolved in the lower portion of the tower, escapes with the cooled combustion gases. Under these conditions the behavior of such a solution is quite different from that of the same solution when heated in bulk to the same temperature as that of the liquor finally issuing from the tower. Thus it has been found that monosulphite of zinc is readily separated from the films of liquid thus treated, and that in some cases it is partially decomposed into zinc oxide with loss of sulphur dioxide; further, that zinc sulphate is also to a small extent rendered insoluble possibly being converted by interaction with the zinc oxide, into a basic sulphate.

There are several basic sulphates of zinc known which have been isolated such as the tetrabasic salt, $ZnSO_4 3ZnO$, the hexabasic salt, $ZnSO_4 5ZnO$, and the octobasic salt, $ZnSO_4 7ZnO$. A basic sulphate of zinc may be produced by heating the normal sulphate until it is partially decomposed and it is possible that some small proportion of zinc is formed in this way on the hottest portion of the shelf plates of the tower; the major portion, however, is produced by the the action of the zinc-sulphate liquor upon zinc oxide arising from the decomposition of the zinc sulphite, these joint reactions occurring on the shelves of the precipitation tower. These separated solids partially escape in the solution issuing from the apparatus, and partially remain as film accretions on the inclined plates or shelves, from which they may be removed periodically by scraping.

The solutions employed in the bisulphite process are dilute and the precipitation of the zinc sulphate therefrom depends to a certain extent upon the proportion of bisulphite which is precipitated from the solution as monosulphite. The zinc sulphate would not precipitate by itself, but requires the precipitation of the monosulphite or oxide to bring any zinc sulphate out of solution.



Bisulphite Zinc-Treatment Tower

With highly sulphated roast there might not be sufficient monosulphite to effect the precipitation of any zinc sulphate, but any deficiency can be made good by adding to the dilute solution a sufficiency of either zinc oxide or zinc monosulphite. These additions are made to the solution before it is exposed filmwise on the shelves of the heated tower or the solution may be subsequently agitated for a short time with these reagents at a temperature of about 80° to 90° C. The result is that the zinc as bisulphite in the solution is precipitated as monosulphite and this, together with the added monosulphite, or zinc oxide, or both, secures the precipitation of some of the zinc sulphate in admixture therewith and in a basic condition.

In the particular apparatus described, the bottom slabs or shelves of the tower, i.e., those nearest to the stove, may be heated to a comparatively high temperature, as for example, from 300° to 800° C., or even more; here the largest and most basic accretions form. This, however, does not communicate the same degree of temperature to the liquor films passing over them, for, as previously stated, the liquors escaping from the tower are, as a whole, heated to a temperature of less than 100° C. By increasing the height of the tower and the heat imparted to the liquors by means of the stove gases, increasingly basic precipitates may be obtained.

The following dimensions and quantities may be taken as a practical embodiment of the tower type of apparatus: Height of tower, 13 ft. Cross-sectional area of the tower, 21x21 in. Number of shelves, 19 (the lower three shelves being composed of refractory material, such as fire-tiles.) Inclination of all except the bottom shelf from the horizontal, 10°. Inclination of bottom shelf from the horizontal, 45°. Area of each shelf, 2.77 sq.ft. (21x19 in.) Size of coke grate, 4 sq.ft. Volume of liquor passing through apparatus in 24 hours, 50 tons of 2000 lb. Temperature of lowermost shelf on its underside, approximately 800° C. Cross-sectional area of gas-way at constricted portions opposite the bottom edge of each shaft, 0.44 sq.ft. (the area of the gas-way, however, varies at different points of its length).

# Calculating Weight of Stacks

The accompanying table was compiled by Charles R. Courtenay for use in estimating the weights of circular steel stacks and smoke breechings (*Amer. Machinist,* Sept. 11, 1913). The table gives the actual weight of a round steel tube 1 ft. long, including longitudinal lap. For stacks No. 8 to No. 3 gage, it is only necessary to add $\frac{1}{12}$ or 8⅓% of the weight given for every girth seam in the stack.

Example—How much will the plate of a 22-in. diameter by 20-ft. stack weigh if the material is No. 16 gage stock and the length of each section, including lap, is 50 in. From table, weight per foot = 16.4 lb., 20 × 16.4 = 328 lb. There are four girth seams = $\left(\frac{20\text{ ft.} \times 12}{50} = 5\right.$, nearly; $5 - 1 = 4$) 8⅓% of 16.4 × 4 = 5.46 lb. extra weight for seams (girth) 328 + 5.46 = 333.46 lb. total weight of plate in stack.

If the gage stock had been No. 0 to No. 6, we would have had to use 15⅝% instead of 8⅓%, as the lap for these gages is 1⅞ in. instead of 1 in. for the lighter-gage stock. In order to obtain the total weight of material in a stack, it is only necessary to add to the plate weight the weight of rivets and bands.

WEIGHT-CALCULATION TABLE. WEIGHT PER FOOT OF ROUND STACKS

| | Use ½" Rivets—Lap 1⅞" | | | | | | | | Use 5/16" Rivets—Lap 1" | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| Diameter | 5/16" | 9/32" | 17/64" | 1/4" | 15/64" | 7/32" | 13/64" | 11/64" | 9/64" | 7/64" | 5/64" | 1/16" | 1/20" | 3/80" | 1/32" | 1/40" | 3/160" | 1/64" | 1/80" |
| 8 | | | | | | | | | | 11 | 7.6 | 6.1 | 4.9 | 3.68 | 3.04 | 2.65 | 1.82 | 1.52 | 1.23 |
| 9 | | | | | | | | | | 12.4 | 8.55 | 6.8 | 5.5 | 4.02 | 3.51 | 2.73 | 2.05 | 1.71 | 1.34 |
| 10 | | | | | | | | | 17 | 13.8 | 9.4 | 7.8 | 6.06 | 4.53 | 3.78 | 3 | 2.27 | 1.87 | 1.53 |
| 11 | | | | | | | | | 18.7 | 15. | 10.4 | 8.31 | 6.64 | 4.97 | 4.14 | 3.22 | 2.49 | 2.07 | 1.66 |
| 12 | | | | | | | | | 20.3 | 16.4 | 11.3 | 9.04 | 7.36 | 5.41 | 4.51 | 3.61 | 2.71 | 2.26 | 1.84 |
| 13 | | | | | | | | | 22 | 17.7 | 12.2 | 9.8 | 7.8 | 5.85 | 4.82 | 3.91 | 2.93 | 2.45 | 2.01 |
| 14 | | | | | | | | | 24.3 | 19 | 13.1 | 10.51 | 8.41 | 6.46 | 5.24 | 4.2 | 3.15 | 2.62 | 2.10 |
| 15 | | | | | | | | | 25.3 | 20.4 | 14.1 | 11.2 | 9. | 6.73 | 5.61 | 4.49 | 3.37 | 2.81 | 2.22 |
| 16 | | | | | | | | 33.7 | 27 | 21.7 | 15 | 12 | 9.58 | 7.17 | 5.98 | 4.79 | 3.55 | 3 | 2.49 |
| 17 | | | | | | | | 35.6 | 28.6 | 23 | 15.9 | 12.7 | 10.2 | 7.51 | 6.34 | 5.08 | 3.74 | 3.18 | 2.5 |
| 18 | | | | | | | | 37 | 30.3 | 24.4 | 16.8 | 13.4 | 10.8 | 7.96 | 6.71 | 5.37 | 4.03 | 3.36 | 2.64 |
| 19 | | | | | | | | 39 | 32 | 25.7 | 17.7 | 14.2 | 11.3 | 8.49 | 7.17 | 5.66 | 4.25 | 3.54 | 2.86 |
| 20 | | | | | | | 49 | 41 | 33.6 | 27 | 18.7 | 15 | 11.9 | 9.2 | 7.44 | 5.95 | 4.47 | 3.73 | 3.0 |
| 21 | | | | | | | 51.5 | 43 | 35.2 | 28.4 | 19.6 | 15.6 | 12.5 | 9.47 | 7.81 | 6.25 | 4.69 | 3.91 | 3.15 |
| 22 | | | | | | | 53.8 | 45.1 | 36.9 | 29.7 | 20.5 | 16.4 | 13.1 | 9.81 | 8.17 | 6.54 | 4.91 | 4.1 | 3.36 |
| 23 | | | | | | | 55.9 | 47.1 | 38.5 | 31 | 21.4 | 17.1 | 13.7 | 10.2 | 8.54 | 6.73 | 5.13 | 4.28 | 3.45 |
| 24 | | | | | | | 58.7 | 49.1 | 40.2 | 32.4 | 22.3 | 17.8 | 14.3 | 10.6 | 8.9 | 7.12 | 5.41 | 4.46 | 3.56 |
| 25 | | | | | | 65.8 | 61.1 | 51.1 | 41.8 | 33.7 | 23.2 | 18.6 | 15 | 11.1 | 9.27 | 7.42 | 5.57 | 4.65 | 3.68 |
| 26 | | | | | | 68.3 | 63.5 | 53.1 | 43.5 | 35 | 24.2 | 19.3 | 15.5 | 11.5 | 9.64 | 7.71 | 5.79 | 4.82 | 3.86 |
| 27 | | | | | | 71 | 66 | 55.2 | 45.1 | 36.3 | 25.1 | 20.1 | 16.04 | 12.1 | 10. | 8 | 6.01 | 5.02 | 4.01 |
| 28 | | | | | | 73.5 | 68.2 | 57.2 | 46.8 | 37.7 | 26 | 20.8 | 16.6 | 12.3 | 10.3 | 8.3 | 6.23 | 5.2 | 4.15 |
| 29 | | | | | | 76 | 70.6 | 59.2 | 48.4 | 39 | 27 | 21.5 | 17.2 | 12.8 | 10.7 | 8.59 | 6.44 | 5.38 | 4.30 |
| 30 | | | | 89.8 | 84.3 | 78.6 | 73 | 61.3 | 50 | 40.4 | 27.8 | 22.3 | 17.8 | 13.3 | 11.1 | 8.92 | 6.67 | 5.57 | 4.45 |
| 31 | | | | 92.8 | 87 | 81.2 | 75.4 | 63.2 | 51.7 | 41.7 | 28.7 | 23 | 18.4 | 13.8 | 11.4 | 9.18 | 6.89 | 5.75 | 4.59 |
| 32 | | | | 95.7 | 89.8 | 83.8 | 77.8 | 65.3 | 53.4 | 43 | 29.7 | 24.1 | 19 | 14.2 | 11.8 | 9.47 | 7.16 | 5.93 | 4.74 |
| 33 | | | | 98.6 | 92.6 | 86.3 | 80.2 | 67.2 | 55 | 44.4 | 30.6 | 24.5 | 19.6 | 14.6 | 12.2 | 9.76 | 7.33 | 6.05 | 4.89 |
| 34 | | | | 101.6 | 95.3 | 89 | 82.6 | 69.3 | 56.7 | 45.7 | 31.5 | 25.2 | 20.2 | 15.1 | 12.5 | 10 | 7.55 | 6.3 | 5.09 |
| 35 | | | 111 | 104.5 | 98.1 | 91.4 | 85 | 71.3 | 58.3 | 47 | 32.4 | 26 | 20.7 | 15.5 | 13 | 10.3 | 7.77 | 6.42 | 5.16 |
| 36 | | | 114.2 | 107.4 | 100.8 | 94 | 87.3 | 73.3 | 60 | 48.4 | 33.3 | 26.7 | 21.3 | 16 | 13.3 | 10.6 | 7.92 | 6.6 | 5.33 |
| 37 | | | 117.3 | 110.4 | 103.5 | 96.6 | 89.7 | 75.3 | 61.6 | 49.7 | 34.3 | 27.4 | 21.9 | 16.3 | 13.6 | 10.9 | 8.26 | 6.85 | 5.48 |
| 38 | | | 120.4 | 113.3 | 106.2 | 99.1 | 92.3 | 77.4 | 63.3 | 51 | 35.2 | 28.1 | 22.5 | 16.8 | 14.01 | 11.2 | 8.49 | 7.02 | 5.63 |
| 39 | | | 123.5 | 116.3 | 109 | 101.7 | 94.5 | 78.7 | 65 | 52.3 | 36.1 | 28.9 | 23 | 17.2 | 14.4 | 11.5 | 8.68 | 7.15 | 5.77 |
| 40 | 149.2 | 134.1 | 126.6 | 119.2 | 111.8 | 104.3 | 97 | 81.4 | 66.6 | 53.7 | 37 | 29.6 | 23.7 | 17.7 | 14.8 | 11.8 | 8.89 | 7.39 | 5.92 |
| 42 | 156.4 | 140.7 | 132.9 | 125.1 | 117.2 | 109.4 | 101.6 | 85.4 | 70 | 56.4 | 38.8 | 31.1 | 24.9 | 18.5 | 15.5 | 12.3 | 9.34 | 7.76 | 6.14 |
| 44 | 163.7 | 147.3 | 139.1 | 131 | 122.8 | 114.6 | 106.4 | 89.5 | 73.2 | 59 | 40.7 | 32.5 | 26.03 | 19.4 | 16.2 | 12.9 | 9.75 | 8.07 | 6.5 |
| 46 | 171 | 153.9 | 145.4 | 136.8 | 128.3 | 119.6 | 111.2 | 93.5 | 76.5 | 61.7 | 43.5 | 34 | 27.2 | 20.3 | 16.9 | 13.5 | 10.1 | 8.45 | 6.8 |
| 48 | 178.4 | 160.5 | 151.6 | 142.7 | 133.8 | 125 | 116 | 97.6 | 79.8 | 64.3 | 44.3 | 36.1 | 28.4 | 21.2 | 17.6 | 14.2 | 10.6 | 8.82 | 7.09 |
| 50 | 185.7 | 167.2 | 157.9 | 148.6 | 139.3 | 130 | 120.7 | 101.6 | 83 | 67 | 46.2 | 37 | 29.6 | 22.1 | 18.4 | 14.6 | 11 | 9.18 | 7.39 |
| 52 | 193.1 | 173.7 | 164.1 | 154.4 | 144.8 | 135.6 | 125.5 | 105.6 | 86.4 | 69.7 | 48 | 38.4 | 30.7 | 23.1 | 19.1 | 15.3 | 11.5 | 9.6 | 7.68 |
| 54 | 200.4 | 180.4 | 170.3 | 160.3 | 150.3 | 140.3 | 130.3 | 109.7 | 89.8 | 72.4 | 50 | 40 | 31.9 | 23.8 | 19.9 | 15.9 | 11.9 | 10 | 7.97 |
| 56 | 207.8 | 187 | 176.6 | 166.2 | 155.8 | 145.5 | 135.1 | 113.7 | 93.5 | 75 | 51.2 | 41.4 | 33.1 | 24.7 | 20.6 | 16.5 | 12.3 | 10.3 | 8.27 |
| 58 | 215.1 | 193.6 | 183 | 172.1 | 161.4 | 150.6 | 139.8 | 117.6 | 96.5 | 77.7 | 53.5 | 42.6 | 34.3 | 25.6 | 21.3 | 17.1 | 12.8 | 10.7 | 8.56 |
| 60 | 222.4 | 200.2 | 189.1 | 178 | 167 | 155.7 | 144.6 | 121.8 | 99.7 | 80.3 | 55.4 | 44.3 | 35.4 | 26.5 | 22 | 17.6 | 13.2 | 11 | 8.85 |
| 62 | 229.8 | 206.8 | 195.3 | 183.8 | 172.4 | 160.8 | 149.4 | 125.8 | 103 | 83 | 57.2 | 45.8 | 36.9 | 27.4 | 22.8 | 18.2 | 13.7 | 11.4 | 9.15 |
| 64 | 237.1 | 213.4 | 201.6 | 189.7 | 178 | 166 | 154.2 | 130 | 106.3 | 85.7 | 59 | 47.2 | 37.8 | 28.2 | 23.5 | 18.8 | 14.1 | 11.8 | 9.4 |
| 66 | 244.5 | 220 | 207.8 | 195.6 | 183.4 | 171.2 | 159 | 134 | 109.6 | 88.3 | 60.3 | 48.7 | 39.3 | 29.2 | 24.2 | 19.4 | 14.6 | 12.1 | 9.7 |
| 68 | 251.8 | 226.6 | 214 | 201.4 | 189 | 176.4 | 163.7 | 138 | 112.9 | 91 | 62.7 | 50.2 | 40.3 | 30 | 25 | 20 | 15 | 12.5 | 10 |
| 70 | 259.1 | 232.2 | 220.3 | 207.3 | 194.3 | 181.4 | 168.5 | 142 | 116.2 | 93.6 | 64.5 | 51.6 | 41.4 | 31.1 | 25.7 | 20.6 | 15.4 | 13 | 10.2 |
| 72 | 266.5 | 238.8 | 226.5 | 213.2 | 200.5 | 186.8 | 173.3 | 146 | 119.5 | 96.3 | 60.4 | 53.1 | 42.7 | 31.8 | 26.5 | 21.2 | 16 | 13.4 | 10.6 |

Add 15⅝% of above for each girth seam. Add 8⅓% of above for each girth seam.

These weights include allowances for over weights as adopted by The Ass'n American Steel Mf'rs

Does not include bands, guy wire and rivets

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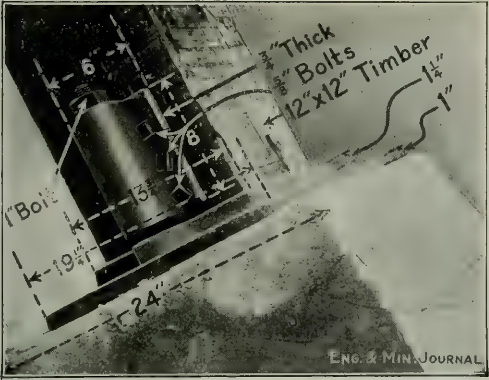
**Shipping Oil to Batum** is very like the traditional "shipping coal to Newcastle." A correspondent of the London "Mining Journal," however, reports that the Transcaucasian Ry. in Russia, the western terminus of which is near Batum and the oil region, has contracted for 2,000,000 poods of American petroleum residuum to be delivered at once, and proposes to take 15,000,000 poods in all.

# DETAILS OF PRACTICAL MINING

## Anchoring Device for Wood Headframe

The accompanying photograph illustrates the method employed to hold down the posts and backstays of the timber headframes used by the Cuyuna-Duluth and the Cuyuna-Mille Lacs companies on the North Cuyuna range. A separate concrete pier, measuring 24 in. square on the top, is built to carry each member. The anchoring device consists of three castings with eight sets of bolts and nuts. One casting is set on the concrete and used as a base plate. The upper portion of this is a socket 1¼ in. deep and 13¾ in. square outside. The 12x12-in. timber rests in this upon the bottom portion, which is 19¼ in. square and 1 in. thick. Lugs are cast on two sides of the socket portion and the two 1-in. foundation bolts pass through holes in the lugs. Two bolt sockets on opposite sides of the timber receive the foundation bolts. These are of the shape shown in the illustration, the metal being ¾ in. thick, the socket 8 in. long and the width of the base portion 6 in. where it bears on the timber. Six ⅝-in. bolts pass through both sockets and hold them to the timber. This would seem to be a neat and efficient way of anchoring a headframe.



Details of Anchoring Device

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## Fire-Damp Whistle

At the opening of the Kaiser Wilhelm Institute for Chemistry, a year ago, the Emperor expressed the hope that science would discover some means of guarding human lives against explosions in mines. On Oct. 28, when he visited the building for the opening of the Institute of Experimental Therapy, he was shown apparatus which, it is claimed, fulfills this hope, says *The Science and Art of Mining*.

The apparatus, which is the invention of Privy Councilor Haber and Dr. Leiser, is called a "fire-damp whistle." Its purpose is to warn miners of the existence of poisonous or inflammable gas in a pit in time to enable them to retreat in safety. The underlying principle is that the whistle when blown in pure air produces an even-toned continuous sound, while when blown in air containing other gases it sends forth tones varying from a shrill tremolo to a jerky staccato, according to the extent of the atmospheric adulteration.

The whistle consists of a metal cylinder 10 in. long by 2½ in. in diameter, and is operated by means of an air pump. It is audible for a distance of over 300 ft. Experiments carried out with pure and contaminated air for the benefit of the Kaiser revealed distinct differences of tone.

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## Substantial Surface Air Pipe Line

The accompanying illustrations show the general method employed by the Witherbee-Sherman company, at Mineville, N. Y., for installing the pipe line which conducts compressed air from the central air-generating station to the various mine entrances. The line has been built in two sections, the first being of 12-in. pipe and extending from the compressor house to the Joker power house, about 1300 ft. In this case the pipe was supported on bents made up chiefly of pipe, the pipe of the cap serving as a roller. The air pipe merely rested on the cap. As a result of bulging, set up by the linear expansion and contraction of the line, side motion on the

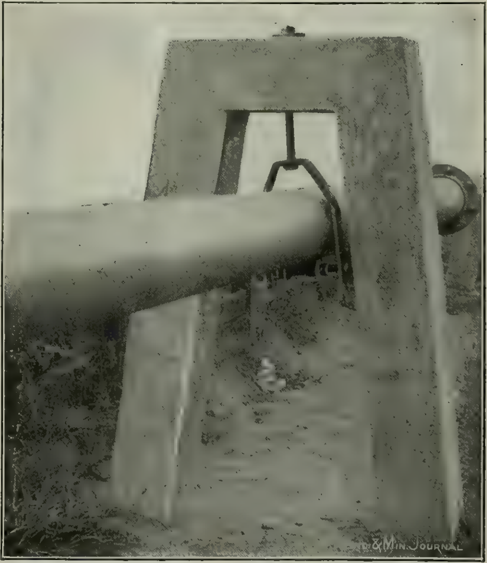

Fig. 1. Concrete Bent, Showing Pipe and Hanger

bents resulted, and the line required watching to prevent the pipe from falling off the bents.

Increases in operations at Barton Hill necessitated an extension of the line to that point. The company, as the result of a property purchase, had come into possession of a large quantity of 7-in. and 8-in. pipe and the desirability of using this determined the diameter of the pipe in the extension rather than any calculations of volume, velocity and friction loss. The line is 4300 ft. long, 1000 ft. of this length being of 7-in. pipe. Concrete bents were used in general, spaced 20 ft., but in certain cases where greater height was desired to cross roads or because of topographic conditions and also because the waiting for the concrete to set introduced awkward delays at times, wooden bents were substituted. A series of such wooden bents on one side of a road is shown in Fig. 3.

The concrete bents, of which one is well shown in Fig. 1, were cast in place; there is a concrete sill or foundation in the ground to complete the bent. Reinforcement is obtained with two pieces of old $1\frac{1}{8}$-in. cable, each piece forming a complete loop through the cap, legs and foundation sill, the ends overlapping in the sill. The average height of the concrete bents is about 4 ft. 10 in. To maintain grade for the pipe, bents of varying height were, of course, necessary. This was provided for by lengthening the legs of the forms. The legs and cap are about 8x8 in. in section, the sill is somewhat larger. The cap is 27 in. across the top. A vertical hole through the center of the cap permits the insertion of a $\frac{7}{8}$x16-in. bolt with a rectangular $\frac{1}{2}$x3x4-in. washer to bear on the concrete. From this bolt hangs the bridle shown, made of $\frac{1}{2}$x2-in. material. A $\frac{7}{8}$x12-in. machine bolt forming the bottom of the hanger, provides a bearing for the iron roller, on which the pipe rests. This roller has a concave surface, the concavity having a slightly greater radius than the pipe. It is 6 in. long, including one 1-in. projections on each end, which gives additional bearing. The center portion is about 2 in. in diameter. The wood bents are also of 8x8-in. section.

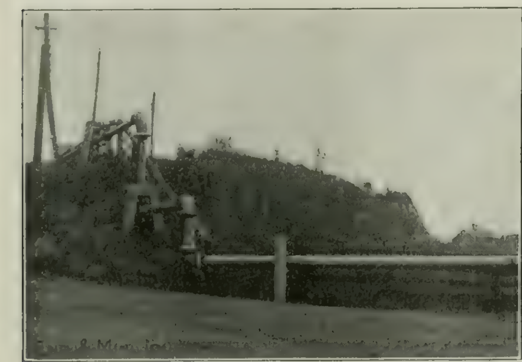

FIG. 2. PIPE LINE TAKING A TURN AND OVERCOMING DIFFERENCE OF ELEVATION

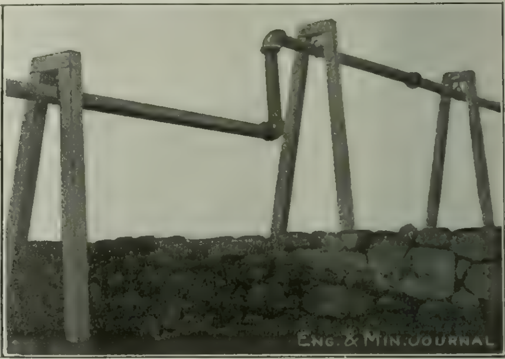

FIG. 3. HIGH WOODEN BENTS CARRYING THE LINE OVER A ROAD

The rollers permit of so easy a motion along the pipe line that provisions to take care of expansion need be inserted only at infrequent intervals. The ells at the corners, such as that shown in Fig. 2, serve this purpose and there are several of these, inasmuch as the line follows a rather tortuous course. In the longer straight stretches, and where necessary, slip joints are inserted and anchoring provided to control the pipe motion.

Concrete is extensively used by the Witherbee-Sherman company, since the tailing piles furnish excellent sand and aggregate up to 2 in. in size. The substantial design of the entire installation is the result of a desire to keep maintenance charges at zero, an attempt that has been successful so far. The pipe and the wood bents are all well painted.

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## Don'ts for Detonator Users

The following instructions of the E. I. du Pont de Nemours Powder Co. are published by *Coal Age,* Oct. 11, 1913:

(1) Don't forget the nature of blasting caps, but remember that with proper care they can be handled with comparative safety.

(2) Don't smoke while you are handling blasting caps, and always keep them away from lights.

(3) Don't shoot into blasting caps, whether electric or other, with a rifle or pistol.

(4) Don't handle or store blasting caps in or near a residence.

(5) Don't allow blasting caps to be stored where children or irresponsible persons can get at them. Keep them under lock and key.

(6) Don't store or transport blasting caps of any kind with high explosives.

(7) Don't keep blasting caps, electric or other, in a damp place.

(8) Don't carry them in your pocket.

(9) Don't tap or otherwise investigate them.

(10) Don't try to pull the wires from an electric blasting cap. The wires should not be jerked or roughly handled.

(11) Don't attempt to take blasting caps from the box by inserting a wire nail or other sharp instrument.

(12) Don't allow priming (the placing of a blasting cap in dynamite) to be done in a thawing house.

(13) Don't fasten the blasting cap to the fuse with the teeth or with a knife. Use a cap crimper made for that special purpose.

(14) Don't handle electric blasting caps during the immediate approach or progress of a thunder storm.

(15) Don't attempt to use electric blasting caps with the regular insulation for extremely wet work. For that purpose, use waterproof fuses.

(16) Don't use old broken leading or connecting wire for electric blasting caps. A new supply will not cost much and will pay for itself many times over.

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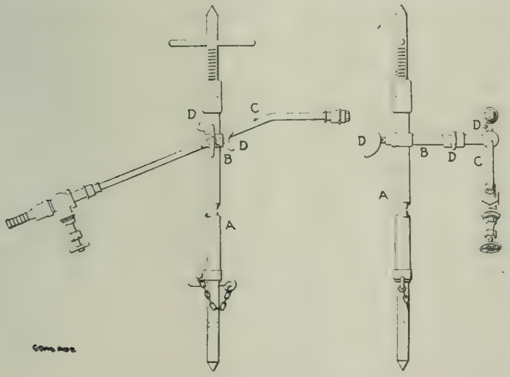
## German Methods of Allaying Dust

Some notes on recent Prussian practice in allaying dust resulting from drilling boreholes are contained in "Zeitschrift für das Berg- Hütten- und Salinenwesen," Vol. 61, No. 1.

At the Richter shafts of the Laurahütte mine in the North Kattowitz district, a water jet is used to remove drill dust from holes bored in the rock by compressed-air hammer drills. Wrought-iron gas pipes about 0.4 in. in diameter and 4 ft. long are connected by hose with the water piping and introduced into the hole during the work of the drill so that the water continuously removes the drill dust.

At the Monopol mine in the Dortmund I mining district, a water-jet device has been used with excellent success to render stone dust of machine drills harmless. This is shown in Fig. 1. It comprises a mounting column 4, similar to a drill post, which extends from floor to roof in the middle of the roadway. Upon it, one or more movable brackets *B* are affixed, according to the number of holes to be drilled simultaneously. On the ends of these arms are carried sprinkling pipes *C*, which can be revolved and moved longitudinally. They have at the front brass or bronze nozzles, while the rear ends, which are provided with valves, are connected with the water-supply piping by rubber hose. The valve of each pipe is so adjusted that a fine stream of water flows from the nozzle. The jet of water is arranged to strike exactly in the drill hole and is clamped in this position by the winged screw *D*. Experience has shown that a water jet about 0.04 in. thick suffices to moisten the waste from a hole so as to prevent the formation of a cloud of dust. Since the workmen are not annoyed by so small a quantity of water and as the apparatus is easily and quickly manipulated, they are willing to use it.



Apparatus for Allaying Drill Dust

To obtain a similar end an appliance is being used in the Schlägel und Eisen I-II mine in the East Recklinghausen mining district. This is patented by Herr Voss and called a "dust destroyer." It is manufactured by the Glückauf Drill Factory, in Gelsenkirchen, Germany. As shown in Fig. 2, the apparatus consists of the small tube *B* connected with the T-piece *A* and the collar *D* on the hammer drill. This little tube ends in a nozzle *C*. Perpendicular to this is another nozzle *E* connected with a hose *F*. When drilling, this is hung in a water tank.

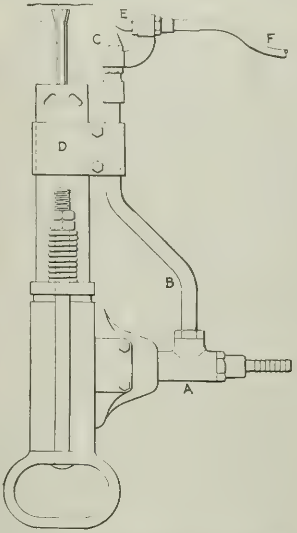


Fig. 2. Hammer Drill Fitted with a Water Jet

The T-piece *A* is connected with the compressed-air piping so that a part of the air flows through the little tube *B* and the nozzle *C* and sucks a supply of water through the nozzle *E* and the water hose *F*. This is finely sprayed around the drill hole thus continuously allaying the stone dust as it forms in drilling. Since the fixture is fast connected with the hand-hammer drill, the workmen are compelled to make use of it.

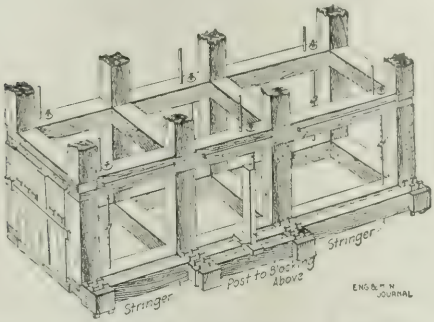
⁂

## Use of the Photostat

We recently described a new apparatus, called the Photostat, for reproducing drawings, documents, etc. At the Alaska-Treadwell mines this instrument is used for a great variety of purposes. All progress maps, new work, etc., is laid out either in pencil or in ink and photostat copies are given to the underground foremen and shift bosses. The same thing is done with regard to stope maps, position of pillars, etc. The use of blueprints in the machine shop, foundry, and other construction departments has practically been discontinued, photostat copies having been substituted, with the exception where large scale drawings are required. In the office, all deeds, leases, etc., are copied as soon as they arrive and the photostat copy is sent to the San Francisco office for filing. This has the advantage of giving an exact copy of the original, with all changes, mistakes, etc., faithfully reproduced.

## Shaft Blocking at Butte

When the ground breaks large in a Butte shaft the method of blocking shown in the accompanying illustration is employed. Blocks about 5 in. thick are placed back of the dividers and end plates and toe-nailed from above (A. I. M. E. Bulletin, August, 1913). A stringer is then nailed to these blocks parallel to the wall plates, the full length of the shaft. Alternating blocks and stringers are nailed on until the space is completely filled. Wedging is then done between the blocks and stringers, the wedges being driven both from above and from below. In order to prevent the blocking being knocked out by blasting an upright post is set on a crosspiece over the blocking, as shown, and wedged to the blocking of the set above.



Method of Blocking Butte Shaft Where Ground Breaks Wide

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## Latch for Holding Car on Cage

The accompanying illustration shows the device for holding timber or other trucks on the cage, employed at the Kennedy mine of the Rogers Brown Ore Co. on the North Cuyuna range. It consists of a horizontal bar of round iron held loosely by staples to the wooden floor of the cage, so as to revolve freely but not to slide. Near one end a $1\frac{1}{4}$-in. round bar is welded to project at right angles and its end is split to form a fork 5 in. across the top. The other end of the horizontal bar is made eccentric for a few inches and then turned at right angles. The latch is placed so that the fork will be at about the center of the cage and the planes of the fork and of the bent end are so related that the operator can slip his foot under the latter when the fork is thrown back out of the way. The construction and dimensions are shown in Fig. 1, which, however, does not represent the latch in a normal position. In Fig. 2 the latch is shown engaging the wheels of a truck. The truck is run on the cage until the space between the wheels is about opposite the fork, when the operator throws the latch over and the fork falls on the treads of the wheels and against the flanges, at a point somewhat above their centers. The truck is thus held against movement in either direction.

The device is in use on a slow-moving cage in a shallow mine. It would seem that on a fast-moving cage, one, for instance, actuated by a first-action hoist, there would be danger that the fork might bound out as the result of a jolt and thus release the truck.

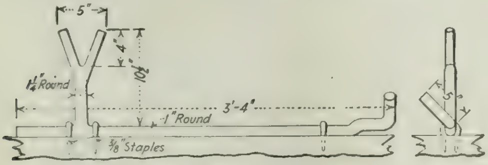

FIG. 1.

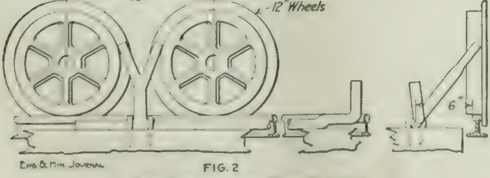

FIG. 2

An Efficient Car Latch

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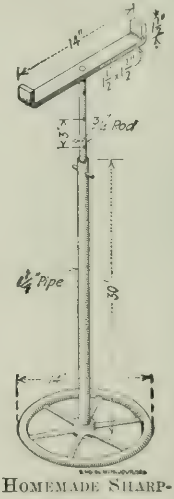
## Stand for the Blacksmith Shop

A handy little device in use in the blacksmith shop of the Sterling Iron & Ry. Co. at Lakeville, N. Y., is shown herewith. It serves as a stand for resting the free end of long drill steel in process of being sharpened or for other long work on the anvil. The supporting base is a discarded handwheel such as is used for rack-and-pinion chute gates or for car brakes. Into the square center hole is fastened a short piece of $1\frac{1}{4}$-in. pipe. In this is telescoped a piece of $\frac{3}{4}$-in. round iron; this is riveted through a horizontal piece of iron bar with its ends turned up, on which the work can rest. The height of this T-shaped standard can be adjusted in the pipe stand by means of a nail thrust through a hole in the pipe and one of several holes in the rod, spaced about 3 inches.



Homemade Sharpening Rest for Long Steel

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**The Use of Round Timber, Satisfactorily Framed,** makes available a larger source of supply for timbering in the Butte mines, which has heretofore served no useful purpose, says G. E. Moulthrop in the November A. I. M. E. Bulletin. This promotes economical mining and also releases large timber for other commercial uses.

# DETAILS OF METALLURGICAL PRACTICE

## Steel-Tape Repairing in the Field

By Frank A. Glass[*]

An article in the Journal of Sept. 20 on "Tape Repair Outfit for Field Use," is of interest and the method is a decided improvement over riveting. Tin, shears, solder and candles, however, are not convenient to carry in one's hat band or vest pocket and the same applies to a riveting outfit. When a tape breaks, it is usually desirable to splice it at once, even though camp is but a few hundred yards away and a good road leads to it.

The "Eureka" tape repairer is a great time saver, and is satisfactory in every respect. It is a strip of tin about ¾ in. long with two of its edges bent over until they nearly meet. The inner faces are prepared with a coating of soft solder by the makers, and to use it, all that is necessary is to insert the cleaned ends of the broken tape, pound the overlapped edges of the tin, support the ends of the tape near the break firmly, and then hold a lighted match under the splice. When the match has burned out and the splice is cool enough to handle without discomfort, the job is finished.

The prepared splices can be ordered to fit any width of tape. They are made by the Chicago Steel Tape Co., and can be obtained through almost any dealer handling engineering supplies for a few cents a dozen. Two or three can be conveniently carried in the field in one's hat band or sewed in the lining of trousers or vest, and are as much a part of a field outfit as notebook or pencil.

Breakages of cross-hairs in a transit are not common in instruments fitted with finely drawn metallic cross-hairs, but the writer had a set made of spider webs that broke when he was far from headquarters. It was easy to find webs in an old building, but no glue, shellac, mucilage, pitch or corn-starch paste was available. Neither was a pair of dividers, the conventional tool of the textbook writers, at hand. As an emergency measure and as an experiment, the webs were fastened in place with the material next to the shell of an egg and the fingers were used to obtain the desired tension. The transit was then given six weeks of hard service and when it was sent to the factory for metallic cross-wires and other repairs, the spider-webs were in good shape. This method is not recommended for general adoption, and is described merely to show one of the ways in which tedious and costly delays may sometimes be avoided.

[While not so good as Mr. Glass' suggestion, some strips of tin and the new soldering pastes now gotten out for home use also suggest themselves. These need no soldering iron, and no separate flux is required.—Editor.]

## Battery-Sand-Treatment Plant

The usual battery-sand-treatment plant, found in the gold mines of the Rand, consists of a tube mill, shaking amalgamating plates, treatment vats, sludge and solution pumps. As the quantity of sand treated is small, the tube mill need not be large, the usual size being 4 ft. in diameter by 6 ft. in length, the construction being similar to that of the full-size tube mill used in the crushing plant. The shaking plates, states C. O. Schmitt, in "A Textbook of Rand Metallurgical Practice," Vol. 2, need not be larger than 6 ft. by 2 or 3 ft. The battery sand is crushed in the tube mill to a considerable fineness, and, after passing over one or more shaking plates where the free gold is extracted, is either treated in a miniature slime plant of the decantation type or in a plant using air-lift vats, as shown in Fig. 1. In the former case, the plant contains two vats, both of which can be used for collecting or treating purposes. The treatment is similar to that given to slime in a decantation plant, excepting that, owing to the greater value of the material handled, the time allowed for treatment is considerably greater. The gold-bearing solution obtained in the plant is either precipitated in a small extractor provided for the purpose, or is sent to the main precipitation plant. The residue may be sent direct to the dump, but generally it is preferred to send it to the slime plant for further treatment.

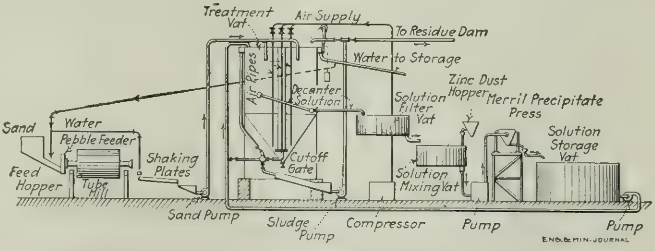

Fig. 1. Elevation of Battery-Sand-Treatment Plant

In the plant using the air-lift vats of the type shown in Fig. 2, the crushed sand is collected in one vat, and after the water is decanted off, the collected charge is transferred with solution to a treatment vat, where it is chiefly treated by aëration in conjunction with cyanide solution. The plant shown in Fig. 1 differs from the usual plant, inasmuch as the gold-bearing solution is precipitated in a Merrill press with the aid of zinc dust.

The Crosse battery-sand-treatment plant, which is illustrated in Fig. 3, consists of a grinding mill, conical treatment vat, settling vat, solution-filter vat, extractor box and solution-storage vat. The grinder consists of an outside cylinder which turns at the rate of 10 r.p.m. There is an inside revolving cylinder which rests on the outside cylinder, revolving at the same rate, and the inside cylinder is worked to and fro during the revolution by the toggle arrangement shown. This combined motion provides the action required to reduce the pyritic portion to a fine state of division. The particles of mineral having been sufficiently finely ground are carried away by the stream of cyanide solution running through the mill.

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[*] Mining engineer, Citizens State Bank Building, Brainerd, Minn.

The method of treatment is as follows: The conical treatment vat is filled with cyanide solution from one of the storage tanks by using the air-lift pump nearest the storage tank. The mill is then started and the overflow from the conical vat is allowed to run into the hopper, and the battery sand is fed in slowly. The air-lift pump connected with the grinding mill is started, and also the agitation in the conical vat. The finely ground material is being continually run into the inner cone of the conical vat, and the overflow returns to the hopper, washing in more sand. Enough lime must be added, from time to time, to keep the solution alkaline; cyanide can also be added if required.

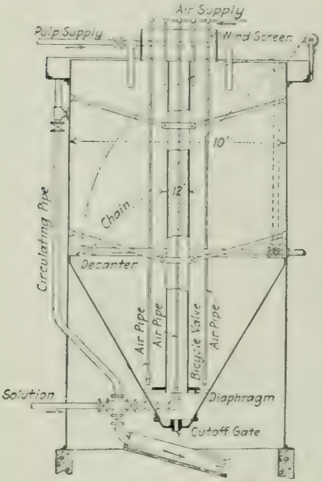

FIG. 2. SECTION OF AIR-LIFT VAT

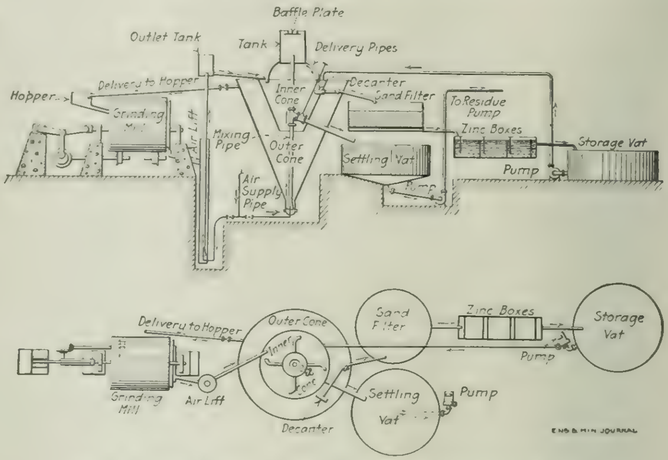

FIG. 3. CROSSE PLANT FOR TREATMENT OF BATTERY SANDS

If the conical vat is constructed to treat two tons of finely ground sand, as soon as this amount has been fed in, as described, the last trace of sand is washed into the cone, and then, if any amalgam was left in the mill, it can be recovered by unscrewing a plug and lifting the inside muller by suitable means and washing out the amalgam into a bucket. Having charged the conical or treatment vat, the solution now contains a large proportion of the gold contents of the sand. The decanter connecting the overflow pipe and the sand filter are lowered into the fairly clean solution on the surface of the outside division of the cone. This solution, after passing the sand filter, is run into the zinc box; the gold having been deposited, the solution is then returned to the storage vat by the air-lift pump, as stated. About 25% of the contents of the conical vat is drawn off per hour, so that in four hours a volume equal to the contents of the vat has been removed and replaced by fresh solution from the storage vat. For every volume of solution equal to the contents of the treatment vat, 75% of the dissolved gold has been removed so that eight hours' circulation would remove 93¾% of the dissolved gold.

This extraction is quite enough in the treatment of most battery sands, as 85% of the remaining soluble gold would be obtained from the decanted solution, and this solution need not be passed through the zinc box, as it could be used for the next treatment. The pulp should not be allowed to settle in the conical treatment vat. To prevent this the pulp is discharged into the conical-bottom settling vat, where the solution is decanted off and the residue discharged to the residue dam or to the slime plant for further treatment. If it is inconvenient to discharge at the bottom of the treatment vat, a suitable method has been arranged by taking off the concentrated underflow through a pipe connected with the air-lift pipe inside the cone. This discharge pipe is connected at a point half way up the air-lift pipe, and by opening a cock, all the fine sand can be pumped into the settling vat at a more convenient height than discharging at the bottom.

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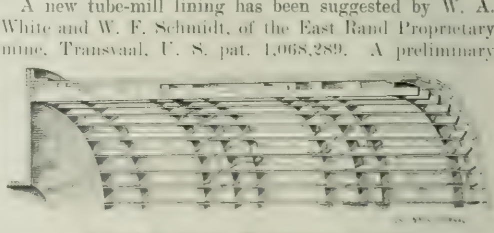
# White-Schmidt Tube-Mill Lining

A new tube-mill lining has been suggested by W. A. White and W. F. Schmidt, of the East Rand Proprietary mine, Transvaal, U. S. pat. 1,068,289. A preliminary shell of steel is laid, composed of thin, narrow bars laid edge-to-edge and cemented together. Upon this lining are placed blocks for receiving the rest of the lining. This, as shown in the illustration, is composed of thin, wide bars of steel, set in chocks and arranged radially. Between the bars is formed a trough into which pebbles are supposed to pack and form a lining essentially like the El Oro lining. The bars may be set away from the shell by resting them on the chocks, the advantage of the system being that the bars may be practically entirely worn out before renewal is necessary.



WHITE-SCHMIDT TUBE-MILL LINING

# COMPANY REPORTS

## International Nickel

The annual report of the International Nickel Co., 43 Exchange Place, New York, for the year ended Mar. 31, 1913, states that during the year the entire outstanding bonded indebtedness of the company was retired. The company offered to the bondholders to pay its bonds at the redemption price, $110 and interest, and all bonds that were not tendered in response to this offer were called for payment on Apr. 1, 1913. The improved conditions in the steel industry resulted in a greatly increased demand for nickel from steel makers, and in all other industries where the company's products are used the demand is said to have been the best in the history of the company. Practically nothing can be gleaned from the report about the affairs of the concern other than shown by bare financial statements. It is stated that the profits are computed on sales actually made to customers and that all inventories are taken at cost. The profit and loss statement shows that the profits for the year amounted to $5,020,304.92 and was obtained as follows: Earnings of all properties after deducting manufacturing and selling expense and ordinary repairs and maintenance, $6,802,886.22; other income, $126,220.73; total income, $6,929,106.95. Administration and head office expenses including general office expense, traveling, legal and office rent, salaries and commissions, $389,956.37; expenses of consolidation, $87,906.07; corporation and capital stock taxes, $64,445.43; total, $542,307.87. This leaves a net income of $6,386,799.08, from which $1,366,494.16 is deducted to provide for the following items: depreciation of plants, $553,449.37; mineral exhaustion, $498,471.50; bond sinking fund, $89,458.34; and interest on bonded debt, $255,114.95, leaving the balance for profit as stated. The consolidated general balance sheet shows that $1,323,276.31 was spent for new construction, equipment and additional property, there was also a deferred expenditure of $255,033.29 chargeable to operations for development and diamond drilling on properties. The current assets amounted to $9,331,200.88 and current liabilities, $2,135,594.54. A balance of $994,501.33 was carried forward for the year after providing for $534,754.70, dividends on preferred stock and $3,491,048.89 on common stock.

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## Esperanza Ltd.

The Esperanza Mining Co., El Oro, Mexico, according to a statement issued from its New York office, made a profit of $30,640 during July, 1913. The mill ran 28 days and crushed 7727 dry tons of ore. Tailings treated amounted to 13,071 tons, concentrates shipped to smelter, 320 tons. All receipts amounted to $110,168, made up as follows: Bullion produced, $70,020; concentrates produced, $39,845; rents and other sources, $303. The value of products are estimated. All expenses amounted to $79,528 and consisted of: $70,020 for working expenses, including development, marketing of bullion, and freight and treatment charges on concentrates shipped to smelter; $263 for New York office expense and $996 for London office. Development work performed totaled 1279 ft. The manager cables that on the San Carlos vein the various drifts have been advanced 368 ft., the average width being 6¼ ft., assaying 0.5 oz. gold per metric ton, also that 85 ft. has been advanced in the raises, the average width being 4¾ ft., assaying 1.75 oz. gold per metric ton.

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## Oriental Consolidated

The report of the Oriental Consolidated Mining Co., in the Unsan district of Chosen (Korea), Empire of Japan, for the year ended June 30, 1913, gives as total receipts in United States currency, $1,661,476; operating costs, $1,016,778; construction and development work, $73,314; leaving net receipts of $571,384. Dividends of $429,390 were paid.

The production of the different mines of the company was as follows: Tabowie, 112,529 tons, valued at $7.18 per ton; Taracol, 93,558, valued at $6.03; Chintui, 28,487, valued at $4.18; Kuk San Dong North, 12,757, valued at $3.92; Kuk San Dong South, 13,774, valued at $2.72; Kuk San Dong Central, 606, valued $4.20; Kuk San Dong Kisen, 6986, valued at $3.63; Charabowie, 37,658, valued at $8.65, and Candlestick, 6463, valued at $10.61. Besides this, tribute mines produced 883 tons, valued at $5.30. The total production of the company was therefore 313,701 tons with an average value of $6.39 per ton and a total value of $2,005,463. There was obtained as bullion $988,715, or $3.15 per ton, and as concentrate, $804,836, or $2.56 per ton. The net yield from concentrate was $640,609, or $2.04 per ton, giving a total net yield of $1,629,324, or $5.18 per ton, a net saving of 81.3%. The mill tails ran $0.68 per ton.

Mining costs for the year were $610,212, or $1.95 per ton; milling costs were $168,657, or $0.54 per ton; cost of transportation was $3602, or $0.01 per ton; concentrate expense was $107,392, or $0.34 per ton mined; general expenses were $126,915, or $0.406 per ton; net development expenses were $4612; construction expenses were $68,702.

Development work in the active mines amounted to 727 ft. of shaft work, 8434 ft. of main drifts, 9364 ft. of subdrifts, 5796 ft. of crosscuts, 8927 ft. of raises and winzes, a total of 33,248 ft. The cost of this work is included in the cost of mining. The cost of the development given as a separate item in the expenses covers 1534 ft. of prospecting work outside the active mines.

Ore reserves are for the Tabowie mine, 470,000 tons containing $2,850,000; for the Taracol, 260,000 tons containing $1,185,000; for the Chintui, 17,400 tons containing $67,875; for the Kuk San Dong, 16,200 tons containing $47,825; for the Charabowie, 38,600 tons containin $301,000; for the East Candlestick, 3700 tons containing $37,000, giving a total reserve of 805,900 tons containing $4,488,800.

Prospecting work was done on the West Candlestick, and some ore found. The Chosan district claims received some attention, but nothing of value was found. The Tong Koll was worked to some extent, but will be more actively handled when machinery is available. On other prospects, some 225 ft. of work was done, but nothing of value was found. The Chittabulbie mine was turned over to Koreans to work on a royalty basis.

The Taracol tube-mill plant treated 25,319 tons of concentrate during the year and yielded $675,656, an extraction of 84.7%. The plant, however, so far is a failure economically, because the extra cost of treatment amounts to more than the gain in extraction. It is hoped to improve the operation of this plant in another year. The Kuk San Dong cyanide plant treated 4826 tons of ore and yielded $98,295, an extraction of 65%. The Kuk San Dong dump retreatment plant handled 17,267 tons of ore and yielded $100,856, an extraction of 70%. The Candlestick cyanide plant treated 6511 tons of ore and yielded $19,416, an extraction of 52.9%.

An interesting item of expense for the year was $975 for a new burglar-proof door on the Tabowie vault. Electrification of the Maibong, Taracol and Tabowie camps is practically completed. The total expenditure is $62,304. The "Wood company" during the year furnished 27,287 cords of wood, 159,697 mining timbers, 57,539 pieces of lumber, and 5644 boxes of charcoal for the Tabowie and Taracol camps. On the advice of the Governor General of Chosen, the company has commenced tree planting, with the assistance of Kosaburo Matsushita, a forestry expert; 30,000 acacia trees were planted and nurseries established for 120,000 seedlings. This work required an expenditure of $2628. The electric water-power plant ran 252 days and was shut down 113 days on account of the lack of water. The company's schooner "Dorothy" was wrecked on the west coast in March and was a total loss. A new schooner to replace her was bought for $500. The medical staff treated 29,345 cases at the Taracol hospital during the year, of which only 13,448 were company employees. No charge is made for hospital treatment, and people come for considerable distance to receive its benefits. The department cost $8868. On Christmas day the management distributed $10,000 among the foreign employees on a percentage basis, the older employees receiving the greater benefit.

It is noted that the ore crushed was less than during the previous year, owing to the shortage of labor, the lack of water during the winter at Tabowie and the fact that only 20 stamps out of 40 ran at Kuk San Dong. The total gross receipts were the largest in the history of the concession, due to improved sorting and a better grade of ore in the lower levels of the Tabowie and Charabowie mines. Total expenses were higher, due chiefly to the larger amount of development work, heavy construction expenses, the Charabowie mine flood and the increased cost of concentrate treatment. Development was good at the Tabowie and Charabowie mines, fairly satisfactory at the Taracol and Chintui and poor at the Kuk San Dong and Candlestick. The ore reserve is the highest now of any time since 1906. During the coming year it is hoped to decrease operating expenses by using a smaller amount of mining timber, introducing electric power and reducing construction expense. The total production of the company to date is 3,236,216 tons valued at $19,858,339. Dividends of $4,932,910 have been paid.

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## Wallaroo & Moonta

The 1912 report of the Wallaroo & Moonta Mining & Smelting Co., Adelaide, South Australia, shows that the company made a profit of $390,927 during the year from which it paid a dividend of $291,600. The expenses were made up of $1,843,616, or $10.10 per ton mined for operations at mines and smelter and $104,478, or 57c. per ton mined for office expenses, royalties, taxes, depreciation, etc.; making a total of $10.67 per ton mined. Wages and underground contracts constituted about 60% of the working expenses. The total tonnage handled at both mines amounted to 182,729 tons of crude vein stuff, averaging 3.813% copper. The smelting works treated 65,920 tons of dressed ore, matte and precipitates from which 6287 tons of refined copper, 102 tons of bluestone, 1757 oz. of gold and 2045 oz. of silver were produced. Owing to the recent fire at the Mount Lyell mine attention was called to precautions taken at the Wallaroo mines for the prevention of fire. Water connections for allaying dust as well as connections to water columns in the shaft are available for fire fighting. In the electric-pump chambers all exposed parts of wood are overlaid with noninflammable material, a protective wash is also used on other exposed woodwork in other parts of the mine. A small flotation plant was in operation during the year resulting in the saving of an extra 100 tons of copper which otherwise would have remained in the tailings. A second and larger unit to the flotation plant was under construction at the end of the year.

MATERIAL HANDLED OR PRODUCED PER MAN PER YEAR

| | Tons of veinstuff at mines | | Tons of Charge at Smeltery | Lb. of fine Copper for all Men |
|---|---|---|---|---|
| | Wallaroo | Moonta | | |
| Miners | 380 | 352 | .... | 29,000 |
| Smelters | | . | 825 | 139,000 |
| Mechanics and skilled workmen | 765 | 2,170 | 2,190 | 5[illegible],500 |
| Engine-drivers and stokers | 3,760 | 990 | 5,550 | 160,000 |
| General surface labor | 650 | 376 | 1,240 | 36,600 |
| General underground labor | 1,900 | 2,940 | ...... | 166,500 |
| Flux quarries | . | .. . | 4,620 | 782,000 |
| Youths and boys | 2,690 | 8,160 | 2,190 | 140,000 |
| Assistants and petty officers | 13,600 | 4,080 | 7,550 | 4,700,000 |
| Officers | 37,600 | 10,900 | 20,800 | 1,280,000 |
| Adelaide office staff | | | | 2,350,000 |
| Total | 149 | 128 | 285 | 9,000 |

A sliding scale of wages is now in force and the following bonuses are paid to boring-machine and other contract miners; when copper is over 11.91@12.99c., 61c. per week; 12.99@14.07c., $1.22; 14.07@17.32c., $1.82; 17.43@20.57c., $2.43; and over 20.57c. per lb., a bonus of $3.05 per week is to be paid. For other employees on standard wages the advance is from 5 to 25%, increasing 5% in the order named for contractors. The cost of producing a long ton of refined copper and placing it f.o.b. ocean steamer was as follows: Mining, including repairs and maintenance, $211.17 per long ton; smelting, including repairs and maintenance, $59.69; shipping charges, $3.73, and Adelaide office expenses, $2.15; total, $276.74 per long ton of refined copper. The following table of labor is based on the number of men employed at Dec. 31, 1912. For comparison it may be stated that in 1911 the average computed in the same way was 9750 lb. of refined copper per man employed, secured from 153,129 tons of ore averaging 4.292% copper by wet assay.

# Laying Out Cananea Underground Curves

By A. Carr Harris*

*SYNOPSIS—Details of a method by which a mine foreman can run his curves with a minimum of work by the surveyor. A set of curve tables is given for this work.*

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In drifting and crosscutting where mechanical haulage is in use, careful attention must be paid to maintaining negotiable curves when connections are made. A simple and effective method is used by the engineers of the Cananea Consolidated Copper Co. At this property there have often been curves of different radius run from time to time and also, at times, as many as four or five curves under way at once. To give daily centers of these curves would entail a great deal of transit work. The method adopted leaves the curve in the hands of the foreman for several rounds at a time and has proved entirely satisfactory. A mine curve at Cananea requires practically no more delay in getting the center each day than is required in taking centers for a straight line drift.

To start a curve from a hard-rock drift, the transit man sets his plug as close to the breast as possible, so that in using his plug as the B.C. (beginning of curve), it will not be necessary to shoot any rock from the side of the drift. He has the foreman put in a good horizontal stull across the drift from 4 to 7 ft. behind his plug, and as high up in the drift as possible. A 4x6-in. stull is usually large enough, but it should be wedged in tightly with dry wedges so that the blasting will not dislodge it. The transitman sets up under his B.C. and turns off from his backsight down the line of drift deflection angles corresponding to centers on curve at distances of every 5 ft. measured from the B.C. plug. For each deflection, he lines in a nail on the stull behind him, the nail being driven partly in by his assistant. He then has a row of nails in the stull, and these nails lined up with the B.C. plug taken in order, will give center on curve at distances of 5, 10, 15, 20 ft., etc., measured from the plug. For curves of 40 ft. radius, he usually would set six or seven nails and for 100 ft. radius curves about eight or 10 nails, depending on how wide the drift is to be carried. To get the center of breast at any time, the distance is measured roughly from plug to breast, then, counting the nails on the stull from the beginning, the line string is placed on the stull which comes nearest to representing the distance measured. This nail lined up with the B.C. plug, gives the breast center.

This method of taking centers does not require any technical skill and does not require the attention of the transitman again until all the nails he has set are used up; this means an advance in the drift of from 20 ft. to 50 ft., depending on the radius and the width of the drift, before the transit is again required. Fig. 1 exhibits the method for a long curve.

For a timbered drift, much the same idea is carried out. Preferably, although not necessarily so, the curve is made to start from the particular set of timbers upon which the B.C. spad is set by the transitman in the center of the cap. A deflection angle is turned for each succeeding set of timber which is to be placed on the curve and a corresponding line nail driven into the cap preceding the one upon which the transit spad has been placed. The center of each set of timbers to be placed on the curve will be lined in with the B.C. spad and the proper nail of the cap behind. To avoid misunderstanding between the transitmen and foremen and shift bosses, the practice has been for the transitman always to make the first-line nail he sets correspond to the first set of timbers ahead of his transit spad.

The regular length of collar brace is put in on the outside of curve, the posts on this side standing 5 ft. center to center. The length of collar brace on the inside of curve is computed for the given cap length and radius, and given to the foreman who passes the measurement along to his timbermen. This collar brace measurement is the only one out of the ordinary which the timberman has to consider, and it is the same for all sets on the curve excepting at the end of the curve, which usually falls between two sets of timber and not on a cap. For this case, a special collar brace is computed to go in with the set which falls beyond the end of curve and a special line nail is set for the particular set. This set is a little more complicated for the transitman to figure, but the timbermen have no more trouble than simply to put in the special length of brace. When this last set is placed, the transitman gets around and gives them line for the straightaway, and thereafter they set the regular collar braces on both sides of the drift. Fig. 2 shows isometrically a typical timbered curve.

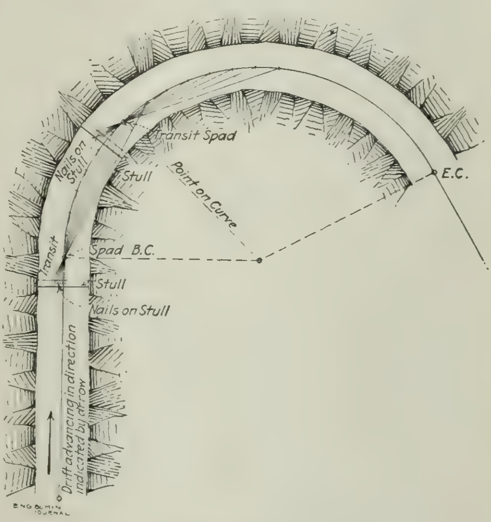

Fig. 1. General View of Curve

Having had a number of these curves to figure and often with different sizes of timbers and different lengths of caps, I decided in 1911 to make up tables with different set dimensions and different radii. These tables, herewith presented, have proved trouble-and-time-savers,

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*Mining engineer, 445 Piccadilly St., London, Ont., Canada.

### CURVE TABLES

| Chord Ft | Deflection | Caps Ft | Caps In. | For Timbering Outside Ft | For Timbering Inside Ft | For Timbering Center Ft | For Timbering Deflection | Chord Deflection Ft |
|---|---|---|---|---|---|---|---|---|
| | | | | 25-Ft Radius | | | | |
| 5 | 5° 44¼' | 3 | 8 | 5 | 4.317 | 4.658 | 5° 20¼' | 0.899 |
| 10 | 11° 32¼' | 4 | 0 | 5 | 4.259 | 4.630 | 5° 18¼' | 0.888 |
| 15 | 17° 27½' | 5 | 0 | 5 | 4.09 | 4.54 | 5° 13' | 0.855 |
| 20 | 23° 34¾' | 5 | 8 | 5 | 3.981 | 4.4905 | 5° 09¼' | 0.834 |
| | | | | 30-Ft Radius | | | | |
| 5 | 4° 46¾' | 3 | 8 | 5 | 4.424 | 4.712 | 4° 30¼' | 0.759 |
| 10 | 9° 35¾' | 4 | 0 | 5 | 4.375 | 4.6875 | 4° 28¼' | 0.750 |
| 15 | 14° 28¾' | 5 | 0 | 5 | 4.231 | 4.615 | 4° 24¼' | 0.727 |
| 20 | 19° 28¼' | 5 | 8 | 5 | 4.137 | 4.5685 | 4° 22' | 0.712 |
| 25 | 24° 37½' | | | | | | | |
| | | | | 35-Ft Radius | | | | |
| 5 | 4° 05¾' | 3 | 8 | 5 | 4.502 | 4.751 | 3° 53½' | 0.657 |
| 10 | 8° 12¾' | 4 | 0 | 5 | 4.460 | 4.729 | 3° 52¼' | 0.651 |
| 15 | 12° 22½' | 5 | 0 | 5 | 4.333 | 4.666 | 3° 49¼' | 0.633 |
| 20 | 16° 36' | 5 | 8 | 5 | 4.251 | 4.625 | 3° 47¼' | 0.622 |
| 25 | 20° 55½' | | | | | | | |
| 30 | 25° 22¾' | | | | | | | |
| | | | | 40-Ft Radius | | | | |
| 5 | 3° 35' | 3 | 8 | 5 | 4.562 | 4.781 | 3° 25½' | 0.580 |
| 10 | 7° 10¾' | 4 | 0 | 5 | 4.524 | 4.762 | 3° 24¼' | 0.575 |
| 15 | 10° 48½' | 5 | 0 | 5 | 4.411 | 4.7055 | 3° 22¼' | 0.561 |
| 20 | 14° 28¾' | 5 | 8 | 5 | 4.339 | 4.6695 | 3° 20¼' | 0.553 |
| 25 | 18° 12½' | | | | | | | |
| 30 | 22° 01½' | | | | | | | |
| 35 | 25° 56¾' | | | | | | | |
| | | | | 45-Ft Radius | | | | |
| 5 | 3° 11' | 3 | 8 | 5 | 4.609 | 4.8045 | 3° 03¼' | 0.519 |
| 10 | 6° 22¾' | 4 | 0 | 5 | 4.574 | 4.787 | 3° 03' | 0.515 |
| 15 | 9° 35⅝' | 5 | 0 | 5 | 4.474 | 4.737 | 3° 01' | 0.504 |
| 20 | 12° 50½' | 5 | 8 | 5 | 4.408 | 4.704 | 2° 59¾' | 0.497 |
| 25 | 16° 07¾' | | | | | | | |
| 30 | 19° 28¼' | | | | | | | |
| 35 | 22° 53⅛' | | | | | | | |
| 40 | 26° 23¼' | | | | | | | |
| 45 | 30° 00' | | | | | | | |
| | | | | 50-Ft Radius | | | | |
| 5 | 2° 52' | 3 | 8 | 5 | 4.646 | 4.823 | 2° 45½' | 0.470 |
| 10 | 5° 44¼' | 4 | 0 | 5 | 4.6154 | 4.808 | 2° 45¼' | 0.467 |
| 15 | 8° 37½' | 5 | 0 | 5 | 4.524 | 4.762 | 2° 43¼' | 0.458 |
| 20 | 11° 32¼' | 5 | 8 | 5 | 4.463 | 4.732 | 2° 42¼' | 0.452 |
| 25 | 14° 28¾' | | | | | | | |
| 30 | 17° 27½' | | | | | | | |
| 35 | 20° 29¼' | | | | | | | |
| 40 | 23° 34¾' | | | | | | | |
| | | | | 60-Ft Radius | | | | |
| 5 | 2° 23¼' | 3 | 8 | 5 | 4.7035 | 4.8517 | 2° 19' | 0.395 |
| 10 | 4° 46¾' | 4 | 0 | 5 | 4.677 | 4.839 | 2° 18¼' | 0.393 |
| 15 | 7° 10¾' | 5 | 0 | 5 | 4.600 | 4.800 | 2° 17½' | 0.386 |
| 20 | 9° 35¾' | 5 | 8 | 5 | 4.549 | 4.7745 | 2° 16¾' | 0.383 |
| 25 | 12° 01½' | | | | | | | |
| 30 | 14° 28¾' | | | | | | | |
| 35 | 16° 57½' | | | | | | | |
| 40 | 19° 28¼' | | | | | | | |
| 45 | 22° 01½' | | | | | | | |
| | | | | 80-Ft Radius | | | | |
| 5 | 1° 47½' | 3 | 8 | 5 | 4.776 | 4.888 | 1° 45' | 0.299 |
| 10 | 3° 35' | 4 | 0 | 5 | 4.756 | 4.878 | 1° 44¾' | 0.298 |
| 15 | 5° 22¾' | 5 | 0 | 5 | 4.69 | 4.848 | 1° 44¼' | 0.295 |
| 20 | 7° 10¾' | 5 | 8 | 5 | 4.658 | 4.829 | 1° 43¾' | 0.292 |
| 25 | 8° 59¼' | | | | | | | |
| 30 | 10° 48½' | | | | | | | |
| 35 | 12° 38¼' | | | | | | | |
| 40 | 14° 28¾' | | | | | | | |
| 45 | 16° 20' | | | | | | | |
| 50 | 18° 12½' | | | | | | | |
| | | | | 100-Ft Radius | | | | |
| 5 | 1° 26' | 3 | 8 | 5 | 4.819 | 4.9995 | 1° 24½' | 0.241 |
| 10 | 2° 52' | 4 | 0 | 5 | 4.803 | 4.9015 | 1° 24¼' | 0.241 |
| 15 | 4° 18' | 5 | 0 | 5 | 4.756 | 4.878 | 1° 23¾' | 0.238 |
| 20 | 5° 44½' | 5 | 8 | 5 | 4.724 | 4.862 | 1° 23½' | 0.237 |
| 25 | 7° 10¾' | | | | | | | |
| 30 | 8° 37½' | | | | | | | |
| 35 | 10° 04¾' | | | | | | | |
| 40 | 11° 32¼' | | | | | | | |
| 45 | 13° 00¼' | | | | | | | |
| 50 | 14° 28¾' | | | | | | | |
| 55 | 15° 57¾' | | | | | | | |
| 60 | 17° 27½' | | | | | | | |
| | | | | 105-Ft Radius | | | | |
| 5 | 1° 21¾' | 3 | 8 | 5 | 4.828 | 4.914 | 1° 20½' | 0.231 |
| 10 | 2° 43¾' | 4 | 0 | 5 | 4.813 | 4.907 | 1° 20¼' | 0.230 |
| 15 | 4° 05¾' | 5 | 0 | 5 | 4.767 | 4.884 | 1° 20' | 0.228 |
| 20 | 5° 28' | 5 | 8 | 5 | 4.737 | 4.869 | 1° 19¾' | 0.226 |
| 25 | 6° 50¼' | | | | | | | |
| 30 | 8° 12¾' | | | | | | | |
| 35 | 9° 35¾' | | | | | | | |
| 40 | 10° 58¾' | | | | | | | |
| 45 | 12° 22½' | | | | | | | |
| 50 | 13° 46½' | | | | | | | |
| | | | | 150-Ft Radius | | | | |
| 10 | 1° 54½' | 3 | 8 | 5 | 4.879 | 4.9395 | 0° 56½' | 0.163 |
| 20 | 3° 49¼' | 4 | 0 | 5 | 4.868 | 4.931 | 0° 56½' | 0.162 |
| 30 | 5° 44¼' | 5 | 0 | 5 | 4.846 | 4.918 | 0° 56¼' | 0.161 |
| 40 | 7° 39¾' | 5 | 8 | 5 | 4.814 | 4.907 | 0° 56¾' | 0.161 |
| 50 | 9° 35¾' | | | | | | | |
| 60 | 11° 32¼' | | | | | | | |
| | | | | 200-Ft Radius | | | | |
| 10 | 1° 26' | 3 | 8 | 5 | 4.909 | 4.9515 | 0° 42¾' | 0.123 |
| 20 | 2° 52' | 4 | 0 | 5 | 4.900 | 4.950 | 0° 42½' | 0.123 |
| 30 | 4° 18' | 5 | 0 | 5 | 4.876 | 4.938 | 0° 42½' | 0.122 |
| 40 | 5° 44¼' | 5 | 8 | 5 | 4.860 | 4.930 | 0° 42¼' | 0.122 |
| 50 | 7° 10¾' | | | | | | | |

| 300-Ft Radius Chord | 300-Ft Radius Deflection | 400-Ft Radius Chord | 400-Ft Radius Deflection | 500-Ft Radius Chord | 500-Ft Radius Deflection |
|---|---|---|---|---|---|
| 10 | 0° 57¼' | 10 | 0° 43' | 10 | 0° 34½' |
| 20 | 1° 54½' | 20 | 1° 26' | 20 | 1° 08¾' |
| 30 | 2° 52' | 30 | 2° 09' | 30 | 1° 43¼' |
| 40 | 3° 49¼' | 40 | 2° 52' | 40 | 2° 17½' |
| 50 | 4° 46¾' | 50 | 3° 35' | 50 | 2° 52' |

and may be used to advantage also in running in small curves on the surface for motor lines.

The first two columns of the tables give the deflection angles for a number of chords of various lengths and are to be used for a curve without timber. Where timber is set, the term "cap" represents lengths of caps measured from shoulder to shoulder; "outside," the distance from center of one cap to center of the next cap, measured at the shoulders, on the outside of curve; "inside," the distance from center of one cap to center of the next cap, measured at the shoulders, on the inside of curve; "center," the distance from center of one cap to center of the next cap, measured on the center line of curve as a chord; "deflection," the deflection angle to be turned for each set of timbers (Sin of defl. angle = ½ $\frac{\text{center dist.}}{\text{radius}}$); "chord deflection," the distance measured along center line of a cap, i.e., radius of curve, from center of cap to intersection with line of centers of the two preceding caps.

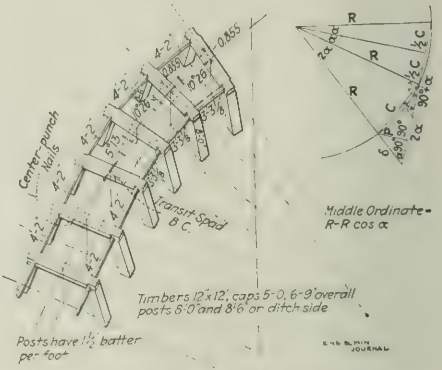

0.855
4-2
0.855
10°26
10°26
3-3⅛
3-3⅛
3-3⅛
6-0
5°13
4-2
Center-punch
Nails
Transit Spad
8 C.
R
R
R
2α
α
α
½C
½C
90°+α
C
P
90°
90°
2α
δ
Middle Ordinate = R-R cos α
Timbers 12"x12", caps 5-0, 6-9" overall
posts 8'-0" and 8'-6" or ditch side
Posts have 1½" batter per foot
ENG & MIN JOURNAL

FIG. 2. TIMBERS ON CURVE
FIG. 3. IDEAL DIAGRAM OF CURVE

Referring to Fig. 3, calculations are made as follows for curves of small radius: .

For any chord $C$ in a curve of radius $R$, where

$a$ = Defl. Angle;

$C$ = Chord;

$R$ = Radius;

$$C = 2 R \sin a$$

To find chord deflection $\delta$ measured along radius of curve:

$$a \quad 180 \quad (90^\circ + 3a) \quad 90^\circ \quad 3a$$

$$P = C \sin 2a$$

$$\delta = \frac{P}{\sin a} = \frac{C \sin 2a}{\sin (90^\circ - 3a)} = \frac{C \sin 2a}{\cos 3a}$$

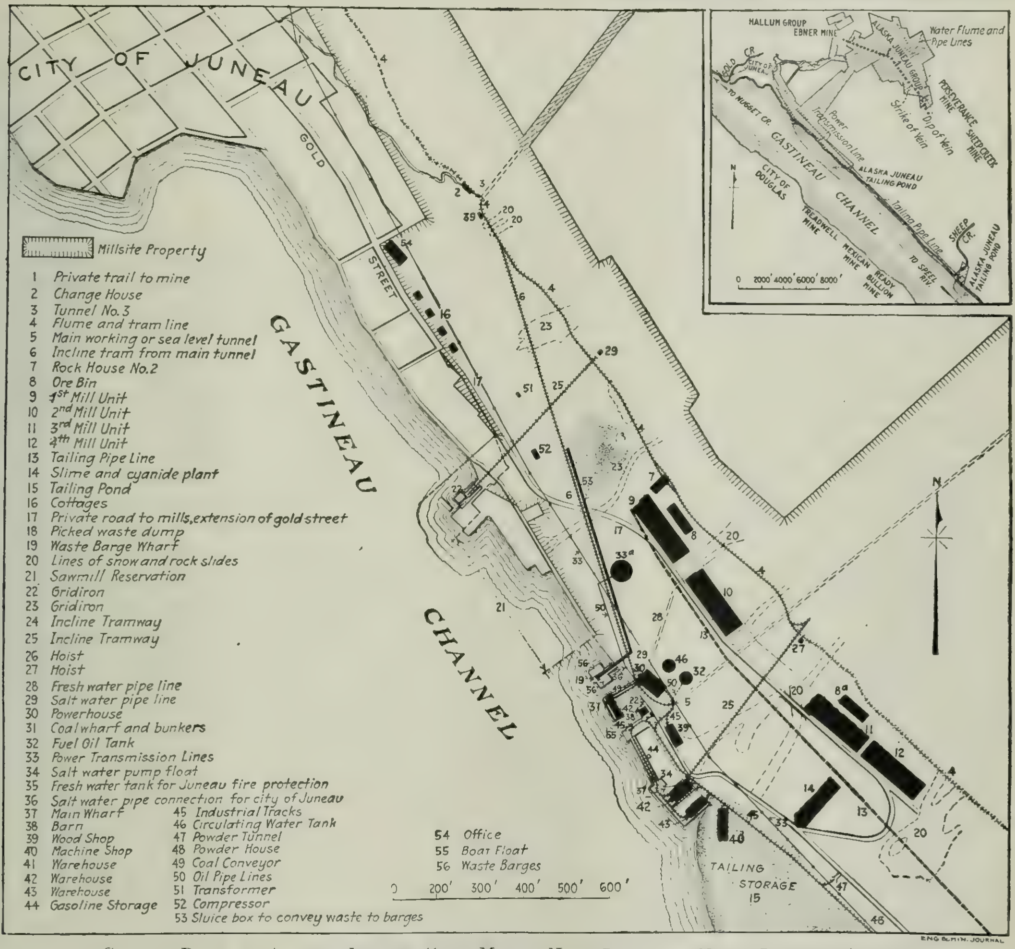
These tables have been checked over by D. E. Curry and J. J. Hasbrouck of the Cananea company, to whom I am much indebted.

⁂

**The Rheinisch-Westfälischen Cement Syndikat** in Germany, which had its headquarters at Bochum, seems to have gone to pieces, several of the more important works having refused to extend the agreement through 1914. An attempt has been made to unite 14 of the Westphalian makers in a new local syndicate, but at the first meeting no agreement was reached as to prices or the regulation of production. The break has been followed by extremely low prices, bids having been made for a large contract at Hanover as low as 16c. per 100 kilos., or less than half the recent price made by the syndicate.

# Developing the Alaska Juneau Mine

The accompanying illustration shows two plats, one an outline of the present property of the Alaska Juneau Gold Mining Co., together with the position of its water rights, flume lines, transmission lines, etc.; the second shows more in detail the proposed position of buildings and improvements constituting the milling plant which is just southeast of the town of Juneau. A part of the improvements shown have been completed, namely, the wharves, floats, warehouses, rock houses, etc., and practically all of the other work is now under way.



Ground Plan of Alaska Juneau Gold Mills, Now Building Near Juneau, Alaska

One of the four mills is completed and will soon begin operations. The positions of the Perseverance and Sheep Creek properties of the Alaska Gastineau Co. (Alaska Gold Mines Co.) and that of the Ebner in which U. S. Smelting, Refining & Mining Co. lately became interested, as well as the older Treadwell mines on Douglas Island, are shown in the insert map.

In a general way the scheme of mining is as follows: In the summer it is intended to work the openpits in Silver Bow Basin about four miles by wagon road from Juneau. The ore will there be crushed and passed through a raise 800 ft. long to the end of an adit driven from Gold Creek through the mountain a distance of about 6700 ft. From this point the ore will be transported by an electric haulage through a series of tunnels and trams to a point just southeast of the town of Juneau, where the milling plants are located. In the winter, the ore will be mined underground and transported in a similar way to that mentioned above.

At the present time, the main or Gold Creek tunnel has been completed and the raise is now being put up to Silver Bow Basin. The stations, and ore chutes at the foot of the raise have been completed. The entire tramways, including tunnels, flumes, track, etc., have been completed. The rock house at the milling plant has been completed and the grading for the first unit of 40 stamps is now well under way and should be completed the early part of next year. The positions of Perseverance and Sheep Creek mines of Alaska Gastineau property are shown in smaller map and also the Ebner mine of the U. S. Smelting, Refining & Mining Co.

## Scandinavian Electric Zinc Smelting

Special Correspondence

The report of the directors of the Hydraulic Power & Smelting Co., Ltd., with statement of accounts for the 14 months ended Aug. 31, 1913, was submitted to the ordinary general meeting of shareholders in London on Nov. 4.

The capital of the company is 1,000,000 shares of £1 each, all of which have been allotted. It is intended, subject to the approval of the shareholders, to make application to reduce the capital to £500,000, by reducing the nominal value of each share from £1 to 10s.

During the period under review the capacity of the zinc-refining works at Sundlokken (Sarpsborg) has been increased from 8000 to 10,000 tons per annum, and the contract for the sale of the entire production from these works has been extended for another year, viz., until the end of 1915, at terms enabling satisfactory profits to be made.

The erection and equipment of the new zinc-smelting works at Trollhättan have been proceeding as rapidly as possible, and at the present time, of the seventeen 1000-hp. furnaces and eight 500-hp. furnaces to be installed, 13 of the former and all of the latter are completed.

For various reasons none of the complex ores for which the works were designed has been available, and the furnaces have been running on the ordinary classes of roasted zinc ores which do not yet prove commercially profitable. Considerable progress is, however, being made and the results achieved for the month of August, 1913, were a great improvement on any previous month's working. It has been decided temporarily to discontinue operations at the old works, and to concentrate all efforts to bringing the company's smelting process in the new works to a profit-earning stage. This scheme will render available a certain amount of surplus energy which the directors propose to utilize in other channels of manufacture already demonstrated as commercially profitable.

In June it became necessary to arrange for the provision of further money for the financing of the zinc smelting, and a scheme for this purpose was thereupon prepared, and approved by the debenture holders.

The scheme provided for the sale of the company's water-power interests in Norway to a new company for a consideration of £1,016,250, made up as to £180,000 in cash, £437,500 in debentures bearing interest from Mar. 31, 1913, and £398,750 in fully-paid shares of 10s. each, and an agreement was accordingly entered into with the new company on July 22. The £437,500 debentures have, since the date of the accounts submitted, been distributed in reduction of the debenture debt from £875,000 to £437,500.

Under the sale agreement the company guaranteed the subscription of £212,500 debentures of the new company, and in placing these debentures, £148,750 of the above mentioned shares were distributed as bonus. It is proposed to distribute the remaining £250,000 shares to the shareholders in reduction of the share capital as mentioned above, and the necessary resolution will be submitted to the shareholders at the general meeting for their approval.

The new company was duly registered on July 18, 1913, as the Hydraulic Power Company of Scandinavia, Limited, and the sale was completed on Aug. 18, 1913.

One of the underlying conditions of the scheme of reorganization was that the company should seek release from a contract with the Sulphide Corporation, Ltd., for the supply of a large amount of slimes concentrates and thus relieve itself of liabilities in connection with the financing of the ore deliveries and the erection and working of a roasting plant.

The result of the negotiations with the Sulphide Corporation was that an arrangement was made for the contract to be cancelled in consideration of the sum of £63,000, which sum had been paid on account in the terms of the contract. This arrangement enables the company to provide for the utilization of the whole of the electric energy contracted for.

The trustee for debenture holders is the Earl of Kintore. The directors consist of Otto C. W. Cedercrantz, of Kalmar, Sweden, Governor of Province (chairman); Knut Tillberg, of Nygard, Gamleby, Sweden, lawyer; Dr. Alfred List, Behrenstrasse 63, Berlin W. 8. Germany, banker; John Alexander Stirling, 33, Old Broad Street, London, E. C., stockbroker; and John Collett Moulden, metallurgist, of Seaton Carew, County Durham, England (managing director).

## The Safe Handling of Missed Holes

In the issue of May 13, the Journal printed an editorial on the subject of missed holes. Following this, we addressed communications to various mining companies asking for their practice in the treatment of missed holes and their opinions on the subject. This article is designed to sum up the testimony received.

The subject is an old one, as old as blasting itself. The danger of accident and death from the explosion of missed holes has been always recognized by mining companies and has been in most cases a matter of diligent attention and stringent rules. The current agitation in favor of safety first, and the attempts to reduce the mining death rate in the United States to a decent figure, render the subject of timely interest, even if not new.

The great cause of mining accidents is falls of ground, and it will probably always so remain. The next most important source, as abundantly proved by figures for all countries, is explosions of powder. There is this important difference between these two hazards, however, namely, that the first is extremely hard to guard against, the governing conditions being infinitely variable, whereas the second can be attacked with much greater success and a standard code of rules prescribed. Among explosive accidents, it is probable that those due to missed holes predominate, and the detection and removal of these is a subject of the greatest importance.

A missed hole once found, the question of how to render it harmless arises. In general, three lines of procedure are open, namely, to remove the powder by picking it out, to explode it with a new primer, to drill a new hole near by, but at a safe distance and in a safe direction, and explode the old hole with the new one. The object of our inquiry was to ascertain the opinion of those competent to have one, as to which of these methods was preferable.

In general it may be stated that the best practice favors shooting the old charge with a new primer, although exceptions to this are to be found. L. F. S. Holland states that the Smuggler-Union company uses the new primer and does not permit the powder to be picked out. Robert E. Hanley, of the Mammoth Copper Mining Co., favors the use of the new primer in most cases. This is also the practice at the Calumet & Arizona. Mr. Gorhing, superintendent of mines, writes that in his opinion the only method of treating a missed hole is to insert a new primer and that he knows of no circumstances under which it would be safe to drill a new hole nearby, or to clean out the old powder. Frank Juliff, foreman of the same company, concurs and adds that he would advise that no drilling in the vicinity be done in drifts, raises or slopes while any powder remains in the holes. M. W. Mitchell, the other Calumet & Arizona foreman, agrees in general, but would permit the cleaning out of the powder in exceptional cases.

W. H. Staver and E. B. Miller, of the Liberty Bell, unite in recommending shooting the old charge. In the event of this method failing, Mr. Staver favors cleaning out the powder or possibly drilling a new hole, if this can be safely done. Mr. Miller remarks upon the fact the collar of the missed hole may be shot off, leaving no room for a new primer. In such case, he would plaster the new primer over the hole and shoot it. He would never dig out the powder, but would permit drilling a new hole when necessary.

The rules of the Hecla Mining Co. governing the subject of misfires are quoted by James F. M'Carthy, manager, as follows:

> Miners who have blasted, on coming off shift, must notify the shift coming on if there have been any missed holes and how many, so that they may have full knowledge of the matter. In such cases also the miners coming off shift must write plainly on the blackboard in the shaft house the places where they have left any missed holes and the number of such missed holes. Miners going on shift must examine said blackboard for the record of any missed holes before going to work.
>
> Every employee, after spitting a fuse, must remain within hearing distance and count the number of shots he hears and carefully note the number of missed holes, if any. No employee shall under any circumstances approach a missed hole within 20 min. after spitting the fuse.
>
> Employees must carefully examine the workings before setting up machines, for loose or scaling rock or any element of danger and all missed holes must be fired before drilling is commenced. Picking giant powder out of a hole is strictly forbidden. No tamping of powder with steel or iron bars is allowed.

It will be noted that the rules prohibit the cleaning of the holes. A copy of these Hecla rules is given every man on the day he begins to work, and a copy is kept posted in the shaft house.

Percy E. Barbour, manager of the Uwarra Mining Co., writes as follows:

> I am not in favor of drilling a hole adjacent to a hole which is full of unexploded powder. In our present work we invariably shoot the hole over, first carefully drawing out the tamping and old primer and inserting a new one. Our primers are made by inserting a fuse and fulminate cap in the end of a stick of powder, the top of which is tied around a fuse. Therefore after the tamping is withdrawn this primer can be pulled out by a gentle tug on the fuse. The old fuse is cut off and the primer and old cap put back in the hole and a new primer made and inserted. If, as sometimes happens, the primer explodes and leaves unexploded powder in the hole we handle it in one or two ways. If there is little powder in the hole and shooting will not seem to break enough rock to pay for smoke delay we take out the powder, but we first fill the hole with water to prevent any chance of explosion. If the contents seem to promise sufficient results we put in a new primer and shoot the powder that is left. As to the detection of missed holes; in our drift work it is easy to tell by the looks of the face whether the hole has failed to go or not. If the hole has been shot, but leaves a boot-leg, these are all tried with a tamping stick to discover if there is any unexploded powder left in the hole.

To pull out the old primer is equivalent in danger to cleaning the hole. Presumably, this primer is on the top of the hole. Mr. Bilharz, general manager of the Doe Run Lead Co., follows the same plan and recommends that the hole be cleaned and that no new hole be drilled.

It is evident that neither extraction of the unexploded charge, nor drilling a new hole, is considered safe by most operators, although Mr. Barbour and Mr. Bilharz advise extracting the primer or the powder, and several others would permit it when necessary. This would seem to represent about the sentiment existing in the industry, and agrees with our own view that leaving the old charge undisturbed and exploding it with a new primer is by far the safest course to pursue.

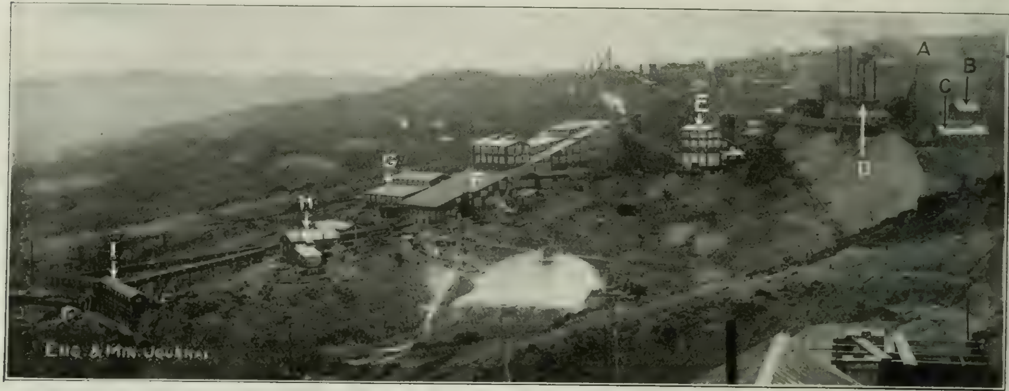
⁂

## Artificial Diamonds

A claim for the production of diamonds by electrolysis of calcium carbide is made by E. du Boismenu, of Paris, in a pamphlet on the *"Fabrication Synthétiqque du Diamant,"* according to *Engineering,* Aug. 15, 1913. Francis P. Mann describes the experiments which were made in 1908, and which he did not witness, in *Metallurgical and Chemical Engineering,* June, 1913; Mann did see some of the diamonds which the well known Paris chemists, Lacroix and Maquenne, are supposed to have pronounced to be pure carbon. As stated, the experiments took place in and before 1908, with rather primitive apparatus and insufficient means; the process is said to be covered by the French patent No. 4566, of 1907, and the experiments do not appear to have been resumed. The furnace was fitted with two horizontal electrodes, which were carbon rods approaching one another within 24 cm. It was charged with calcium carbide, fused by the continuous currents applied.

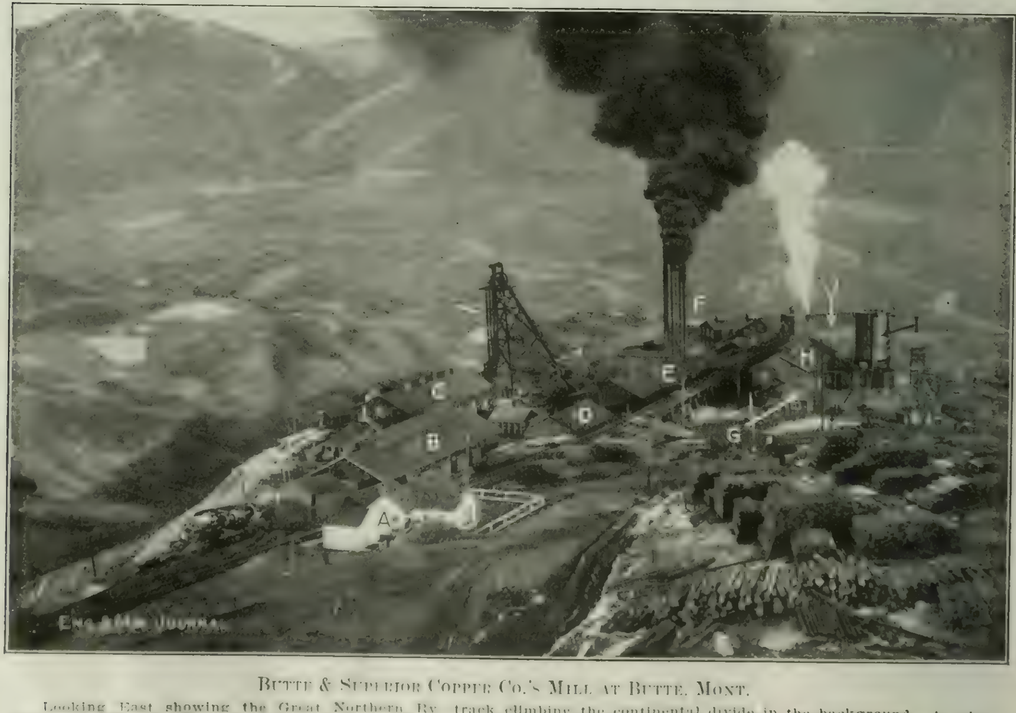
At the end of a run of twelve hours—the apparatus did not permit a further continuation of the experiment—the carbide was found to be "enriched" with fine crystals near the anode. In the space between the two electrodes the carbide was left undecomposed. The cathode, however, was surrounded by a black mass, from which some flakes of graphite and also some colorless, mostly quite irregular, crystals or globules were isolated, which consisted of pure carbon. When the furnace had been run for six hours, the length of these crystals was 1.5 mm.; the length increased with longer runs, and crystals of 2.7 mm. were obtained by the run of 12 hours; the rate of growth was generally 0.2 mm. per hour. Mann points out that the crystals certainly did not look as if they had been produced by breaking up natural diamonds. It is hardly advisable to express an opinion. Yet one would rather expect to find the carbon near the anode, and the metallic calcium to travel to the cathode; it is stated that rose-colored vapors of burning calcium (and carbon monoxide) escaped, and that the cathode was enriched near the anode by carbon migrating in that direction. Du Boismenu refers, of course, to Moissan. It is very doubtful, however, whether Moissan's good crystals of so called diamonds were really carbon; he did not try to burn the few fairly large crystals he obtained in oxygen, and other workers have acknowledged that they were, in similar researches, deceived by small crystals of silicon carbide and alumina (corundum), both of which are nearly as hard as diamonds. Moissan burned only some small crystals.

# PHOTOGRAPHS FROM THE FIELD



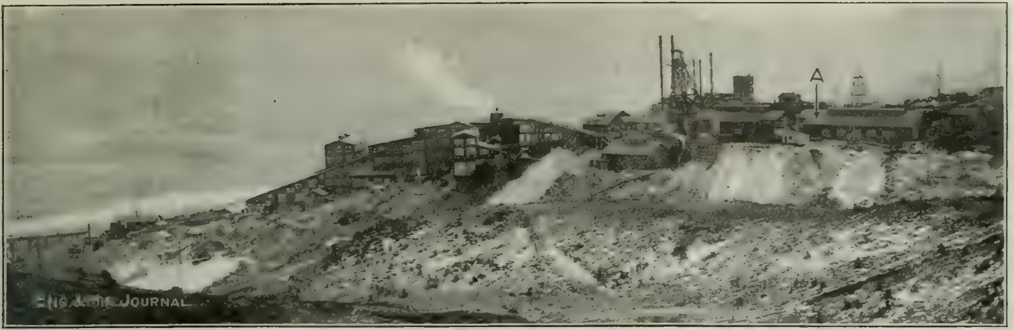
General View of Butte & Superior Plant, Looking Southwest

In background shafts of Tuolumne Copper Mining Co., Speculator shaft of North Butte Mining Co., Tramway, Berkeley Mountain View, High Ore and Diamond shafts of Amalgamated company. Different sections of Butte & Superior property are: A, headframe; B, machine shop; C, change house; D, boiler plant; E, steel ore bin and secondary crushing plant; F, main mill building; G, settling tank building; H, laboratory and testing plant; I, concentrate bins. Black Rock shaft, 1620 ft. deep, is main working shaft. From it zinc ore carrying 20% zinc is being mined from nine levels, highest of which is 700-ft. level. This ore is hoisted, crushed, and conveyed to the secondary crushing plant, thence to main mill building where it undergoes complex water concentration followed by oil filtration. Normal capacity of plant is 1200 tons of ore per day which can be readily increased to 1400 tons per day. Present production of zinc concentrates is 12,000 tons per month, containing 12,000,000 lb. of zinc, recovery being about 90% of the zinc.

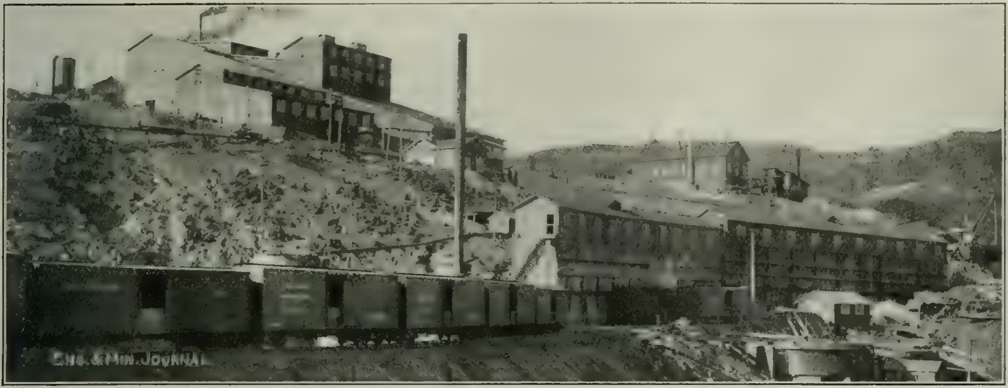


Butte & Superior Copper Co.'s Mill at Butte, Mont.

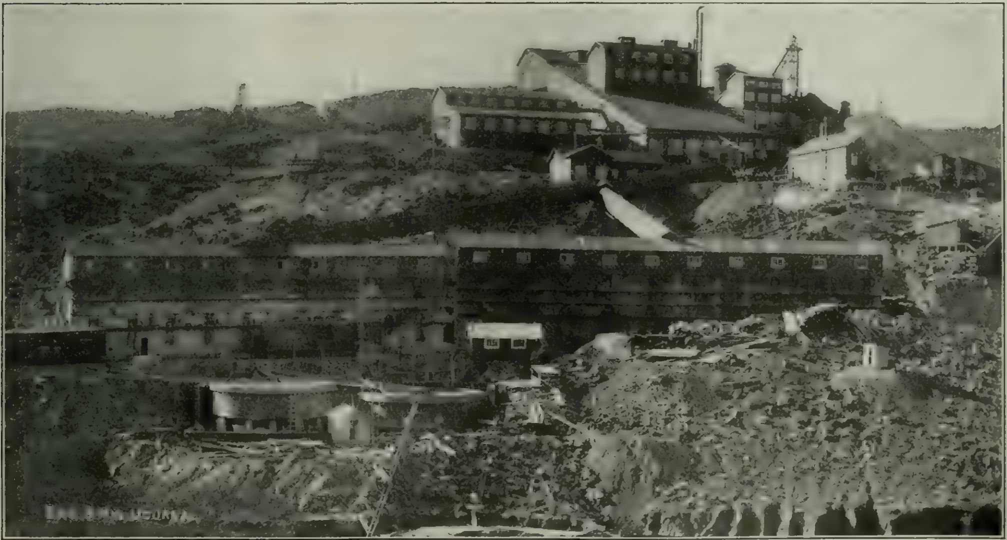
Looking East showing the Great Northern Ry. track climbing the continental divide in the background. A, mine-foreman's residence; B, carpenter shop; C, machine shop; D, timber-framing shop; E, hoist room; F, boiler house; G, office; H, compressor house; I, water storage tank; J, main mill building.



LOOKING TO SOUTHEAST WITH SILVER BOW CREEK AT THE FOOT OF THE HILL
The continental divide is in the distance. The carpenter shop is shown at A.



THE MILL BUILDING, LOOKING JUST NORTH OF WEST
In the foreground are the concentrate bins, of a capacity of 2500 tons and a train load of concentrates.



LOOKING WEST AT HEADFRAME, AND MAIN MILL BUILDING
Settling-tank building, laboratory, concentrate bins are also shown and in the foreground the settling tanks for drainage from concentrate bins.

# CORRESPONDENCE AND DISCUSSION

## Motor Trucks for Mines

On p. 457 of the JOURNAL of Sept. 6, 1913, appears an article "Motor Trucks for Mines," which it would be well to analyze more deeply before coming to the hasty decision that the truck is at fault. I have no connection with the company which manufactures the truck used and write this in a spirit of one who wishes to see fair-play. I am, in fact, connected with a rival company. I have run across many similar instances wherein the purchaser of the truck was himself entirely to blame for the want of success.

To begin with then, the truck purchased is one of a well known make, has proved itself over many years and to my own personal observation is capable of doing good work.

I have seen exactly similar trucks doing heavy work, day in and day out, round the steep hills of Pittsburgh, and making no fuss about it. It is highly probable that the truck supplied was in every respect up to its standard and that therefore if it fell down on the work, there was something radically wrong with the conditions. The average grade down which the load was to be taken is 10%, the steepest being 14%. Now this is nothing exceptional, and is, in fact, much in favor of the truck, as during this run with the load, practically no gasoline would be consumed, and only a small amount of oil in the engine.

The principal work would fall on the brakes, and as there are two independent sets on this make of truck, the driver should have used them alternately, allowing the other to cool off. This work would have happened chiefly in the 2000-ft. stretch of 14%. Further, the use of the engine as a brake (going down on compression) is quite usual, and a simple change in the carburetor would have converted the motor into a serviceable brake, which could be used for emergency purposes. The motor is used as a brake regularly on motor trucks running in the mountainous parts of Europe.

The clue to the situation is given in the statement that rubber tires lasted only a week. The tire manufacturers usually guarantee their product for 8000 miles. This mileage is often exceeded, and road conditions must be exceedingly severe to make the tires run out their mileage at 150 miles, which is what this truck seems to have been doing as a maximum per week.

This statement is ridiculous and is grossly exaggerated. I have taken trucks over rough, gritty country roads and over 18% grades with rough surfaces, and tires never did wear anything as fast as that. On the whole, therefore, one should be strongly inclined to investigate further the statements made by Mr. Sonne, as it is only too probable that his conditions were quite unsuitable for any kind of motor hauling. No one knows any better than the manufacturer that there are many cases where a motor truck will not operate successfully, and is may be assumed as a fact that he is not at all anxious to sell a truck under these conditions. The failure reacts much more strongly on him than it does on the purchaser.

JOHN YOUNGER.

Buffalo, N. Y., Sept. 16, 1913.

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## Public Land Withdrawals

The article in the JOURNAL of Sept. 20, 1913, on "Extralateral Rights" is about as concise and convincing an argument against the continuance of this antiquated piece of legislative folly, as can be made within its compass.

The closing sentences, however, leave the impression that the author considers the decisions of the Supreme Court and the various interpretations of the application of the law to be well settled. I quote these last sentences:

> It would seem that the law of extralateral rights under the statute of 1872 is practically settled. It is fully settled, when applicable to conditions which have presented themselves for adjudication, yet the forms of mining locations may be so variant, and the position of veins within the vertical boundaries thereof so strange and peculiar, that many complications now unthought of, may present themselves for adjudication, but, if the courts continue to bear in mind the purpose and intent of the Mining Act, and the principles already settled, no serious difficulty will arise in determining the law applicable to any complications.

To arrive at the conclusion that no serious difficulty will arise, after having just quoted case upon case where eminent authorities have come to diametrically opposed conclusions, and one where *three* different interpretations of the application of the law on the unappropriated rights to a vein on the dip are shown, surpasses my understanding.

However, it is not my purpose to dwell on this subject, as I wish to call the attention of my fellow sufferers to a sin of omission which is practiced by the U. S. Land Office, that of failing to notify the public effectively of withdrawals of the public domain from entry. Such withdrawal is quite frequently made at the request of some of the departments of the Government, by a letter addressed to the local land office, either by the Secretary of the Interior, or the Commissioner of the Land Office, and then the local office delegates one of the force to enter the withdrawal on the margin of the township plat, and to color the withdrawn portions of the township to call attention to their withdrawal.

It may be that the withdrawal was only a temporary one and that the lands were restored to entry at some future date, when a similar marginal note may appear, but the coloring would probably be left, and the casual inspection of the plat might lead to the erroneous conclusion that the land was still withdrawn, especially if the notice of restoration happens to be recorded on some other portion of the margin, than the notice of withdrawal, which happens rather frequently.

No record outside of this one is kept at some of the land offices, at others there is in addition to the plat a record book, which on a printed form shows the status of the various entries, withdrawals, restorations, patents granted for mineral, homestead and other entries.

To emphasize the point which I wish to make, namely, that the record of these withdrawals and restorations of public lands should be communicated in every instance to the recorder of the county, where such lands withdrawn or restored are located, I shall cite a case, coming under my personal observation.

Some mining claims had been taken up in Colorado. The locations had been made in conformity with the statutes and the local regulations. An inspection of the county records showed, that there were no serious interferences by prior locations, as no work had been done in the district for a number of years, as evidenced by the lack of assessment work records in the recorder's office and from the testimony of residents.

Upon looking over the records of the state engineer, it was found that the waters of a stream on the claims had been appropriated at one time for the purpose of developing hydro-electric power, further inquiry at the Forestry Department and at the office of the locating engineer showed that the former had never issued a permit to the locators and appropriators of the water and that the latter had lost track of the promoters of the enterprise and considered the scheme abandoned.

It then remained to ascertain in the land office whether the lands filed on were United States lands, open for entry. This investigation had been left to the last for two reasons. In the first place, the persons living in the immediate vicinity of the claims maintained that the entire district was open to mineral entry, the only restrictions being those incident to its being comprised in a forest reserve, and in the second place, that the United States land office is, or was, at that time at Montrose, practically a day's journey from Denver.

When I reached Montrose, it did not take me long to realize that Pascal hit the nail on the head, when he wrote in his "Pensées," anent the cussedness of inanimate nature and matter, "The last thing you find out, when doing a piece of work, is what you should have done first."

About five sections of a township had been withdrawn from all entry by the Secretary of the Interior on the request of the Reclamation Service, as there was a possibility of part of them becoming necessary or expedient at some future time in connection with a reclamation project, since completed. This explained why the promoters of the hydro-electric development laid down their arms and why we did likewise, the withdrawal covering the claims under consideration.

A similar case happened in connection with some properties in Arizona, only this time, keeping in mind Pascal and my former experience, I went to the land office first, thus saving myself a great deal of unnecessary work. It seems to me that the land office should at least file a statement with the recorder of the county where a withdrawal or a restoration takes place, a notice of such withdrawal, giving a description of the lands withdrawn, thus giving notice to the locator of the existence of this vital interference, at a point that he or his representative is bound to visit when he files his location notice. There should also be a notice of the withdrawal posted on the property itself or at a post office on the ground or its vicinity, so that the local people would be apprised of the action of the department.

Had this latter course been adopted, neither the Colorado nor the Arizona locations would have been made, as in either case there were sufficient local people who would have called the attention of the locators to the withdrawal, as no secrecy was observed in making the locations.

It may occur to the reader that an inquiry by mail would have brought the required information from the department, which is no doubt correct, only in this case, it was considered necessary to make a personal investigation of the records, which is much more satisfactory, especially in a case involving a large expenditure.

The regulations imposed on the locator by the statutes and the various rulings of the land department are stringent and detailed enough to warrant the other party to the transaction, viz., the United States Government, to throw the additional safeguard around the locations, which can be obtained by the recording of the withdrawal of lands in the county offices and the posting of notices of withdrawal and restoration on the lands in question.

The locator is not always a man who is well versed in the matter of titles to the United States mineral lands, and would generally neglect writing to the land office, to find out whether the property he has located was open to entry at the time of location. but he could hardly fail to have his attention called to the fact of the lands having been withdrawan, if the local population had notice of it.

H. J. Hohl.

San Francisco, Calif., Sept. 26, 1913.

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## Some Close Work in Iron Mining

In the Journal of Sept. 13, 1913, there is an article by Dwight Woodbridge, taken from the "Transactions of the Lake Superior Mining Institute" (p. 506), in which the following statement appears:

> In New York State there are large deposits of magnetites running, say, 40% iron and up to 2% phosphorus, that are being made into a high-grade bessemer ore by the elimination of the contained apatite, which is the mineral carrying the phosphorus. At Mineville they are now concentrating these 2% phosphorus ores at the rate of 1,000,000 tons per year, which is the capacity of their mills when working one shift per day. In these mills they are bringing their 40% ore up to 65% and their 2% of phosphorus they are reducing to 0.03% and they are making a product that does not vary from one month to another more than four or five one-thousandths of 1% in its phosphorus content. Such close work seems almost uncanny.

To one familiar with the Eastern magnetites and their treatment, such a statement provokes only a smile or at most a good laugh. Thinking that the members of the Lake Superior Mining Institute might take the statement seriously, I take the liberty of replying.

Mr. Woodbridge has fallen into error by forgetting that at Mineville at least three grades of ore are mined and three corresponding grades of concentrates are produced. The ore he describes as a 2% phosphorus ore is the "Old Bed" ore and a typical analysis of the crude ore and resulting concentrate is as follows:

| "Old Bed" Crude | | "Old Bed" Concentrates | |
|---|---|---|---|
| Fe | 59.59 | Fe | 67.34 |
| P | 1.74 | P | 0.675 |

These figures are taken from *New York Museum Bulletin* No. 19 (Newland and Kemp), p. 82. Although published in 1908, I am sure that the statement as to phosphorus elimination is as good now as then.

The fact is, there is also produced at Mineville, a "Barton Hill" Ore, which is a bessemer ore in the crude and of course a bessemer ore in the concentrates. To confuse "Old Bed" and "Barton Hill" in showing concentration results, would be like confusing a high-phosphorus Iron River District ore and that from the Pewabic mine at Iron Mountain.

To show further the results in concentrating high-phosphorus ores, I give below some typical results secured at the Cheever mine near Mineville. This property is controlled by the Bethlehem Steel Co.

| | Cheever Crude Ore | Cheever Concentrates |
|---|---|---|
| Fe | 38.00% | 61.00% |
| P | 0.426% | 0.32% |
| $SiO_2$ | 30.00% | 9.00% |

In this case the iron enrichment is secured almost entirely by the elimination of the $SiO_2$. In "Old Bed" Mineville ore it is secured by the elimination of $SiO_2$ and also pyroxene and hornblende, which are weakly magnetic. In both cases it is seen that a considerable percentage of the phosphorus in the crude ore remains in the concentrates.

I am sure the people responsible for the fine concentration results in eastern New York do not see anything "uncanny" in their achievements, but they may think there is something "uncanny" in the way their results are presented to the Lake Superior Mining Inst.

W. L. CUMINGS.

South Bethlehem, Penn., Oct. 22, 1913.

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## Argo Mill, Idaho Springs, Colorado

In the JOURNAL of Aug. 30, 1913, there appeared an article on the Argo cyanide mill, at Idaho Springs, Colo. We are keeping in close touch with the operation of this plant, as there are a number of our machines there, beside the fact that continuous counter-current decantation is used to recover the dissolved values. We wish to bring to your attention the following facts in regard to the Argo article.

The flow sheet, as published on p. 387, was one of several that were drawn at the time the mill was first talked of, but does not represent the flow of the mill as built, nor as operated today. The slime overflow from the duplex Dorr classifier in actual practice passes through a spitzkasten, the underflow from which is handled on No. 1 Card table. The overflow from the spitzkasten goes to Dorr *A*. The overflow from this can either be sent to precipitation via the clarifying filter, or be pumped direct to the head of the mill.

The underflow from Dorr *A* goes to the first agitator, which is a 20x12-ft. Dorr machine, and not to Card table No. 1, as shown. The other agitator is a Parral, which is causing a lot of trouble on account of the continual building up of the solids. The overflow from the Parral passes to Dorr No. 1 (thickener), and the flow through the three other thickeners and the Dorr classifier used as dewaterer is approximately as shown. The dewatering classifier is one of our three-deck washing machines which is used to wash out any dissolved value contained in the sand coming from the Card tables, and to recover the cyanide.

The middlings from the first set of Card tables pass to tables Nos. 2 and 3, the whole of the product from which, except the concentrate, going to the tube mill and Dorr classifier operated in closed circuit. The slime from this classifier gravitates to the two tanks, Dorr *B* and Dorr *C*, which are thickeners and not agitators. The thickened overflow then passes to the first Dorr agitator and on to the continuous decantation system.

In the sampling mill the 24-in. conveyor belt shown should be a cast-iron trough conveyor.

J. V. N. DORR.

Denver, Colo., Sept. 22, 1913.

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## Questions and Answers

### SKIMMING TAILINGS DUMPS

I read with great interest the description of recovery of valuable material from cyanide-tailing dumps appearing in the JOURNAL of Mar. 22, 1913. As this information was new to me, I had the crusts of our dump assayed at once and found that they contained sufficient gold and silver to warrant re-treatment. I would appreciate a full description of methods.

SUBSCRIBER.

The crust appearing on the surface of cyanide-tailing dumps is due to the evaporation of water from solutions containing dissolved gold and silver. Loss of water from the surface induces the rising of more solution through the capillary openings in the tailing, resulting in a concentration of gold and silver salts in the surface crust. These salts are, of course, soluble in water, and all that is necessary to recover the valuable materials is to dissolve, separate solution and solids and precipitate. When an operating mill is at hand, the recovered skimming is simply added to the material under treatment.

Skimming the dump may be performed in several ways, depending upon the result desired. If a very rich product is desired for sale to a smelting or milling plant, an extremely thin layer should be taken up, confining the material recovered, as nearly as possible, to the pure surface crust. This can best be accomplished by sweeping the surface lightly with a broom, operating on a quiet day, so that the valuable dust may not be scattered by the wind.

The dump surface, especially when it contains much slime, is very likely to be full of cracks through which most of the valuable dust may be lost. This difficulty is avoided by going over the surface to be swept and tamping the cracks with a shovel handle, or some similar instrument, closing the cracks and allowing the surface to be swept without losing the dust.

Should an operating mill be at hand, it will very likely be desirable to take up more than the surface crust, for the upper half or three-quarters of an inch will be impregnated with the valuable salts. In this case a square-pointed, long-handled shovel is used, taking up the surface for the required depth and forming little piles, which are later taken to the mill and treated along with the ordinary material. The depth which it is advisable to recover should be determined by experimental testing.

After a dump surface has been thoroughly skimmed, the whole process may be repeated by flooding the surface with a small quantity of water and allowing it to dry off again. The process is assisted by loosening the dump surface by plowing or spading, allowing the water to reach considerable depth. If running water is not convenient, rain will accomplish the desired result as well. Current tailing from a mill may be disposed with a view to future skimming, using new dump locations or depositing it over old dump which has been skimmed so often that further working is not profitable.

# EDITORIALS

## Metal Market Reports

Every two or three years we are attacked by somebody on account of our metal-market reports, especially copper. This has been during the last 25 years or so and is about as regular as colds in the head recurring in winter. The latest comes from Chicago. Our quotations are used extensively as bases for commercial transactions, buying and selling, and consequently they are often criticized, sometimes for being too low, sometimes for being too high. Naturally, everybody is not always suited.

We quote the market as it is according to actual transactions. We derive information from numerous quarters, both selling and buying, we make use of all the reliable reports that we can get, and we summarize the data, often discordant, to the best of our ability. We consult the agencies and smelters, to be sure, for it is they that sell the metals, and nobody could know much about the market otherwise. In fact, their offices *are* the market.

Our quotations are generally referred to because they are accurate. About all of the producers report each year what they get for their copper. Some sell on the basis of our quotations; many do not. It has not been observable that the latter realize more for their output. On the contrary, they do not on the whole come quite up to the quotational average. Persons—who think the markets are higher than they are—ought to try selling on their own account. We can't do anything but report the facts.

## The Flotation Process

The 600-ton experimental mill of the Inspiration Consolidated is expected to be ready for operation early in December. In this mill such mineral as can be extracted by gravity separation will be taken out in that way, after which the remainder of the ore will be treated by the flotation process, experiments with which have given highly encouraging results. The Inspiration company has, indeed, entered into a contract with Minerals Separation, Ltd., and contemplates the eventual installation of the process in a 6000-ton mill.

The caution of the Inspiration management in starting with only a single unit is explained by some opinions expressed at the last meeting of the New York section of the Mining and Metallurgical Society, at which the flotation process, speaking generally, was the subject of discussion. It was brought out there that the Minerals Separation process in some cases has been found to give seriously variable results according to just how it is handled, which statement *per se* is not, of course, unusual. A more precise statement would be, perhaps, that the oil flotation process requires more expert handling than does the ordinary method of gravity concentration.

Anyway, it is well known that the process installed by the Braden Copper Co. in Chile gave excellent results so long as it was operated by the experts from England. After they had turned the mill over to the mining company's men and had gone home the percentage of mineral extraction fell off very seriously, which is one of the main reasons why Braden has failed to make its expected production. The experts were recalled from England and they have improved things, but whether they will succeed in properly instructing the regular mill force remains to be seen. The Inspiration management has, no doubt, had this experience in mind.

Of course, the Braden experience may not be universal; probably is not. Nothing of the kind has been reported from El Cobre in Cuba or from Britannia in British Columbia, so far as we know. At both of those places the Minerals Separation process is said to be giving very satisfactory results.

## Engineering English

Prof. H. R. O'Brien, of the Oklahoma Agricultural and Mechanical College, Stillwater, Okla., contributed to *Engineering News*, of Nov. 6, 1913, an article in which he discusses the generally defective English of graduates of American engineering schools. Professor O'Brien introduces his argument by the following illuminating remarks:

> "There is a reproach attached to our engineering graduates, largely because they cannot express themselves in a written document," declared Prof. J. J. Flather, of the University of Minnesota, in a discussion on Engineering English, at a recent meeting of the Society for the Promotion of Engineering Education. To drive home this statement, he tells that some years ago a request came to him for a graduate of the mechanical-engineering department. The only limitation imposed was that the applicant should be able to write English correctly. The position was that of assistant to the works manager "who wanted a man that could express himself properly in English." "There were 26 men who graduated that year but I could not recommend any one for the position," declared Professor Flather. Not long since, the department of English at the Massachusetts Institute of Technology issued a pamphlet in which were printed a number of letters of application which had been written by graduates of that institution in answer to an advertisement that appeared in "Engineering News." These letters had been turned over to the department by a graduate now in a responsible engineering position, who had inserted the advertisement. Each of these letters had been written in such poor English that this alone had been sufficient to keep the writer from being employed for this $3000 position.
>
> Instances such as the above might be multiplied indefinitely. What is true in regard to the graduates of these two great engineering schools is true of practically every engineering school in the country. Engineers as a rule do not know how to use good English. They are weak in the most common fundamentals of grammar, punctuation and spelling. How to arrange a technical report according to the rules of unity, coherence and emphasis is beyond their utmost conception. The idea of filing a report on electrolysis at the general office or submitting specifications for building a concrete sewer, in clear, concise sentences and paragraphs, never enters their minds. These things are not by any means true of all engineers. Many of the older men in the profession use good English because they have served years of apprenticeship in the college of Hard Knocks. Among the younger men who have gone out from the engineering schools in the past few years, it is true—more true than most engineers are willing to admit.
>
> Engineers often give as their excuse for poor English that an engineer does not need to know how to write. Any

> man who makes such a statement is unfit to be called an engineer. Clear, definite, concise writing is, perhaps, the hardest to write, and yet this is the kind that the engineer is constantly called on to write. True, he does not have to write glowing descriptions of the sunset, nor does he have to work out essays on honesty. He does have to write letters of application, where his letter is put by the side of a dozen or a hundred others and his chance for the position depends upon his ability to state his case better than the other fellow. There are specifications to be submitted in competition, where the one that gets the award is the one that is expressed in the clearest manner. Contracts are to be drawn where one obscure clause may bring on a lawsuit Reports must be made to superior officers that will bring promotion or discharge—depending entirely upon the work. That an engineer needs English is too obvious to be discussed more.

The theme of Professor O'Brien's paper is the responsibility for the situation that he describes and the steps that should be taken to correct it. It does not interest us to reproduce that part of his paper which especially concerns the professional teacher. It is sufficient for us to join in driving home the fact that Professor O'Brien states, not only to undergraduates, but also to graduates; and the important bearing that deficiency in their use of language may have upon their careers. We are glad that this is becoming recognized in several of the leading schools, which are giving more and more attention to the matter.

In this connection the influence of the engineering press is not to be overlooked. The importance of the technical paper as a tool of everyday necessity and use, just as much a tool as a transit or an assay balance but of immensely greater magnitude in scope and application, was never more commonly recognized than now. Every man engaged in any art is still a student, and he is a backward student who does not make use of the special paper of his art and profession. That such use is increasingly made is evidenced by the increasing number of both readers and contributors.

In the writings of the latter that come to our office we think that we have discerned an improvement during the last 10 years. In saying this we do not have any individual in mind. We have not even any statistical records bearing on the subject. It is simply an impression that there is not now the necessity of "rewriting" so much to winnow grains of good wheat out of a nearly hopeless chaos of chaff, nor so much correspondence with authors to elicit from them a clarification of their obscurities as there used to be. On the whole, the contributions that come to us now are pretty well done; many are very well done.

This may be partly the result of work in the engineering schools, partly of the work of the engineering papers. The man who submits a carelessly phrased contribution and critically examines its mutations in editing is apt to derive some profit therefrom. In this particular, Doctor Raymond has been one of the greatest teachers that we have ever had, and the long series of his volumes of the transactions of the American Institute of Mining Engineers has been one of the greatest schools.

We recall the adage that an old dog can't be taught new tricks, but an old practitioner can be taught, or can teach himself, to write good English. There is a man of a name that ranks among our greatest, who was well along in years when he wrote his first book. The Ms. of that book was a tangled jungle of literary effort. However the ideas were there, and after they had been rewritten by a humble hack both the book and its author became famous. The author subsequently directed his attention to the use of language and made of himself a purist and a stylist, one of those whose work is passed by the editor to his assistants with the directions, "Take no liberties with this Ms. Edit it for typography, but let it be set up just as the author has written it."

## Book Title Page Dates

The McGraw-Hill Book Co., in one of its recent bulletins, takes up a question that is of much interest and importance to buyers of engineering and technical books. It states the case and gives the answer in so concise and conclusive a way that there is but little that can be added. It says:

> For several years we have adhered to the practice of retaining as a title page date the year of first publication of a book, on all books manufactured by us, until the book was thoroughly revised, and calling our reprints "Impressions," not "Editions." We have believed that "Second Edition" should mean a revision, and that unless the revision was thorough—not merely plate corrections—the title page should bear the date of first publication, and the reprint should be labelled "First Edition, Second Impression," without alteration of the title-page date.
>
> We have had occasion recently to protest to another publisher against this practice of calling reprints editions. This has been brought about by the complaints of some of our customers, who regularly buy all of their technical books from us, that they had purchased a so called new edition of a book of this publisher which was not, in fact, a new edition, but only a reprint.
>
> Very recently a well known bookseller urged us strongly to adhere to "the old-fashioned custom of changing title pages because his customers frequently hesitated to buy one or another of our books, fearing, because of the title-page dates, that they were old."
>
> The morals of this request seem to us about on a par with those of the fruit dealer who puts the fine, large peaches on top of the basket. Our only problem is to determine, in rare cases, whether our revision is sufficient to warrant asking the owner of an old edition to buy the new edition in its place. That is our standard.

The publishing of engineering books is a very different matter from the publishing of fictional literature. There is here no list of best sellers and there is here something of consequence in stating honestly the date of publication. The sale of any engineering book is relatively small, 1000 to 1500 copies for a reasonably successful publication, let us say. The publisher, not desiring to increase his risk unnecessarily, plates the book and prints 1000 copies. If the demand require, after the lapse of two or three years, the printing of another 1000 copies, the original plates are put again on the press. Material changes in them are seldom if ever made, it being very costly to change a book that is in plate form. Errors in names, or even in the statements of a paragraph, may be corrected by cutting out and patching certain plates, but that is about all that is feasible. The second printing is the same old book, and a false impression is conveyed if anything else be represented. The engineer who buys a book bearing upon some subject in which he has become interested, thinking that he is getting something recent because the publisher has advertised it as being of 1910, let us say, and learns from the copyright page that it was really of 1905, ends with the distinct feeling that he has been fooled.

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The promoters of mining companies offering shares to the general public now make a point of advertising that they have been licensed to sell their shares, if such be the case, under the Blue Sky laws of states which are mentioned. Such licenses are, therefore, referred to as a *quasi* indorsement of the company's shares. The Blue Sky laws, which have been modeled after those of Kansas, are more or less of a joke. In some cases, they have become a roaring joke, as reported by our Black Hills correspondent in the Journal of last week, who mentioned some of the peculiarities of the South Dakota law. We opine that some day some of these Blue Sky laws will prove to be mischievous.

## BY THE WAY

### After Huerta, What?

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Newspaper reports intimate that Pancho Villa, intoxicated by his success in taking Juarez, is contemplating a desertion of Carranza and the starting of a new revolution on his own account, after the fashion of Señor Orozco. Villa, it is said, was once patio foreman at the Tecolotes mine.

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The newspapers report that the Mexican Government is now raising money from the foreign business firms and corporations. Those in Monterey have been "requested" to help to maintain the army in that district. The American Smelting & Refining Co. is said to have been assessed for $12,500, the Monterey Steel Co. for $10,000 and the Waters-Pierce Oil Co. for $7500. It was said at the New York office of the American Smelting & Refining Co. recently that President Huerta has been raising money in this way for two months. "Have you met his demands?" a representative of the company was asked. "We had to, or he'd take us by the throat," was the reply.

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This is a recent newspaper dispatch from Houghton, Mich.: "Despite a night of terror at Painesdale and Trimountain, where strikers in ambush fired repeated volleys at deputy sheriffs and mine guards protecting mine property and several workmen had narrow escapes from mobs, all the nonunion men went to work Tuesday morning. The firing, which continued from nightfall to daybreak, is believed by the officers to mark the opening of the campaign to intimidate workmen because of the rapid strides the Copper Range Consolidated is making toward normal production. The force of deputy sheriffs on the South Range has been increased. Tuesday passed without serious trouble. A score of strikers were arrested in connection with the night shooting." This causes us to rub our eyes and wonder whether the Michigan dispatch did not become confused with something from Mexico.

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The *Wall St. Journal* reports that India is taking measures to promote gold deposits in banks at a lucrative rate of interest, in order to arrest the burying of gold treasure, as silver has been buried in India for more than 100 years. According to Sir George Paish, the record for 1913 will show another $100,000,000 of gold buried in India, lost to the civilized world of the present time as though it were thrown into the ocean. In 1912 and 1911, more than $200,000,000 of gold disappeared into India. It is no longer safe to talk about the output of South African gold as the cause for rising prices, when an arm of the British Empire is burying 30% of the gold South Africa is producing. Indeed, Sir George Paish believes that we have turned the corner in commodity prices, and that we are now in for a recession in commodity values.

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What is going on in business and finance is accurately summarized by the financial editor of the New York *Sun* in these words: The foreign dispatches tell of more and more contraction in leading lines of industry on the Continent and in Great Britain, and it is a common topic of conversation in our own country today that business is falling. It is not in human nature to welcome the processes of cure that are being applied, but if the gravity of the economic disorder which has afflicted us is recognized there is not apt to be so much risk of unwise rebellion against the application of the remedy and of unwise effort to abort the processes of cure. That precisely was the mistake which was made in the sequel to the 1907 panic. We were then unwilling to recognize the panic as proof of the serious derangement of fundamental conditions. The panic was treated as a psychological episode not warranted by facts, and that is one of the main reasons why our times have been out of joint since. There has been a far more sane appreciation of facts in the past 12 months, and the sanity is owing chiefly to Europe's intelligent perception of the disclosures incident to the Balkan upheaval last autumn. That upheaval brought on a worldwide crisis, but the outbreak of war in the Balkans was not the cause of crisis. It was merely the accident which showed that the world's supplies of capital had been extravagantly consumed and that credit has been abused to make up for the deficiencies of wasted capital.

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The New York *Sun* clearly has a correct idea of conditions in Mexico, as the following from a recent editorial shows: The Hague War Regulations as to the treatment of prisoners of war state the practice of civilized nations:

> Prisoners of war are in the power of the hostile Government, but not in that of the individuals or corps who captured them. They must be humanely treated. All their personal belongings, except arms, horses and military papers, remain their personal property.

The Federal and the so called Constitutionalist forces have a simpler rule. Death, with sometimes the privilege of digging their own graves, is the law of the vanquished. Often a private soldier of the conqueror on any field or after any siege gives the quietus to a squad of prisoners. A "victory" is followed relentlessly by the murder of the soldiers of the other side who cannot make their escape. There are no laws of war in the Mexican campaign. Santo Domingo or Hayti in its worst days of savage massacre was not bloodier or more brutal than those "patriots" to the south. Other diversions worthy of old Dahomey, violence to women, slaughter of noncombatants, torture, multilation, are reported in sickening numbers, especially in that part of Mexico that enjoys the virtuous activity of Carranza, the benevolent old gentlemen who proposes to execute everybody who adheres to his rival Huerta. Only disgust and horror can accompany the "victories" of these bloodthirsty banditti. The civilization of the 20th century is ashamed before this revival of the cruelest barbarities and butcheries of wars of extermination. How long will the civilized world stand for these monstrous inhumanities?

## The Radium Supply

Lecturing on radium before the Society of Civil Engineers, in Paris, last week, M. Paul Blesson stated, according to the N. Y. *Sun,* that the latest statistics on the quantity of salts of radium existing at the present moment in the different scientific and medical laboratories prove that there are not more than 6 to 7 grams of metallic radium in the whole world. From the creation of the radium industry in 1899 under the impetus of Professor Curie up to 1904, only 2 to 3 grams of radium were extracted from 13 tons of pitchblende residues, and these 2 to 3 grams were supplied to the laboratory of M. and Mme. Curie.

Then the Austrian government prohibited the exportation of radioactive ore from Joachimsthal and radium had to be extracted in France from much poorer ore, containing 0.5 to 2 mg. of radium to the ton, such as autunites from Portugal and carnotites from Colorado, whereas pitchblende residues contained from 100 to 200 mg. of radium to the ton.

In recent years Austria has not treated more than 3 to 4 tons of pitchblende annually, yielding less than one gram annually. America and England do not yet produce salts of radium. The command of the production and the market are held in France. The price of a gram of hydrated radium bromide is about $80,000, which makes the gram of pure metallic radium worth about $156,000.

The chief holder of radium is Mme. Curie, with about 2.6 to 3 grams. After her comes Sir Ernest Cassel.

[There is a good deal of uncertainty respecting the supply of radium. While the above report appears to come from a good source, we are inclined to think, in view of the considerable shipments of ore containing radium, that are regularly being made from Colorado, that the actual supply of radium must be greater than M. Blesson states. It is worth while to report that the U. S. Bureau of Mines is taking steps to produce radium at Denver, Colo., with the coöperation of Dr. James Douglas, who is greatly interested in this subject.—EDITOR.]

## Preparation of Barium Sulphide

In a recent number of the *Gazetta Chimica Italiana* (abstr. *Chem. Tr. Journ.*, Oct. 1, 1913), Messrs. Merino and Danesi described a method which they have devised for the conversion of barium sulphate into barium sulphide at a low cost. It is recommended that a long rotary furnace of iron, lined with refractory material, and slightly inclined to the horizontal, be used, water gas free from carbon dioxide being employed both as reducing and heating agent. Working at a temperature of 600° to 650° C., the size of the discharge opening and the speed of rotation of the furnace are so regulated that the barium sulphate remains in the furnace for one hour; a yield of 95 to 98% of barium sulphide is obtained. The escaping gases contain only traces of hydrogen sulphide. Strontium sulphate and calcium sulphate can be reduced in a similar manner, but somewhat higher temperatures are necessary, and in the case of calcium sulphate small quantities, and in that of strontium sulphate, traces of oxide and thiosulphate are formed in addition to sulphide.

The cost of fuel per ton of barium sulphide produced is stated to be 14s. 6d. less when water gas is employed than by the known method of reduction with solid carbon, and in addition, a purer product is obtained in shorter time and with less labor.

## The Chisana Gold District of Alaska

### By Phillips Thompson*

The section of the Yukon Territory immediately adjoining the Chisana gold district in Alaska, is one which the Geological Survey of Canada has regarded as offering exceptional promise, and for some years the investigation of the region has been in contemplation. Circumstances prevented this until the present year, when two parties were sent into the district, a topographical party under W. E. Lawson and a geological party in charge of Dr. D. D. Cairnes. These parties were at work in the district when the rush to the Alaskan placer field commenced and Doctor Cairnes visited the discoveries in August to correlate the geology of the Chisana with that on the Yukon side of the line, and to determine whether the gold-bearing gravels are likely to extend into Canadian territory.

He reports to the Survey that throughout a small area within Chisana district, Alaska, not exceeding 10 or 12 miles in extent, rich gold-bearing gravels have been found, but what the adjoining territory may contain is as yet problematical. The geological formations and other general characteristics appear to persist to the eastward well into Canadian territory, 30 to 40 miles distant, and it is quite possible that further valuable deposits of placer gold may be found within this belt.

The original Chisana discovery generally known as the James discovery, is located at about latitude 62° 10′ N and longitude 141° 55′ W. The gold-bearing belt lies along the southern edge of the Notzotin mountains and within 25 miles of the northern slopes of the snow- and ice-capped Wrangell Mountains. The Chisana gold deposits, situated as they are near the head waters of the White and Tanana rivers, are in a district which is difficult to reach, and may be considered one of the least accessible portions of Alaska. Five main routes are available, two of which may be considered as Alaskan and the remaining three as Yukon routes.

The two Alaskan routes are respectively by way of the Copper River & Northwestern Ry., and the Tanana River. All three of the Canadian routes proceed from the tidewater at Skagway River over the White Pass & Yukon Ry. to Whitehorse, a distance of 110 miles. From Whitehorse, the routes diverge and may be named the Kluane, Coffee Creek and White River routes, respectively. The Canadian routes are all available throughout the entire year, but traveling and freighting are easier, quicker and cheaper in the winter, when sleds can be employed. It is difficult to say which of them is the best.

Little was known concerning the particular locality of the discovery until the past summer, but geological work had been performed in adjoining territory on practically all sides of the district, so that a great amount of general information was available. The creeks in which the gold has been found are tributary to the Chisana River, from which the district takes its name. The name

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*Oakville, Ont., Canada

"Chisana" appears on the older authentic maps, the name of "Shushanna," which has frequently appeared in the press, being a corruption. The district is mountainous, but immediately adjoining the gold-bearing creeks, is not rugged, being undulatory in character. The mountains to the north, in which direction these creeks head, are quite rugged and rise to elevations of 9000 to 10,000 ft. above sea level, the James discovery being about 5000 ft. above the sea. All the higher elevations, including the main gold-bearing creeks, are above timber line.

The geological formation is dominantly sedimentary and consists of dark-gray and black shales and slates which are extensively invaded by basic volcanics, occurring prevalently in the form of dikes less than 100 ft. in thickness. The strata of the prominent, easterly-trending range toward which the gold-bearing creeks head, and which are undoubtedly the source of all the placer gold, have been very highly mineralized as a result of this igneous invasion, and have a general bright-red appearance throughout, due to leaching and oxidation of the contained iron-ore minerals. No evidence of glaciation was detected, which partly accounts for the presence of the gold. Had the district been glaciated, the water-sorted accumulations of gold in the gravels would have become scattered through enormous masses of unsorted material, and would thus have been lost.

Gold is believed to have been first discovered in Chisana about May 3, last, by William E. James and Peter Nelson, of Dawson, who had spent the previous winter prospecting in White River district. The partners commenced sluicing on Discovery claim on Little Eldorado Creek, on July 4, and by Aug. 2, had obtained about $9000 from this claim, an average of about $300 per man for each eight hours of work performed. When Doctor Cairnes left the district on Aug. 4, the Discovery was the only claim from which any considerable quantity of gold had been obtained. Since that time, however, from information from what are thought to be reliable sources, it appears that a number of other properties have become important producers.

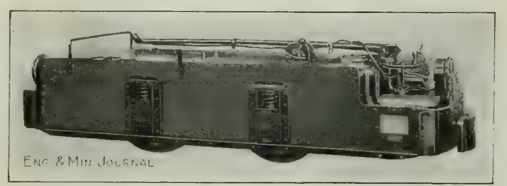
The creek gravels are not frozen in summer, as they are not covered by muck or moss, but the bench gravels are frozen in most places throughout the year. A number of the present streams have comparatively recently formed cañon-like valleys, and in places the material of the older stream channels is quite apparent and the gravels they contain constitute the main bench gravels of the district. From these gravels, it is possible that the bulk of the gold will be obtained either from the old channels themselves directly, or from the present stream channels, where these cut the older gravels. In such places the gold originally in the older gravels is now concentrated in the gravels of the intersecting streams. The creek gravels are easily worked, being in most places less than 4 ft. in thickness, and not over 100 ft. in width and they constitute typical prospector's diggings as a minimum of equipment, time and labor is required to obtain the gold. The hope that the gravels in the adjoining Canadian territory may also prove rich in gold is entertained, as James and Nelson, the Chisana discoverers, claim having found pay in Frying Pan Creek in the Yukon, in the course of their operations last winter. They state that they were obliged to stop work there as water came in so rapidly when they reached bedrock, that the pits had to be abandoned.

Several thousand men went into Chisana district this summer, before the freeze-up, but with rare exceptions they were prepared to remain only a few days, so that possibly there were no more than 300 or 400 persons there at any one time. A number have now returned with large outfits, prepared to spend the winter prospecting and getting ready for work in the spring. A considerable number of cabins are being built and a post-office and mail service established. It is expected that by spring there will be plenty of provisions and ordinary outfits available at the camp, though prices will naturally be high. Practically all the known valuable ground was located by Aug. 1, and all persons going in should be prepared to do *bona fide* prospecting, in which case important discoveries may be made quite outside the area at present considered valuable. Nearly all the fatalities attending the stampede might have been avoided, had those going into the district been properly outfitted.

## Pioneer Electric Locomotives in Alaska

What are thought to be the first electric locomotives used in Alaska were placed in service within the past few months for mining operations by the Alaska Treadwell Gold Mining Co., at Treadwell, Alaska. The two locomotives are each of six tons capacity, and are operated on a 500-volt direct-current circuit from an overhead trolley. They were manufactured by the General Electric Co. and are of the standard outside-frame type, with type HM-801 motors having ball-bearing armatures.

The motors are of the usual series-wound type, and the controller is of the rheostatic magnetic-blowout type. A commutating switch is incorporated in the reverse cylinder, the handle of which has four "on" positions, two for each direction of motion, one with the motors in series and the other with the motors in multiple. This system of control, by permitting the motors to be started in multiple, allows them to exert their maximum tractive effort independently, so that the slippage of one motor does not affect the other. The locomotives are operated on the track leading from the central shaft house to the various mills and haul ore trains composed of ten or more trailers aggregating a gross trailing load of 80 tons.



Gathering Locomotive for Alaska Treadwell Company

## Zinc Smelting in the Electric Furnace

Regarding the slags from the Johnson electric zinc furnace, described in the Journal of Nov. 22, we are advised by Ledoux & Co., that it has assayed a sample of 5854 lb. of slag made in a 266-hour run, with the following results: Sample dried at 100° C.; $Al_2O_3$, 10.81%; Cu, 0.12; Pb, none; Zn, 0.65; Ag, 0.15 oz. per ton; Au, trace.

## PERSONALS

Arthur W. Burgren, of Matehuala, Mexico, is now at 4143 Holbrook Bldg., San Francisco, California.

Herbert C. Enos is at present in Colorado, where he has been inspecting a number of the large mines.

W. F. Battersby has been appointed mill superintendent of the Dome Mines Co., South Porcupine, Ontario.

M. G. Doll has accepted a position as general sales manager with Bury Compressor Co., Erie, Pennsylvania.

C. W. Merrill, of San Francisco, who has been spending two months in the East, returned to San Francisco last week.

R. B. Lamb, of Toronto, Ont., has gone north on a professional trip through the Cobalt and Porcupine mining districts, and expects to return about the end of November.

Kenichi Nakamura, representative of the Japanese government board of railroads, who has been delegated to conduct a series of railroad investigations, has arrived in this country.

C. Ewald Grunsky, Jr., mining engineer, formerly superintendent of the Standard Consolidated Mining Co., has associated himself with the American Engineering Corporation, San Francisco.

Thomas J. Grier, general manager of the Homestake Mining Co., of South Dakota, has been visiting New York. After a trip to the West Indies he will return to New York before proceeding to South Dakota.

At the recent fair, held in Prescott, Ariz., Mohave County, secured first prize for the excellence of its mineral exhibit. The credit for the gathering and arrangement of the exhibit is due almost entirely to W. O. Ruggles.

W. M. Corse, works manager of Lumen Bearing Co., Buffalo, N. Y., has resigned to become general manager of the Empire Smelting Co., Depew, N. Y., on Jan. 1. H. P. Parrock, sales manager, will assume Mr. Corse's duties as superintendent, combining the two offices.

Dr. L. W. Stephenson, geologist and paleontologist of the United States Geological Survey has received leave of absence for four months from Jan. 1 and during that time will act as professor of Paleontology at the University of California during the absence of J. C. Merriam.

Dr. Richard Moldenke, Watchung, N. J., and Walter Wood, R. D. Wood & Co., Philadelphia, sailed for London on Nov. 15 to be away about a month in connection with the committee on specifications for pig iron and castings of the International Association for Testing Materials.

George Nash, general superintendent of the plant of the Pittsburgh Steel Co., at Monessen, Penn., has been appointed general manager of the company's entire works, located at Monessen, Glassport and Hamilton, Ont. C. J. Morgan, former assistant to Mr. Nash, has been appointed general superintendent.

C. V. Kerr, organizer of the Kerr Turbine Co., and later with McEwen Bros., of Wellsville, N. Y., recently joined the staff of the A. S. Cameron Steam Pump Works, New York. Mr. Kerr delivered an interesting address on "A New Centrifugal Pump with Helical Impeller" at the last monthly meeting of the American Society of Mechanical Engineers.

Hymel Davies, of Lexington, Ky., and W. J. von Borries, of Louisville, Ky., announce their connection under the firm name of Davies & Von Borries, consulting mining, civil and industrial engineers. The firm is prepared to make reports, plans, maps and surveys for mining, industrial, municipal and railroad projects and operations, and to supervise construction.

## OBITUARY

Dr. Adolf Hoffman, professor of geology in the mining school at Przibram, Bohemia, died recently, aged 60 years. He was well known as a lecturer and writer on geological topics.

Guy A. Du Bois, president and general manager of the Byron Jackson Iron Works, San Francisco, and designer of the gold dredge which bears his name, died Nov. 12 at his home in Berkeley, Calif., aged 45 years. He was a native of New York. He leaves a widow, two sons and two daughters.

Charles D. Smythe died at Angel's Camp, Calif., Nov. 6. He was 87 years old, a native of Prussia. He went to California when a young man and had been a resident of Angel's Camp for 25 years. He was owner of the Smythe quartz mine and mill, and had followed mining since going to California.

W. W. Leach, of the Canadian Geological Survey, died at Ottawa, Nov. 16, aged 41 years. After graduating from McGill University, Montreal, he engaged in mining engineering for a few years until his appointment to the Geological Survey. He was in charge of many expeditions into unexplored areas, and his researches made some important contributions to the knowledge of the mineral resources of Canada. He was one of the collaborators in the preparation of the textbook issued under the auspices of the International Geological Congress on the "Coal Resources of the World."

Jay Morse Pickands, member of the firm of Pickands, Mather & Co., Cleveland, Ohio, died suddenly in that city Nov. 18. He was the youngest son of the late Col. James Pickands, one of the founders of the firm and was born in Marquette, Mich., 1880. He was graduated from Yale in 1902 and 1903 became associated with Pickands, Mather & Co., in the pig-iron department. In April, 1911, he was admitted to the firm. He was a member of the American Iron & Steel Institute and the Union, Country, Athletic, Tavern and Mayfield clubs in Cleveland. He leaves a widow and a daughter.

## SOCIETIES

**Mining and Metallurgical Society of America**—A meeting of the New York section will be held at the Engineers' Club, New York, on Thursday, Dec. 18, at 8 p.m. The subject of discussion will be the one-man drill.

**American Institute of Mining Engineers**—The annual meeting of the Columbia Section—formerly the Spokane Section—was held at Wallace, Idaho, Nov. 15 and 16. A few members of the recently formed Montana Section were also present. A business meeting on Nov. 15 was followed by a visit to the Hercules mill at Wallace. In the evening a technical session was held at which two papers were presented, one prepared by Professor R. S. McCaffery, of the University of Idaho on the "Electric Smelting of Complex Lead-Zinc Ores," was read by Professor Bard, of the University of Montana, in the absence of the author. The second paper was presented by Rush J. White, of the Federal Mining & Smelting Co. on "Treatment of the Refractory Morning Ores." A lengthy discussion followed the presentation of each paper. F. G. Cottrell, of the Bureau of Mines, told briefly of work which has been accomplished in the treatment of complex ores, especially those of the copper-zinc type. On Nov. 16 a visit was made to the Bunker Hill & Sullivan plant at Wardner, where besides the mill and yards the excellent mine models were seen. A luncheon was held in Wallace after the return of the party. In the afternoon a special train was run to the various plants near Mullan. The Snowstorm mill was visited where the concentration of a low-grade copper ore is the problem. The new National mill was next visited. The construction work is going on at this plant and no machinery has as yet been installed. This mill will handle a low-grade copper ore, but unlike the Snowstorm mill it will be accomplished principally by flotation. The last stop was made at the Morning mill, and this proved especially interesting for it had been described at the technical section by Mr. White. After the return to Wallace the members and their guests partook of a banquet, which was remarkable for the good fellowship shown on all sides.

## INDUSTRIAL NEWS

Phillip P. Bourne has recently been appointed chief engineer of the Epping-Carpenter Pump Co., with shops at Pittsburgh. Mr. Bourne was for eight years chief of the engineering staff at the Blake-Knowles steam pump work, East Cambridge, Mass. This appointment is in line with other recent activities of the Epping-Carpenter company, in strengthening its organization and enlarging the plant.

The Dorr Cyanide Machinery Co. has opened an Eastern office at 50 Church St., New York, to handle its expanding business in metallurgical and industrial lines. The Dorr thickener is now being installed by the large copper companies quite extensively, both in connection with water concentration and flotation process. Mr Dorr will spend a great deal of his time in New York this winter in connection with the business of the company and professional work.

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Nov. 19

**Right to Diverge Waters of Owens River** through Los Angeles aqueduct is being contested by Natural Soda Products Co. in Superior Court of Inyo County at Independence. It is charged by plaintiff company that 80% of the water sought to be diverged by aqueduct system is contemplated by city of Los Angeles to be sold for irrigation purposes and not to be used for municipal purposes. Plaintiff company complains that aqueduct will wholly drain Owens Lake and destroy the soda industry which is capable of producing 70,000,000 tons of salts.

**The California Oil Bulletin,** promised by State Mining Bureau is in preparation. R. P. McLaughlin, a practical petroleum engineer formerly in employ of Associated Oil Co., has been engaged to do the field work and prepare data for a bulletin that will treat of practical operation of wells, marketing and refining of crude product. Mining bureau has contributed to geology and chemistry of petroleum occurrences in state more than to industrial and commercial phases of production and marketing. It is the practical side of the industry that is desired by investors in oil wells and by consumers of oil, and it is expected that the bulletin in preparation will fill the demand.

**Reopening Pipe Line Cases** by state board of railroad commissioners was set for Nov. 20. The common carrier law will be enforced by commission, provided the several pipe line companies can be forced to regulate their rates and terms of transportation to meet requirements of law and satisfy demands of shippers. Regulations to which Standard desires shippers shall submit, unwillingness of Associated to become a common carrier and hope of many producers for an economic system of pipe line transportation combine to give commission a good deal of food for thought. When the commission settles the matter to satisfaction of themselves, constitutionality of the law may rise up to disturb them, as that phase of the situation has not yet been seriously taken up.

### DENVER—Nov. 22

**Relief from the Coal Strike** is now hoped for, as dispatches from Washington, Nov. 18, indicated that the Government is to take part in settlement. The President, it is stated, has instructed Secretary of Labor Wilson, now on Pacific coast, to go to Denver and to bring the factions together. Governor Ammons also hopes to bring about settlement and is in communication with prominent labor leaders with view to have them use their influence with Colorado officers of the United Mine Workers to call off strike, proposing to them that if strikers will return to work he will assist in having a law initiated which will compel arbitration of all further labor difficulties. The morning of Nov. 18 the fifth explosion since strike began, occurred at Piedmont, when dynamite was exploded under the house of the town marshall. Huerfano, Sunnyside, and Black Diamond mines, reopened, troops guarding miners as they returned to work. The Supreme Court ordered State Auditor Kenehan to issue certificates of indebtedness for maintenance of state troops. Denver bankers will cash them charging 4%. Efforts were made to induce United Mine Workers employed in Wyoming collieries, of whom there are more than 8000 to walk out on sympathetic strike, because Wyoming operators are shipping coal into Colorado. This was set at rest by President A. G. Morgan, of the United Mine Workers, who issued a statement that such strike was not under consideration, would not occur, and that it was "impossible," because of an agreement with operators covering wages, hours of labor, working conditions, methods of adjusting disputes, etc., which would not be violated. Eugene Debs is in Denver and according to leaders of United Mine Workers, he is here to urge a strike among Colorado railway employees in sympathy with coal miners' strike. He makes the statement that "Colorado is in the throes of one of the greatest industrial conflicts in the history of the nation, and that a state of civil war exists, though people do not seem to realize it." However, in face of all this trouble, coal dropped 50c. per ton Nov. 20, this reduction being announced by Rocky Mountain Fuel Co. There is an ample supply of coal on hand, and upwards of 400 carloads are standing on railway tracks in Denver, and northern mines are working at full capacity. At this writing the strikers are apparently rapidly losing ground. Steel, railroad and wire mills of the Minnequa plant of Colorado Fuel & Iron Co. were started again Nov. 17 with 8 open-hearth furnaces and about 1200 men have been taken back to work. Soon after commencement of strike output of Colorado Fuel & Iron mines was so curtailed that force at steel plant was reduced from 4000 to about 800 men, but for two weeks now company has been receiving big coal shipments, and sufficient has been stored to run the plant for some time. It had been practically closed for about four weeks.

### BUTTE—Nov. 19

**Butte & Superior** is putting in a Kelly filter press plant for reducing moisture in blende flotation concentrate. At present this contains about 13% water, and having to go to smelters in Oklahoma, whither freight rate is high, there is an expense of about $1 per ton of concentrate for freight on water. It is hoped to make some saving here.

**Electric Light and Power Rates** hearing before public utilities commission of Montana, began Nov. 13 at Helena. Hearing was on subject of electric light and power rates charged consumers, in Butte, Anaconda, Billings, and other cities in state by Montana Power Co. Company asked for an adjournment of six months in order to complete valuation of its properties, started last July, so that a scientific basis of rate making could be obtained. The day was taken up with testimony of expert witnesses on subject of rates and conditions governing them, and at adjournment it was decided by members of commission that request of company for an extension of six months be decided next day. The following day commission denied this request, stating that whereas it realized that it would be impossible to make an inventory, appraisal, and cost analysis of such extensive properties as those owned by Montana Power Co. in less than six months, yet it believed that certain reductions should be made now in order that people of state should benefit at earliest possible time, and especially during coming winter months when rates are particularly burdensome. It however recommended that company continue in its work of appraisal so that at end, in event that reduction in rates, to be settled upon by commission, should be found unjust, a readjustment might be made. An adjournment of hearing until Nov. 28 was then ordered, at which time a schedule of reduced rates, drawn up by commission, will be given company for consideration.

### HOUGHTON—Nov. 22

**Secretary Wilson's Speech** at Seattle was the chief encouragement given strikers in the Michigan copper country this week. The speech was used quite generally to arouse further enthusiasm in the strikers to maintain their attitude of defiance to the mining companies. Wilson was followed on the same platform by Gompers, Ryan and Walker and other socialist orators who told stories of conditions at Calumet that were retold all over the United States, Associated Press dispatches carrying a 1000-word story on the situation. Notwithstanding that in these addresses palpable falsehoods were made, well known to everybody here in the copper country, the fact remains that the majority of newspaper readers never see the denials that follows such stories, if any do follow, and they believe that men like Gompers and Lennon tell the truth and know whereof they speak. People here, naturally, are indignant at the address of the Secretary of Labor. The explanation of the Gomper's address is that he had to go the limit of socialist doctrine in order to get himself reëlected president of the American Federation. The general effect of the attitude of these various federation leaders is to bring about further contributions to the financial end of the strike from labor-union men throughout the country. With the exception of the clash at the Quincy early Monday morning, Nov. 17, between the strikers and the deputies, in which a striker was wounded by revolver shots, there were no further serious disturbances in the strike zone. Morning parades, which really amount to mass picketing, were held as usual. The quietness prevailing is probably due to awaiting decision of the Supreme Court, which heard arguments in the mandamus proceedings on the O'Brien injunction Tuesday. Preparations for landing imported men continue in Keweenaw County and mines to the north, and probably as soon as accommodations have been obtained, a large force of men will be brought in. Representative McDonald, from this district, has asked for a Federal investigation into the conditions of the copper strike, and what the outcome of this will be is problematic. The Department of Labor sent investigators into the district early in the dispute and made a thorough investigation. The Department asked 110 questions of the companies, covering the entire situation, which were answered in full, and the Copper Country Commercial Club, which comprises about 500 representative business men in the district, appointed an investigating committee, which has rendered an exhaustive report, and it is doubtful if anything new can be brought out. Calumet & Hecla, and Superior are producing normally. Others gradually are coming up to normal. This is being done in spite of all kinds of intimidation. The fact is that the trammers who continue to strike are content to live on the poor food furnished by the federation, and to let their wives and families eke out a bare existence. The extent of their labor is to walk in the daily parade, which they must do to get their order for goods at the federation place of business. These chaps have become so accustomed to loafing that it will be difficult for them to get into the habit of working again.

### SALT LAKE CITY—Nov. 20

**Salt Lake & Alta R.R.** from Midvale to Wasatch and granite quarries in Little Cottonwood cañon was completed, Nov. 15. Several trainloads of granite for new capitol building were sent over line before this date. Granite is being quarried as rapidly as possible, and since opening of railroad working forces have been increased. Line is 11 miles long, and will soon be opened for all kinds of freight and passenger traffic. It facilitates ore hauling from camp of Alta. Rate heretofore has been $2.75 to $3 per ton from mines to railroad cars at Sandy. Present railroad comes to within three miles of lower terminus of Alta tramway down Little Cottonwood, and materially shortens the wagon haul.

**Utah Copper Co. Taxes** paid to county treasurer, Nov 15, amounted to $200,000. Payment was made under protest, as there is a question with the county, over method used in determining value of company's taxable property. About $35,000 of the $200,000 is claimed to be in excess of the amount actually due. Suit to recover this excess from county will be filed in federal court in near future, according to letter of protest sent with check. Last year a similar suit was filed, after taxes had been paid, and company won in local court. The county appealed to federal court of appeals, which will meet in St. Paul, and hear the case in April. Until former case is decided, county can collect taxes on present basis of assessment.

### DULUTH—Nov. 21

**Ore Shipping for the Season** of 1913 is practically over, but it will be a few days yet before final and exact statistics of the season's movement will be available. The grand total will not be far from 49,200,000 gross tons, which is about 1,000,000 tons in excess of the shipments in 1912. Earlier in the season the movement seemed to be in a fair way to cross the 50,000,000-tons mark, but later it fell off heavily. Considerable ore that was sold for delivery this year has been carried over for delivery in 1914. As near as can be ascertained the ore movement from Minnesota this year has been 36,565,000[1] tons of the estimated grand total for Lake Superior of 49,200,000 tons. Great Northern reports 13,050,000 tons, Duluth, Missabe & Northern, 12,300,000 tons, Duluth & Iron Range, 10,500,000. The movement from the Cuyuna range is estimated at 700,000 tons, the bulk of which was delivered at the head of the lakes by the Soo Line, and the rest by the Northern Pacific. The latter's dock did not go in commission until August. Great Northern suffered a loss of about 900,000 tons as compared with 1912, owing to the ore dock strike at its Allouez properties last summer. The Steel Corporation shipments this season have been about 23,700,000 tons, substantially the same as during 1912. The new steel and concrete ore dock for the Duluth, Missabe & Northern road, to be known as No. 5, is to be completed earlier than was originally expected. It was estimated when the work was begun that it would be ready for receiving ore in the spring of 1915, but President W. A. McGonagle, of the Missabe road, states that a part of the dock will be ready to go in commission during the autumn of 1914. The foundation is completed, and the American Bridge Co. is now erecting the steel superstructure. The Missabe docks are expected to close Nov. 24, Soo Line dock, Nov. 13, Great Northern, Nov. 29. All the other docks are closed now.

### JOPLIN—Nov. 22

**The Issue of Lowering Wages** throughout the sheet-ground camps was forced by the decline in ore prices this week and Saturday night saw the announcement of 10% reduction by a large number of producers at Webb City, Carterville, Prosperity and Duenweg. In some cases the reduction was offered as an alternative to closing down the property for an indefinite period so the miners have accepted the cut in order to keep employment. The cut was made with the understanding with the men that with a resumption of normal prices of $45 and over the wage scale would be raised again. It has been the custom ever since 1907 that when ore prices fell to $45 a cut was made and with a further reduction to $40, another cut was made approximating 10% each time. When prices regained their levels, the old wage scale was automatically resumed. During the last few months, however, operators have tried to carry on their old $45 wage scale even with ore below that figure. Most of the mine operators have felt that the low prices would end soon but the long stretch of low prices has discouraged them and the cut was finally announced. In some instances, however, the operators announced suspension of operations till a better price period. While the wage cut has been confined to the sheet-ground areas so far, it is likely to be introduced elsewhere in the district following the announcement today.

### BISBEE—Nov. 17

**Winter Work in Warren District** is well started, and January is expected to see the biggest pay-roll in history of the district. As compared with November a year ago, pay-rolls are at present much larger. Estimates on the larger number of men employed now than a year ago range from 15 to 35%, with the majority opinion favoring the latter figure. It is an excellent class of labor, too, on the whole, particularly so as measured by the best standard to be found in industrial centers, the preponderence of married men. These have constantly increased on the pay-rolls of the Warren district, in the last few years, and the percentage of gain the present year has been marked. It is steadily continuing.

**Copper Queen Surface Construction Work** now underway is extensive and much new work is being done underground. At the new precipitation plant satisfactory headway is being made. It is noticeable in this connection that preparations have been made in the way of general cleanliness for most any sort of sloppy weather that may come about in the winter season. Of course, as winter weather goes when measured by freezing temperature and blizzards, the Warren district has none of it, but there have been winters in which there was considerable rainfall, though none in which men have not worked out of doors in their shirt sleeves a part of each day at least. Nevertheless, it looks good to see things as shipshape at the beginning of winter as if there was really to be real winter weather, and that is the form they are in here now. Now is the time that men begin to come in from all of the colder climates. Some of them are, of course, not the most desirable of citizens, but with them come many who are good miners and who will remain and become good citizens. During the last few weeks the new arrivals have been noticeable about the streets. The best feature in connection with this and one that tells a great deal about the activity of the district and its prosperity, is that none of these men remains idle who really wants work. Some of them do not care to look it in the face, but those who want employment are going on the pay-rolls, and they are not displacing anybody in doing so.

### SILVER CITY, N. M.—Nov. 18

**The Organ Mining District** 13 miles from Las Cruces has been boomed by the indorsement of the directors of the El Paso chamber of commerce in a resolution recommending the district as "being worthy of investigation." The region is now practically idle, but one with much good property ready for development. The El Paso smelter in years past is said to have bought the bulk of the product of the mines, though much was shipped to Torreon, Mexico. Development has been held back by extensive litigation but this is gradually clearing away, but water was an important factor in closing down some of the lead-silver mines.

### VANCOUVER—Nov. 17

**A Blast Furnace at Vancouver** may be built for production of pig iron provided financial arrangements, at present being carried on in Europe, are successfully terminated. If the furnace is successfully operated rolling mills, etc., will be built. The company which is backed by Henry Hewett & Son, of Tacoma, Wash. and T. D. McFarland, of Vancouver, is to be capitalized at $15,000,000. The syndicate has acquired coal properties in British Columbia in addition to obtaining control of iron deposits. A force of men is opening the iron deposits.

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[1] Our estimates give total of 37,465,000 tons, the only discrepancy between these and above figures being in the [illegible] ascribed to Great Northern, which is credited with 13,[illegible] tons.—Editor.

# THE MINING NEWS

## ALASKA

S. S. "VICTORIA" brought gold to Seattle, Nov. 14, $150,000 from Nome and $107,000 from Fairbanks district.

BENNETT JAMES, of San Francisco, and associates, it is reported, will install a large dredge on Moore Creek, tributary to Kuskokwim.

COAL FROM MATANUSKA FIELD, 900 tons of it, has been mined and sacked, ready for transportation. It is to be tested by U. S. Navy. George Evans, in charge of party, has started cutting a road around cañon of Matanuska River and the big undertaking of transporting the coal to tidewater will be started as soon as snow falls.

MINING IN VALDEZ DISTRICT has made wonderful progress in last few months. While there has been nothing in nature of a boom, work of development has been carried on steadily. Many properties which were considered at best but promising prospects last year have entered dividend list or been sufficiently developed to show merit.

A WINTER RUSH TO CHISANA is predicted by P. C. Collins, traveling passenger agent of Canadian Pacific Ry., who has just returned from Dawson. He thinks from appearance of activity displayed about the mouth of White River that there is going to be a big rush. Old-timers in Dawson believe Chisana will be a big camp, and are preparing to go in as soon as sledging is easier. There is now a roadhouse every 10 miles from the mouth of White River in to diggings. It is significant that several miners are now outfitting for a return who went in to new fields with first rush with barely enough provisions for the trip in and out again, and who reported adversely on their return.

PRIMROSE—New strike has been made on this property near Lake Kenai. New drift is 8 ft. wide, and shows rich gold ore.

BIG FOUR (Valdez)—Robert Martin was killed and John Connelly, Warren Nelson and E. S. Bruner were injured in an avalanche on these claims at Mineral Creek. One of the men was under snow and dirt for seven hours. The men were caught without warning and carried to within 10 ft. of a precipice. Brunner chopped his way out with a piece of whiskey flask and rescued his companions.

## ARIZONA

### Mohave County

COPPER GIANT (Hackberry)—It is stated that sinking shaft below 300-ft. level will soon be resumed.

GOLCONDA (Golconda)—Company is shipping regularly to smelters at Bartlesville, Okla. Ore is hauled from Golconda to railway in auto trucks.

TENNESSEE (Chloride)—Three cars daily are being shipped from old tailings dumps to mill at Needles; company is also shipping two cars of raw ore.

CHAMPION (Chloride)—McDonald & Co., have taken lease on mine and will jig ores from dumps, with jigs from Tennessee mill. Considerable ore left in mine will also be put through jigs.

GOLD ROAD (Gold Road)—A recent weekly bar was valued at $20,000. There have been two deaths during last few months from electric shock, so changes are being made in wiring and equipment and lead-covered cable has been ordered.

MAY BELLE (Kingman)—Long crosscut has reached May Belle vein which is 6 ft. wide at this point assaying $49 in gold, 7 oz. silver. Crosscut is to be continued quite a distance further to cut large, rich lead vein which shows in shallow workings.

BI-METAL (Kingman)—For three weeks A. B. Richardson, of Tucson, representing Mines Co. of America, has been sampling this property. Property is on both sides of Santa Fé R.R. and apparently contains a large body of low-grade ore. It is stated that ore assays about $4 per ton in gold and silver.

NIL DESPERANDUM (Vivian)—A company has recently been organized by H. E. Woods and F. M. Woods to develop this and several adjacent claims which have been purchased by California Southern Oilfields Co. Property is south of Leland-Mitchell group. Some of the richest specimens ever found in the county have been taken from this property on which but little development work has yet been done.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—Mr. Overstrom, designer of new mill, has been at property for several weeks making changes and adjustments in concentrating tables, classifiers and other equipment. Mill has had several trial runs and latest report is that it is working satisfactorily and turning out high-grade concentrates. Company is now making an effort to secure a larger supply of water, quantity now available being inadequate for continuous operation of mill at full capacity.

### Yavapai County

COPPER CHIEF (Jerome)—It was reported some time ago that the Guggenheims had taken over this mine. Report is still in circulation as some of the Guggenheim engineers who made extensive examinations of property last spring were recently making further examinations, and it is said now that they expect to start further development with a large mining force in near future.

EQUATOR (Jerome)—It is general belief that W. A. Clark who operated this mine a few years ago, will resume operations in near future. Property has produced about $1,500,000 and it is said that it was shut down for lack of transportation and smelting facilities. Since starting erection on new custom smelter at Clardale it is said that ore from this mine can be used to good advantage in smelting works. Railroad survey has been extended from Clarkdale to the Copper Chief which adjoins Equator.

UNITED VERDE EXTENSION (Jerome)—This mine locally known as the Little Daisy, has completed connection in Douglas shaft with East drift on 800-ft. level from old shaft. A rerord in sinking in this distrirt has been made. A winze was sunk in this East drift 200 ft. and then a drift was driven back under ore encountered above in 800-ft. drift. Driht is also being driven from this winze to connect with Douglas shaft which will be sunk 1600 or 1800 ft. deep. New electric hoist is working well.

## CALIFORNIA

### Amador County

KENNEDY (Jackson)—Compressed-air hoist at winze on 3400-ft. level failed to work Nov. 12 just as skip carrying Superintendent Webb Smith and four miners had reached station. Skip dropped, but engineer quickly regulated speed so that at 150-ft. point below station skip was brought to an easy stop. Men were uninjured except for bruises and sprains, which were not serious.

ARGONAUT (Jackson)—North reel of electric hoist was temporarily put out of commission, Nov. 13, by accident to skip and cable. An axle broke and caused skip to lodge in collar of shaft as skip was being lowered. Darkness prevented engineer from seeing that cable was piling up about gear of hoist. Gear was badly broken before motor was stopped. South reel and gear were not affected, and work proceeded through south compartment of shaft. No one was injured.

### Butte County

NATURAL GAS at a depth of 110 ft. was found in well driven for irrigation water on G. J. Lohman ranch west of Oroville. Later well filled with water. Well will be deepened to 500 feet.

### Calaveras County

STATE HIGHWAY ROUTE connecting Sonora with main trunk line has been determined as far as Oakdale. Bids for construction will be called for at December meeting of State Highway Commission.

EASY BIRD (Mokelumne Hill)—Preparations are being made to reopen mine by deepening shaft. Stamp mill will be overhauled. Corral Flat Mining Co. has an option.

### Fresno County

MOVING PICTURES are being prepared of underground and mill operations in Randsburg district.

EIGHT TUNGSTEN CLAIMS located by Frank Feldman and others of Randsburg, in Kelso mining district, 55 miles northwest of Randsburg, have been taken over on purchase option by Colorado men. Mill is being built and four-mile pipe line is being laid. Cropping of sheelite reported 7 ft. wide on surface. Ore contains tungsten, gold and silver.

PACIFIC (Dos Palos)—New vein of cinnabar disclosed by recent exploration, is 14 ft. wide and carries 1% ore.

ROBERT GROUP (Atolia)—Development progressing on four claims. Strong showing of tungsten reported. Three shafts 80 and 60 ft. deep have been sunk.

### Merced County

ORIGINAL (Merced)—Recent rain at lower elevations and snow in mountains insures water for resumption of milling. Large amount of ore has been mined.

### Placer County

EXCELSIOR MINING CO. (Forest Hill)—Retimbering Baltimore tunnel is in progress and new mill is being built.

BELLEVUE-BULLION (Ophir)—Electric-power plant is being installed and new stamp mill is under construction.

### Shasta County

BALAKLALA (Coram)—Work on installation of gas plant in connection with Hall desulphurizing processes in progress. Commercial demonstration of Hall process expected in latter part of December.

BAKER (Ingot)—Installation of a gasoline hoist is completed and sinking shaft to 200 ft. has been started. This is a zinc-copper property recently taken over by Utah men. Shipment of ores to Utah for smelting is contemplated.

### Siskiyou County

CARLOCK GOLD MINING CO. (Fort Jones)—Property consisting of 10-stamp mill, rock crusher, pumps and other machinery has been purchased by C. A. Reichman, of Fort Jones. Mine, which has produced about $400,000, will probably be reopened.

### Yuba County

CONSOLIDATED WILLOW MINING CO. (Marysville)—Suit has been brought by George W. Lister and others against directors for an accounting. Stock to amount of $130,000 was sold and complaint alleges only $20,000 expended on property. Superintendent and directors are charged with conspiracy to defraud corporation. Property is at Weeds Point, Slate Range township, and consists of patented placer claims and ditch.

## COLORADO

### Clear Creek County

W. J. CHAMBERLAIN ORE CO. (Idaho Springs)—During October, company purchased ore to amount of $47,000, $12,000 more than for September. October was best month since 1908.

VIRGINIA CITY—Development is in progress on this Lincoln Mountain property; 40-oz. silver ore is being mined from development and shipped to independent smelters at Salida. In addition to smelting ore, considerable low-grade milling ore has been opened up.

LITTLE MATTIE—A shaft was recently sunk 200 ft. from tunnel level. West drift from bottom of this shaft has opened a 7-ft. vein of smelting ore. Returns from trial shipments indicate $120 per ton. West drift is now over 200 ft. long and during this advance vein has widened from 1 to 7 ft. and appears to be improving as work proceeds. It is reported that value of shipments from this property to local sampler during month of October, amounted to $30,000. Low-grade ore from mine is being treated in company's 100-ton concentrator on Chicago Creek. Concentrates are reported to be worth $80 per ton.

### Gilpin County

GOLDEN FLINT—This mine in Perigo district, northern Gilpin County, now has in operation a new 175-ton mill, process being amalgamation concentration and cyanidation, saving effected being said to be from 90 to 92%. There is enough ore in sight to keep mill running for a year at full capacity, and development will be kept ahead of extraction.

### Gunnison County

GOLD LINKS (Ohio)—It is estimated that recent years' production has been between $600,000 and $780,000.

CARTER MINING CO. (Ohio)—Four-compartment raise is up 960 ft. The 1000-ft. station will be cut and then driving 130 ft. will reach the bottom of old Volunteer shaft.

### San Juan Region

JUNTA CONSOLIDATED (Telluride)—Tramway and mill are nearing completion.

BUTTERFLY MILL (Ames)—Twenty-five stamps are dropping with plenty of good ore ahead.

BALLARD (Telluride)—Mill is up and ready for a trial run and is only waiting finishing of a two-bucket tramway to begin production.

CARRIBEAU (Ophir)—The mine and mill which started up last month have already shipped two carloads of concentrates. A compressor is being installed; machine drills will be used.

### Teller County

STRATTON'S ESTATE (Victor)—In American Eagles mine a new oreshoot has been opened at 1000 level by sublessees.

CRESSON CONSOLIDATED CO. (Cripple Creek)—Company has purchased Maggie mine on Raven Hill, credited with production of $250,000 from workings not over 600 ft. deep.

## IDAHO

### Cœur d'Alene District

A BOOM IN LEASING is expected in Wardner, due to arrangements just completed with Bunker Hill company. Old east mill will be at service of all lessees. Ore will be sampled as it comes to mill and lessees will be paid for their ore on basis of this sampling, which will remove necessity of maintaining separate bins. All ore can now be delivered for hauling at county road, the two leases working above this road now having tramways in operation. Wretched condition of road has caused no little difficulty in getting ore to mill at Kellogg. Caterpillar engine is only thing which is making two-mile trip regularly. With roads in first-class condition output could be doubled.

SONORA (Burke)—John H. Moffat, original owner and locator of this property, has undertaken for a stock consideration to find faulted part of vein.

FEDERAL (Gem)—New 300-ton mill at Frisco property will be in operation by first of year. A crew of 32 men now has framework practically completed and interior work is well along. Mill will have two floors, each of which will be 126x144 ft., and equipment will include Hardinge mills for fine grinding, and Franz tables exclusively. These tables were invented and are manufactured in Wallace. An incline is to be built to haul ore from mine to mill.

## MICHIGAN

### Iron

MANSFIELD (Mansfield)—Oliver Iron Mining Co. has a small force of men employed at this property removing machinery as lease has expired and will not be renewed. Mine is about played out and it is not believed that it will ever be worked again.

BERKSHIRE (Iron River)—A new shaft is being put down on this property and it is quite likely that when work is completed mining work will be resumed. Property has been idle for several months because of new work that had to be carried on and because only a small part of ore in stock was sold. A new compressor house will be built at property, foundations are about completed.

CLEVELAND-CLIFFS IRON CO. (Gwinn)—Steel is now on the ground for headframes to be erected at Mackinaw and Gardner properties and concrete foundations have been put in. Shafts were sunk to ore over a year ago but no work has been carried on at either place since. Work of sinking has been started again and mines will probably be ready to enter producing class next summer.

BALKAN MINING CO. (Alpha)—Shaft has reached ore. Considerable difficulty was experienced in getting shaft started as there was a band of quicksand to go through and a large volume of water had to be taken care of. When a depth of 100 ft. is reached first drift will be started to ore which lies 130 ft. south of shaft. Part of property will be stripped and mined as an openpit and bids for work have been called for. Bids were submitted several months ago but all were rejected.

LAKE ANGELINE (Ishpeming)—This property, owned by Jones & Laughlin Co., laid off a part of its force last week because mine is about exhausted, only a few drifts now being worked. Mine is now being worked with only a few men and it will not be long before it will be found necessary to suspend all operations. Company is getting ready to open up its Iron Mountain Lake property, a road from Ishpeming now being constructed. Just when work of putting down shaft will be commenced is not known but condition of iron market will probably settle this. Many men now employed at Lake Angeline will probably be transferred there when work is started.

## MINNESOTA

### Cuyuna Range

RAILROAD EXTENSIONS— Considerable activity is shown in Cuyuna district by both Northern Pacific Ry. and Soo Line, which roads absolutely control Cuyuna range ore shipments. Minnesota & International Ry., a Northern Pacific subsidiary, has just completed the Leaks cutoff into Brainerd. Cuyuna Northern Ry., another Northern Pacific subsidiary, is contemplating, it is said, a track along south shore of Rabbit Lake to Roger-Brown Ore Co.'s timber shaft at Kennedy mine. Duluth-Brainerd Mining Co. has signed an agreement with Northern Pacific for a spur into its property in Sec. 32, 47-29, which line will start near Ironton, a total length of three to four miles. Soo Line has completed its six-mile extension westward to Rowe hydraulic operation of Pittsburgh Steel Ore Co. at Riverton, and is working on extension to Iron Mountain mine. In the scramble for tonnage on Cuyuna range, Soo Line appears to have had the best of it up to present, controling tonnage from Armour No. 1 and No. 2, Kennedy, Pennington, Iron Mountain, Thompson and Rowe mines, while Northern Pacific gets ore from Cuyuna-Mille Lacs, Cuyuna-Duluth, Brainerd-Duluth, Adams, Barrows and Brainerd-Cuyuna mines. Methods employed by two competitors in obtaining this profitable 100-mile haul to Superior docks are radically different. Northern Pacific through its subsidiary, Northwestern Improvement Co., has taken an active part in actual exploration of district, and owns in fee or by lease an immense tonnage of ore, which later on will result in a great deal of business for railroad. Plan is to sublease ore deposits, with a clause providing that all ore be hauled via Northern Pacific to docks. Soo Line, so far as is known, controls no mineral land in district, but is extremely active and aggressive and has many influential friends, with whose aid, up to present it has been enabled to secure bulk of tonnage hauled during past seasons.

U. S. STEEL CORPORATION—Officials of company visited Cuyuna range last week, among them being D. G. Kerr, vice-president; W. J. Olcott, president, and John U. Sebenius, chief mining engineer of Oliver Iron Mining Co. Several years ago Steel Corporation withdrew from Cuyuna range entirely, and present visit has some significance, due to recent encouraging developments on range.

### Mesabi Range

ADVERSE WEATHER CONDITIONS are resulting in 1913 ore shipping season closing sooner than had been anticipated. While this year will exceed all previous years, excess will not be great. Week before last many large producers suspended shipments, including Mahoning, of Mahoning Ore & Steel Co., Mesabi range's largest pit; Myers & Winifred, of the Steel Corporation; Stevenson pit, of Corrigan-McKinney & Co.; Leetonia, of Jones & Laughlin; Shenango, of Shenango Furnace Co.; La Rue, and Hanna, of M. A. Hanna & Co.; Scranton, and Albany, of Pickands, Mather & Co.; Laura, of Inland Steel Co.; and La Belle, of Pitt Iron Mining Co. With exception of Pickands-Mather's Utica mine, it is likely that not a mine on the Mesabi will be shipping so late as Dec. 1. At Virginia, Jones & Laughlin Co. are preparing to strip Columbia property, which adjoins business district of city. All buildings are being removed, and stripping operations will begin by Jan. 1. At Biwabik, it is said that U. S. Steel interests expect to strip Higgins property during coming year, although no official announcement has been made. Incident to curtailment of operations on the range, pay rolls are being reduced, and floating population is undergoing its annual transition from miner to "lumberjack." During winter months, laborers go to logging camps, and at Hibbing alone fully 3000 men will be given employment in logging until cold weather breaks up in spring.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

A TRIPOLI DEPOSIT is being developed by Edward M'Conkey, on his farm near Baxter Springs, Kan. He believes 100,000 tons are accessible and has arranged to market it in the rough.

DRILLING OPERATIONS AT BUTTERFIELD, MO., show orebodies sufficient to indicate new zinc field will be opened up. Joplin men have taken leases and are prospecting. Ore is found from 108 to 130 ft., average being about 4 per cent.

MONTHLY FUND OF $1000 is being pledged to prevent threatened shutdown of Providence Mining Co.'s pumps at Webb City, Mo.; 20 big properties being affected. Providence company demands this financial aid to meet expense of draining tract, which lies in North Webb City field, and no other adequate pumping facilities are available. Operators believe appropriation will be raised, as heavy producers would be compelled to cease operation within short time.

GOPHER (Duenweg, Mo.)—Good outputs are made weekly. Ore is found in sheet-ground formation and mill recovery is large.

POCATELLO (Thoms Station, Mo.)—Concentrator made its initial run last week. It is of 150-tons capacity. Two shafts and several drifts are producing ore.

SKY LAND (Miami, Okla.)—Fair ore has been encountered by the drill from 140 to 200 ft. Lease is held by Franklin Smith and George Bock, of Joplin.

PLYMOUTH ROCK (Sarcoxie, Mo.)—John M. Malang has taken a lease and started drilling. Property lies near Church farm, which also is to be leased and prospected.

## MONTANA

### Butte District

BUTTE MINERS' UNION WON SUIT brought against Miners' Union, of Lead, S. D., to recover two loans made during Lead strike in 1910. According to decree of court, about $30,000 is coming to Butte Union and about $10,000 to Western Federation. To secure payment of loans, a mortgage was taken on a six-story business block owned by the Lead Union at the time. It was the fight over legality of mortgage that has just been decided. Building is now tenantless, and it is doubtful whether an amount covering mortgage can be realized from its sale.

BARNES-KING (Butte)—Failure of Congress to make appropriation to maintain state assay office is going to cause considerable inconvenience and some annoyance as bullion has now to be sent to Denver, which is the nearest office, and means a delay of 10 days or two weeks in getting returns. This company was formerly always in a position to give out its earnings for the month a few days after opening of next month, but the October bullion had to go to Denver, thus delaying settlement time.

TUOLUMNE (Butte)—At request of some stockholders a complete audit of books and accounts has been made by J. P. Callan. Report, which covers a period of five years, gives detailed statement of operating expenses and receipts during period. It appears that dividends amounting to more than $375,000 have been disbursed in that time. Liabilities, outside of $800,000 of stock, amount to $16,682. Callan criticized expenditure of over $36,000 for legal expenses and recommends curtailment of legal and other expenses in future.

ELM ORLU (Butte)—Perfected water system in the new zinc mill will cost, it is said, about $100,000. Water will be brought to mill through 12-in. pipe a distance of two miles, a pumping station having been established at source of supply. A high-pressure pump connecting with fire hydrants will be put in for fire purposes and about mill there will be a complete automatic sprinkling system. Capacity of water system will exceed 1,000,000 gal. per day. An electric railroad has also been built and arranged so that it has connections with the five railroads running in and out of this city, and with the street-car lines. Progress now being made with construction of concentrator leaves little doubt but that it will be ready for operation early in the spring.

ANACONDA (Butte)—Federal court will not hear case of minority holders of Alice company against Anaconda company until next February. An effort was made to have case set for trial, but at instance of Alice protestants there was an objection on ground that one of the persons needed at hearing was ill and unable to be present. Judge said that he would not be able to take case up until February term of court. There is said to be a desire on part of Anaconda company to have questions involved as to legality of sale of property and right of Alice stockholders to sell property without unanimous consent, settled in order that mining operations may be resumed. Months ago it was understood that work would be started in Lexington mine which adjoins Alice and which it is understood is now controlled by John D. Ryan, but it has since been deemed inadvisable until matters in connection with the Alice are settled. J. H. Gillie and R. H. Sales, general manager and chief geologist, respectively, for company, have just returned from inspection of company's newly acquired copper property in Flathead Reservation near Kalispell, Mont. They report having made arrangements for extensive development of property which promises high-grade copper ore with fair silver. Buildings are being erected for miners and three shifts will be put to work immediately. In order to cause as little delay as possible in mining operations during certain times in winter months when weather conditions make it impossible to ship ore steadily to works at Anaconda and Great Falls, or freezing of ore in cars makes it slow and difficult to unload them, the company has for some time been increasing the ore-bin capacity at a number of its larger and more important mines. With this work completed it will be possible to store in these bins about 50,000 tons of ore, so that when traffic is suspended for any reason mines will be able to keep in operation at full capacity for two or three days at least, instead of either closing down or curtailing output, as has been necessary in the past when such conditions arose. Properties where these improvements have been completed or are now under way, are Mountain View, Badger State, Anaconda, Neversweat, Tramway, Berkeley, West Gray Rock, Stewart, Original and Modoc. Plans have also been made for a similar addition at Bell and Diamond mines, but it has not been decided how soon this work will be commenced. Robert Emmet lode claim, southwest of Gagnon mine, and south of Gambrinus claim of Corbin Copper Co., has been acquired.

### Lewis & Clark County

PIEGAN-GLOSTER (Marysville)—Since recent return of C. W. Goodale, president of Barnes-King Mining Co., from an inspection of this property in Marysville district, it has been decided that only a small force of men will be employed during winter. A raise has been started from Norman tunnel at west end of mine, and this will be continued through to surface for development purposes and for ventilation. Assessment work will be done on several unpatented claims in group.

### Madison County

PYRAMID (Virginia City)—It is reported that three Nevada mining companies are negotiating for purchase of this company's mines at Pyramid Lake. Mason Valley Copper Co. is one of the prospective purchasers.

### Powell County

EMERY (Deer Lodge)—An English syndicate represented by Charles Herzig, of Butte, has leased and bonded this mine from present owners of lease, Higgins & Gruwell, of Butte. Corporate name of syndicate will be Butte Daryumsu Co., Ltd., of London. Mine has produced in years past a large amount of ore but was forced to shut down. Present company is a strong concern financially and it is expected that a large force of men will be put to work at once.

## NEVADA

### Churchill County

A GOLD-SILVER DISCOVERY has been made near the old Bayfield mine in the I X L district.

### Comstock Lode

CHOLLAR LEASING CO (Virginia City)—Large tonnage is being broken in glory-hole workings.

MEXICAN MILL (Virginia City)—Ore from Monte Cristo mine is being treated.

COMSTOCK PHOENIX (Virginia City)—Ore is being stoped on 550-ft. level and regular shipments are made to mill.

CONSOLIDATED VIRGINIA (Virginia City)—Southwest drift from northwest crosscut on 1000-ft. level is being driven. Flow of Water from face has ceased. Repairs to shaft and airways are being made.

### Humboldt County

CASEY JONES (Rochester)—A 3-ft. vein of silver ore was recently discovered on this fraction.

BIG FOUR (Rochester)—It is reported that an oreshoot carrying free gold has been struck in south drift at a point 300 ft. vertically from surface. This is the first free gold found in property.

TOMBOY (National)—This group of 12 claims on Buckskin Mountain will be operated by a company which will incorporate in near future. A tunnel, now in 400 ft., has cut a 4-ft. vein of gold ore.

### Lyon County

SMITH VALLEY MINES CO. (Smith Valley)—Rich gold-silver ore is being sacked for shipment.

CAPITOLA (Loma)—A shaft is being sunk. Good grade of gold ore is now being mined.

BLUE BIRD & AURORA (Yerington)—A lease has been granted on this property for one year. Ore has been shipped steadily for the last 18 months.

MONTANA-YERINGTON (Yerington)—An option on this property, formerly operated by George Wingfield, has been given to Mason Valley Mines Co.

BLACK COPPER (Yerington)—It is reported that this group, north of Montana-Yerington, was sold recently. A shaft will be sunk and a hoisting plant installed.

EMPIRE-NEVADA (Yerington)—Lessees have struck the shoot of good-grade ore lost in the Smith Bros. lease. Regular shipments from this and other blocks under lease are being made.

BURLINGTON-NEVADA (Yerington)—Shaft is being retimbered preparatory to further sinking; new hoisting plant will be necessary. On 180-ft. level an oreshoot assaying 12% copper has been opened.

BLUE JAY (Yerington)—Pipe for the air line from the New Yerrington compressor plant has been received. As soon as this line is in, air drills will be installed. Development on the 200- and 400-ft. levels is in progress.

MASON VALLEY MINES CO. (Thompson)—Ore receipts for week ended Nov. 13, 1913, were as follows: From Mason Valley mine, 2167 tons; from Nevada-Douglas, 1353 tons; from other mines, 763 tons; total, 4282, or a daily average of 612 tons. Five cars of matte were shipped.

McCONNELL (Mason)—A raise is being driven from the 200-ft. level in the shaft to connect with the upper workings, and is in ore all the way. Drifting on an oreshoot on the 200-ft. level, which was partially developed by former operators, is being done. In the lower levels considerable copper ore is being found which closely resembles the "spot" ore of the Nevada-Douglas mine.

### Mineral County

NEVADA CHAMPION COPPER CO. (Luning)—A hoist has been installed and shipments are being made.

MAYFLOWER (Luning)—Operation is now being carried on through the tunnel, and shipments of good-grade copper ore are being made.

SHIPPER COPPER CO. (Luning)—Shaft has been sunk to 300-ft. level on which good-grade copper ore has been developed. Shipments are being made.

WAGNER AZURITE COPPER CO. (Luning)—Incline shaft has been sunk to 100-ft. level, and crosscut will now be driven to vein. At 50-ft. level crosscut has been driven 50 ft. to vein, and drift has been driven 60 ft. to north in ore.

QUALEY (Mina)—Copper ore of good grade, carrying some gold and silver, has been cut by two tunnels at depths of 500 and 750 ft.; upper tunnel cut vein at 1000 ft. from portal and lower tunnel at 1600 feet.

### Nye County

TONOPAH PRODUCTION FOR OCTOBER was as follows: Tonopah Belmont, 15.233 tons; Tonopah Mining, 15.043; Tonopah Extension, 5019; Montana-Tonopah, 4878; West End, 4455; MacNamara, 2517; Jim Butler, 1646; Merger, 1695; North Star, 285; Halifax, 250; Midway, 200; total, 51,221; total gross value, $1,029,245.

PIONEER CONSOLIDATED (Pioneer)—Mill is being completed and a pipe line 2¼ miles long through which water for mill will be pumped is also nearly finished.

MUSHETT & WITTENBERG (Manhattan)—Company has purchased 10-stamp mill and sampler of Manhattan Milling & Ore Co. and has secured Brady lease on Union No. 9. A four-year lease and bond on Big Pine has also been taken. A shoot of ore averaging $9 has been developed in Big Pine and a large tonnage of ore assaying $7.50 has been developed in Gold Crater claim.

### Washoe County

RENO-PEAVINE (Reno)—Headframe is completed and a gasoline hoist has been installed.

TWIN METALS (Summit)—Shaft is being enlarged and retimbered. Ore broken in work is being shipped.

## OREGON

### Baker County

COLUMBIA—All arrangements for winter work and no shutdown, no matter how deep the snow gets, have been made.

### Josephine County

ROGUE RIVER BANKS AND BARS have recently been thoroughly prospected by men who contemplate putting in a dipper dredge. They seem satisfied with the results of their investigations, which reached from Grants Pass to Galice.

GOLD RIDGE—This quartz mine, recently sold by T. M. Anderson, to Eastern men, will soon be equipped and developed.

ALMEDA CONSOLIDATED MINING CO. (Galice)—Superintendent John Ross is making tests to determine what type of concentrator will be best suited for ore. Water is being pumped out of the different shafts getting ready for operations on a large scale.

## SOUTH DAKOTA

### Lawrence County

GOLDEN REWARD (Deadwood)—A large portion of the ore supply for mill at Deadwood is coming from lessees who are operating at various places on property in Bald Mountain and Ruby Basin district.

RATTLESNAKE JACK (Galena)—A 10-stamp mill and cyanide plant is being built on this property, adjoining the Gilt Edge-Maid. Plant will be operated by electricity throughout. It is expected to be in operation before spring.

HOMESTAKE (Lead)—All of brickwork has been completed, and last portion of roof is being finished on Recreation Hall. Steam-heating plant has been installed, and is working. Plasterers have commenced, and it is planned to finish building this winter.

MONARCH (Two Bit)—A car of $75-ore was recently loaded for shipment to the Omaha smelter. Property is being worked by Nickoli Bros., lessees. Oreshoot is narrow, and, although production is small, a good profit is made. There is a large amount of milling ore on dump.

NEW RELIANCE (Bald Mountain)—Several thousand feet of diamond drilling is to be done on this property in few months. Mill is running steadily, and in addition to company ore is treating a small tonnage for P. H. Bertschy, who is leasing on Imperial ground, adjoining.

TROJAN (Trojan)—Cyanide plant is operating steadily at full capacity, 275 tons daily. Good progress is being made installing new equipment, which includes thickeners, storage tanks, etc. A tube mill will also be installed. New machinery will effect an increase in capacity of at least one-third.

HEIDELBERG (Two Bit)—Property is showing up well under development by Deadwood Business Club. Recently a 3-ft. vertical of $20 ore was uncovered in main tunnel. It is now proposed to sink to explore this shoot at depth. Ore is being piled on dump which will be shipped as soon as new, soft roads freeze.

## UTAH

### Juab County

DRAGON (Silver City)—It is expected that new pumping plant on 800 will be ready for operation in near future. This will furnish water for Knight mill.

IRON BLOSSOM (Iron Blossom)—Fissure opened a short time ago on 500 level, and parallel to main ore-bearing fissure has been cut on 600, where it is 10 ft. between walls, and carries low-grade ore. On 500, shipments are being made from same vein. Development work is being done in southern end of property.

### Salt Lake County

U. S. SMELTING, REFINING, MINING—Regular quarterly dividend has been declared, payable Dec. 15.

OHIO (Bingham)—Management has been accepted by G. F. Waddell, who takes charge Dec. 1. It is stated that Mr. Waddell will give much attention to milling operations until these have been simplified.

UTAH COPPER (Bingham)—During October, 10,263,575 lb. copper were produced as compared with 11,817,428 lb. during September, a decrease of 1,580,853 lb. The decrease is due principally to the lower grade of the ore. The tonnage treated was practically same as during September. Operations are on a normal basis, variations occurring in production, owing to change in grade of ore from time to time.

UTAH APEX (Bingham)—Quarterly report for period ended Sept. 30, shows net profits amounted to $48,752, as compared with $83,198 for quarter preceding. Difference in earnings was caused by difficulty experienced in having necessary tonnage accepted by smelter. Smelter notified company that it was unable to handle as large a tonnage as shipped during preceding quarter, on account of ore being unoxidized. Mine was closed for several days, and since shipments were resumed, it has been necessary to keep output down to about half usual production. Development work is being continued on same scale as heretofore. During quarter company retired $52,000 worth of bonds, leaving $137,000 still outstanding. Receipts for quarter were $187,164; total operating expenses and development were $132,851; interest on bonds, $5560.

### Summit County

PARK CITY SHIPMENTS for week ended Nov. 14 amounted to 3,255,040 pounds.

SILVER KING CONSOLIDATED (Park City)—High grade silver-lead ore is being mined from above 1500 level from [illegible] of orebody cut in sinking shaft.

ONTARIO (Park City)—The raise from 1600 is still in ore, mostly second-class, with bunches of first-class. Workings are within about 25 ft. of old 1200-ft. level stopes.

AMERICAN FLAG (Park City)—Operations have been resumed after a short shutdown, while repairs were being made. Colorado stockholders have recently been inspecting condition of property.

## WASHINGTON

### Lincoln County

CRYSTAL (Miles)—Operations are to be resumed at once under direction of M. H. O'Connell. Mine has been closed for some time, and it is estimated it will take two weeks to clear it of water.

### Okanogan County

ALDER (Twisp)—It is reported that this company is considering an offer of $1,350,000 for its property. A large tonnage of ore is now blocked out ready for shipment.

### Stevens County

BLAND (Chewelah)—Company has been organized by G. M. Edwards, of Spokane, and others, for development of a gold property. Operations will begin at once.

## CANADA

### British Columbia

LONE STAR, AND WASHINGTON (Greenwood)—British Columbia Copper Co. is building concentrator near Boundary Falls to get rid of excess of silica in ore.

SILVER KING (Nelson)—Substantial camp buildings have been erected and mine has been equipped for regular operation. Consolidated Mining & Smelting Co. operating the property.

### Ontario

COBALT SHIPMENTS for October were: Alladin, 32.09 tons; Coniagas, 80.93; Cobalt Comet, 56.70; Cobalt Townsite, 112,35; Cobalt Lake, 63.73; Hudson Bay, 43.36; Kerr Lake, 93.32; La Rose, 294.17; Lumsden, 20.00; McKinley-Darragh, 292.12; Nipissing, 131,42; Peterson Lake, 34.61; O'Brien, 119.55; Trethewey, 20.00; Casey Cobalt, 25.86, total, 1423.11 tons.

CROWN RESERVE (Cobalt)—Company is understood to be negotiating for control of Lumsden mine.

HURONIA (South Porcupine)—Ten-stamp mill has been completed and is now in operation. Property is short distance from Larder Lake.

BURNSIDE (Swastika)—Operations on this property have been discontinued due, it is believed, to lack of funds. It is stated that property will be diamond drilled.

NORTH THOMPSON (Schumacher)—Property adjoining McEnaney has been optioned to Associated Gold Mines of Western Australia, which is one of the operating companies of Erlich & Co., of London, England.

KERR LAKE (Cobalt)—Extension of east main vein which was found by unwatering lake, is one of the most spectacular surface showings ever seen in Northern Ontario. Vein has been trenched for 200 ft. and averages about 7 in. silver ore.

WETTLAUFER (Cobalt)—Matter of applying part of remaining funds of company toward purchase of new claims recently came up for discussion and was favorably received by directors. Final action will be taken at annual meeting to be held in January.

CHAMBERS-FERLAND (Cobalt)—Contract has been entered into with Northern Customs Concentrator for use of 30 stamps for a period of five years, which will mean that approximately 100 tons of ore per day will be treated. Mill will not be in operation until early part of new year.

ELDORADO (South Porcupine)—An effort is being made to resuscitate this property which has been closed down for some time, and a meeting has been called to ratify a bylaw to increase the capitalization to $1,000,000 and to take necessary steps for financing operations. Company at present is in debt.

HOLLINGER (Timmins)—Although it is reported that the four-weekly dividend will be increased from 3% to 5%, this report is not generally credited, but it is altogether probable that a bonus will be paid before the end of year. Present rate of production is hardly sufficient to justify an increase in regular dividend rate.

DOME LAKE (South Porcupine)—A deal has been closed for purchase of 200,000 shares of treasury stock and a certain proportion of vendors' shares, at approximately 25c. per share. Deal was put through by C. L. Sherrill of Homestake Mines Finance Co., of Porcupine who is also a director of Hudson Bay Mines Co., of Cobalt. Property will be operated by Hudson Bay Co.

## MEXICO

### Sonora

SUBLIMA (Nacozari)—A boiler and pump are being installed to unwater shaft so that work can be started below water level where best ore occurs. J. M. Archuleta is owner.

SAN DIEGO (Nacozari)—A new shaft was sunk on this property to tap vein which had faulted in old shaft and has been encountered on 50-ft. level and shows richer than in old workings. First car has been sent to Nacozari and others will follow shortly.

MANZANAL (Cananea)—S. M. Greenidge, of Douglas has secured a lease on this property and will commence work at once. Work will be in charge of A. R. Dickson, one of the owners of Washington mine in the Moctezuma district, and about 20 men will be employed. Mine is about 20 miles south of Cananea.

SANTA ROSA (Cabullona)—Brown & Englant, who have leased all properties in this district of James Kirk, of Cananea, have cleaned out most of the old workings on property and nearly all show shipping grade of ore and men are being put on as fast as room is made for them. One car of 14% copper ore is now at smelter at Douglas and shipments will amount to about 200 tons during coming month.

SWAMP ANGEL (Cabullona)—First shipment from this new property has been sent to smelter and runs 63 oz. silver and 52% lead. Mine is six miles east of Cabullona and ore encountered in shaft at 60-ft. level varies from 6 in. to 2 ft. F. J. O'Neill owner of property has gone to New York to make arrangements to put in a modern plant as now he can only ship about 50 tons per month.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Nov. 26

The metal markets generally have been quiet and rather heavy. Prices are generally lower, and the tendency is downward just at present.

### Copper, Tin, Lead and Zinc

**Copper**—The market has been dull and weak. The leading producer, which named a nominal asking price toward the end of our last week abandoned it and since then apparently everybody has been soliciting business at concessions, and offers to sell at 14¾c. delivered, usual terms, have been general. Even though considerable concessions below that price were made, very few orders were forthcoming. On Nov. 22 and 24 the market was disturbed by offers of speculators to domestic consumers of January and later copper at 14½c. and 14¼c., cash, New York. There was some improvement in business reported by producers on Nov. 25 and still more on Nov. 26, when some fair quantities were disposed of, especially to Europe. Some other evidences of increased interest on the part of buyers over there created a better tone in the market here. Domestic consumers continued in the main to be apathetic.

The situation in Lake copper has remained unchanged. The leading producer has not yet named any price so far as has been reported.

Casting copper has been freely offered at 14¼c., delivered, including freight charges, etc., amounting to 0.15c. The pressure in this kind of metal is explained by the accumulation of unsold stock.

At the close we quote electrolytic in cakes, wirebars and ingots at 14½@14⅝c. Casting copper is quoted nominally at 14.05@14.15 cents.

The London standard market, which on Nov. 20, was £67 10s. for spot and £66 5s. for three months, declined £1 on Friday and a further £1 on Nov. 24, on which day spot was £65 and three months £64 2s. 6d. On Tuesday there was considerable bear covering, and the market advanced to £66 7s. 6d. and £65 7s. 6d. respectively. On Nov. 26 sentiment improved and the market closes firm at £67 12s. 6d. for spot and £66 7s. 6d. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16½@16¾c., carload lots at mill.

A shipment of 1015 metric tons of copper from the Union Miniere de Haut Katanga was received at Antwerp Nov. 1. This was followed 10 days later by another lot of 585 tons, the 1600 tons representing the output of the smelting furnaces for 1½ months. The company is arranging to add three units to the two now in operation. The first consignment brought about £70 per ton, being sold in one lot.

**Tin**—The market developed a sagging tendency. Prices on the London Metal Exchange declined easily, and were lowered correspondingly by the New York dealers. There was no interest shown by consumers, who complained of a severe contraction of business, and the falling off in consumption consequent thereto augurs for an impairment in the statistics and lower prices for the metal. On Nov. 25, some speculation developed in the domestic market, with the result that the orders placed in London brought about a slight advance over there. It closes firm at £181 for spot and £181 15s. for three months, and about 39⅝c. for December tin here.

**Lead**—The market has been weak, the metal being pressed for sale from several quarters. Still, business has been dull, and the market closes at 4.07½@4.10c., St. Louis, and 4.22@4.25c., New York. At 4.10c. St. Louis, there were sellers over. On Nov. 26 the American Smelting & Refining Co. reduced its price to 4.25c., which was immediately shaded by outsiders.

The London market is also lower, Spanish lead being quoted £18 10s., and English lead 2s. 6d. higher.

**Spelter**—This market has been narrow and dull. Some sellers report a little improvement in business; others the opposite. Up to Nov. 25 some sales of 50- to 100-ton lots were made at 5.07½c. On Nov. 25 sales were made at 5.10c., and on the same day at 5.05c. All through the week round tonnages have been offered at 5.05c. There is considerable difference of opinion as to the spelter market. Some consider it to be scraping bottom, while others look for it to go lower. There is an accumulation of unsold stock and at times some pressure to sell, while the demand continues light. At the close we quote the market at 5.05@5.10c., St. Louis, and 5.20@5.25c., New York.

The London market for good ordinaries is quoted £20 15s., and specials £21 12s. 6d. per ton.

Base price of sheet zinc in carload lots is $7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

### Other Metals

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders.

Exports from Baltimore for the week included 661 lb. selenium to Liverpool.

DAILY PRICES OF METALS

NEW YORK

| Nov. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 4.8540 | 58⅜ | *15½<br>@16 | 14.80<br>@14.90 | 39¾ | 4.25<br>@4.30 | 4.10<br>@4.15 | 5.17½<br>@5.22½ | 5.02½<br>@5.07½ |
| 21 | 4.8530 | 58¼ | *15½<br>@16 | 14.60<br>@14.80 | 39¼ | 4.25<br>@4.27½ | 4.10<br>@4.12½ | 5.17½<br>@5.22½ | 5.02½<br>@5.07½ |
| 22 | 4.8550 | 57⅞ | *15½<br>@16 | 14.50<br>@14.70 | 39¼ | 4.25<br>@4.27½ | 4.10<br>@4.12½ | 5.17½<br>@5.22½ | 5.02½<br>@5.07½ |
| 24 | 4.8535 | 58⅛ | *15<br>@15½ | 14⅜<br>@14½ | 39¾ | 4.22½<br>@4.27½ | 4.10<br>@4.12½ | 5.17½<br>@5.22½ | 5.02½<br>@5.07½ |
| 25 | 4.8545 | 58½ | *15<br>@15½ | 14⅜<br>@14⅝ | 39⅝ | 4.22½<br>@4.27½ | 4.10<br>@4.12½ | 5.20<br>@5.25 | 5.05<br>@5.10 |
| 26 | 4.8535 | 58¾ | *15<br>@15½ | 14½<br>@14⅝ | 39⅝ | 4.22½<br>@4.25 | 4.07½<br>@4.10 | 5.20<br>@5.25 | 5.05<br>@5.10 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Nov. | Silver | Copper: Spot, £ per Ton | Copper: Spot, Cts. per Lb. | Copper: 3 Mos. | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos. | Lead: £ per Ton | Lead: Cts. per Lb. | Zinc: £ per Ton | Zinc: Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 27 | 67½ | 14.67 | 66¼ | 73¾ | 180¼ | 181¼ | 19⅛ | 4.16 | 20⅝ | 4.45 |
| 21 | 26 15/16 | 66¼ | 14.39 | 65¼ | 71½ | 180¼ | 180¾ | 18⅞ | 4.10 | 20⅝ | 4.45 |
| 22 | 26¾ | .. | ... | . | | | | | ... | . | ..... |
| 24 | 26⅞ | 65 | 14.12 | 64⅛ | 70½ | 179 | 179¼ | 18⅞ | 4.10 | 20½ | 4.43 |
| 25 | 27 1/16 | 66⅜ | 14.42 | 65⅜ | 71½ | 179 | 180 | 18¾ | 4.07 | 20½ | 4.43 |
| 26 | 27 | 67⅝ | 14.69 | 66⅜ | 72¼ | 181 | 181¼ | 18½ | 4.02 | 20¾ | 4.48 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅜c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

**Aluminum**—The market is still dull, with light demand and moderate sales. Quotations are uncertain and rather weaker. We give 19@19½c. per lb. for No. 1 ingots, New York. The foreign market is reported quiet.

**Antimony**—The market has been quiet, with not much more than a retail business doing. Quotations are rather weak. Cookson's is 7.50@7.65c. per lb.; Hallett's 7.25@7.40c.; while 6.25@6.50c. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Demand continues fair and prices are firmer. New York quotation is $39@40 per flask of 75 lb. San Francisco, $39 for domestic orders and special terms for export. London price has been advanced 5s. and is now £7 10s. per flask, with the same price quoted from second hands.

**Imports and Exports in Great Britain** of metals other than iron and steel are reported as follows for the nine months ended Sept. 30, in long tons, except quicksilver, which is in pounds:

| Metals | Imports 1912 | Imports 1913 | Exports 1912 | Exports 1913 |
|---|---|---|---|---|
| Copper | 96,039 | 101,881 | 41,412 | 53,512 |
| Tin | 30,472 | 34,345 | 3[illegible]208 | 33,211 |
| Lead | 153,470 | 152,222 | 42,617 | 46,267 |
| Zinc | 113,067 | 117,155 | 7,513 | 7,623 |
| Quicksilver, lb. | 3,371,685 | 3,213,293 | 1,835,238 | 1,627,231 |
| Minor Metals | 5,634 | 6,913 | 19,855 | 20,748 |
| Ores, etc.: | | | | |
| Tin Ore and Concentrates | 21,778 | 25,871 | .......... | .......... |
| Pyrites | 652,634 | 601,263 | .......... | .......... |

Copper includes metal contents of ores, matte, etc. Exports include reëxports of foreign material.

## Gold, Silver and Platinum

**Gold**—Price of gold on the open market in London remained at the Bank level 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. Some gold is still going to Egypt. In New York about $4,000,000 gold has been taken for Canada in the past 10 days.

**Iridium**—The market is unchanged, sales being made at $80@81 per oz. New York. Supplies are a little larger than they were.

**Platinum**—The market continues quiet. Contracts for large lots can be placed at $43 per oz., while smaller orders bring up to $44. We quote $43@44 per oz. for refined platinum and $47@50 for hard metal. The demand for the electrical trade has been smaller recently, and the purchasing for the jewelry trade this fall has been light. No. 1 scrap brings $41@42 per oz., according to its condition.

Our Russian correspondent writes, under date of Nov. 10 that demand is quite up to the offering, though no large sales are reported. Offerings of new metal by the starateli have been large for the season, but have been promptly taken up. The conditions point to a strong market and probably some advance in prices. Quotations at Ekaterinburg are 9.50 rubles per zolotnik—$35.72 per oz.—for crude metal, 83% platinum; at St. Petersburg 36,500 rubles per pood—$35.77 per oz.—for the same grade.

**Silver**—The market shows but little signs of reaction from the decline; this is owing in part to the disturbed conditions in India owing to the embarassment of the India operators and bank troubles, together with the additional fact of unfavorable crop reports from the United Provinces of that country.

Shipments of silver from London to the East, Jan. 1 to Nov. 13, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £9,434,500 | £9,094,000 | D. £340,500 |
| China | 1,377,000 | 752,000 | D. 625,000 |
| Total | £10,811,500 | £9,846,000 | D. £965,500 |

Imports of silver at New York for the week were $596,483, from Mexico and South America; exports were $817,567, nearly all to London.

**Gold and Silver Movement in the United States** 10 months ended Oct. 31:

| | Gold 1912 | Gold 1913 | Silver 1912 | Silver 1913 |
|---|---|---|---|---|
| Exports | $44,058,544 | $74,563,059 | $58,519,766 | $53,896,586 |
| Imports | 50,677,285 | 51,590,693 | 40,985,536 | 29,968,758 |
| Excess | I. $6,618,741 | E. $22,972,366 | E. $17,534,230 | E. $23,927,828 |

Exports of merchandise for the 10 months this year were valued at $2,005,010,884; imports, $1,460,188,031; excess of exports, $544,822,053. Adding excess of exports of gold and silver gives $591,722,247 in the total export balance.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Nov. 22

Best grades of zinc blende were purchased a half dollar less. The highest price is $45.50, the base per ton of 60% zinc ranging from $40@42.50. Ores of excess iron were purchased up to 10% of iron with no penalty on a base of $42@42.50. The usual penalty is $1 per ton in excess of 1% of iron. Calamine is on a firm base of $21@23 per ton of 40% zinc. The average of all grades of zinc is $41.44 per ton. There is no change in the lead situation, each buyer being as active as possible without advancing prices which are $54.50 high on a base of $52 per ton of 80% metal contents.

SHIPMENTS WEEK ENDED NOV. 22

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 11,200,640 | 818,330 | 2,185,740 | $302,960 |
| Totals 47 weeks | 515,586,050 | 38,987,440 | 86,039,740 | $14,035,089 |

Blende value, the week, $238,185; 47 weeks, $12,150,891.

Calamine value, the week, $10,865; 47 weeks, $502,029.

Lead value, the week, $53,910; 47 weeks, $2,282,179.

### PLATTEVILLE, WIS.—Nov. 22

The base price paid this week for 60% zinc ore was $40@42 per ton. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED NOV. 22

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,036,620 | 63,960 | 1,116,280 |
| Year to date | 132,888,990 | 4,997,080 | 184,550,840 |

Shipment of carbonate ore has been resumed from the mines at Highland. Shipped during week to separating plants, 2,628,110 lb. zinc ore.

## IRON TRADE REVIEW

### NEW YORK—Nov. 26

The iron and steel markets are quiet and show little change from last week's report.

The volume of new business coming forward is not increasing. Buyers are holding back and do not seem inclined to contract for any long time ahead. Railroad purchases are light and limited to necessary material. Structural steel is quiet, and few new contracts are being placed outside of the municipal work going on in New York and other cities.

Prices have not materially changed, but gradually seeking a lower level. It is not believed, however, that they will go much lower, though there is a good deal of competition for such orders as come out. Mills are gradually curtailing operations, but are still running at a pretty fair gait in most cases.

Pig iron is dull and buying is on a small scale and chiefly for early delivery. Foundry iron is in moderate demand, and the same can be said of basic pig.

### PITTSBURGH—Nov. 25

Orders for finished-steel products have decreased further, though not greatly, and probably average 40 to 45% of capacity, while there remains some old business being filled, enabling finishing mills to operate at between 55 and 60% of capacity. Many of the smaller mills are operating at only 40 to 50% of capacity. The Carnegie mills in this district are operating at 75% or more of capacity, but some detached mills, the Columbus plant, for instance, have been closed entirely. It seems certain that next month the mills will drop to operating at about 50% of capacity. After that an improvement in tonnage is expected, for the present orders are believed to be below the actual rate of consumption. Prices will probably not harden on an improvement in tonnage until the mills are brought up to operating at 85 to 90% of capacity. This was the experience in the latter half of 1911. Wage reductions are being discussed and various reductions have been made at minor plants, but at the large steel works no reductions have been made and it is not admitted that any are in contemplation.

**Pig Iron**—Consumers take a pessimistic view, and are withholding orders to the last moment, and then buying only in the most limited way. Both bessemer and basic are quotable lower and the new quotations could probably be shaded on an attractive order. We quote: Bessemer, $15; basic, $13; No. 2 foundry, $13.50; forge, $13.25, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is extremely quiet, only carloads being sold and those not frequently. Prices are well maintained, at $50 for English and $49.50 for German, f.o.b. Baltimore.

**Steel**—The market for billets and sheet bars has not declined since the adjustments on November tonnages, and it is possible December tonnages will be adjusted on the same basis: Billets, $20.50; sheet bars, $21.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are nominal at $26, Pittsburgh.

**British Exports and Imports of Iron and Steel** and manufactures thereof are valued by the Board of Trade returns for the nine months ended Sept. 30 as follows:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel | £40,962,292 | £11,192,013 | Exp. £29,770,279 |
| Machinery, hardware, etc | 46,328,507 | 11,907,521 | Exp. 34,420,986 |
| Total | £87,290,799 | £23,099,534 | Exp. £64,191,265 |
| Total, 1912 | 82,153,805 | 20,186,118 | Exp. 61,967,687 |

Quantities of iron and steel exported were 3,537,835 long tons in 1912 and 3,723,606 in 1913. Quantities imported were 1,432,757 tons in 1912, and 1,611,493 this year. Value of new ships built for foreign counties is included in the exports.

**Pig-Iron Make in Germany** in October is reported by the German Iron and Steel Union at 1,650,205 metric tons, being 61,008 tons more than September. For the 10 months ended Oct. 31 the total production was:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Foundry iron | 2,744,507 | 3,039,091 | I. 294,584 |
| Forge iron | 445,953 | 416,304 | D. 28,649 |
| Steel pig | 1,794,518 | 2,156,771 | I. 362,253 |
| Bessemer pig | 318,463 | 301,746 | D. 16,717 |
| Thomas (basic) pig | 9,445,900 | 10,179,698 | I. 733,798 |
| Total | 14,749,341 | 16,093,610 | I. 1,344,269 |

The total increase this year is 9.1%. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

### IRON ORE

The great storm on the Lakes which wrecked a number of vessels and damaged many others, has demoralized the ore trade from the Lake Superior region. The shipments this week have been light, and another week will probably see the business almost closed for the season.

**Imports of Iron Ore in Great Britain** for the 10 months ended Oct. 31 were 5,428,260 long tons in 1912, and 6,371,980 in 1913; increase, 943,720 tons. Imports of manganese ore were 316,208 tons in 1913, and 484,253 in 1913; increase, 168,045 tons.

### COKE

**Connellsville Coke**—Contrary to expectations, negotiations are now in progress in several instances for furnace coke on contract for 1914, and it is possible two or three deals may be closed within the next week. The usual asking price is $2, but $1.90 has already been quoted on some brands. Dealers have picked up prompt coke at $1.75, selling to consumers at $1.85, but only in very small lots. Production seems now to be closely regulated to consumption.

**Fuel Exports and Imports in Germany**, nine months ended Sept. 30, metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Coal | 25,629,048 | 7,954,578 | Exp. 17,674,470 |
| Brown coal | 44,873 | 5,328,967 | Imp. 5,284,094 |
| Coke | 4,991,420 | 430,991 | Exp. 4,560,429 |
| Briquettes | 2,358,967 | 106,923 | Exp. 2,252,044 |
| Total | 33,024,308 | 13,821,459 | Exp. 29,202,846 |

The exports this year included 16,949 tons of coke shipped to the United States.

**Coal Production of German Empire** nine months ended Sept. 30, metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 124,094,741 | 130,083,565 | I. 5,988,824 |
| Brown coal | 48,925,069 | 51,736,564 | I. 2,811,499 |
| Coke | 21,071,920 | 24,096,566 | I. 3,024,645 |
| Briquettes | 17,918,209 | 20,400,080 | I. 2,481,871 |

Of the briquettes reported this year 13,216,964 tons were made from brown coal or lignite.

## CHEMICALS

### NEW YORK—Nov. 26

The general market is still quiet and business in most lines is on a moderate scale.

**Arsenic**—There is no activity as yet, though the season for better trade is approaching. Prices are nominally unchanged, $3 per 100 lb. being asked.

**Copper Sulphate**—A moderate business is reported. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market is still dull, though some signs of recovery are looked for. Prices continue 2.25c. per lb. for spot, 2.30c. for December and 2.35c. for January-May delivery.

### PETROLEUM

The Ohio Oil Co. on Nov. 21 advanced its buying prices 5c., making quotations for North Lima oil $1.49; South Lima and Indiana, $1.44; Princeton and Illinois, $1.45 per lb. These are the highest prices ever paid for these grades of oil.

### OTHER ORE MARKETS

**Manganese Ores**—The schedule of prices adopted by the Carnegie Steel Co. is as follows, for deliveries in the Pittsburgh district or at South Chicago: Ore containing 49% or over metallic manganese, 25c. per unit; 46 to 49%, 24c.; 43 to 46%, 23c.; 40 to 43%, 22c. These prices are based on ores containing not more than 8% silica or 0.20% phosphorus. Deductions will be made of 15c. per ton for each 1% of silica in excess of 8%; of 2c. per unit of manganese for each 0.02% of phosphorus in excess of 0.20%. Ores containing less than 40% manganese, more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at buyer's option.

### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | July | August | September | October | November |
|---|---|---|---|---|---|
| Alaska shipments | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 | .......... |
| Anaconda | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 | .......... |
| Arizona, Ltd. | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 | .......... |
| Copper Queen | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 | .......... |
| Calumet & Ariz. | 3,800,000 | 4,500,000 | 4,000,000 | 4,500,000 | .......... |
| Chino | 4,746,525 | 5,788,572 | 4,196,296 | 4,767,466 | .......... |
| Detroit | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 | .......... |
| East Butte | 1,060,257 | 1,162,007 | 1,233,018 | 1,040,997 | .......... |
| Giroux | 584,546 | 524,953 | 198,178 | 156,084 | .......... |
| Mason Valley | 908,892 | 867,060 | 918,000 | 1,052,000 | .......... |
| Mammoth | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 | .......... |
| Nevada Con. | 5,403,919 | 5,989,973 | 4,441,671 | 5,898,046 | .......... |
| Ohio | 601,700 | 689,000 | 685,900 | ........ | .......... |
| Old Dominion | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 | .......... |
| Ray | 4,097,000 | 4,269,519 | 4,336,434 | 4,725,419 | .......... |
| Shannon | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 | .......... |
| South Utah | 140,000 | 223,498 | 241,843 | ........ | .......... |
| Tennessee | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 | .......... |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 | .......... |
| Utah Copper Co. | 9,849,043 | 10,302,251 | 11,463,905 | 9,929,478 | .......... |
| Lake Superior* | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 | .......... |
| Non-rep. mines* | 6,200,000 | 6,200,000 | 6,000,000 | 6,200,000 | .......... |
| Total prod. | 101,669,653 | 96,427,264 | 91,835,075 | ........ | .......... |
| Imp., bars, etc. | 29,029,990 | 22,474,471 | 35,703,660 | ........ | .......... |
| Total blister | 130,699,643 | 118,901,735 | 127,538,735 | ........ | .......... |
| Imp. ore & matte | 8,527,046 | 9,171,351 | 10,800,162 | ........ | .......... |
| Total Amer. | 139,226,689 | 128,073,086 | 138,338,897 | ........ | .......... |
| Miami† | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 | .......... |
| Shattuck-Arizona | 1,019,388 | 1,001,634 | 1,163,237 | 993,224 | .......... |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,379 | 647,905 | 621,120 | ........ | .......... |
| Granby | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 | .......... |
| Mexican Cos.: | | | | | |
| Boleo† | 2,240,720 | 2,264,640 | 2,369,920 | 2,424,800 | .......... |
| Cananea | 3,328,000 | 3,186,000 | 3,148,000 | 3,682,000 | .......... |
| Moctezuma | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 | .......... |
| Other Foreign: | | | | | |
| Braden, Chile | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 | .......... |
| Cape Cop., S. Af. | ........ | ........ | 607,040 | 712,320 | .......... |
| Kyshtim, Russia | 2,500,000 | 1,585,000 | 1,187,000 | ........ | .......... |
| Spassky, Russia | 660,800 | 1,048,320 | 1,025,920 | ........ | .......... |
| Exports from | | | | | |
| Chile | 9,856,000 | 8,736,000 | 5,600,000 | 6,160,000 | .......... |
| Australia | 10,304,000 | 7,720,000 | 6,944,000 | 7,728,000 | .......... |
| Arrivals–Europe‡ | 11,728,640 | 14,624,960 | 9,661,120 | 18,040,960 | .......... |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| XI, '12 | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII. | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | .......... | .......... | .......... |
| I. 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV. | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V. | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI. | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX. | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X. | 139,070,481 | 68,173,720 | 68,123,473 | 29,793,094 | 53,625,600 | 83,418,692 |
| XI. | .......... | .......... | .......... | 32,566,382 | 48,787,200 | 81,353,582 |
| XII. | .......... | .......... | .......... | .......... | .......... | .......... |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq. | Sale | Amt. |
|---|---|---|---|
| Atlantic, Ida | Nov. 3 | Dec. 2 | 0.0005 |
| Beaver Copper, Utah | Nov. 12 | Dec. 2 | 0.005 |
| Belcher, Nev | Nov. 12 | Dec. 4 | 0.10 |
| Cardiff, Utah | Nov. 20 | Dec. 10 | 0.01 |
| Clear Grit, Ida | Nov. 10 | Dec. 10 | 0.0025 |
| Coeur d'Alene Invest., Ida | Nov. 7 | Dec. 8 | 0.003 |
| Colusa, Ida | Nov. 10 | Dec. 2 | 0.005 |
| Copper Chief, Ida | Nov. 10 | Dec. 6 | 0.0025 |
| Deer Trail, Utah | Nov. 3 | Dec. 3 | 0.0075 |
| Eagle Mountain, Ida | Nov. 18 | Dec. 6 | 0.0005 |
| East Hercules, Ida | Nov. 15 | Dec. 15 | 0.0015 |
| Emerald, Utah | Nov. 15 | Dec. 13 | 0.005 |
| Empire, Ida | Oct. 20 | Dec. 1 | 0.005 |
| Federal Ely, Nev | Nov. 10 | Dec. 10 | 0.005 |
| Giant, Ida | Nov. 1 | Dec. 4 | 0.003 |
| Hider-Nevada, Nev | Nov. 17 | Dec. 6 | 0.02 |
| Hornet, Utah | Nov. 14 | Dec. 1 | 0.01 |
| Laclede, Ida | Nov. 24 | Dec. 15 | 0.003 |
| Little North Fork, Ida | Oct. 8 | Dec. 1 | 0.001 |
| Nabob, Ida | Nov. 17 | Dec. 15 | 0.005 |
| Ruby Hill, Utah | Nov. 1 | Dec. 6 | 0.005 |
| Silver Cliff, Ida | Nov. 20 | Dec. 10 | 0.005 |
| Snowstorm, Ida | Nov. 13 | Dec. 12 | 0.002 |
| Utah Fertilizer, Utah | Nov. 8 | Dec. 9 | 0.15 |
| Utah First National, Utah | Nov. 17 | Dec. 3 | 0.001 |
| Wisconsin, Ida | Nov. 10 | Dec. 10 | 0.002 |
| Wonder of Pine Creek, Ida | Nov. 3 | Dec. 3 | 0.001 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56.260 | 62.938 | 24.865 | 25.887 | 28.983 |
| February | 52.222 | 59.043 | 61.642 | 24.081 | 27.190 | 28.357 |
| March | 52.745 | 58.375 | 57.870 | 24.324 | 26.875 | 26.669 |
| April | 53.325 | 59.207 | 59.490 | 24.595 | 27.284 | 27.416 |
| May | 53.308 | 60.880 | 60.361 | 24.583 | 28.038 | 27.825 |
| June | 53.043 | 61.290 | 58.990 | 24.486 | 28.215 | 27.199 |
| July | 52.630 | 60.654 | 58.721 | 24.286 | 27.919 | 27.074 |
| August | 52.171 | 61.606 | 59.293 | 24.082 | 28.375 | 27.335 |
| September | 52.440 | 63.078 | 60.640 | 24.209 | 29.088 | 27.986 |
| October | 53.340 | 63.471 | 60.793 | 24.594 | 29.299 | 28.083 |
| November | 55.719 | 62.792 | .... | 25.649 | 29.012 | |
| December | 54.905 | 63.365 | .. | 25.349 | 29.320 | |
| Year | 53.304 | 60.835 | .. | 24.592 | 28.042 | |

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14.094 | 16.488 | 14.337 | 16.767 | 62.760 | 71.741 |
| February | 14.084 | 14.971 | 14.329 | 15.253 | 62.893 | 65.519 |
| March | 14.698 | 14.713 | 14.868 | 14.930 | 65.884 | 65.329 |
| April | 15.741 | 15.291 | 15.930 | 15.565 | 70.294 | 68.111 |
| May | 16.031 | 15.436 | 16.245 | 15.738 | 72.352 | 68.807 |
| June | 17.234 | 14.672 | 17.443 | 14.871 | 78.259 | 67.140 |
| July | 17.190 | 14.190 | 17.353 | 14.563 | 76.636 | 64.166 |
| August | 17.498 | 15.400 | 17.644 | 15.904 | 78.670 | 69.200 |
| September | 17.508 | 16.328 | 17.698 | 16.799 | 78.762 | 73.125 |
| October | 17.314 | 16.337 | 17.661 | 16.913 | 76.389 | 73.383 |
| November | 17.326 | .... | 17.617 | | 76.890 | ...... |
| December | 17.376 | .... | 17.600 | | 75.516 | ...... |
| Year | 16.341 | | 16.560 | | 72.942 | .. |

New York, cents per pound, London pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42.529 | 50.298 | 191.519 | 238.273 |
| February | 42.962 | 48.766 | 195.036 | 220.140 |
| March | 42.577 | 46.832 | 192.619 | 213.615 |
| April | 43.923 | 49.115 | 200.513 | 224.159 |
| May | 46.063 | 49.038 | 208.830 | 224.143 |
| June | 45.815 | 44.820 | 205.863 | 207.208 |
| July | 44.519 | 40.260 | 202.446 | 183.511 |
| August | 45.857 | 41.582 | 208.351 | 188.731 |
| September | 49.135 | 42.110 | 223.762 | 193.074 |
| October | 50.077 | 40.462 | 228.353 | 184.837 |
| November | 49.891 | | 227.619 | |
| December | 49.815 | | 226.875 | |
| Av. year | 46.096 | | 209.322 | |

New York in cents per pound. London in pounds sterling per long ton

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4.435 | 4.321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4.026 | 4.325 | 3.946 | 4.175 | 15.738 | 16.550 |
| March | 4.073 | 4.327 | 4.046 | 4.177 | 15.997 | 15.977 |
| April | 4.200 | 4.381 | 4.118 | 4.242 | 16.331 | 17.597 |
| May | 4.194 | 4.342 | 4.072 | 4.226 | 16.509 | 18.923 |
| June | 4.392 | 4.325 | 4.321 | 4.190 | 17.588 | 20.226 |
| July | 4.720 | 4.353 | 4.603 | 4.223 | 18.544 | 20.038 |
| August | 4.569 | 4.624 | 4.452 | 4.550 | 19.655 | 20.406 |
| September | 5.048 | 4.698 | 4.924 | 4.579 | 22.292 | 20.648 |
| October | 5.071 | 4.402 | 4.894 | 4.253 | 20.630 | 20.302 |
| November | 4.615 | | 4.463 | | 18.193 | .... |
| December | 4.303 | | 4.152 | | 18.069 | ... |
| Year | 4.471 | | 4.360 | | 17.929 | |

New York and St. Louis cents per pound. London, pounds sterling per long ton

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6.442 | 6.931 | 6.292 | 6.854 | 26.642 | 26.114 |
| February | 6.499 | 6.239 | 6.349 | 6.089 | 26.661 | 25.338 |
| March | 6.626 | 6.078 | 6.476 | 5.926 | 26.048 | 24.605 |
| April | 6.633 | 5.641 | 6.483 | 5.491 | 25.644 | 25.313 |
| May | 6.679 | 5.406 | 6.529 | 5.256 | 25.790 | 24.583 |
| June | 6.877 | 5.124 | 6.727 | 4.974 | 25.763 | 22.143 |
| July | 7.116 | 5.278 | 6.966 | 5.128 | 26.174 | 20.592 |
| August | 7.028 | 5.658 | 6.878 | 5.508 | 26.443 | 20.706 |
| September | 7.454 | 5.694 | 7.313 | 5.544 | 27.048 | 21.148 |
| October | 7.426 | 5.340 | 7.276 | 5.188 | 27.543 | 20.614 |
| November | 7.371 | .... | 7.221 | .... | 26.804 | |
| December | 7.162 | ..... | 7.081 | ... | 26.494 | |
| Year | 6.943 | .. | 6.799 | . | 26.421 | |

New York and St. Louis, cents per pound. London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15.12 | $18.15 | $13.32 | $17.35 | $14.00 | $18.59 |
| February | 15.03 | 18.15 | 13.28 | 17.22 | 14.01 | 18.13 |
| March | 14.95 | 18.15 | 13.66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13.90 | 16.71 | 14.15 | 16.40 |
| May | 15.14 | 17.68 | 13.90 | 15.80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15.40 | 14.22 | 15.10 |
| July | 15.15 | 16.31 | 14.38 | 15.13 | 14.38 | 14.74 |
| August | 15.43 | 16.63 | 14.90 | 15.00 | 14.85 | 14.88 |
| September | 16.86 | 16.65 | 16.03 | 15.04 | 15.63 | 14.93 |
| October | 17.90 | 16.60 | 17.18 | 14.61 | 17.22 | 14.80 |
| November | 18.07 | ...... | 17.09 | ..... | 18.00 | ... |
| December | 18.15 | ...... | 17.45 | ... | 18.73 | |
| Year | $16.01 | | $14.93 | | $15.28 | |

## STOCK QUOTATIONS

**COLO SPRINGS** Nov. 24

| Name of Comp. | Bid. |
|---|---|
| Acacia | .02½ |
| Cripple Cr'k Con. | .01 |
| C. K. & N. | .08 |
| Doctor Jack Pot | .05 |
| Elkton Con | .51 |
| El Paso | 2.75 |
| Findlay | .02 |
| Gold Dollar | .06½ |
| Gold Sovereign | .02½ |
| Golden Cycle | 2.00 |
| Isabella | .08 |
| Jack Pot | .04½ |
| Jennie Sample | .04 |
| Jerry Johnson | .03½ |
| Lexington | ‡.03 |
| Old Gold | .01 |
| Mary McKinney | .56 |
| Pharmacist | .01 |
| Portland | .98 |
| Vindicator | .82 |

**SALT LAKE** Nov. 24

| Name of Comp. | Bid. |
|---|---|
| Beck Tunnel | .03½ |
| Black Jack | .03½ |
| Cedar Talisman | ‡ .00½ |
| Colorado Mining | .10 |
| Columbus Con | ‡ .01 |
| Crown Point | .00½ |
| Daly-Judge | 5.10 |
| Grand Central | .50 |
| Iron Blossom | 1.12½ |
| Little Bell | .15 |
| Lower Mammoth | .01 |
| Mason Valley | 1.50 |
| May Day | .04½ |
| Nevada Hills | .35 |
| New York | ‡ .02½ |
| Prince Con. | .24 |
| Silver King Coal'n | 3.50 |
| Sioux Con | .01 |
| Uncle Sam | .03 |
| Yankee | ‡ .06 |

**TORONTO** Nov. 24

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Bailey | .05½ | Foley O'Brien | .16 |
| Coniagas | 7.15 | Hollinger | 17.50 |
| T. & Hudson Bay | 65.00 | Imperial | ‡ .02 |
| Timiskaming | .14 | Jupiter | .08 |
| Wettlaufer-Lor | .07 | Pearl Lake | .09 |
| Apex | ‡ .01 | Porcu. Gold | .10 |
| Big Dome | 12.50 | Preston E. D. | .03 |
| Crown Chartered | ‡ .00½ | Rea | .10 |
| Doble | ‡ .10 | Swastika | .02 |
| Dome Exten | .07½ | West Dome | .05 |

**SAN FRANCISCO** Nov. 18

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| **Comstock Stocks** | | **Misc. Nev. & Cal.** | |
| Alta | .06 | Belmont | 7.50 |
| Belcher | .30 | Jim Butler | .73 |
| Best & Belcher | .04 | MacNamara | .09 |
| Caledonia | 1.75 | Midway | .38 |
| Challenge Con. | .11 | Mont.-Tonopah | .90 |
| Chollar | .04 | North Star | .45 |
| Confidence | .35 | West End Con. | 1.27½ |
| Con. Virginia | .12 | Atlanta | .10 |
| Crown Point | .26 | Booth | .02 |
| Gould & Curry | .03 | C.O.D. Con. | .03 |
| Hale & Norcross | .07 | Comb. Frac | .04 |
| Mexican | 1.30½ | Jumbo Extension | .08 |
| Occidental | .70 | Pitts.-Silver Peak | .38 |
| Ophir | .21 | Round Mountain | .36 |
| Overman | .30 | Sandstorm Kendall | .07 |
| Potosi | .03 | Silver Pick | .03 |
| Savage | .11 | Argonaut | 3.00 |
| Sierra Nevada | .07 | Bunker Hill | 2.00 |
| Union Con. | .12 | Central Eureka | .20 |
| Yellow Jacket | .30 | So. Eureka | ‡2.00 |

**N. Y. EXCH.** Nov. 24

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 68¾ |
| Am. Agri. Chem. | 43 |
| Am.Sm.&Ref.,com. | 62¾ |
| Am. Sm. & Ref., pf. | 98½ |
| Am. Sm. Sec., pf. B | 81 |
| Anaconda | 33¾ |
| Batopilas Min. | .75 |
| Bethlehem Steel, pf. | 68½ |
| Chino | 37¼ |
| Federal M. & S., pf. | 32 |
| GreatNor.,ore.,ctf. | 32 |
| Guggen. Exp. | 43¾ |
| Homestake | 112 |
| Inspiration Con | 14 |
| Miami Copper | 21 |
| Nat'l Lead, com | 43 |
| National Lead, pf. | 103 |
| Nev. Consol. | 15 |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 87 |
| Quicksilver, pf. | 3 |
| Ray Con. | 17¾ |
| Republic I&S,com. | 19¼ |
| Republic I&S, pf. | 79 |
| SlossSheff'd,com. | 26 |
| Sloss Sheffield, pf. | 86 |
| Tennessee Copper | 28 |
| Utah Copper | 47¼ |
| U. S. Steel, com. | 55 |
| U. S. Steel, pf. | 104¾ |
| Va.Car.Chem.,pf. | 92 |

**N. Y. CURB** Nov. 24

| Name of Comp. | Clg. |
|---|---|
| Ariz. Belmont | .04 |
| Barnes King | ‡1¾ |
| Beaver Con. | .34 |
| Big Four | .10 |
| Braden Copper | 6¾ |
| B. C. Copper | 2¾ |
| Buffalo Mines | 1¾ |
| Can. G. & S. | .11 |
| Caribou | .60 |
| Con. Ariz. Sm. | .25 |
| Coppermines Cons | 1 |
| Davis-Daly | 1¾ |
| Diam'field-Daisy | ‡ .03 |
| Ely Con | .02 |
| Florence | .22 |
| Gold Hill Con | .25 |
| Goldfield Con | 1½ |
| Greene Cananea | 31¾ |
| Greenwater | .06 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 4¾ |
| La Rose | 1¾ |
| McKinley-Dar-Sa | 1¾ |
| Min. Co. of A. new | 2 1/16 |
| New Utah Bingham | .45 |
| Nipissing Mines | 7¾ |
| Ohio Copper | 5/16 |
| Pacific Sm. & M. | ‡⅜ |
| Puebla S. & R. | 2¾ |
| South Utah M&S | ‡3/16 |
| Stand'd Oil of N.J. | 377 |
| Stewart | 1¾ |
| Tonopah | 5¾ |
| Tonopah Ex. | 1¼ |
| Tonopah Merger | .57 |
| Tri-Bullion | ⅛ |
| Tularosa | 9/16 |
| Union Mines | ‡ .08 |
| United Cop., pfd | ‡¾ |
| Yukon Gold | 2 1/16 |

**LONDON** Nov. 15

| Name of Comp. | Clg. |
|---|---|
| Camp Bird | £0 14s 0d |
| El Oro | 0 11 0 |
| Esperanza | 0 16 3 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 7 6 |
| Santa Gert'dis | 0 16 3 |
| Stratton's | 0 0 9 |
| Tomboy | 1 6 3 |

**BOSTON EXCH** Nov. 24

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1½ |
| Ahmeek | 225 |
| Alaska Gold M. | 18¾ |
| Algomah | 1 |
| Allouez | 30½ |
| Am. Zinc | 16¾ |
| Ariz. Com., ctfs. | 4¾ |
| Bonanza | .50 |
| Boston & Corbin | .50 |
| Butte & Balak | 4 |
| Calumet & Ariz. | 60¾ |
| Calumet & Hecla | 385 |
| Centennial | 11 |
| Cliff | ‡1 |
| Copper Range | 32½ |
| Daly West | 2½ |
| East Butte | 6¾ |
| Franklin | 2¾ |
| Granby | 68 |
| Hancock | 13½ |
| Hedley Gold | 30 |
| Helvetia | .25 |
| Indiana | 3 |
| Island Cr'k, com. | 46½ |
| Island Cr'k, pfd. | 81 |
| Isle Royale | 16½ |
| Keweenaw | 2½ |
| Lake | 4¾ |
| La Salle | 3⅝ |
| Mass. | 2 |
| Michigan | .75 |
| Mohawk | 38½ |
| New Arcadian | 1½ |
| New Idria Quick. | 2½ |
| North Butte | 22½ |
| North Lake | 1 |
| Ojibway | .75 |
| Old Dominion | 47 |
| Osceola | 67 |
| Quincy | 53 |
| Shannon | 6 |
| Shattuck-Ariz. | 25½ |
| Superior | 20¾ |
| Superior & Bost. | 2¾ |
| Tamarack | 25 |
| Trinity | 3¾ |
| Tuolumne | .75 |
| U. S. Smelting | 36½ |
| U. S. Smelt'g, pf. | 46½ |
| Utah Apex | 1¾ |
| Utah Con | 7½ |
| Victoria | 1 3/16 |
| Winona | 1¾ |
| Wolverine | 39¾ |
| Wyandot | .40 |

**BOSTON CURB** Nov. 24

| Name of Comp. | Bid |
|---|---|
| Bingham Mines | .5 |
| Boston Ely | .46 |
| Butte&Lon'nDev | .30 |
| Cactus | .02 |
| Calaveras | 1¾ |
| Chief Cons. | 1 3/16 |
| Corbin | ‡1 |
| Cortez | .21 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | .90 |
| First Nat. Cop. | 2½ |
| Houghton Copper | 2¾ |
| Majestic | .25 |
| Mexican Metals | .33 |
| Moneta Pore | ‡ .07 |
| Nevada-Douglas | 1½ |
| New Baltic | .50 |
| Oneco | .80 |
| Raven Copper | .10 |
| Rhode Island Coal | .01 |
| Smokey Dev | .25 |
| So. Lake | 2½ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | .30 |
| Trethewey | .30 |
| United Verde Ext. | .40 |

‡Last Quotation.

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# Lithia Deposits of the Black Hills

By Victor Ziegler*

*SYNOPSIS—Lithia deposits occur in pegmatite dikes of Precambrian age, in the Harney Peak district. Chief producing areas are near Keystone, Custer and Oreville. Amblygonite, spodumene and triphylite are the commercial lithia minerals, though many others exist. Spodumene is found in great log-like crystals. Other minerals occur in irregular pockets and nodules, often of great size, associated usually with milky quartz.*

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Contact of Pegmatite and Schist, Showing Enrichment in Mica, Bob Ingersoll Mine, Keystone, S. D.

Open Cut at Etta Mine, Showing Spodumene Logs, Keystone, S. D.

The lithia deposits of the Black Hills lie in the area of metamorphic rocks of Precambrian age thought, in part at least, to represent the Huronian system of the Lake Superior region. These rocks occupy the central core of the Black Hills and consist of a series of ancient sedimentaries now metamorphosed into slates, phyllites, quartzites, mica-, tourmaline-, garnet-, actinolite-, staurolite-, and quartz-schists, and gneisses, which are cut by a series of eruptives consisting of a prominent phase of basic rocks, now amphibolites, and a large massive silicic rock body, now granite gneiss. All, in turn, are cut by a great system of pegmatite and granite intrusions of less age, centering in intensity and magnitude in Harney Peak, the loftiest point in the whole Black Hills uplift.

## Precambrian Rocks Form Core of the District

Previous to these intrusions the sedimentaries had been intricately folded and somewhat metamorphosed, while both previously and subsequently much faulting took place, making the structure of the region very complex and difficult to ravel. The metamorphism of the Precambrian rocks is more marked as we approach the granites and as has been suggested by Van Hise, is probably in part an effect of this intrusion. This Precambrian core is surrounded on all sides by the parallel fringes of the sedimentary formations, rising in the geological scale as we move away from the hills and representing more or less completely all geological epochs from the Cambrian to the Pleistocene.

The granites of Harney Peak were intruded as a great batholith and did not actually reach the surface until exposed by erosion. Their general character shows that up to the present time erosion has done no more than lay bare the upper portion of this great granite body. Accompanying these granites, there is a large series of pegmatite dikes and quartz veins. These, as a rule, are intruded along the schistosity of the metamorphics. They have affected the general topography of the region profoundly, rising in bold precipitous hills or picturesque needle-like and castellated forms above the schists, but due to the relatively higher rate of erosion, the pegmatites, when introduded into quartzites, occupy the valleys and the more gentle slopes. The pegmatites and their accompanying quartzose phases afford deposits of important mineral products, chief of which are mica, lithia, tungsten, tin and gold. Of lesser importance are deposits of beryl, niobium, tantalum, monzonite, barite and bismuth.

The important lithium minerals are amblygonite [$LiAl(F.OH)PO_4$], triphylite [$Li(FeMn)PO_4$], griphite (a complex phosphate of lithia, iron, manganese and magnesia), spodumene [$LiAl(SiO_3)_2$], lepidolite [$(LiKNa)_2$

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*Professor of petrography and mineralogy, South Dakota State School of Mines, Rapid City, S. D.

(OH.F)$_2$SiO] and petalite ($LiAlSi_4O_{10}$). Griphite, petalite and lepidolite have as yet not been used as a source of lithia, although the latter would seem to be high enough in lithia to merit earnest consideration at some future time.

Lepidolite occurs in micaceous aggregates, colorless or of various shades of green, lavender, lilac and brown. Rarely it occurs in exceedingly dense masses, which show no evidence of micaceous structure and possess excellent conchoidal fracture. The lilac and lavender lepidolite is highest in lithia content. Caesium and rubidium are present in some Black Hills lepidolites. Griphite is so far known only from the Black Hills and is a resinous, light- to dark-brown mineral usually suggesting resin jack in appearance. Very rarely it is jet black. It occurs in pegmatites in nodules and masses which show good conchoidal fracture, and are often as much as 50 and 60 lb. in weight. The percentage of lithia is too low to make it suitable as a source of this oxide. Triphylite, which occurs in a similar way, is of a brown to brownish-black color, and has a submetallic to dull luster. It has poor cleavages and is often coated with purple or deep-red purpurite (FeMN) $PO_4$. Spodumene has been used to quite an extent as a lithia mineral. It occurs in huge crystals, usually white in color, quite hard, fairly heavy (sp.gr. 3.1), and possessing excellent cleavage. On weathering, the spodumene turns chalky-white, unless stained by iron oxide, and disintegrates into a fine slivery or splintery mass, which is often almost fibrous. Petalite occurs in pearly-lustered, small, white and cleavable masses, that are very hard and comparatively light. It is too rare to be of any importance as a lithia mineral. Amblygonite is the most important of these minerals, both on account of its high lithia content and on account of its ready solubility and consequent easy treatment. It occurs in nodules often as much as 200 to 300 lb. in weight. They are usually white in color, not quite as hard as spodumene, a trifle heavier (sp.gr. 3.2), and do not possess as good cleavage. It is most easily confused with the albite and oligoclase with which it is associated but can readily be distinguished by its greater specific gravity.

### Spodumene in Nearly All Pegmatites

Spodumene as an accessory mineral occurs in nearly all the pegmatites of the Harney Peak district. In a number, however, spodumene is so prominent as to replace practically all the feldspars and make the rock a quartz-spodumene rock carrying only subordinate amounts of the latter and other accessory minerals. Especially prominent are the Etta, the Bull Con, the Swanzy, the Wood Tin and the Dyke Lode claims near Keystone. The Hugo mine and the Equality Lode claims near Keystone and the Bond mine near Custer also carry appreciable amounts of spodumene, but are of chief interest on account of the accompanying amblygonite. The Etta deposit will serve best as an example of the spodumene deposits. This deposit is an oval, conical-shaped pegmatite body about 200 ft. in longest diameter on the surface, which forms the core of a small rounded hill, spoken of as Etta Knob, rising above the intruded quartzose phyllites and schists. This deposits has had quite a checkered career as a mine. It was originally worked for mica. Subsequently it passed into the hands of the Harney Peak Tin Co., and much work was done in search of cassiterite. Spodumene was next mined for several years. At the present time no work is being done, but the property is being held to await the exhaustion of the amblygonite deposits.

The deposit is opened up by a large open cut and by two tunnels, the lower of which is about 175 ft. below the top of the hill and cuts clear through the pegmatite from wall to wall. There are also several small tunnels and drifts and a shaft which are at present inaccessible.

### Spodumene Crystals Attain Great Size

As shown in the open cut and in the tunnel the deposit possesses a roughly zonal structure. At the contact the pegmatite approaches in composition a typical granite, i.e., it consists of an aggregate of alkali feldspar, quartz, abundant biotite and muscovite. The individual minerals are quite coarse in grain and will average about ¾ in. in diameter. This zone grades quickly and irregularly into a zone of giant pegmatite, consisting essentially of milky quartz masses penetrated and cut through in every imaginable direction by huge crystals of spodumene. These lie so irregularly as to suggest in appearance a jumbled mass of logs. Rarely the logs are arranged in star-shaped clusters. Many attain a length of 30 ft. and a diameter of 3 ft. The largest so far found was 42 ft. in length and 5 ft. 4 in. in maximum diameter. The best and largest spodumene crystals occur on the east side of the deposit. On the west side the spodumene is quite prominent but occurs in smaller masses. At the point of intersection of the spodumene logs one is usually continuous while the other is quite decomposed and cut off.

Irregularly placed in about the center of this zone, there occur irregular pockets of an aggregate of muscovite and quartz suggesting greisen in appearance and carrying fair amounts of disseminated grains of cassiterite and columbite. This is of importance only on the east side of the deposit. On the west side these pockets are absent or very restricted. In some of these aggregates the mica flakes reach a diameter of several inches. Triphylite, in nodules up to a foot across, small crystals of amblygonite, tapiolite, struverite and cupro-cassiterite occur, disseminated in this zone. Often the spodumene logs are surrounded by fine, scaly muscovite masses plentifully peppered with columbite and cassiterite grains. Stannite also was found in such an aggregate. Although this second zone is not sharply marked, it grades into a central zone quite rich in spodumene but characterized predominantly by large masses of feldspar (mostly microcline and oligoclase) and quartz. These masses are often as much as 6 to 7 ft. across. Large masses of pale-green beryl, aggregates of green scaly lepidolite, and of lamellar albite are also prominent in the central portion.

It is difficult to conceive of the extreme abundance and huge size of the spodumene crystals as shown in the open cut. One cannot help but marvel that molecular forces were powerful enough to govern the deposition of substances for such distances as 42 ft., and not only definitely orient all the matter over this distance, but also exclude rigorously all foreign material as well. In the tunnel, 175 ft. below the top of the hill, the pegmatite body has widened and shows spodumene in as large crystals and in as great abundance as on the surface.

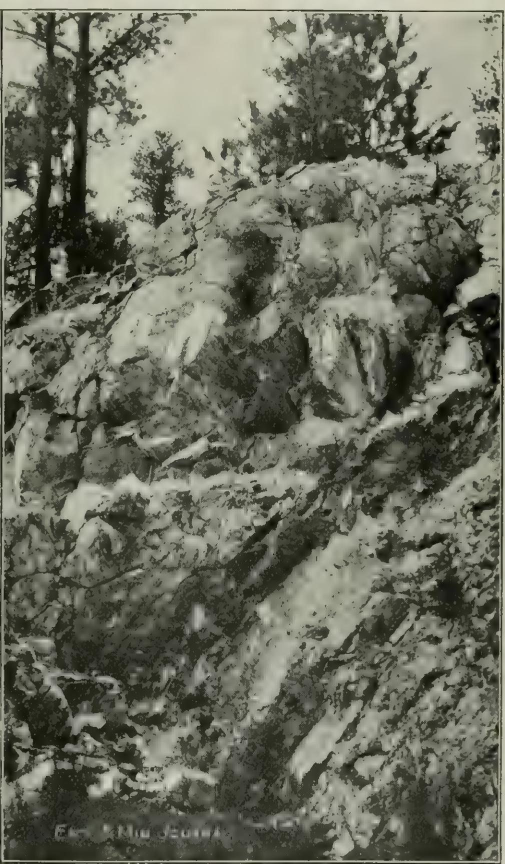
The Hugo and Dyke Lode near Keystone, the Wood Tin claim between Harney City and Hayward, and the Bond mine near Custer, show spodumene logs on the surface apparently as large as those in the Etta. Conditions of occurrence are practically the same. The Bull

Con and Swanzy claims near Keystone, where exposed, show spodumene in as great abundance as in the Etta, but in crystals of smaller size.

Spodumene varies in lithia content quite decidedly. Thus various analyses made at the South Dakota State School of Mines show percentages from 1.18 to 6.16. The theoretical lithia content is 8.4%, but as a rule some lithia is replaced by soda.

Up to the last five or six years spodumene was the chief source of lithia and was mined extensively at the Etta mine. Since then, however, owing to the opening of amblygonite deposits none has been produced.

Open Cut at Hugo Mine, Keystone, S. D.


Amblygonite Nodules in Pegmatite, Hugo Mine

The first spodumene from the Hills was put on the market in 1900. Since then and up to 1908 (with the exception of 1905), spodumene production has averaged less than 200 tons per year, the maximum being over 400 tons in 1904. The total production is about 1400 tons. The value depends on the lithia content and fluctuated in the above years from $9 to $40 per ton.

### Amblygonite Found in Nodules and Pockets

The more important amblygonite deposits are the Hugo, Peerless and Bob Ingersoll near Keystone, the Nichols near Hayward, the Tin Queen near Oreville and the Bond near Custer. The Hugo mine may best serve as an example of these deposits. It is located southwest of Keystone and about one mile northwest of the Etta Knob. This deposit is a large pegmatite body of oval character, similar to the Etta and widening downward. At the contact with the schists there is usually an enrichment in black tourmaline in regularly arranged streaks and masses. This is quickly followed by an enrichment in coarse, irregular muscovite books occurring in large pockets and shoots, and mined at the present time for scrap mica. This gives place irregularly to coarse granite, which grades into giant pegmatite made up of large masses of feldspar and quartz interspersed with pockets of coarse plumose muscovite-book aggregates, streaks of muscovite-quartz rocks carrying cassiterite and columbite, with the latter in masses up to 100 lb. in weight. There is much coarse pale-green and white beryl, blue apatite, lepidolite in pale-green micaceous masses, and triphylite up to 50 and 60 lb. in weight. There are logs of spodumene suggesting in size and occurrence those at the Etta. The central portion of the deposit gives at first sight the impression of one huge mass of milky quartz. This carries some large feldspar masses, some beryl, blue apatite, triphylite, and amblygonite. The latter mineral occurs quite irregularly in nodules and pockets, sometimes of great size. Thus one shoot of practically solid amblygonite showed on the face of the open cut for a distance of 15x22x40 ft. Masses 300 to 400 lb. in weight are frequently found, but there is no regularity in their occurrence. Their presence cannot be foretold until they are actually encountered. Amblygonite is more liable to occur when the milky quartz masses carry triphylite, spodumene and lepidolite, even if only in small amounts. When the amblygonite masses lie next to triphylite, they tend to be higher in lithia than when they occur near spodumene. In the former case most or all of the available fluorine seems to have been taken up by the triphylite while in the latter case it enters into the amblygonite. This deposit is quite vigorously worked by the Reinbold Metallurgical Co., open-cut methods being employed. Cassiterite, columbite, beryl, apatite, triphylite, and lepidolite are all saved incidentally while taking out the amblygonite, and are held awaiting future market demands.

### OTHER DEPOSITS IN WHICH AMBLYGONITE IS FOUND

The Peerless deposit which is mined by the same company is of similar character. Spodumene does not occur here nor at the Bob Ingersoll nor the Nichols claims, except in rare and small crystals. The occurrence of amblygonite at the Bond mine near Custer is similar The deposit, however, is not of such great size and occurs in a roughly north- and south-striking dike, rather than a cone-like body.

The Nichols mine near Hayward is quite unusual. Here amblygonite is found in loose brecciated material in well rounded, boulder-like nodules, immediately underneath the basal sandstones of the Deadwood formation. The amblygonite is traversed by cracks and these and the outside are heavily coated by iron oxide derived by leaching from the overlying sedimentaries. The amount of iron oxide so present reduces the lithia percentage of the whole below the marketable limit. Geologic conditions suggest that the amblygonite is not in place, but has been transported here probably by rolling partly down hill, before the Deadwood formation was laid down.

The first amblygonite was found at the Tin Queen mine in 1903. It was first mined in 1905. Since then the production has varied from a few tons to 800 tons per year (1912), the total production from 1905 to Sept. 1, 1913, being about 2800 tons. The value has fluctuated greatly, depending on production and on the lithia content. Soda, as in spodumene, replaces part of the lithia. At present amblygonite is sold on the basis of 9% lithia content. Prices in the last eight years have run from $10 to $45 per ton.

### DEPOSITS OF OTHER MINERALS WORKED

Lepidolite which may serve as a possible source of lithia in the future is prominent only at the Bob Ingersoll and possibly the Peerless mine, the lavender or lilac-colored variety being the highest grade. At the former this occurs somewhat like amblygonite in irregular shoots. One such of deep-lilac lepidolite is 2½ ft. thick and shows for 5 to 6 ft. in a small open cut. Some pale-lilac lepidolite occurs at the Bond mine. Green lepidolite is quite abundant at the Peerless, the Hugo and other claims.

Triphylite is of quite common occurrence in all of the pegmatites so far mentioned. It occurs much like amblygonite, but is more persistent and reliable in occurrence. Nodules up to a foot in diameter are common. These favor the coarser pegmatites. About 60 tons were taken from the Dyke lode, ¾ mile northwest of Bismuth, in 1907 and 1908, and about 40 tons were taken at various times from the Lost Bonanza (now the Mica King) about one mile south of the Etta. All was shipped to Germany by the Reinbold Metallurgical Co. No triphylite has been used for lithia extraction since the amblygonite deposits have been opened. Owing to its high lithia content it will probably take the place of amblygonite when the deposits of this mineral become exhausted.

### LITHIA-BEARING PEGMATITES FORMED BY INFLUENCE OF ROCK CRYSTALLIZATION

The lithia-bearing pegmatites are simply those portions of the Harney Peak granitic magma which are expelled during the process of crystallization and which do not enter into the composition of the essential minerals of the granite. They are the last to crystallize and are forced out to the margin of the granite into cracks developed by cooling and into the fissures of the country rock. Since these last molten portions are concentrations of water and volatile gases as $SO_2$, B, Cl, F, and others, usually spoken of as mineralizers, their fluidity is high. Most metallic minerals, as cassiterite, wolframite, columbite, are soluble in these mineralizers and are carried out in solution, together with some quartz and feldspar. The metals also tend to increase the fluidity of such a fusion. This extreme fluidity affords the necessary condition which allows of the formation of crystals as much as 42 ft. in length. Water is held in solution as vapor under pressure. As the different consituents are eliminated the fusion becomes more and more watery until it exhibits a complete gradation into water solutions at high temperatures.

Thus the Harney Peak granite, consisting of orthoclase, microcline, oligoclase, quartz and muscovite, shows complete gradations into giant pegmatites with their large quartz and feldspar masses, their huge crystals of spodumene, and their hosts of rare minerals as columbite, cassiterite, uraninite, tapiolite, triphylite, griphite, etc. These show gradations into the large milky quartz masses with their amblygonite, tourmaline, and apatite enrichment which represents a slightly later stage in crystallization. Pegmatite can be directly traced into quartz veins at a number of places as, for example, at the Equality lode near Keystone. These closely related quartz veins are usually rich in muscovite, tourmaline and griphite, and carry varying amounts of one or more of the following minerals: Barite, cassiterite, wolframite, hübnerite, gold and bismuth tellurides, siderite and other carbonates. Hence we find a perfect gradation from the true typical granite into the coarse-grained pegmatite, and from the latter, into the true quartz vein, which is the last stage in the whole series and represents the residue highest in water content, from which most of the rarer substances have been removed during the crystallization of the pegmatites.

⁂

**Iridium has been discovered in South Africa**, according to information received from the Commissioner of Customs and Excise at Pretoria The Secretary for Mines reports the discovery in the Heidelberg district of a small gold reef which also contains iridium A test showed the presence of 8dwt. gold, 10dwt silver, 3½dwt. iridium, and a trace of platinum per ton of ore

# Scandinavian Mining and Metallurgy

SPECIAL CORRESPONDENCE

The mineral and metal output of Norway in 1912 shows about a 35% increase both in value and in number of men employed, but it should be noted that the increase is practically confined to those propositions which began working before restrictions of the concession laws became operative some five years ago. At that date all appreciable progress in new mining ventures practically ceased. So far as the 1912 output and values are concerned, it may be pointed out that apart from the 44,500 tons output of the Salangen iron mines (which shut down in that year), the bulk of the iron-ore output as represented by Sydvaranger, is not dividend-paying. In the meanwhile this company's undertaking, though still more or less in its construction stage, is, at present, shipping an average of about 45,000 tons of slig and briquettes per month, and it has been recently decided to carry on the extension to a point whereby an annual output of 700,000 tons will be secured. The installation of the new machinery in the separation works is well forward, and will be probably completed by the end of the year.

### SWEDISH IRON ORE TO AMERICA

The Swedish minister at Washington has strongly advised the home authorities to increase the Norrbotten ore shipments to the United States. He bases his recommendation on the fact that the new tariff gives it free admittance, and that the leading steel firms are prepared to take all of this ore they can get sent them. The reserves of the Norrbotten ore, which has an Fe content of about 63%, are computed at 1,000,000,000 tons.

The Swedish Luossavaar Kirunavaarabolaget has notified the railway authorities that, in 1915, Lappland iron ore to the amount of 3,738,000 tons will be mined for shipment.

### ELECTRIC IRON-ORE SMELTING IN NORWAY

The electro-metallurgical committee in its report on the smelting operations at Hardanger arrived at the conclusion that the economical failure of the Elektrometal method, using coke as reducing material, was caused by the poor-grade ores employed, and errors in the selection of the roaster and electric equipment. French interests are, at present, converting the plant into an aluminum-cable factory, that metal having lately been increasingly substituted for copper.

The failure of the Hardanger attempt at electric iron-ore smelting on a commercial basis, has concentrated attention on the Norwegian Bie-Lorentzen smelter at the Tinfos iron works, in Telemarken. At a recent meeting of the shareholders of the Tinfos company, the chairman, Herr Christiansen, said that the initial difficulties were being gradually overcome. The total charges in connection with the production of the pig iron had now worked out at 75 kroner (1 krone equals 26.8c.) per ton. The sale price was from 81 to 82 kroner per ton, and there was still a prospect of bringing the cost charge further down. The product cost more than was anticipated, but this was also owing in a measure to the fact that ore, and especially coke, had become dearer than was expected. The smelting at Tinfos, it should be mentioned, commenced in August, 1912, with furnace No. 1, with furnace No. 2 in December, No. 3 in March, 1913, followed later on by No. 4. The working for last year showed a loss, which is attributed to a number of unexpected difficulties, and mishaps, including labor troubles.

However, the results have been sufficiently encouraging to induce Herr Kammerherre Cappelen, the owner of the well known Ulefos mines and foundries, to adopt the process, or a modification of it for his works. He has applied for a concession for a high-tension connecting with Vrangfos and Eidfos falls, in Telemarken, with a view to the installment of electrochemical works at Ulefos. As Herr Cappelen's methods are known by repute to be anything but speculative, his decision has aroused much hopeful anticipation in those who desire to see a solution of Norway's iron ore-coke smelting problem.

A. S. Tysse Falls, Norway, has concluded a loan of $1,750,000 at 5½% to extend the Odda power plant, in Hardanger. This now develops 86,340 e.hp., and the extensions will give 13,000 more.

### CANADIAN COPPER ORE TO SULITELMA

A parcel of 100 tons of copper pyrites from Canada has been delivered by a Norsk-American boat at Bergen, and transhipped via Fineidet to the Sulitelma smeltery. The Swedish-American engineer, Mr. Warn, says that the Canadian Copper Co., which smelts its ore in blast furnaces, will try the Knudsen process at Sulitelma. At the same time Mr. Warn proposes to investigate the methods of the Hybinette electrolytic process in Norway.

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# The Steel Corporation's Proportion of Business

The annual report for 1912 of the American Iron & Steel Institute—which takes the place of the American Iron & Steel Association—gives a table of production, showing the proportion of the total make of iron and steel and the production of iron ore credited to the United States Steel Corporation and the outside or independent producers during that year. We take from this table the figures showing total production and the percentages credited to the corporation and other producers:

| Ore, etc.. | Total Tons | Percentages Steel Corp. | Percentages Independent |
|---|---|---|---|
| Lake Superior iron ore | 48,221,546 | 50.46 | 49.54 |
| Total iron ore | 55,150,147 | 47.92 | 52.08 |
| Coke | 43,983,599 | 38.01 | 61.99 |
| Iron and Steel: | | | |
| Spiegel and ferro | 221,724 | 80.82 | 19.08 |
| Pig iron | 29,505,213 | 47.47 | 52.53 |
| Total furnace products | 29,726,937 | 47.72 | 52.28 |
| Steel ingots, all kinds | 31,251,303 | 54.08 | 45.92 |
| Steel rails | 3,327,915 | 56.27 | 43.73 |
| Structural shapes | 2,846,487 | 49.83 | 50.07 |
| Plates and sheets | 5,875,080 | 50.37 | 49.63 |
| Wire rods | 2,653,553 | 63.20 | 36.80 |
| Other rolled products | 9,953,806 | 40.56 | 59.44 |
| Total rolled products | 24,656,841 | 48.52 | 51.48 |
| Wire nails, kegs | 14,659,700 | 49.30 | 50.70 |
| Tinplates | 962,971 | 60.37 | 39.73 |

Other finished rolled products include nail plate, merchant bars, rolled forging blooms and billets, semi-finished products for export, etc. Wire nails are given in kegs of 100 lb. each, the total being equal to 65,445 long tons. Semi-finished products, except those exported in such forms, are not included.

⁂

**High-Grade Lime Deposits Exist Near Buenos Aires,** Argentina, and a movement is on foot to standardize their product in terms of CaO, a certain amount to be valued at one peso.

# The United Verde's 400-Ft. Steel Chimney

By C. W. Cromwell*

The United Verde Copper Co. is building as a part of its new works, at Jerome, Ariz., a chimney which is believed to be the tallest steel stack in the world. This chimney is 30 ft. in diameter inside the brick lining, 30 ft. 9½ in. inside of the steel shell, and 400 ft. 1 in. from top of foundation to top of steel. The unusual size of this structure, the connections for three flues, and the protection of the steel plate from the flue gases, caused several interesting problems in the design.

The diameter and height of the chimney were determined by the draft calculations; the diameter and height of bell were made one-eighth of the height of chimney, or 50 ft. The brick lining was supported on the legs of circular angles riveted to the inside of shell and spaced 15 ft. apart. By this method, the bearing capacity of the brick is not exceeded and any section can be replaced without affecting the others. The weight of brick is carried directly down the shell and was added in when computing the maximum stresses on the compression side, but was neglected on the tension side as it was assumed that the maximum wind might occur before the chimney was lined.

The wind load was assumed to be 50 lb. per sq.ft., or 25 lb. per sq.ft. on the projected diameter, equal to 770 lb. per ft. of height. The dead load was taken as the actual weight of steel plus the weight of brick lining assumed at 112 lb. per cu.ft. The following unit stresses were used: Tension, 16,000 lb. per sq.in., on net section; compression, 10,000 lb. per sq.in., on gross section; shop rivets, 10,000 lb. per sq.in. for shear and 20,000 for compression; field rivet values 80% of shop. The section modulus of any section was computed by multiplying the area of the inside of shell by the thickness.

In order to find the points where assumed sections of plates and spacing of rivets changed a formula was derived as follows to eliminate the customary "cut and try" method.

Where

$h$ = Distance in feet from top of chimney to section in question;
$r$ = Least value rivet in shear or bearing;
$d$ = Diameter of rivet in inches;
$a$ = Distance between rivets in inches;
$t$ = Thickness of plate in inches;
$W_s$ = Weight of column of steel 1 ft. high. (For 1 sq.in. of steel is weight on circumference of length $\frac{1.0}{t}$);
$W_b$ = Weight of brick as above. (For 1 sq.in. of steel is $\frac{3.0}{t}$);
$S_c$ = Allowable compression per square inch on steel plate, to develop rivets in joints;
$S_t$ = Allowable tension per square inch on steel plate, to develop rivets in joints;
$M$ = Moment from wind in inch-lb. = $4620\ h^2$;
$M_s$ = Section modulus.

Then

$$S_c = \frac{r}{at} \qquad (1)$$

$$S_t = \frac{r}{(a - d - \frac{1}{8})\,t} \qquad (2)$$

$\frac{M}{M_s}$ = *actual stress due to wind on either tension or compression side of chimney* (3)

$$\frac{M}{M_s} + h\,W_s + h\,W_b = \frac{r}{at} \text{ or } \frac{4620\,h^2}{M_s} + h\,W_s + h\,W_b = \frac{r}{at}$$

(compression side) (4)

$$\frac{M}{M_s} - h\,W_s = \frac{r}{(a - d - \frac{1}{8})\,t} \text{ or}$$

$$\frac{4620\,h^2}{M_s} - h\,W_s = \frac{r}{(a - d - \frac{1}{8})\,t} \quad \text{(Tension side)} \qquad (5)$$

All the quantities in the above equations are known except $h$, which can be readily solved from (4) and (5) as a quadratic. The minimum value found in the two equations should be used, which was always to be on the compression side. This method proved to be a great labor saver, the known values were substituted in equations (4) and (5), and getting these equations in the form of the standard quadratic $ah^2 + bh + c = 0$, the value $h$ became $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, which was solved by the aid of the slide rule. An example of the use of the formula will be given.

To find the limiting distance h with ¼-in. plate and ¾-in. rivets spaced 2¼-in. centers.

$\frac{3000}{2\frac{1}{4} \times \frac{1}{4}}$ = 5330 allowable compressive stress in plate.

$\frac{3000}{1\frac{3}{8} \times \frac{1}{4}}$ = 8725 allowable tensile stress in plate.

Weight of steel per linear inch circumference is 0.98h, or 3.92h for 1 sq.in. of steel. Weight of brick per linear inch circumference is 3.00h, or 12.00h for 1 sq.in. steel.

Total per linear inch circumference is 3.98h, or 15.92h for 1 sq.in. steel.

Then, $\frac{4620h^2}{26750} + 15.92h = 5330$, and h = 140 ft. = allowable depth on compression side.

Also, $\frac{4620h^2}{26750} - 3.92h = 8725$, h = 238 ft. = allowable depth on tension side.

This shows that the assumed plate and rivet spacing should extend 140 ft. from top of chimney.

The first change in section was designed to be made at 160 ft. from top of chimney, and the others at 58, 29, 29, 22, 22, 7½ and 22½ ft. farther down, but this spacing was slightly changed to fit plates ordered. The thickness of plates, diameter of rivets, and details of joints are shown in Fig. 1. The bell was made of 36 plates $\frac{11}{16}$ in. thick running vertically, with one horizontal butt-joint splice, to top of bell. Two plates 26x⅜ in., with four rows of rivets each side connected the bell with the main shaft. These plates were made unusually large to give additional stiffness and prevent any possible tendency to flatten the shell due to the curvature of the bell.

At the top of the bell it was necessary to provide three openings 120° apart for the reverberatory, blast-furnace and roaster flues. The sizes of these openings are given on Fig. 1. The bottoms of these openings were at the same elevation—the top of the bell. At these openings a lower unit-stress was used on the shell plate, and at each side of them the plates were reinforced as shown in detail. This T-section reinforcement was designed as a column

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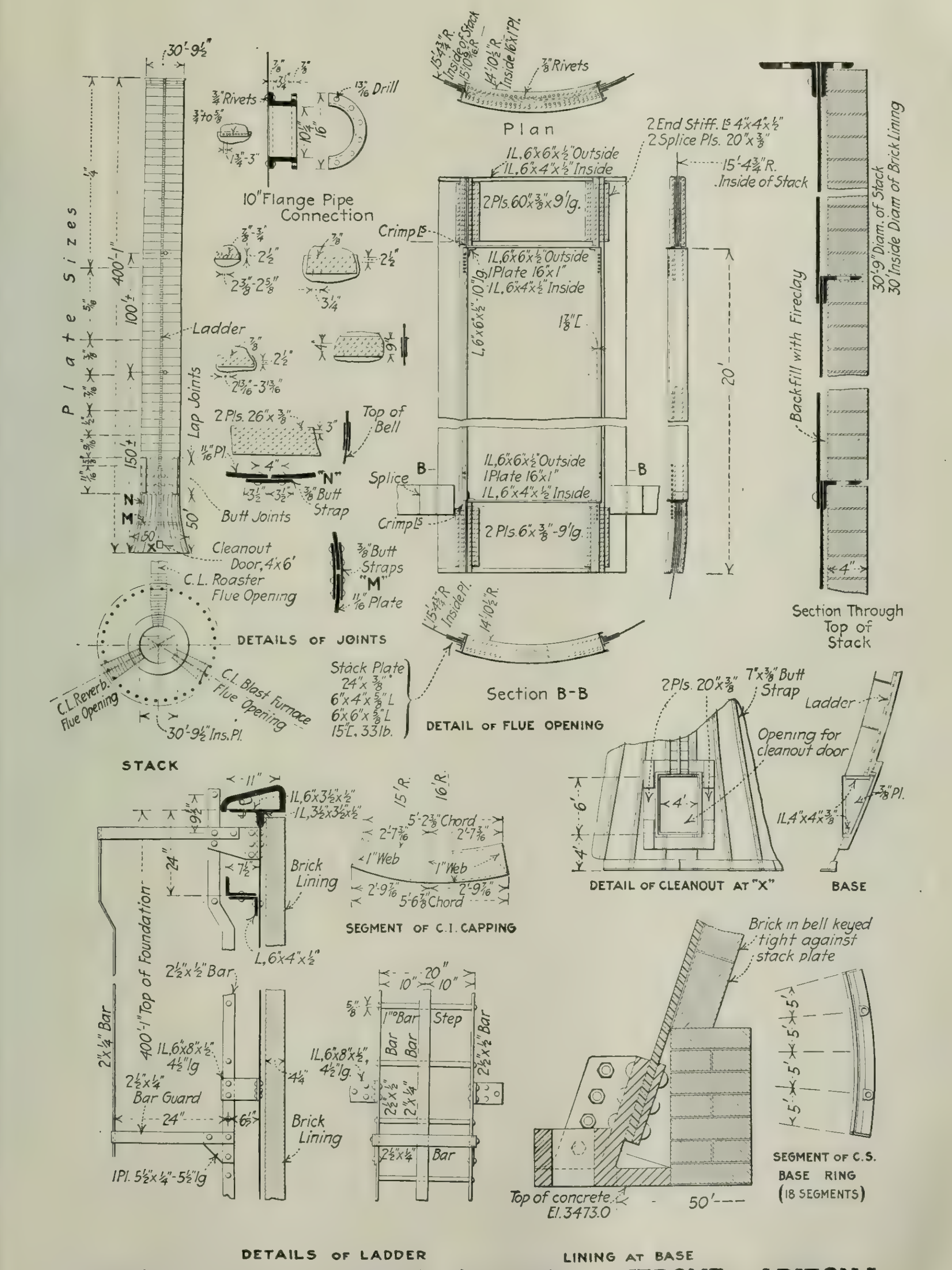
*Structural engineer, Repath & McGregor, Douglas, Ariz.



DETAILS OF 400-FT. STEEL CHIMNEY - JEROME ARIZONA to take a load equal to the maximum stresses the plate in half the opening would have taken. At the tops and bottoms of these openings, built-up girders were riveted to both sides of the shell plates, and were designed to take load equal to the maximum stresses at these points.

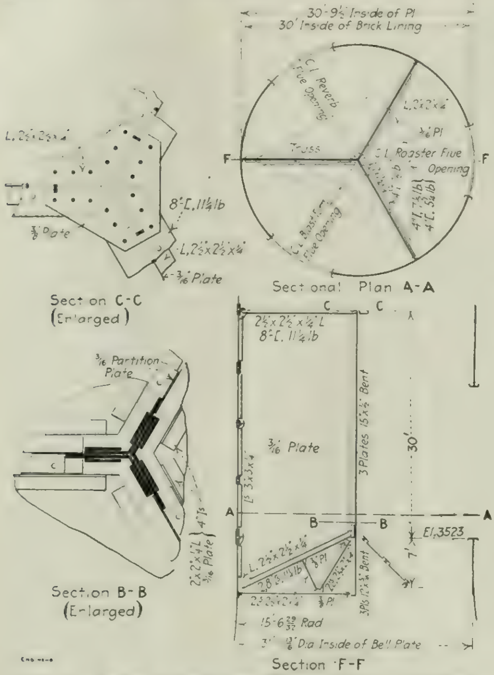


Fig. 2. Steel Baffle for Three-Flue Chimney

The top of chimney is stiffened by outside and inside angles, the former supporting a cast-iron coping made up of 18 segments. This coping protects the steel and makes a good finish for the top. Two feet below the top there is a built-up Z-section with the outstanding leg turned up. This section acts as a strut and is to be used as a painting ring.

As previously stated, the brick lining is supported every 15 ft. by angles riveted to inside of shell; the angles are spliced and also act as stiffeners for the shell. At the bell the brick lining rests on the foundation and follows the contour of the bell to the top without any supporting shelf angles. Standard-size common brick is used, as in the remainder of the chimney, laid in rings and keyed against the bell plate.

There is a steel ladder running from bottom to top of the chimney and two feet back is a vertical bar connected to the ladder every 5 ft. and acting as a guard.

At points 150 and 250 ft. from the base there are flanged pipe connections with bolted cover plates to allow for inspection or tests. There is a large cleanout door at the base used also for erection purposes. Between adjoining flue openings, there is a baffle-plate extending from the shell to the center of chimney. These baffles extend from about 7 ft. below the bottoms of the flue openings to the full height (30 ft.) and cause the flue gases to come together while moving in practically parallel courses.

At the bottom of the bell, the plates are triple riveted to a cast-steel base ring, made up of 18 segments which are bolted at flanged ends and spliced with a reinforcing plate. This ring is connected to the foundation by 36 anchor bolts 1 in. in diameter by 11 ft. 2 in. long. At the lower end of these bolts a cast-iron washer 1 ft. square gives them a positive connection under the reinforcing rails.

The foundation is octagonal with a short diameter of 70 ft. and a depth of 10 ft. Piers for some of the flue columns are connected to this foundation but do not affect the general design. It is made of concrete with mix proportions of 1:3:6, the lower 3 ft. with a maximum of 2½-in. stone, the next 5½ ft. with a maximum of about 18-in. boulders and the next 1 ft. 5 in. with 2½-maximum stone and a 1-in. finish of a 1:1 mortar. It is reinforced top and bottom with two layers of old 45-lb. rails laid at right angles. The underlying sand is a coarse gravel partly cemented. The maximum bearing pressure at toe is about two tons.

The total weight of this chimney is about 875,000 lb. The erection rigging consists of a steel frame of two decks, the upper one supporting a guyed derrick, the mast of which is at the center of the chimney. The falls are led down through the center of motion to the chimney base, and through the cleanout door to an electric hoist. The frame will be raised by means of chain hoists attached to the upper sheet of the chimney. For placing the brick lining a similar scheme will be used, the frame being raised by means of chain hoists attached to shelf angles. These shelf angles have been provided with holes for such connections.

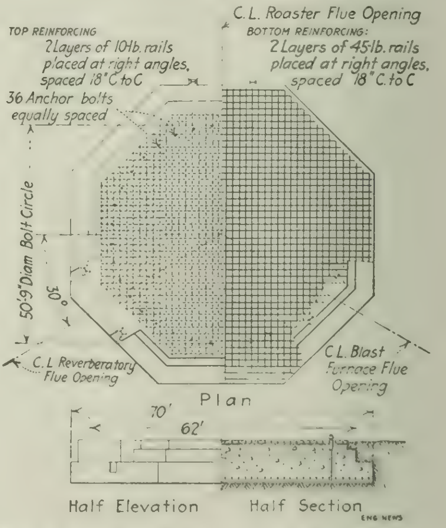

C.L. Roaster Flue Opening
TOP REINFORCING
2 Layers of 10 lb. rails placed at right angles, spaced 18" C to C
BOTTOM REINFORCING:
2 Layers of 45 lb. rails placed at right angles, spaced 18" C. to C
36 Anchor bolts equally spaced
50'9" Diam Bolt Circle
30°
C.L. Reverberatory Flue Opening
C.L. Blast Furnace Flue Opening
Plan
70'
62'
Half Elevation
Half Section
ENG NEWS

Fig. 3. Foundation for 400-Ft. Steel Chimney

The chimney was designed by Repath & McGregor, engineers, Douglas, Ariz., who are designing the entire smelter. C. W. Cromwell, structural engineer, was in personal charge of the chimney design, with C. W. Brunskog as designing draftsman. The steel was fabricated and is being erected by the Chicago Bridge and Iron Works, of Chicago.

# Copper Prices, Consumption and Supply

By Heath Steele*

*SYNOPSIS—A slight decrease in present prices of copper would eliminate the small producers. Arguing from past figures the world's demands for copper are likely to increase faster than will copper production. Therefore, it is more likely that future prices of copper will be higher than recent prices, rather than lower.*

⁂

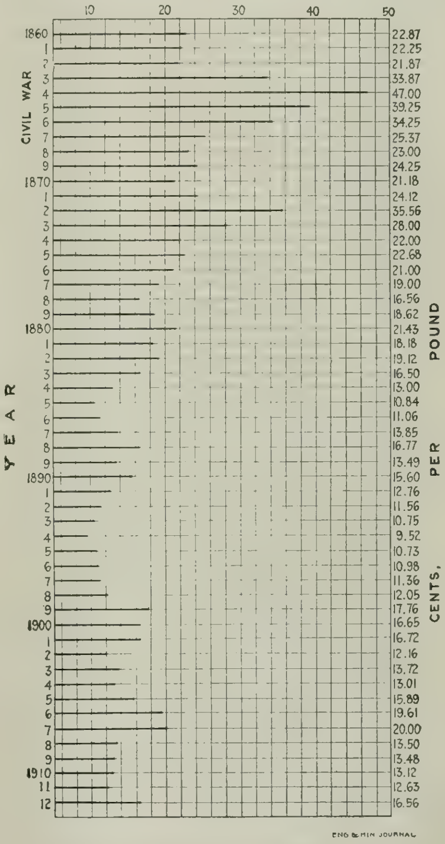
In a previous article published in the Engineering and Mining Journal, Aug. 9, 1913, on the "Cost of Copper," I stated that the price of the metal was subject first to the law of demand; second, to the supply, and again the supply would be regulated by the cost of production. The general conclusion from statistics gathered in that article was that the cost of the world's copper was about 10.5c. per lb. for all operating charges, but not including investments in mining property. Further, that a price of 14c. to 15c. per lb. for copper seemed necessary to provide for the return of capital invested in mining property and to give the profits demanded of the business. If this conclusion is correct, or nearly so, we then have a sound basis for thinking that the price of copper will not average below this point.

Some of the largest producers would only about break even on 12c. copper and others would even operate at a loss on a better market. If copper falls below the price that returns all producers a fair profit, and remains there for any length of time, the small producers will naturally be forced to close down. I shall try to show further on that the world needs all the copper it is getting; therefore, if the production from the concerns operating on a narrow margin is cut off, the principal producers would be in actual control of the market; the corollary follows that they would demand and obtain a good price. There is nothing new in this; it has always been accepted in a general way; but the factors, cost, supply and demand, are not clearly understood by all.

### Price Records

The accompanying table and chart shows the record of copper prices for Lake copper from 1860 to the end of 1912. Conditions have changed to such an extent within the last 20 years that it is doubtful whether past records of prices are of much value in forming an opinion as to future prices. However, we may get in a way a confirmation of the inference that a price of 14c. to 15c. per lb. is necessary to meet all demands of the producers.

Starting with 1860, the highest price on record is 55c. for the month of July, 1864; the average for the year, 47c. per lb., is also the highest yearly average. Beginning from a low price of 17.5c. in July, 1861, the price started upward and continued so until it reached the peak of 55c. From this high record it gradually declined in curves until it reached an apparent level of about 23c. in the middle of 1867. From this date until the middle of 1871 it fluctuated from 19c. to 27c. We have here a period of about seven years during which the price was affected by the Civil War, which was also the cause of inflated money. The Lake Superior district was then producing about 70% of the copper of the United States. At the same time Lake copper was selling for 55c. in America, tough copper was selling for about 21.22c. per lb. in London, or less than half of the American price. If we were to be thrown into such a state of affairs at the present time and our mines forced to curtail their production even one-half, it is probable we would see a repetition of inflated prices; in fact, the situation would be so acute it is hard to foresee just what would happen, Now we are producing over half of the world's output, while even as late as 1880 our proportion was only 17 per cent.



American Copper Prices for 50 Years

If we are to consider anything like normal conditions the first peak indicated by the chart must be left out. Since the Civil War period the price of copper has fluctuated, or rather we have had well defined waves of high prices six times, including the present one. In 1872 it rose from a low price of 21.188c.; in 1870 to 35.56c.; from this point it fell to what was then a new low yearly record since 1860, 16.56c. per lb. In 1880 it had worked back to 21.43c., and from that date steadily declined until it reached another new low record of 10.84c. In 1888 copper was again selling for 16.77c., and was fairly steady between this price and 15.60c. to 1890, after this it gradually fell until it reached the lowest price on record for Lake copper, 9c. per lb., the yearly average was 9.52c. Since the low prices of 1894 there have been three big waves: 1894 to 1902, 1902 to 1911 and 1911 to the present movement, which has yet to work itself out. The peak of the 1894-1902 movement was reached in April, 1899, at 19⅜c. and extended to the latter part of 1901. The 1902-1911 movement started at a low point of 11c. in January and reached its highest point, 26¼c. in March, 1907, and ended in May, 1911, when the average price for the month was 12.214c. per lb. From this point it again started upward, and as stated, the full swing has yet to be completed. Granted that the price will continue to work in curves, and there is no reason to suppose it will not, a gradual rise in the price of the metal since 1894 and its continuance is evident from a study of the rise in the base price of each wave.

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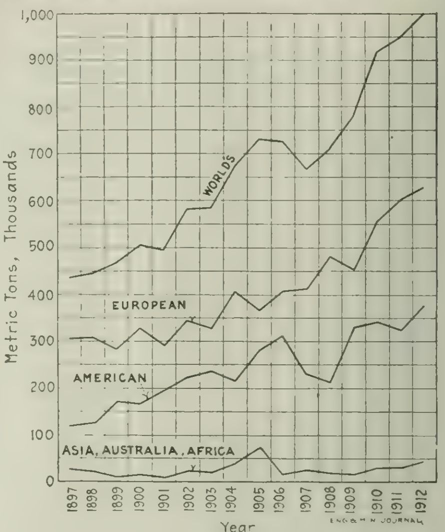
*52 William St., New York.

Five of the movements mentioned as occurring since the Civil War have been the result of industrial booms and consequent depressions, aided once or twice by attempts at controlling the copper market by certain interests. The sixth upward swing was started about the middle of 1911 and was from all appearances caused more by the normal growth of consumption than to any unusual industrial movement. The high crest of this wave to date was reached about September, 1912, and after remaining fairly steady for four months, the price began to recede until the average of March, 1913, was 14.93c. It again rose to 15.73c. for May and then fell to 14.56c. for July. At the present, September, 1913, it has again worked back to about 17c. Referring to the base line of the long upward swings; in 1911 it was 12.21c.; 1902, 11.55c.; 1894, 9c.; showing a rise of 3.21c. since 1894. If we were to consider the short movement in 1913 with a base of 14.56c. the rise would be 5.56c. per lb. It is possible to obtain numerous averages from past prices but, they all indicate that 14c. to 15c. has been a normal price for the metal. For example, the average price for 10 years ended 1905 was 13.79c.; 1906, 14.515c.; 1907, 15.30c.; 1908, 15.14c.; 1909, 15.06c.; 1910, 14.70c.; 1911, 14.71c.; and 1912, 15.15c., averaged for the 10 years to each date.

### Past Consumption

The tables on consumption and production that follow were compiled from figures given by the Metallgesellschaft, which obtains many of its figures from the Engineering and Mining Journal, the others from Government reports, the Copper Producers' Association, and estimates by experts. The tables and charts given herewith tell a wonderful story of the increase in use of copper. Since 1897 the consumption has increased from 435,700 to 1,040,200 metric tons, or in other words, the world is using 604,500 tons, or 139% more copper per annum today than it was in 1897. By continents the increase has been: Europe, 105%; American, 218%; Australia, Asia and Africa, 233%. The American consumption represents all copper consumed in the United States, Both North, South and Central America. Outside of the United States the American consumption was estimated at 500 metric tons in 1897, in 1912 it was estimated at 3[illegible] tons, an increase of 500%. The consumption of the United States has risen from 117,400 to 371,800 metric tons in 1912, an increase of 217% for 16 years. Here we have evidence that the greatest percentage of increase is in the countries that are the least developed, which seems perfectly natural. Turning to the European countries we find the following percentages of increase: Italy, 370%; Austria-Hungary, 182%; Russia, 163%; Germany, 158%; miscellaneous European countries, 150%; and the lowest of all, France and England, showing an increase of 94 and 44.5%, respectively.



World's Copper Consumption

WORLD'S CONSUMPTION OF COPPER

(Metric Tons)

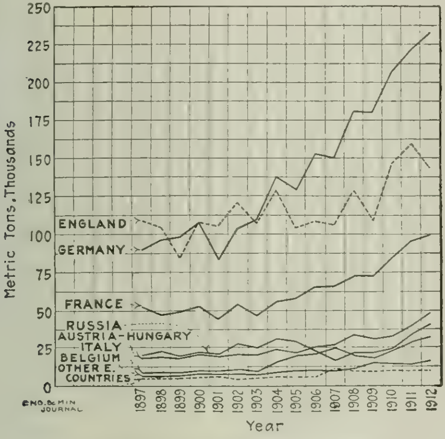
| | Europe | Australia, Africa and Asia | America | World |
|---|---|---|---|---|
| 1897 | 305,800 | 12,000 | 117,900 | 435,700 |
| 1898 | 308,000 | 10,700 | 121,800 | 440,500 |
| 1899 | 286,600 | 6,500 | 170,100 | 463,200 |
| 1900 | 328,200 | 10,200 | 169,700 | 508,100 |
| 1901 | 293,500 | 8,500 | 191,100 | 493,100 |
| 1902 | 341,900 | 17,200 | 223,400 | 582,500 |
| 1903 | 330,300 | 17,600 | 238,800 | 586,700 |
| 1904 | 402,900 | 38,800 | 220,800 | 662,500 |
| 1905 | 370,200 | 73,000 | 284,200 | 727,400 |
| 1906 | 404,800 | 12,000 | 305,800 | 722,600 |
| 1907 | 411,600 | 23,000 | 229,000 | 663,600 |
| 1908 | 480,500 | 14,800 | 211,200 | 706,500 |
| 1909 | 452,600 | 11,600 | 323,300 | 787,500 |
| 1910 | 550,100 | 20,700 | 342,900 | 913,700 |
| 1911 | 602,100 | 26,700 | 324,900 | 953,700 |
| 1912 | 625,000 | 40,400 | 374,800 | 1,040,200 |

EUROPEAN CONSUMPTION OF COPPER

(Metric Tons)

| | Germany | England | France | Austria-Hungary | Russia | Italy | Belgium | Other European Countries |
|---|---|---|---|---|---|---|---|---|
| 1897 | 89,800 | 109,600 | 51,400 | 17,200 | 19,400 | 7,800 | 6,200 | 4,400 |
| 1898 | 97,000 | 104,100 | 48,800 | 18,600 | 21,800 | 7,800 | 5,800 | 4,100 |
| 1899 | 97,700 | 85,600 | 49,900 | 17,100 | 18,700 | 7,700 | 5,500 | 4,400 |
| 1900 | 108,900 | 108,500 | 51,600 | 19,700 | 20,400 | 8,300 | 6,300 | 4,500 |
| 1901 | 84,800 | 105,200 | 45,100 | 18,400 | 19,000 | 9,400 | 6,500 | 5,100 |
| 1902 | 102,000 | 120,000 | 53,400 | 19,100 | 26,300 | 10,700 | 6,700 | 3,400 |
| 1903 | 110,100 | 107,600 | 48,600 | 18,900 | 25,000 | 9,600 | 6,100 | 4,400 |
| 1904 | 136,300 | 127,900 | 56,600 | 23,200 | 31,200 | 14,900 | 7,800 | 5,000 |
| 1905 | 128,000 | 103,300 | 57,800 | 22,700 | 27,600 | 17,200 | 8,600 | 5,000 |
| 1906 | 151,100 | 107,600 | 64,100 | 24,700 | 23,500 | 19,800 | 9,000 | 5,000 |
| 1907 | 150,000 | 106,100 | 65,300 | 26,600 | 17,600 | 25,800 | 9,500 | 10,700 |
| 1908 | 180,800 | 127,600 | 73,700 | 33,500 | 20,900 | 22,300 | 11,000 | 10,700 |
| 1909 | 179,400 | 108,300 | 73,400 | 31,100 | 21,600 | 17,000 | 13,000 | 8,800 |
| 1910 | 209,400 | 146,000 | 85,700 | 33,500 | 28,600 | 22,500 | 13,000 | 11,400 |
| 1911 | 222,100 | 159,100 | 95,700 | 38,500 | 32,800 | 29,400 | 13,500 | 11,000 |
| 1912 | 232,700 | 144,700 | 99,800 | 48,200 | 40,000 | 33,600 | 15,000 | 11,000 |

For the last five years consumption has increased at the rate of 6.5% in 1908; 11.5% in 1909; 16% in 1910; 14% in 1911 and 9.05% in 1912. In fact, since 1907 there has been an increase for each succeeding year, and going back over the 16-year period only three years have registered a decrease over the preceding year. Two noticeable and important facts may be seen on the chart of the world's consumption of copper; first, that the United states and Europe are practically the consumers of copper; second, the American and European consumptions are by no means parallel in movements. In Europe, Germany and England are the consumers of copper in the order named and France is third. The rest of Europe consumes about as much as England.



European Copper Consumption

This enormous increase in the use of copper is undoubtedly due mainly to the development of electrical appliances. But the real base of the movement goes beyond this; we are passing through the age of machinery and the period of substitution of metal for wood and other materials. Communication, transportation, manufacturing and farming are rapidly changing from man and horse labor to mechanical methods in every part of the world. Even a great part of our household duties are now performed by machines. It is needless to point out this development, for there is not one of us who has not seen this evolution going on. Today we are not surprised to see machines built to perform any kind of work even better than it is possible to do it by hand. It is true this advance has gone pretty far in the principal countries of the world; covering Europe and the United States and parts of other countries, but there is a greater field ahead than has been covered. Some general statistics on the increase of electrical apparatus show that the manufacturing of dynamos, generators, etc., increased 730% in the United States from 1899 to 1909; transformers, 197%; switchboards, 223%; motors, 64%; storage batteries, etc., 188%, and telegraph instruments, 19%. The value of incandescent lamps increased 342%, and lighting fixtures, 243%. Practically all this output of equipment has been consumed at home and in countries where the development of mechanical arts is as advanced as ours. The population of the world being about 1,522,000,000 people, we are then using 1.5 lb. of copper per capita. But carry this further and we see how unevenly this consumption is distributed. Europe is apparently using about 3.6 lb. per capita per annum; America, 5 lb.; while Africa, Australia, and Asia combined use only about 0.09 lb. per capita.

### Future Consumption

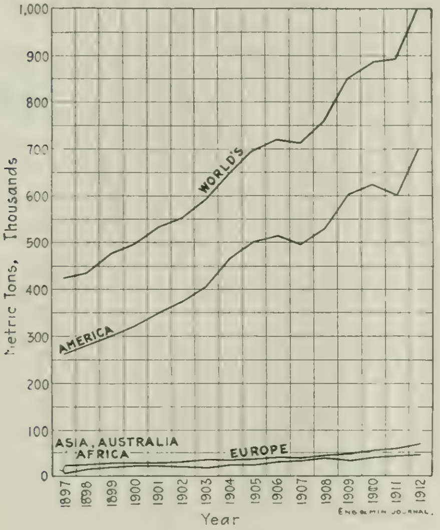
The world moves faster today than ever. When new territory is opened up it requires only a short time to introduce the most modern methods and machines. Take for example middle and western Canada. As soon as possible the farmer equips his farm with modern machinery, and we find him a consumer of metal quite in proportion to his brother in the fully developed districts of the United States. Or, as another instance, the mining camps of southern Nevada. Within four years after the discovery of Tonopah and Goldfield, situated in the heart of a desert, the inhabitants were enjoying all the comforts of modern conveniences quite in proportion to those of large cities. These are cited to show what may be expected in the way of increased consumption in any country not now fully developed in the use of modern machinery and appliances.

In Argentina this development has been going on much faster than most of us have realized. Brazil also is fast taking its place among the first countries of the world. American capital is now turning to Chile and Peru for the development of mines on a scale equal to the operations now conducted at any of our own. Good governments have been established in what we once thought were hotbeds of revolution, so today we are undoubtedly seeing the turning point in the temperate zones of South America at least, if not in a part of the tropics. In Japan the growth has been wonderful and in China the signs of an awakening of the people was evidenced by a radical change of government, which may mean the forerunner of a great industrial improvement.

When Asia with its 850,000,000 people reaches the point where it consumes one-fifth the amount of copper per capita of the United States its consumption will be about 30,000,000 lb. more than ours is today. Using the average for the world it would be consuming nearly 1,300,000,000 lb. per annum. It would take less than half the consumption per capita of the United States to bring the South American consumption up to the present consumption of Africa, Asia and Australia. It is easy to contemplate the future need of copper when we stop to consider how little is needed to bring these countries to where their total annual consumption is equal to ours. In 1912 I had occasion to make a rough estimate of the future consumption of copper and calculated that the world should be using about 3,000,000,000 lb. by 1921. In the Engineering and Mining Journal, Apr. 12, 1913, on p. 742, may be found an estimate of a little over 3,500,000,000 lb. consumption for 1920. The method used to arrive at this figure is fully explained in the article. My estimate was made on about the same line of reasoning. If new fields are to be opened for consumption by the improvement of methods and development of resources in the countries mentioned, it does not seem at all unlikely that we will need this much copper within the next decade. Beyond that, should we look for any cessation in the use of copper? Certainly not until every country has reached its maximum industrial growth and we are all using the same materials and doing things by methods subject to no further improvement.

### FUTURE SUPPLY OF COPPER

The absorbing and unanswerable question suggested by this discussion, granting we will need 3,500,000,000 lb. of copper annually by 1921 is, Where will it come from? The table and chart of the world's smelter production of raw copper shows we will need an additional 1,350,000,000 lb. by 1921. It shows that about 70% of the present copper supply is coming from America and fully 95% of this 70% is from North American ores. Europe, the next in rank of copper producers, gives a little less than 19.5% of the world's supply. In the "Cost of Copper" it was shown that fully 72% of the North American copper came from about 30 mines. As stated then, it is doubtful if any of these mines, except those not fully developed and equipped, can materially increase its output, being necessarily limited by economic conditions. We certainly cannot add anything to the Lake Superior group's output. It would be surprising if the district does not show a decline of at least 25,000,000 lb. by 1921. The present operators of the porphyry group may somewhat increase their outputs. But allowing liberal increases for all, including the new properties under development, we cannot safely count on them to supply an additional 200,000,000 lb. annually in eight years. Going over the miscellaneous mines in North America it is hard to see where there will be an increase in production that will much more than offset the decline of some. It seems to be stretching the point to say that we may expect the United States to furnish an additional 250,000,000 lb. annually from known sources.



WORLD'S COPPER PRODUCTION

WORLD'S SMELTER PRODUCTION OF RAW COPPER
(Metric Tons)

| | Europe | America | Asia | Australia | Africa | World's |
|---|---|---|---|---|---|---|
| 1897 | 124,800 | 262,000 | 20,400 | 12,400 | | 420,200 |
| 1898 | 121,300 | 280,500 | 21,000 | 15,600 | | 438,400 |
| 1899 | 134,500 | 300,900 | 24,300 | 19,200 | | 478,900 |
| 1900 | 132,000 | 321,400 | 24,300 | 21,800 | | 499,500 |
| 1901 | 134,600 | 351,300 | 27,300 | 22,000 | | 535,200 |
| 1902 | 127,900 | 376,400 | 29,000 | 20,000 | | 553,300 |
| 1903 | 136,100 | 402,500 | 33,200 | 19,500 | | 591,300 |
| 1904 | 129,700 | 463,400 | 32,100 | 22,700 | | 647,900 |
| 1905 | 132,100 | 504,200 | 33,700 | 23,900 | | 693,900 |
| 1906 | 139,800 | 512,800 | 38,500 | 29,500 | | 720,600 |
| 1907 | 144,900 | 498,200 | 36,400 | 32,500 | | 712,000 |
| 1908 | 151,900 | 530,000 | 41,400 | 34,500 | | 757,800 |
| 1909 | 156,200 | 616,400 | 45,500 | 31,100 | | 849,200 |
| 1910 | 175,700 | 623,200 | 50,100 | 37,900 | 1,000 | 887,900 |
| 1911 | 181,500 | 614,900 | 55,000 | 40,000 | 2,000 | 893,400 |
| 1912 | 197,000 | 707,900 | 67,000 | 44,900 | 3,000 | 1,019,800 |

Although the demand for copper has made such rapid strides Europe has shown only a slight increase in production. If Russia is to bring more copper into the market the new supply can only be obtained after proper development and equipment of these new mines. Siberia is reported to contain some good copper deposits and Australia and Africa can also furnish additional supplies in time. Alaska is also a field of some promise, and Canada will probably bring some more copper into the market. In Chile and Peru preparations are now being made that will bring several million pounds on the market in a few years and we might be able to get 200,000,000 lb. more per annum from them within eight or 10 years. But the serious phase of the question is this: We are contemplating an additional increase of at least 1,000,000,000 lb. of copper within eight years, an amount almost equal to our present North American mines' output, the production of which is yet to be provided for. When we stop to think that some of this will surely have to come through the discovery of new fields, that miles of railroads must be built to reach some deposits, and that it takes about five years to bring a fair producer up to its maximum, we can easily see what the situation may be if we actually need this increase in production.

A production of 250,000,000 lb. annually means a group of mines equal to the porphyries in 1912, more than the present Lake Superior district, and practically equal to another Anaconda. But notwithstanding this let us assume that two such fields may be developed and brought to the producing stage within the next 10 years, we will have only provided for one-third of the expected increase in consumption. Even if the increase is much less, the situation is still quite a problem. There is evidence that certain large copper interests are convinced of the probable shortage and are already taking such steps as possible to meet it. There may be short periods of cessation in increase of consumption, but a demand has been created for copper and other metals and the cause is certainly deeper than any temporary boom or wave of industrial activity.

If there is any truth in this analogy the only relief will come from the discovery of new fields, full development of known deposits or maybe some revolution in the treatment of ores. If more of our copper is to come from our small deposits, heretofore unprofitable, there is good argument for higher prices for the metal than in the past. It may be that the greatest danger ahead will be a movable surplus so small that it may easily be cornered by speculators.

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**The Energite Explosives Co.,** whose plant was destroyed by an explosion a year ago, resulting in the loss of six lives, has been recently sued and one of the plaintiffs, a widow was awarded $3700. The cost of the case will be borne by the defendants. Other cases against the company are pending. The jury found that the company was negligent in not having the crushing room properly isolated from the mixing and finishing room, in not having confined the dangerous operation of crushing chlorate of sodium within properly constructed fireproof walls, and in permitting an unnecessarily large quantity of finished product to be stored in the finishing room where several employees were engaged.

# Notes on Lake Champlain Iron Mines

By L. O. Kellogg*

*SYNOPSIS—Detached observations on the magnetic deposits and the methods of working in the eastern Adirondack region. Possibilities of the district are great. Magnetic concentration highly developed. Uses of tailings. Excellent power plants and surface works. Mining methods less advanced. Curious survivals in hoisting practice. Labor is inferior. Costs low and continued operation in the face of rather hard conditions indicates good management.*

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Four iron-mining companies are at present operating in the Adirondack region in northeastern New York, bordering on Lake Champlain. They are the Chateaugay Ore & Iron Co., at Lyon Mountain, owned by the Delaware & Hudson R.R.; the Port Henry Iron Ore Co. and Witherbee, Sherman & Co., Inc., at Mineville; and the Cheever Iron Ore Co., near Port Henry. Most of the product of these mines is shipped some distance, usually after concentration. A certain amount of the Mineville concentrate, however, is smelted in a furnace at Port Henry and the entire product of the Chateaugay company is handled by Standish furnace a few miles away. Both these furnaces are operated by the Northern Iron Co. Standish furnace was operated on charcoal for many years up to 1904, as the lack of forest on the surrounding hills bears witness.

### Extensive Reserves

The magnitude of the deposits of magnetite in this part of the Adirondacks, as well as in other parts, not to mention the New York and New Jersey Highlands, is not popularly realized. Measured in tons they are quite capable of comparison with the reserves of the Lake Superior ranges and of Alabama, and constitute an important item in our iron resources. Especially in the Adirondack region under discussion are there deposits of enormous extent, and drilling operations in the last few years have served to extend considerably the limits of the orebodies. Speaking broadly, the unit here seems to be a hundred million tons; of these units, the Chateaugay Ore & Iron Co., at Lyon Mountain, is said to have five and, according to report, Witherbee, Sherman & Co., Inc., are credited by one geologist with two at Mineville and two in the country near Arnold Hill. These figures are not official, nor are they complete, but they indicate the magnitude of future developments in this district, taking no account of the magnetites in the New York Highlands, the New Jersey Highlands, and other parts of the Adirondacks.

Such estimates do not represent ore blocked out, as in copper or gold mining. They are based rather on a few drill holes, the results from which are interpreted in the light of geological study and data from past mining operations. A fair amount of knowledge can be had with surprisingly few holes. Experience has shown that the magnetite beds are unusually persistent, even though in some cases erratic, and there is a little likelihood that the tonnage is overestimated. It is not attempted to develop extensively by underground workings and this seems wise, as the additional information gained would hardly make up for the expense involved. Work is conducted on a narrow margin and capital expenditures are reluctantly made.

It is evident that with resources such as this, to which may be added the titaniferous ores and the Clinton hematites, while the Central Atlantic states may never again regain control of the iron industry, they will, nevertheless, increase in relative importance up to a certain point and become a strong factor in the industry.

### Concentration and Utilization of Tailings

Material running 28% in available iron is considered ore, although much of the magnetite is of shipping grade, beating 60% iron. Evidently the ores require concentration before use in a furnace and the accepted method of performing this is with magnetic machines. Magnetic concentration has been brought to a high stage of development and remarkable results are obtained. The effect of concentration is twofold: to increase the iron content and to decrease the phosphorus. The Witherbee-Sherman company, in particular, has done pioneer work and has gone far in the development of iron magnetic concentration, and may be considered quite the leader in that branch of metallurgy.

What may be termed the utilization of byproducts is an interesting feature of practice. Thus the Chateaugay company ships practically all of its tailings during the summer months. They are used for road surfacing, for railroad ballasting and for concrete work, especially in sidewalks. A large part of northeastern New York is paved and ballasted with Lyon Mountain tailings. No charge is made for this material, but the Delaware & Hudson, which owns the mines, gets its return in freight charges. Witherbee, Sherman & Co. is not fortunate so to control freights as to make it profitable to ship its tailings to any great extent. An appreciable amount, however, is absorbed in making concrete. The company uses concrete wherever possible, with excellent results in the line of appearance and permanency. In addition to this use some of the high-phosphorous tailings from the Old Beds are reconcentrated, the iron minerals being lifted out with Wetherill machines, leaving an apatite-silica mixture righ enough in phosphorous to be marketable as raw fertilizer material.

### Good Surface Plants

The surface plants in general, except for the hoisting, are comparable with the mills in excellence. The Chateaugay company has an excellent power house, although it is not operated to capacity; the Cheever company has also a good electrically compressed air converter station; the Witherbee-Sherman generating station on Lake Champlain is a model and the central power house in Mineville as well as the compressor house, are above the general run of mine plants. This company pays great attention to its power department, with good results.

Gratuitous criticism by a stranger, of mining practice in any district, is usually unwise. It is exceeding difficult to grasp the situation without long experience, nevertheless I may hazard the remark that the underground methods of the region are not up to the standard of the surface plants and that the hoisting practice shows some curious survivals from past ages. It must be admitted that there are conditions, evident even to an outsider, accounting for many of the peculiar methods followed. It is exceedingly difficult, for instance, to plan a systematic mining method when the shape of the orebody is not known until it is mined out. Again, at the Barton Hill deposit in Mineville and more especially at Cheever, the foot wall rolls both ways so as to give a doubly corrugated surface. The effect of this condition on the mucking and tramming is evident. The flat deposit at Cheever with its rough bottom offers about as mean a problem as the miner has to solve, short of bad ground. It does seem, however, as if some mining method could be devised at the various properties which would eliminate the extravagant, two-man piston drill.

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*Of editorial staff, "Engineering and Mining Journal."

A great fear of dead work in the past has produced curious shaped openings and operated against the economical handling of material underground. The golden rule of following the ore was observed to the letter. The Bonanza shaft of Witherbee-Sherman starts as a soberminded, vertical shaft, turns to an incline and again to a vertical. This is a turned-vertical shaft with a vengeance! It is not the intention of Witherbee-Sherman, however, to continue using this shaft to any great extent. In fact, stage hoisting is to be substituted for turned-vertical shafts in most of this company's mines.

### Unusual Features of Hoisting Practice

The use of a great number of drums on one shaft, the guiding of the hoisting rope with turn sheaves and pulley stands, and the failure to hoist in balance, are curious variations from common hoisting practice which may probably be attributed to the isolated development of the region. Multiple-drum hoisting is about to disappear. At one time at Lyon Mountain, there were eight drums on one shaft and six on another. The Port Henry Iron Ore Co. also had a six-drum hoist. The shafts of these hoists were driven practically all the time by relatively small engines, and each drum at Lyon Mountain at least, had its clutch and brake manipulated by long wooden levers. An engineer ran the engine and there was a brakeman for each drum. With eight drums spinning, such a shaft house must have been a busy spot. This was an interesting method of approximating a uniform load, but it seems not to have survived the stress of competition with other systems. Each cable from the shaft house was carried out through a narrow slot and around a turn sheave to a direction parallel to the strike of the deposit, then over a series of pulley stands to a point opposite its shaft or slope, around another turn sheave, and over the small headframe. The rows of pulley stands along the foot wall of the outcrop can still frequently be seen standing.

At present the only thing of this nature is the hoist serving "A" and "B" shafts of the Witherbee-Sherman Harmony mine, in which a single motor is used to drive the four drums, mounted, however, on two shafts parallel to the motor shaft. Two of these drums are to be taken off before long and the activities of the hoist confined to one shaft and headframe.

The necessity of utilizing old openings and surface structures probably makes it impossible to do away with the turn sheaves or to hoist in balance in all cases. It must not be supposed, however, that hoisting in balance is entirely neglected. The Joker haft of Witherbee-Sherman is equipped with an excellent hoist for balance hoisting, and the Port Henry company, as well as the Chateaugay company at its No. 4 shaft, uses this method.

An interesting variant from ordinary hoisting methods is found in the opencuts of the Chateaugay company, where derricks are used, mounted on the edges of the cuts, the sides of the cuts being approximately vertical. The broken ore is loaded into typical quarry boxes, i.e., low wooden boxes with one end open. These are lifted by the derrick and swung to position over the awaiting ore car and then dumped by letting drop the open end.

### Multiplicity of Turn Sheaves

The turn sheave is an excellent device for overcoming topographic conditions unfavorable to simple relations between hoist and shaft. It is all right in its place, but in northern New York it seems to have become an obsession. The use of two turn sheaves on one cable, except under extraordinary conditions, is carrying matters too far. It is self-evident that the power consumed in bending the rope around two sheaves additional to the one on the headframe and in revolving these sheaves with possibly a line of guide sheaves on pulley stands, is far from negligible; furthermore, the first cost of the additional sheaves installed is a considerable item and the wear on the ropes is theoretically nearly doubled.

### Foreign Labor Exclusively

The quality of labor over the region in general leaves much to be desired; Hungarians, Poles, other Slavs and Italians make up the greater part of the miners and muckers. There is little English spoken or understood by the men and rules have to be printed in several languages. Wages are low compared with the West, or even with Lake Superior, and the men are probably worth just what they are paid, or a little less. At Lyon Mountain the Poles predominate and are looked upon favorably by the management. It must be stated that they are a fine husky lot of men to see. Italians here are said not to have proved satisfactory underground, being nervous in the face of the apparently dangerous conditions. At Cheever also, the Poles are esteemed. At Mineville, however, they are avoided, as being trouble makers; the Hungarians here are considered most satisfactory. The Witherbee-Sherman company also has a warm place in its heart for its Italians, who proved unusually loyal during recent strike troubles. This loyalty sprang in part from hatred of the Poles, who were the striking element. It is noteworthy that the Finns and the Poles, two races that have received a crooked deal in Europe, seem determined to even things up in America by starting something whenever possible.

### No Candles Underground

Illumination methods in these iron mines differ from general practice in the Western camps. The candle is practically never seen and the choice lies between an open-wick lamp burning kerosene, sunshine, or some other hydro-carbon, and the acetylene lamp. There is no question about which is preferable; the acetylene light, in spite of the many defects of the lamp itself, is far superior to the smoky, red flame from an open wick. The kerosene lamps used by the machine men at Lyon Mountain are as large as small dinner buckets, and make a tremendous smoke. The fact that the men work in rather large groups, removes one of the main objections to the acetylene lamp. In case of a fall or a stoppage, there is always a light handy by the aid of which repairs can be made. The black material of the walls so absorbs the light as to make candles quite ineffective, it is stated.

### Cost Considerations

It should be noted in magnetite mining, as well as in the mining of other ores in which the valuable constituent is heavy, that costs per ton are not a fair criterion. Costs per unit of volume such as a cubic yard would be a much fairer basis for comparing results. It is self-evident that it need cost no more to break a cubic yard of 60% ore than a cubic yard of 30%, but a much greater tonnage would result in the first case. In mucking and hoisting, of course, the heavier cubic yard costs slightly more to handle than the lighter one, but not at all in proportion to its specific gravity. Any mucker would prefer to shovel a ton of gold, rather than a ton of snow, even without considering the possibility of personal enrichment. The result of a comparison on a ton basis of the costs of different properties is to penalize the low-grade mine, where a larger bulk of material must be handled to obtain a given tonnage.

While total and itemized costs per ton are not obtainable from the various mines, their continued operation indicates that a profit is being made in most cases and the ability to make a profit in the face of existing conditions indicates good management as a whole. Mining conditions are only average, and the deposits are in general of low grade. To break and hoist the ore, to concentrate in some cases in as high a ratio as 3:1, to dispose of a product rather undesirable in many ways and to show a final profit, shows good mining, close work, and low costs.

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## French Iron Production in 1913

Pig-iron production in France for the half-year ended June 30 is reported by the Ministry of Public Works at 2,374,583 metric tons in 1912, and 2,618,420 in 1913; an increase of 243,837 tons. The production this year included 438,340 tons foundry; 268,098 tons forge; 86,544 tons bessemer; 1,784,822 tons basic, and 40,616 tons ferromanganese, spiegeleisen and other ferroalloys.

### Steel

The production of steel ingots and direct castings for the half-year was as follows:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Acid converter | 56,398 | 65,308 | I. 8,910 |
| Basic converter | 1,355,138 | 1,501,125 | I. 145,987 |
| Openhearth | 685,215 | 758,659 | I. 73,444 |
| Crucible and electric | 18,040 | 15,918 | D. 2,122 |
| Total | 2,114,791 | 2,341,010 | I. 226,219 |

The production of finished iron and steel for the first half of 1913, as reported by the Comité des Forges, was 1,568,722 tons, an increase of 96,039 tons over 1912. The heavier items were 522,813 tons of bars and shapes, 298,013 sheets and plates, 261,908 structural steel and 235,859 tons of rails.

## Deep Shaft Development at Placerville, California

By Lewis H. Eddy*

The Pacific shaft of the Placerville Gold Mining Co., at Placerville, Eldorado County, Calif., has been deepened from the 1000-ft. level to the 1600-ft. point in the past seven months, and will be continued to the 2000-ft. point before new crosscutting or drifting is started. This is not record drilling. But the method of development is in the line of advancement adopted in other similar undertakings of reopening old mines in the Mother Lode region in the past year. This property had been worked for several years with the apparent idea of developing a mine at shallow depth. A vertical shaft was sunk to 700 ft. From this point a crosscut was run 140 ft. east. The shaft was then deepened by a winze to 1000 ft., following the dip of the formation which is about 70 deg. east. A drift 180 ft. was run from the winze to the north along the strike of the formation.

That was the extent of the development at the time of my first visit to the property in September, 1912. The physical features disclosed were interesting from their similarity to disclosures in developed mines in other districts to the south in the Mother Lode region. The situation is in the footwall slates on the western edge of the Central Belt of the Mother Lode, at an elevation of 2000 ft. at the collar of the shaft. This elevation is about 5000 ft. higher than the mines in Amador, Calaveras and Tuolumne Counties. The company, of which Alexander Baring, of London, is president, has a large amount of mining property adjacent and in this vicinity and it was determined to reopen this property and prospect it. A. E. May, who had been in charge of operations of the Barings in Mexico, was made manager. Mr. May pumped out the shaft, made an examination of the physical features and visited some of the producing mines in Amador County and then decided to go down deep enough to provide prospecting ground sufficient to enable him to determine by careful development whether or not the same geological formation and physical conditions in Eldorado County as occur in other Mother Lode counties, will make a producing mine.

An accident which occurred in the initial stage of the work of pumping out the mine is of peculiar interest as it indicates the possibilities of accident and the necessity of care in pumping old workings of an abandoned quartz mine. The following details of this accident were given me in August, 1913, by Mr. May, from the note which he made at the time of the accident:

> On Aug. 31, 1912, we commenced to pump out the winze on the 700-ft. level of the Pacific mine. "A" was one of the men employed to care for the pump, in oiling and lowering the same. On Sept. 29, 1912, the water in this winze had been pumped out, so that the floor of the 1000-ft. drift was uncovered, and a man could enter the old level, which extended about 180 ft. from the winze to the north. At 5:30 a.m., "B," who was on shift caring for the pump at this hour, made a trip from the winze into the face of the old level. Again at 6 a.m. "B" repeated the trip, going in to the face of the old 1000-ft. level. At 7 a.m., "A" came on shift to relieve "B." "A" made a trip to the face of the old 1000-ft. level and returned to the pump, then climbed out of the winze up to the 700-ft level. Later he returned to the bottom of the winze and went into the drift again. When about 50 ft. from the mouth of the level and at the foot of an old raise

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*3430 Peralta St., Oakland, Calif.

that had been put up about 30 ft., an explosion of gas occurred, which burned "A's" face and neck, singed his hair and burned his hands most painfully. He picked himself up after the explosion, lighted his candle, climbed the 300 ft of ladders to the 700-ft. level, and was then hoisted to the surface.

Mr. May said that he had all the time been prepared for bad air in the nature of carbon dioxide and kept candles burning at the points in the winze to give warning, but had never anticipated encountering marsh gas, which he thought was probably the cause of the explosion. The force of the explosion was considerable as the top of the winze at the 700-ft. level was covered with 3-in. plank and these were blown off. There were a few pieces of old timber in the top of the raise where the explosion occured, and the gas may have resulted from these, as they had been there under water for about 30 years The man's hands are not well yet

The deepening of the shaft was started in the last of December, 1912. In the first five months the drillers averaged 80 ft. per month. In July they sank 96 ft. and in August, 109 ft. Mr. May stated in August, that he expected to average 100 ft. per month in the succeeding four months and complete the shaft down to the 2000-ft. point by the end of the year. There has been no effort at record drilling. The old hoisting equipment, which is being used for this preliminary work, is not adapted to rapid hoisting. The surface hoist is air driven. The underground hoist at the 700-ft. station is an old steam hoist that was used in the '80s. It has been overhauled and is now air-driven. These hoists are adequate to the purpose of sinking a prospect shaft. The drills are Ingersoll-Rand class C-110 and are doing good work. It was decided at the beginning that the matter of new equipment would be deferred until the development proves whether or not there is a prospect of making a mine. The indications down to the 1600-ft. point are favorable to the continuation of the shaft.

The shaft is sunk in the black and gray slates in the foot-wall side of the lode, following the formation in its dip to the east and disclosing strong quartz all the way down to the 1200-ft. point. In some places this quartz is 25 ft. wide with fine greenstone foot and hanging wall. There are several faults below the 1000-ft. point, and between the 1000- and 1100-ft. point the quartz dips back toward the vertical. The shaft was continued with the formation, and below the 1100-ft. point the quartz came in again. It was followed, dipping generally with the formation, to the 1200-ft. point where it pinched out. The laminated rocks stand fairly vertical, and the faulting of the quartz and dipping back to the west is a probable indication that the vein series at 2000 ft. or below that point will be found to be generally nearer to vertical than the 70 deg. dip of the slate formation followed by the shaft.

The sinking of this shaft and the crosscutting and drifting that is contemplated, whether or not it proves a mine of commercial value to the owners of the property, will be of incalculable benefit to the owners of mining claims on the Central Belt of the Mother Lode in Eldorado County. Deep prospecting is essential to the future development of quartz mines in this region, and there are few of the holders of claims, which extend along the lode for a distance of 20 miles in an almost continuous chain, who are financially equipped for deep shaft sinking and exploration. The Mother Lode formation extends in a general northwesterly direction entirely across the county, and the Placerville district is the most favorable point for deep prospecting. The general formation in the Placerville district is of serpentine on the east or hanging-wall side and black slates on the west or foot-wall side. In the southern part of the district the black slates are flanked on the west by granitic rocks, and in the northern part diabase follows the slates along their western edge.

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# The Use of Lead in the Tropics

By W. H. Mawdsley*

For many purposes, such as roofs and gutters, where exposed to smelter fumes, sheet lead would at first sight seem eminently suitable. Under a tropical sun, however, it becomes soft, expands and finally creeps. This action appears to go on indefinitely without a corresponding contraction, until eventually it becomes buckled and cracks. When used for gutters, it proved unsatisfactory and had to be replaced by cement reinforced with wire netting.

When used for lining wooden tanks to contain hot acid, the same trouble from creeping and buckling occurred: where the tanks were 5 ft. deep or more, I found it advisable to burn straps on the lead about half way down, take these through an opening left in the woodwork and make them fast to a rail around the outside of the tank. This relieved the strain upon the top and prevented the creeping. The corners of rectangular tanks seemed to become crystalline and finally porous, and I found that by burning a vertical piece about four inches wide from top to bottom in each corner, it stiffened the lead and made it last much longer.

It is a mistake to have the bottom boards of a lead-lined tank nailed down, as the nails often work partly out and damage the lead; there is the advantage, too, that should a board need replacing, it can often be done without disturbing the lead. With the vertical lead pipe used for raising acid to the top of the towers, I found the "wiped" joints most satisfactory, especially when the pipes were burned together before being "wiped." The protuberance formed by the solder was convenient for supporting the pipe by a wooden clip, and sometimes a ring of solder was put around the pipe in other places for the purpose of supporting it. Where the pipe was flanged and connected by iron washers, the root of the flange seemed often to crack and then leak. Burning a strip of lead to the pipe and nailing it to timber did not prove satisfactory, as the lead invariably stretched. It was also advisable to case the pipe with easily removable timber to prevent it bending between the brackets.

When a pipe is laid horizontally for any considerable distance, it should be supported on timber, and side pieces fixed on the carrier at intervals to prevent the pipe projecting at either side. An expansion loop should also be provided, care being taken that the upper part of the pipe does not come in contact with the lower. When pipes are buried, the expansion loop is not so necessary as the variations of temperature underground are not so great.

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*Mt. Morgan, Australia

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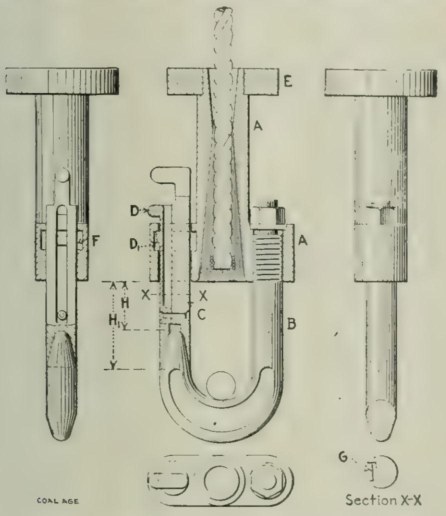
**The Sanitary Advantages of Sand Filling of Stopes** are only secondary to its function of supporting the back. This is pointed out in the "Journal" of the South African Institution of Engineers, September, 1913 The unfilled stopes on the Rand interfere with ventilation and are open to the irresponsible Kaffirs who pay no heed to hygiene. By filling with sand the worked-out areas, the health of the men underground is promoted.

# DETAILS OF PRACTICAL MINING

## Safety Hook for Sinking Buckets

A new safety hook for sinking buckets in connection with a cable clamp has been devised by an engineer at the Myslowitz colliery, in the North Kattowitz mining district of Germany and has been used there with success. It is described in the "Zeitschrift für das Berg- Hütten- und Salinenwesen." It consists of the following principal parts: (1) The cable sleeve *A* with flange $A_1$ forged from the same piece: (2) the bucket hook *B*; (3) the lock bolt *C*; (4) the lock spring *D* welded on lug $D_1$; (5) the flange *E*.



Detail Construction of the Safety Hook

The cable clamp is bored out conically for receiving and fastening the rope. In the flange $A_1$ are held the bucket hook *B* and the lock bolt *C* which together form a closed shackle, the hook *B* being screwed into the flange $A_1$ and further secured with a keyed jam nut, while the lock bolt *C* is loosely passed through its hole in the flange.

The lock bolt *C* is made of an iron bar cut or forged away at the upper part and is formed at the top as a handle for easy manipulation. At the lower end it is bored out conically to receive the point of the bucket hook. It is provided lengthwise with the groove *G* in which is set and riveted the lock spring *D*. The safety hook is closed in the illustrated position and, by the lock spring *D*, upon which the lug $D_1$ engaging in the cavity *F*, prevents self release of the lock bolt *C* and thus an unhooking of the bucket suspended from the hook *B* even when the bucket is let down to the bottom of the shaft and the rope is slackened.

In order to let the bucket be hooked to and unhooked from the hoisting cable, the workman must press back the lock spring *D* and raise the bolt *C*, which opens the bucket hook. As soon as the bolt is let go, it falls back by its own weight and again the lock spring *D* closes the lock bolt *C* by an engagement of the lock-spring lug $D_1$ in the cavity *F*. The flange *E* screwed on the rope sleeve prevents the bolt *C* from being lifted so high as to drop out when opening the hook.

The manipulation of this safety hook is easy and simple. It is automatic and reliable. In making the hook care is taken that the upward movement allowed for the lock bolt bears a correct proportion to *H* and $H_1$.

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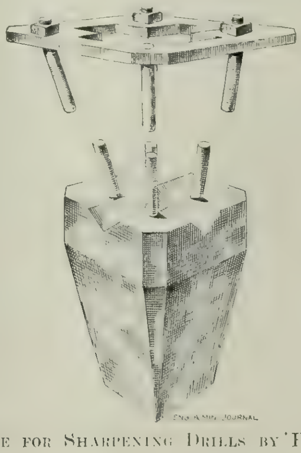
## Sharpening Machine-Steel by Hand

By Emory M. Marshall*

For sharpening machine-steel at a mine where the sharpening is done by hand, the device, designed by S. J. Collins and used by the McConnell Mines Co., is of value.

The ordinary dolly used for sharpening is drilled at the four corners, as shown in the accompanying sketch, and rods of $\frac{7}{16}$-in. iron are screwed into each hole. The dolly is then mounted in an anvil block or fastened securely to the floor. The rods at the corners may be of any length, say 12 to 18 in. The shortest length of steel that can be sharpened depends upon the length of these rods, so they must be short enough to accommodate the starters. These rods are fastened at the top about 2 in. apart by bolting to a plate of $\frac{1}{8}$-in. iron, which has been cut out at the center to allow the drill to pass through easily.



Swage for Sharpening Drills by Hand

The method of sharpening is the same as the old method, but instead of holding a dolly on the bit while a helper strikes it with a heavy hammer, the blacksmith drops the heated steel between the rods and pounds it up and down on the dolly. The iron rods are set so close to the corners that the steel cannot turn, while the flare at the top allows the steel to work freely. Of course, the blacksmith cannot strike as heavy blows as his helper can with a hammer, but by working the drill steel up and down 12 or 15 times, he can get as good, or a better, bit than he can by having a helper to strike for him, and he can do it in the same or less time. This method enables one man to sharpen drill steel as fast as two by the ordinary method of hand sharpening, and the miners claim the bits are better.

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*Mason, Nev.

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## Preservation of Boreholes

Recent events have served to remind mining engineers of the advisability of preserving all boreholes put down for prospecting and other purposes, says the *Iron and Coal Trades Review*. Hitherto most boreholes have been lost through the mining companies or others not being prepared to purchase the contractor's tubing put into the holes; the tubes have been withdrawn by the contractor on completion of boring operations, with the result that the boreholes collapse and are lost. In many cases a probable valuable asset has been thus thrown away for the paltry cost of the tubes—an item of, say, anything from £10 to £100, according to the diameter and depth of the borehole.

A remarkable instance of a preserved borehole being the means of saving life has been experienced in the recent mishap at Egremont, Cumberland, England, where two men employed by the Townhead Mining Co., Ltd., were imprisoned in the workings of one of that firm's mines through an inrush of water completely cutting off exit by the shaft. The men knew of a borehole to the east of the shaft; they made their way to it, and soon got into communication with the officials at the surface, who had also gone to the borehole, some 150 yd. from the shaft, and were able to converse with the imprisoned men. Arrangements were immediately made to send down through the borehole thermos flasks containing hot drinks, food, etc., to say nothing of other comforts in the shape of candles, a watch and such woolen clothes and wraps as could be safely put down a borehole 5 in. in diameter. The borehole was also used for pumping air down to the men. The men were imprisoned 5½ days before the shaft was unwatered and they could be brought to the surface, and the borehole was the means of considerably allaying the fears of the management, to say nothing of the anxious relatives and friends of the entombed men.

Stimulated by this notable example, mining companies and others ought in the future to seriously consider the desirability of preserving all boreholes, even if at the time of boring their use as a means of life saving, etc., may appear remote. Cases have been known where boreholes only partially tubed have remained good for 20 years or more. Apart from their use as a means of saving life, boreholes can be and are being used for water supplies and ventilating purposes; and as holes can be bored of a diameter large enough for a man to be lowered up and down, mining companies may consider making such provision where a second exit by shaft or other means does not exist. Moreover, a borehole of such large diameter might have other uses; it could be utilized for the lowering of all timber required in the workings, a work of magnitude in some metalliferous mines which takes up much valuable time at the drawing shaft. Such a borehole could also be used for conducting electric cables to the workings, thus removing the danger of their presence in the shaft, with the further possibility of reducing the length of cable required. The question will, no doubt, be seriously considered in the future.

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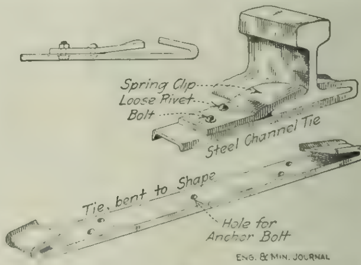
## A Steel Channel Tie for Mine Tracks

The steel tie is becoming the approved support for the rails in mines, largely because of the economy of space its use affords. It seems, however, that it has a marked adaptability for outside and heading tracks. It is true that it tends to bend when subjected to the heavy straining thrusts of the hoofs of mules or horses, and these thrusts also tend to move the tie from its proper place in the track. These defects are met, states *Engineering News*, however, by the W. H. Coffman tie, because instead of the bearing surface being flat, it is channeled, which increases its strength and by indenting the floor prevents slipping.

It would seem that the saving in ballast is an advantage which would serve with the reduction in the ties needed, to pay for their greater cost. Where the floor is hard, the laying of a few steel ties on the bottom of the cut or on the top of the bottom rock will be better than using wood ties and bringing in crushed ballast from outside. The maintenance of ditching with a shallow track is cheaper than with one which is of standard depth, especially where that track has to be kept close to a traveled road, as in a mine heading.



Steel Channel Tie for Mine Tracks, with Spring Clip Fastenings to the Rail

The ties are made of ½-in. steel, and they weigh from 1.75 to 1.90 lb. per running foot. They have already been in use for years.

The tie is shown in the accompanying illustration, which is self-explanatory. The channel is 2x$\frac{9}{16}$ in., $\frac{3}{16}$ in. thick, and is bent cold to shape in a machine specially designed for the purpose. A form of steel tie used somewhat extensively is made from a flat bar 1½x½ in., weighing 2.55 lb. per ft., but this is not so stiff as the channel of lighter weight. The price for the channels, however, is a little higher than that for the bars. For track of 44-in. gage the channel is 50½ in. long, and the two spring clamps are 6 in. long. Such a tie will weigh 9½ to 10 pounds.

A special advantage of the steel tie is its shallowness as compared with wood ties, and it is said that this is sufficient to enable 8 or 9% more load to be carried in each car. It also enables the rails to have a bearing on the floor of the mine, so that track will keep in better surface than when the rails are unsupported between the ties.

Under these conditions it is stated that the steel ties may be spaced 5 to 8 ft. apart, especially if the cars are not heavy and are drawn by mules. Some of the steel ties, however, are used on tracks operated by electric motors. Separate short pieces of steel channels, not attached to the rails, may be placed longitudinally under the joints or at intermediate points. These steel channel ties and the bending machine used in their manufacture are the invention of W. H. Coffman, Bluefield, W. Va.

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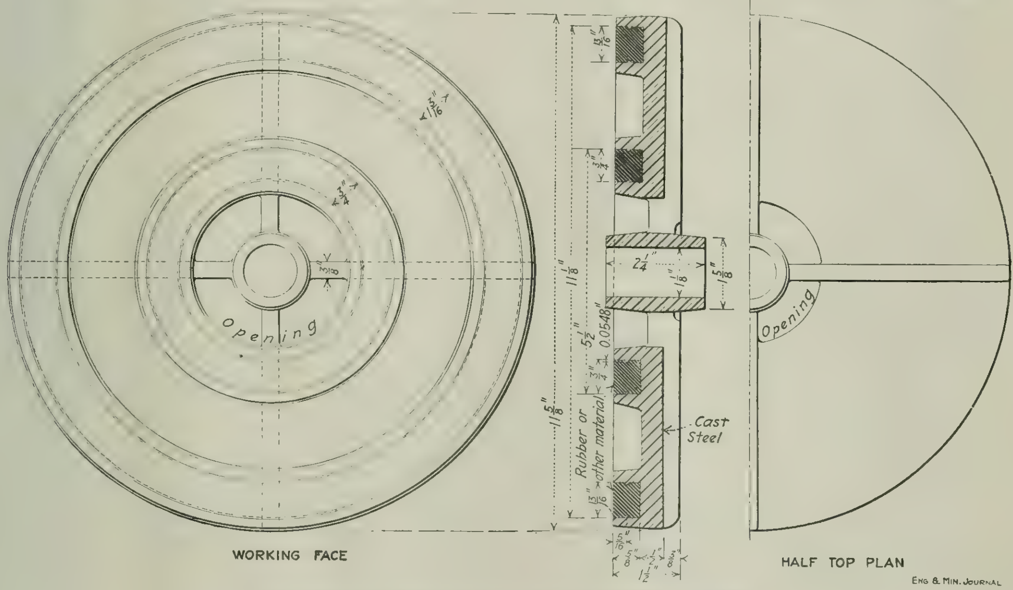
## Cast-Steel Pump Valve

A valve designed and patented by J. P. Matthews, of the Rogers-Brown Ore Co., is herewith illustrated. It was found in the operations of this company on the Cuyuna range that the solid rubber valves on the underground pumps were expensive in the first place and required constant changing. The new valve is designed to consist principally of steel; a casting is made as light as possible by being built in skeleton form and reinforced with ribs and two circular grooves are left to receive packing rings of rubber or other available material. The packing soon wears flush with the steel and thereafter wear on the whole valve is much slower. The arrangement obviously saves rubber in the first place and also gives the valve a longer life. It is stated to be eminently satisfactory in service. The valve illustrated is for the smaller type of Prescott pump used by the company; for the larger pump, however, the only change is in the dimensions.



Cast-Steel Skeleton Valve to Hold Rubber Packing

## Safety Rules—Employees Underground*

(1) All employees working where there are three 8-hr. shifts or two 12-hr. shifts should positively relieve their outgoing partners at their regular working places; they should talk over the progress of the work and acquaint themselves with the possible dangers before starting work; they shall examine the back and sides and the timbering carefully and correct all apparent dangers on coming to work, on working places and after blasting.

(2) Eight-hour men should leave the change house 15 min. before the hour of going on shift so as to be on duty promptly in their respective working place.

(3) All employees in going on or off shift should proceed directly by the usual or designated route to their respective places and shall not leave such places except on company business.

(4) No employee should travel from one part of the mine to another through any raise, stope or opening, but only by the ladderways and manways expressly reserved and in use for that purpose.

(5) Miners should go after their timber by the designated way, or by the usual way.

(6) Never stand on loose ore over a raise; it may drop at any time and draw one in.

(7) As often as necessary to secure safety, miners shall pick down the back and keep it picked down and secured.

(8) All shafts, drifts and levels in disuse or in disrepair should be at once permanently closed and kept closed. No employee should go or be therein or thereon for any purpose whatever unless engaged in repairs, until until the opening is again in good repair and properly lighted and guarded.

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*From Inland Steel Co.'s book of rules.

(9) All openings in use shall be sufficiently and frequently inspected and kept well timbered and in good repair and any employee finding dangerous conditions such as crushing timber, caving ground, unusual water or smoke, should at once report the same to the shift boss or other superior, and take whatever immediate precaution is necessary to insure the safety of the place.

(10) All chambers, backs or roofs should be sufficiently secured and should be inspected by someone or more of the employees using them after each blast and should be examined and sounded as often as necessary and all loose and dangerous rock shall be blasted or barred down and the back picked and kept secured. This rule should have special application to all rooms or places where tools, air, cutoffs, air hose, powder or other supplies are stored or kept by the miners when not in use and should apply generally to such other places as are frequently visited or used by the men in the course of their work.

(11) Tram cars on inclined tracks should be provided with blocks to hold them in position.

(12) When removing blocks from in front of tram cars, do not stand in front of the car, but to one side.

(13) When pushing cars, exercise great care and do not stand in such a position that should the car jump the track, you may get caught between it and the timbers.

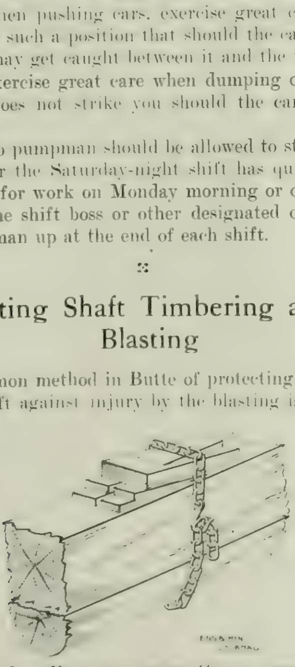
(14) Exercise great care when dumping cars so that the brake does not strike you should the car jump the track.

(15) No pumpman should be allowed to stay alone in a mine after the Saturday-night shift has quit until the mine opens for work on Monday morning or on holidays.

(16) The shift boss or other designated official shall be the last man up at the end of each shift.

## Protecting Shaft Timbering against Blasting

The common method in Butte of protecting the bottom set of a shaft against injury by the blasting is with logs.

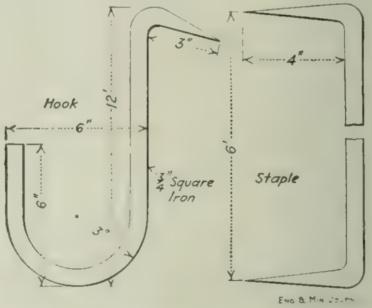


Blasting Log Fastened with Chain and Wedges

Timber 8x12 in. is often used or a 14-in. round stick split lengthwise; in the latter case the round surface tends to throw off the rock ("Bull." A. I. M. E., August, 1913). Such timber may be fastened to the bottom set with either bolts or chains, the last method being shown in the accompanying drawing. The wedges can be loosened easily with a side blow from an ax, and the method is probably the best and most reliable way of holding the logs. In case bolts are used, the head is always placed down. The common size of bolt is 1 in. Instead of logs, ¼-in. iron and 3x3-in. angles are sometimes placed along the edge of the shaft timber, but such pieces are easily twisted out of shape and require frequent straightening by the blacksmith.

## Hook and Staple for Staging

In topslicing on the Mesabi, the face of the ore in a room may be as much as 14 ft. high. To reach the top of this for drilling, a staging is necessary. The typical set of timber consists of two posts and a cap, with no studdle the long way of the room. Ordinarily a staging is built on two pieces of logging spiked to the four posts of the two sets nearest the face so as to have the direction that studdles would have. Nails of 30- or 40-penny size are used and are left in either the logging or the posts when the staging is torn down. They are a constant nuisance and source of danger, tearing the clothes and skin of the miners.



Devices Used in Erecting Staging in Top-Slice Sets

Captain James Rosewall, of the Harold mine, an Oliver property, has devised a method of eliminating this trouble. He uses four hooks or hangers of about the design illustrated, driving them into the post and laying in them two rails or poles on which the staging is built. Since there is danger that the set next the face will fall out toward the other and there is no studdle to prevent, 6-ft. staples, also illustrated, are used to drive into each pair of posts in the direction of the studdle. Since a set of this nature will last as long as a mine, it follows that its use is cheaper in the long run than that of nails.

The staple is long enough to span the greatest distance between adjacent sets and is also available for intervals down to 4 ft. by setting it at an inclination. It is found advisable to bend the drive points of the hooks down from a right angle, as shown, since thus there is no tendency for the weight of the staging and men to pull the hook out of the timber. The pieces are shown made of ¾-in. square iron; round iron may also be used; sharp points are rather preferable to chisel edges on the ends.

Hangers and staples somewhat similar to these are common enough underground for many purposes in connection with timbering, but this particular combination seems to be new.

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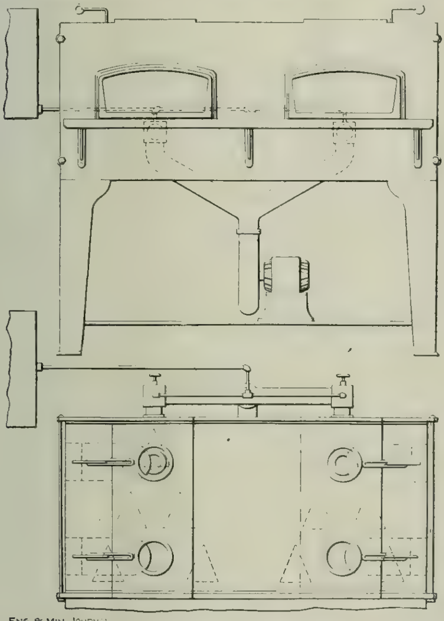
**Charcoal as a Precipitant in Cyaniding** has been largely used in some places, but has not been considered very satisfactory as it consumes cyanide. Carbon is not the precipitating element, as other forms do not have the same effect. Precipitation is said to be due to carbon monoxide and hydrogen occluded by the charcoal.

# DETAILS OF METALLURGICAL PRACTICE

## Crude Oil for the Assay Furnace

By W. G. Haldane*

Crude oil has long been used in a desultory fashion as a substitute for solid fuels in many operations, but it is only recently that it has been adopted on a large commercial scale for locomotive as well as stationary engines. Metallurgically, it is being used as a substitute for long-flamed coals in the roasting of sulphide ores and the smelting of copper ores in reverberatory furnaces, and, while many attempts have been made to apply it to blast-furnace smelting, particularly on copper ores, the results have not been sufficiently gratifying to warrant commercial installations.



Eng. & Min. Journal

Oil-Fired Assay Furnace

The main advantages of liquid over a solid fuel may be summarized as follows: Higher calorific power; smokeless flame (when burned properly); practically no dust or ash; no stoking required, hence less labor; closer temperature regulation; combustion can be started and stopped instantly; economy in storage for equal heating capacity; can be stored a long distance from burners.

The application of crude oil to the assay furnace has been tried repeatedly, but with slight success except in a few isolated and unusual cases, the principal difficulty encountered being in securing proper atomization of the oil at a small cost. The objections incident to the use of steam jets and high-pressure air for spraying the oil into the combustion chamber are manifest and need not be mentioned here.

The United States navy in its various navy yards has entirely done away with the high-pressure fuel-oil burners and uses the low-pressure system throughout (cf. *American Machinist,* Sept. 11, 1913).

I had the opportunity, a short time ago, of conducting a test on a new low-pressure burner, designed by the Denver Fire Clay Co., the results of which may be of interest.

The oil under a head of 6 to 12 in. at the burner is atomized by a blast of air, provided by a 12-in. aluminum blower designed to furnish 4000 cu.ft. per min. through a 2-in. opening and under a pressure of 4 to 5 oz., driven by a ¼-hp. General Electric high-speed induction motor, connected to an ordinary lighting circuit.

The burner can be started with an ordinary match through a small pilot hole at the back of the furnace, the latter also serving to indicate the completeness of the combustion during the operation, and perfect oxidation is easily obtained by simple manipulation of air and oil-supply valves.

The furnace on which the test was made contained two muffles placed side by side, was of special design under the Case patents, each muffle worked independently and each muffle was operated by a burner. This arrangement was so that you could do two classes of work at the same time, in the same furnace, but in different muffles. For instance, you could have a crucible fusing temperature in one muffle and a cupellation temperature in the other muffle. Each muffle was fitted with double-damper arrangement; one damper controlling the atmosphere of the interior of the muffle, and the other, the flame or atmospheric conditions from around the muffle or combustion chamber. The entire furnace was, therefore, under perfect control at all times and excellent work was accomplished.

Thirty minutes after starting the burner, both muffles were ready for work and in 50 min. from the start, 40 fusions were made with a total consumption of 1.6 gal. of crude oil. Cupellation was effected in 35 min. with an oil consumption of 0.9 gallons.

The oil used in this test was Texas crude, selling at 6c. per gal. in barrel lots, but any crude oil, distillate or residue that will flow through a ¼-in. pipe may be used.

The construction of the burner is unique. It requires from 4 to 5 oz. only of air pressure, but great volume. All necessary air for complete combustion goes through the burner proper and is under perfect control by valves fitted thereto; therefore, sufficient air is turned in for the amount of oil, which is also under perfect control, and perfect combustion takes place, thus preventing the formation of carbon and giving the exact temperatures desired within the muffles. Furthermore, with the use of these burners, the muffles are absolutely free of the nonconducting glaze, so characteristic of muffles used in coal-fired furnaces.

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*Acting president, Colorado School of Mines, Golden, Colo.

Owing to the simplicity of an outfit of this sort, the cleanliness, the rapidity and accuracy with which the work is accomplished, equipments of this sort should appeal to the metallurgical chemist.

Aside from its application to this muffle type of furnace, the burner should offer an attractive inducement to the operators of crucible furnaces for the melting of cyanide precipitates and bullion, also its application in connection with melting furnaces in brass foundries.

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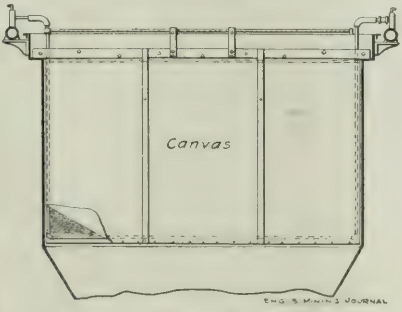
## Vacuum-Filter Improvement at Tonopah

Another step has been taken in the filter controversy. Under No. 1,078,994, Charles Butters has been granted U. S. patent on a new filter leaf which is designed to avoid infringement upon the Moore system as defined by the decision of the U. S. Circuit Court of Appeals for the Third Circuit[1].

As shown in the accompanying illustration, the new leaf is designed much as the former Butters leaf in that it consists of a pipe framing filled with coco matting, and covered by a canvas filtering medium. The wooden fillers are replaced by the coco matting, and no sewing is done on the leaf except the outside edges. The filtering medium is clamped together at the top by the header, and at the bottom is left open, terminating in a short flap which closes when vacuum is applied and opens when vacuum ceases. An outside perforated flooding pipe is placed above the leaf header for discharging the cake. When the cake is to be discharged, vacuum is dropped, water admitted through the perforated pipe under more or less pressure and the cake discharged. The entire operation is effected outside the filter leaf and no difference of pressure between the inside and outside of the leaf is depended upon to secure the desired result. The Butters interests believe that the omission of this step avoids infringement of the Moore process patent. This new system has been in operation at the plants of the Belmont Milling Co., in Tonopah, and in Millers, since last June.



THE NEW BUTTERS FILTER LEAF

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**Electrolysis of Cyanide Solutions**, while apparently beneficial in laboratory tests, has not been able to demonstrate any consistent advantages in large-scale operations over long periods of time.

## Strength of Adobe Brick

It is reported by *Engineering News* that tests on the strength of adobe brick were made some years ago by Herbert N. Alleman (now a resident of South America), assisted by W. F. Schaphorst, the latter of New York City, but at that time resident in the Rio Grande Valley. As is well known, adobe is the alluvial clay of southwestern United States and Mexico, which is formed into brick (usually 9x12x4 in. in size) and allowed to be sun dried. Mexican brickmakers generally add chaff or some other fiber substance for binding together the mixture. The ingredients are mixed without the aid of machinery. Peons tread in the wet mixture barefooted until the proper consistency for molding has been reached. When dry, adobe has the appearance of an ordinary chunk of dry, gray mud, but it will give a metallic ring when struck, similar to the ring of ordinary burned-clay brick.

The tests were made in tension on briquettes of 1-in. section, of the standard cement-testing type; in compression on 1 in. square by 5 in. long prisms (in compression along the 5x1-in. surface); and in flexure on 1-in. square pieces over a span of about 4 in. The average tensile value of the briquettes was found to be about 60 lb. per sq.in., few falling below that figure and some attaining a tension as high as 80 lb. per sq.in. The compression specimens ran up to about 500 lb. per sq.in. on the average, with not very great variation. The flexure specimens broke uniformly in tension with an extreme-fiber stress value of about 60 lb. per sq.in. All specimens were carefully made and were undoubtedly of considerably greater strength than would be attained by the materials commonly used and mixed in the usual way.

Adobe brick is an excellent building material for many purposes, as engineers who have operated in Mexico well know. There are adobe houses of great age still standing in Mexico, and showing but little deterioration. Much depends, of course, upon the character of the adobe. Ill-made brick of sandy mud may not last through a single rainy season, while properly made brick of a good kind of mud may stand exposure to the weather for 100 years or more. The authors of the statements quoted by *Engineering News* evidently referred to good brick. The high strength against compression that they report, viz., 500 lb. per sq.in. on the average, is surprising. This reminds us of an experience related by a smelter of our acquaintance. He built a battery of roasting stalls out of adobe brick in default of any other material. However, he found adobe brick to answer so well for this purpose that later on he would not have chosen any other material even if he could have had it. At one end of the line of roasting stalls, he turned up a little nub of a chimney. Of course, the draft was poor. In order to improve it, he raised the chimney 10 ft. at a time, being fearful to do very much lest the whole thing might crumble and fall. Having attained a height of 40 ft., his courage gave out and he stopped there. Now, a chimney of 40 ft. in height would have a weight of only about 43 lb. per sq.in. Assuming Mr. Alleman's figure of 500 lb., there was, of course, a large factor of safety. We should not, however, advise too much reliance upon any single figure of this kind, knowing very well the wide range of difference among several kinds of adobe brick. The dimensions of the Mexican adobe are frequently 18x8x[illegible] in.

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[1] "Eng. and Min. Journ.," Nov. 16, 1912, p. 923.

# THE COST OF DOING THINGS

## Kerr Lake Mining Co.

The Kerr Lake Mining Co., Cobalt, Canada, in the year ended Aug. 31, 1913, produced 2,109,075 oz. of silver and shipped 2,160,878 oz. to smelting works. The smelter settlements for shipments aggregated 1,977,870 oz., indicating a deduction of about 8.5% for losses, etc. After charging all construction to operations, a profit of $837,315 was carried forward for the year. This profit was accounted for in the following manner: Proceeds from sale of product, after adjustments of stocks on hand, $1,164,126; interest, $18,368; total receipts, $1,182,494; expenditures were made up of mining and development expense, $218,993; shipment, treatment, etc., $114,449; administration and general expenses, $11,736; total expenditures, $345,178. A dividend of $600,000 was paid to the Kerr Lake Mining Co., of New York, the holding company. Dividends to date aggregate $4,620,000.

The following tonnages were mined during the year: Sacking ore, first grade, 379 tons; second grade, 161 tons; jig concentrates, 192 tons; total sacking ore, 732 tons; mill ore, 16,625 tons; waste from bumping tables, 16,381 tons; total ore mined, 33,738 tons; mine waste hoisted, 9396 tons; total rock hoisted, 43,134 tons. The mill treated 18,252 tons of ore, averaging 29.29 oz. of silver per ton, 3389 tons of this ore came from dumps. The cost of mining and development was $5.07 per ton of rock hoisted for the following items:

KERR LAKE MINING CO. COSTS

| | |
|---|---|
| Stoping | $0.435 |
| Development | 0.674 |
| Power, light and heat | 0.639 |
| Ore sorting and jigging | 0.356 |
| Tramming | 0.673 |
| Hoisting | 0.187 |
| Timbering | 0.396 |
| Pumping | 0.071 |
| Drills and steel | 0.216 |
| Mine expense | 0.260 |
| Repairs to plant and buildings | 0.138 |
| Stable expense | 0.121 |
| Office expense | 0.096 |
| Surface maintenance | 0.254 |
| General expenses | 0.023 |
| Taxes | 0.574 |
| Boarding house | 0.018 |
| Total | $5.077 |

Other expenses, including milling but not smelting deductions, etc., bring the total cost of operating up to $8 per ton of rock hoisted. Development work performed amounted to 4984 ft., consisting of: 2974 ft. of drifting; 160.5 ft. of raising; 186 ft. of sinking and 1663.5 ft. of crosscutting. Development work to date totals 34,663 ft. It is stated that the ore reserves were only reduced 600,000 oz. of silver, leaving still approximately 6,000,000 oz. in reserve. Mine property account was increased from $55,000 to $130,000 by the purchase of an undivided one-half interest in the seven-acre Drummond tract. The balance of current assets amounted to $820,957.

In the treasurer's report the cost of producing an ounce of silver is figured as follows: Mining and development, 10.38c.; shipment and treatment charges, 10.45c.; administration and general, 0.56c.; total, 21.39c. per oz.

The company has undertaken jointly with the Crown Reserve Mining Co. to drain Kerr Lake, in order to develop and stope the orebodies lying beneath it. The plant for dewatering the lake consists of two pumping units of two centrifugal pumps each, the two units each being driven by a 250-hp. motor. The plant is mounted on a barge of 60 tons capacity and the water is pumped through a 20-in. pipe to Giroux Lake, 2700 ft. distant, against a head varying from 60 to 125 ft. It is estimated that from 300,000,000 to 400,000,000 gal. of water must be handled. The rate of flow from the pumps will average about 6000 gal. per min. for the entire operation. It is figured that once the water is out it will be an easy matter to keep the lake drained.

⁂

## Liberty Bell Unit Costs

The following data were furnished by W. H. Staver, general manager, Liberty Bell Gold Mining Co., Telluride, Colo., and were taken from the records of the mine for the month of January, 1913. According to the records, 14,030 tons of ore were delivered to the mill; 8715 tons from stopes and 5315 tons from development work. All the ore from the stopes was mined by stulling. Development work consisted of 509 ft. of drifts and crosscuts, 320 ft. of raises and 2600 cu.ft. of stations and pockets. The labor employed was practically 20% American, 38% Scandinavian and 42% Italian, Austrian and Slav. According to the statement of labor about 121 men were employed at the mine; 65 in stoping, 30 in development, 4 general and 22 on surface. Of the men stoping, 12 were engaged in breaking ore, 4 shoveling ore to chutes, 14 tramming from chutes to shaft, and 35 in timbering and general work. In development, 9.6 men were advancing, 15 men mucking and tramming and 5.4 men timbering. From these figures it may be inferred that about 116 tons are secured per month per man employed at the mines, or a little over 3.7 tons per day per man. For men underground the average is about 114 tons per month, or 4.65 tons per day. It was estimated that 9700 tons were broken in the stopes, which gives an average of about 807 tons per month per man breaking ore or about 26 tons per day per man. It apparently required one man shoveling in the stopes to chutes for every 2179 tons delivered per month. The rate of tramming was about 20 tons a day per trammer from stope chutes to shaft. The ore in stopes was broken in 260 machine shifts or at the rate of 37 tons per shift. The development work was performed with 193 machine shifts. Dynamite consumption in stoping was equal to 1.98 lb. of dynamite per ton broken, the total consumption in development was 6280 lb. Timber consumption reported was as follows: For stoping and general, 13,016 linear ft. of stulls, 1884 bd.ft. of lagging, 31,000 bd.ft. of lumber; for development, 2600 linear ft. of stulls, 1350 bd.ft. of lagging; and 2200 bd.ft. of lumber. The lumber consumption for stoping and general work was about 20,000 ft. above normal.

Electric power is used exclusively and about 25 hp. is used a day for hoisting. Main drifts and stations are lighted by electricity and candle consumption is 1.12 per man in 8 hr. On an average of 50 to 75 machine drills are sharpened per day on an Ingersoll-Rand No. 5 drill sharpener, this requires two men actually three hours to sharpen and temper. In drifting, Ingersoll C-110 2¾ drills are used and on an average of 45 ft. of holes are drilled per shift, making two set-ups; the first requiring from 20 min. to 1 hr., including picking down, and the second set-up about 10 min. In stopes from 75 to 80 ft. of holes are drilled in an 8-hr. shift with Ingersoll BC 21 stopes. Oil consumption is ⅜ pint per shift.

In driving a 9x10-ft. drift through calcite, quartz, pyrolusite and silicified andesite it required 93 eight-hour shifts, or 90 machine shifts actually drilling 6 hr. each to advance 298 ft. There were two trammers and one machine man on each shift and on day shifts a timberman. Compressed air was from 90 to 100 lb. pressure and 2850 lb. of 40% dynamite was consumed. Actual time in timbering was 31 eight-hour shifts. The rate of advance was 3.3 ft. per shift, or 10.8 cu.ft. of drift per man hour. The dynamite consumption was about 1 lb. for 9.4 cu.ft. of drift. In raising a 17x4½-ft. raise 315 ft. it required one machine man 88 eight-hour shifts, drilling from 6 to 7 hr. per shift. All timbering was done by one timberman working an equal number of shifts. Dynamite consumption was 1650 lb., or about 14.6 cu.ft. of drift per pound of dynamite. The rate of advance was 3.6 ft. per shift. In tramming, a record for two months, in a drift on bonus working three shifts shows that one man shoveling from a plat averaged fifteen 33-cu.ft. cars in 8 hr. on an average tram of 200 ft. The average life of a mine car at the Liberty Bell is five to six years.

⁂

## West End Consolidated

A summary of the annual report of the West End Consolidated Mining Co., Tonopah, Nev., for year ended Mar. 31, 1913, shows:

| | |
|---|---|
| Dry tons of ore shipped to smelter | 129 |
| Dry tons shipped to Nevada Milling Co | 44,521 |
| Tons of waste to dump | 20,464 |
| Tons waste sorted from washer | 10,238 |
| Total tonnage handled | 75,352 |
| Cost per ton, ore and waste mined | $2.46 |

| | | | |
|---|---|---|---|
| Mine—Receipts and Charges | | Total Amount | Per Ton |
| Gross value of ore shipped to smelter | | $11,792 | $91.41 |
| Gross value of ore shipped to mill | | 759,084 | 17.05 |
| Gross value of ore shipped | | $770,876 | $17.27 |
| Freight and treatment on smelting ore | | $2,837 | $21.99 |
| Freight and treatment on milling ore | | 402,693 | 9.04 |
| Total freight and treatment | | $405,530 | $9.09 |
| Total mining expense on ore shipped | | 185,747 | 4.16 |
| **Profit from mining operations** | | 179,599 | 4.02 |
| Mill—Receipts and Charges | | (44,756 tons) | |
| Gross receipts from treatment of West End Consolidated ores | | $313,316 | $7.04 |
| Gross receipts from treatment of Gold Mountain lease | | 3,585 | 11.63 |
| Total gross receipts from treatment of ore | | $316,901 | $7.08 |
| Mill operating expense | $162,440 | | |
| Purchased ore | 1,987 | | |
| Total charges at mill | | $164,427 | $3.67 |
| Profit from milling operations | | $152,474 | $3.41 |
| Miscellaneous earnings, mine and mill | | 774 | |
| Total profit | | $332,848 | |

The report states that the company now owns 158.371 acres patented and 25.7 acres of unpatented claims, total, 184.071 acres. Most of the ore produced came from the south vein above the 500-ft. level. Development work amounted to 5859 ft. and consisted of 1546 ft. of drifts, 2078 ft. of crosscuts, 1512 ft. of raises, 383 ft. of winzes and 34 ft. of shaft sinking. The average cost of development was as follows: Drifting, $6.50 per ft.; crosscutting, $6.44; raising, $6.66; winzing, $13.39; shaft sinking, $27.78.

The extra excavations for the year, including winze and shaft stations, amounted to 251 cu.yd., at a cost of $4.77 per cu.yd. The following table gives details of mining and milling costs:

WEST END CONSOLIDATED COSTS

| Mining | Cost per Ton | Milling | Cost per Ton |
|---|---|---|---|
| Superintendence | $0.135 | Superintendence | $0.062 |
| Breaking | 0.802 | Crushing and conveying | 0.103 |
| Timbering | 0.090 | Stamp batteries | 0.248 |
| Tramming | 0.372 | Tube mills | 0.492 |
| Hoist and engine room | 0.200 | Concentration | 0.130 |
| Ore loading | 0.233 | Agitation | 1.033 |
| Ore washing and sorting | 0.366 | Filtering and discharging | 0.218 |
| Ore sampling | 0.004 | Precipitation | 0.260 |
| Surveying | 0.047 | Elevating and separating | 0.103 |
| Surface and plant | 0.135 | Motors and lights | 0.036 |
| Assaying | 0.040 | Refining | 0.097 |
| Drayage | 0.015 | Drayage | 0.010 |
| 2nd class ore dump | 0.045 | Assaying | 0.042 |
| Development | 0.862 | Steam heating | 0.130 |
| Electric wiring underground | 0.012 | Water | 0.214 |
| Shaft sinking | 0.212 | General expenses | 0.110 |
| Extra excavating | 0.027 | | |
| Assessment work | 0.011 | | |
| Total direct | $3.608 | Total direct | $3.288 |
| Salaries | $0.145 | | $0.074 |
| Office expense | 0.046 | | 0.010 |
| Legal and traveling | 0.031 | | 0.002 |
| Taxes | 0.012 | | 0.040 |
| Insurance | 0.020 | | 0.036 |
| Depreciation | 0.067 | | 0.158 |
| Automobile | 0.044 | | |
| Bullion tax | 0.131 | | |
| Liability insurance | 0.058 | | 0.021 |
| Total indirect | $0.551 | Total indirect | $0.341 |
| Total operating | $4.162 | Total operating | $3.629 |

At the mill the stamps dropped 94.7% of the total time, with a stamp duty of 6.12 tons a day. One per cent. of the lost time was due to lack of power and the remainder to repairs and holidays. During the last quarter the stamps dropped 97.4% of the total time and stamp duty was 7.26 tons a day. The total recovery of metals was as follows: Gold extraction, 94.24%; silver, 89.02%; total, 89.91%. The extraction of metals was made as follows, by cyanidation: Gold, 87.38%, and silver, 73.49%; by concentration, gold, 6.85% and silver, 15.53%; the gross content of the ore before treatment was 9357 oz. gold and 933,371 oz. silver. During the last quarter of the fiscal year, the cost per ton for the following in milling items was:

| | |
|---|---|
| Labor, at an average of $4.50 per shift | $0.80 |
| Power, at 1¼c. per kw.-hr. | 0.436 |
| Cut zinc, 1.25 lb. @ 11.4c. | 0.1425 |
| Sodium cyanide, 2.46 lb. @ 25c. | 0.614 |
| Lime, 4 lb. @ 0.85c. | 0.034 |
| Lead acetate, ½ lb. @ 9.5c. | 0.0475 |
| Fuel oil for heating, 1¾ gal. @ 4c. | 0.078 |
| Water, 1.18 tons @ 18c. | 0.213 |
| Chrome steel shoes | 0.0222 |
| Cast iron dies | 0.0092 |
| Cast iron tube mill liners | 0.044 |
| Pebbles, 4.7 lb. @ $1.57 cwt. | 0.074 |
| Other supplies | 0.2326 |
| Total | $2.747 |

In the milling costs power is not charged as a separate item, being proportioned by meter readings to the different departments. The refining cost per ounce of bullion was 0.47c.; divided into labor, 0.185c.; supplies, 0.285c. per oz. Zinc cost per ounce of bullion, 0.95c., or 0.083 lb. avoirdupois per troy ounce of bullion. It is hoped to increase the tonnage by 50 tons a day without increasing the working force. The company closed the year with $168,192 cash in banks and $50,000 bills receivable.

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23,887—OIL FUEL—Cleaning of Oil Fuel. R. T. Strohm. (Elec. Wld., Sept. 13, 1913; 2¼ pp., illus.) 20c.

23,888—POWDERED COAL—The Use of Pulverized Coal as a Fuel for Metallurgical Furnaces. H. R. Barnhurst. (Bull. A. I. M. E., Oct., 1913; 10 pp.) 40c.

23,889—PRODUCER GAS—Suction Gas in Mining Work. Ralph N. Lewis. (Austral. Min. and Eng. Rev., Sept. 5, 1913; 1½ pp.) 40c.

23,890—PRODUCER GAS—The Application of Producer Gas to Brass Foundries. E. F. Bulmahn. (Advance Copy, Am. Inst. of Metals, Oct., 1913; 27 pp., illus.)

23,891—WASTE GASES—The Utilization of Blast-Furnace and Coke-Oven Gases in Metallurgy. E. Houbaer. (Advance copy, Iron and Steel Inst., Sept., 1913; 43 pp., illus.)

23,892—WASTE HEAT—The Generation of Steam by Waste Heat from Furnaces. F. Peter. (Advance copy, A. I. M. E., Oct., 1913; 29 pp., illus.)

23,893—WOOD—Power on Mines. Timely Notes on Production of Gas from Wood. Items of Cost. W. J. Loring. (Min. Mag., Oct., 1913; 2 pp.) 60c.

### MINING AND METALLURGICAL MACHINERY

23,894—AIR COMPRESSORS and Compressed-Air Machinery. Robert L. Streeter. (Eng. Mag., Sept., Oct. and Nov., 1913; 46 pp., illus.) First three articles of series. Uses of compressed air; fundamental principles of air compression; small steam, electric, gas and belt-driven compressors; large steam-driven compressors, etc. $1.

23,895—BELT CONVEYERS. Reginald Trautschold. (Can. Engr., Sept. 18 and Oct. 2, 1913; 6 pp., illus.) 40c.

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23,902—HYDROELECTRIC PLANT—Puntledge Hydroelectric Power Plant, Vancouver Island, B. C. (Eng. Rec., Sept. [illegible] and 27, 1913; 5 pp., illus.) 40c.

23,903—LOCOMOTIVE—Field Test of the Electric Locomotive. Leonard V. Newton. (Colliery Engr., Oct., 1913; 1 p., illus.) 40c.

23,904—LOCOMOTIVE—The Storage-Battery Locomotive in Coal Mines. [illegible] R. Anderson. (Colliery Engr., Oct., 1913; [illegible] pp., illus.) [illegible]

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23,906—MOTOR TRUCK in Contracting and Construction Work. Rollin W. Hutchinson, Jr. (Eng. Mag., Nov., 1913; 12 pp., illus.) Third of a series of articles dealing in present installment with "Contractors' objections, both valid and invalid." 40c.

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23,909—PUMPS—Low-Lift Centrifugal Pumps of High Efficiency Manufactured by Yuba Construction Co. (Eng. and Min. Journ., Nov. 15, 1913; 1¼ pp., illus.) 20c.

23,910—RESCUE APPARATUS—Die Atmungsapparate im Rettungswesen beim österreichischen Bergbau. Wilhelm Pokorny. (Oest. Zeit. f. B. u. H., Sept. 6, 13 and 27, 1913; 13 pp.) $1.

23,911—RESCUE APPARATUS—Neuerungen auf dem Gebiet der Sauerstoff-Atmungsgeräte und damit angestellte Versuche. Grahn. (Glückauf, Sept. 27, 1913; 4¼ pp., illus.) Innovations on the subject of oxygen-inhaling apparatus and tests made therewith. 40c.

23,912—SKIP CAR—Rear-Dumping Skip-Car Used at the Sterling Mine, New York. L. O. Kellogg. (Eng. and Min. Journ., Nov. 8, 1913; ¾ p., illus.) 20c.

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23,917—SLAG ANALYSIS—Die Bestimmung der Phosphorsäure in Thomasmehlen. Popp. (Zeit. f. angew. Chem., Sept. 5, 1913; ¾ p.) Determination of phosphoric acid in ground Thomas slag. 40c.

### INDUSTRIAL CHEMISTRY

23,918—AMMONIA—Neues direktes Ammoniak-Gewinnungsverfahren ohne Distillation. Strommenger. (Glückauf, Oct. 25, 1913; 2½ pp., illus.) A new method for the direct recovery of ammonia without distillation.

23,919—AMMONIA CONCENTRATION. R. B. Richardson. (Gas Age, Sept. 15, 1913; 2 pp.) 20c.

23,920—AMMONIUM SULPHATE—Ein weiterer Beitrag zur Geschichte der direkten Verfahren zur Gewinnung von schwefelsaurem Ammoniak. Ohnesorge. (Zeit. f. angew. Chem., Oct. 10, 1913; 3 pp., illus.) A further contribution to the history of the methods for the direct recovery of sulphate of ammonia.

23,921—ATMOSPHERIC NITROGEN—Progress in the Fixation of Atmospheric Nitrogen. Thomas C. Pinkerton. (Am. Fertilizer, Oct. 4, 1913; 2¾ pp.) 20c.

23,922—ATMOSPHERIC NITROGEN—Synthèse des Oxydes d'Azote par l'Arc Electrique. Eugene Roselier. (Rev. Univ. des Mines, Aug., 1913; 75 pp., illus.)

23,923—COKE BYPRODUCTS—Benzol—How it is Recovered from Coal Gas. Franz Puning. (Iron Tr. Rev., Oct. 9, 1913; 8 pp., illus.) 20c.

23,924—NITROGEN and the Electric Furnace. H. G. A. Stedman. (Iron and Coal Tr. Rev., Sept. 5, 1913; 1½ pp.) 40c.

23,925—SODIUM CYANIDE—Fabrication du Cyanure de Sodium. A. Vasseur. (Rev. Chim. Ind., Sept. and Oct., 1913; 9¾ pp.) 80c.

### MATERIALS OF CONSTRUCTION

23,926—CEMENT MATERIALS and the Manufacture of Portland Cement in Montana. W. H. Andrews. (Bull. A. I. M. E., Sept., 1913; 4¾ pp.) 40c.

23,927—CONCRETE—Notes on the Economies of Gravel Screening for Concrete. Geo. A. Merrill. (Eng. and Contract., Oct. 15, 1913; 1¼ pp.) 20c.

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23,929—MAGNESIA CEMENT—Studien über Sorelzement: I. Die Konstitutionsfrage. Kallauner. (Chem.-Ztg., Sept. 2, 1913; 1½ pp.) Studies on Sorel (magnesia) cement: I, Question of constitution. 40c.

### MISCELLANEOUS

23,930—ACCOUNTING—Keeping Personal Accounts. A. H. Sawyer. (Eng. and Min. Journ., Oct. 11, 1913; 1¼ pp.) 20c.

23,931—ALASKA—Across Alaska by Motor. (Eng. and Min. Journ., Oct. 11, 1913; 1 p.) Notes on a trip by U. S. Army engineers from Valdez to Fairbanks. 20c.

23,932—INDUSTRIAL EDUCATION—Report of the Committee on Industrial Education. P. Kreuzpointner. (Advance Copy, Am. Foundrymen's Assn., 1913; 16 pp.)

23,933—PHILIPPINES as a Business Proposition. Lewis R. Freeman. (Eng. Mag., Aug., 1913; 15 pp., illus.) 40c.

23,934—POTTERY INDUSTRY—Statistics of the Pottery Industry in the United States in 1912. Jefferson Middleton. (Advance Chapter from Mineral Resources of the U. S., 1912; 16 pp.)

# November Mining Dividends

Dividends paid by 31 United States mining companies making public reports amount to $2,343,646, as compared with $1,574,596 in the same month of 1912. Iron-smelting, other metallurgical, and holding companies paid $10,926,180, and Mexican and Canadian mining and smelting companies paid $1,879,896, as compared with $1,343,718 in 1912.

| United States Mining Companies | Situation | Per Share | Total |
|---|---|---|---|
| Alaska Mexican, g | Alas | $0.20 | $36,000 |
| Alaska Treadwell, g. | Alas | 1.00 | 200,000 |
| Alaska United, g | Alas | 0.50 | 90,100 |
| Arizona pf, B, c | Ariz | | 53,842 |
| Bingham-Newhaven, c | Utah | 0.10 | 22,869 |
| Bunker Hill & Sullivan, l.s | Ida | 0.25 | 81,750 |
| Bunker Hill Con., g | Calif. | 0.05 | 10,000 |
| Eagle & Blue Bell, g.s.l | Utah | 0.05 | 44,657 |
| Elkton, g | Colo | 0.02 | 50,000 |
| Fremont, g | Calif. | 0.02 | 4,000 |
| Frontier, z | Wis. | 2.00 | 2,500 |
| Gemini, g.s.l | Utah | 10.00 | 50,000 |
| Gethin-Leroy, g.s.l.c | Utah | 0.01 | 7,500 |
| Golden Cycle, g | Colo. | 0.03 | 45,000 |
| Hecla, l.s | Ida. | 0.02 | 20,000 |
| Homestake, g. | S. D. | 0.65 | 163,254 |
| Miami, c | Ariz. | 0.50 | 372,202 |
| Nevada Wonder, s | Nev. | 0.10 | 140,000 |
| Parrot, s.c | Mont | 0.15 | 34,477 |
| Pittsburgh Silver Peak, g. | Nev | 0.02 | 55,800 |
| Standard Con., g | Calif | 0.25 | 44,598 |
| Stratton's Independence, g | Colo. | 0.06 | 60,750 |
| Tonopah-Belmont, g.s | Nev. | 0.10 | 150,000 |
| Tom Reed, g | Ariz. | 0.06 | 54,573 |
| Utah Con., c | Utah | 0.50 | 150,000 |
| United Verde, c | Ariz. | 0.75 | 225,000 |
| Wasp No. 2, g | S. D. | 0.01 | 5,000 |
| West End Con., g.s | Nev. | 0.05 | 93,424 |
| Yellow Aster, g. | Calif | 0.05 | 5,000 |
| Yellow Pine, z.l.s. | Nev. | 0.02 | 19,000 |
| Yosemite Dredging, g | Calif. | 0.10 | 2,400 |

| Iron, Industrial and Holding Companies | Situation | Per Share | Total |
|---|---|---|---|
| Amalgamated, c | Mont. | 1.50 | 2,308,319 |
| Cambria Steel | Penn. | 0.62½ | 562,500 |
| Great Northern Ore | Minn. | 0.50 | 750,000 |
| International Nickel, pfd. | N. J. | 1.50 | 133,689 |
| National Carbon, pfd | U. S. | 1.75 | 78,785 |
| Penn. Steel, pfd | Penn. | 2.50 | 413,500 |
| U. S. Steel, pref. | U. S. | 1.75 | 6,304,919 |
| Vulcan Detinning | N.J.-Ill. | 21.00 | 315,000 |
| Warwick, I. & S. | Penn | 0.40 | 59,468 |

| Canadian, Mexican and Central American Companies | Situation | Per Share | Total |
|---|---|---|---|
| Amparo, g.s | Mex. | 0.04 | 80,000 |
| Buffalo, s | Ont. | 0.07 | 70,000 |
| Cobalt Townsite, s | Ont. | 0.24 | 120,000 |
| Crown Reserve, s | Ont. | 0.03 | 35,376 |
| Cobalt Lake, s.* | Ont. | 0.36 | 109,350 |
| Chontalpan, g.s.l.z | Mex. | 0.50 | 3,500 |
| Conigas, s. | Ont. | 0.70 | 560,000 |
| Dominion Steel, pfd | Can. | 1.50 | 105,000 |
| Greene Consol., c | Mex. | 0.50 | 500,000 |
| Hollinger, g | Ont. | 0.15 | 90,000 |
| Lucky Tiger, g.s. | Mex. | 0.06 | 42,920 |
| Standard, l.s | B. C. | 0.25 | 50,000 |
| Steel Co. of Canada | Can. | 1.75 | 113,750 |

* English holding company.

There are no changes of importance except the increases by Golden Cycle and Lucky Tiger, and the initial dividend by Gethin-Leroy. The Standard Consolidated dividend is the first this year.

Dividends for the first 11 months of the year amounted to $64,519,256 paid by United States mining companies: $102,807,003 by iron-smelting, other metallurgical and holding companies; and $20,697,712 for other North American companies. This compares with $54,744,870 paid by United States mining companies for the first 11 months of 1912.

⁂

# Mexican Financial Situation

Special Correspondence

By the law of 1905, establishing currency on a gold basis, the peso is 75 mg. of gold, or one-half the United States dollar standard. The old peso fuerte, of silver, weighing 417.80018 grains, 902.777 fine, contains 377.2 grains of fine silver, and is worth 58c., U. S. currency. The New York papers quote the peso at 47 and 48, but banks here allow hardly 36. The coin is being melted into bullion and sold for uncoined silver at a good profit. One firm a few days ago melted down 150,000 silver pesos. As our bank circulation is supposed to be secured by the equivalent of the silver in gold, the banks are refusing to exchange silver for bills. This refusal adds to our local distress and uncertainty, and many banks are on the verge of insolvency.

⁂

# Zinc Smelting at Port Pirie

F. W. Reid, lecturer in metallurgy, South Australian School of Mines, Adelaide, has described in the *Mining and Engineering Review* of Oct. 6, 1913, the zinc smeltery of the Broken Hill Proprietary Co. at Port Pirie. The following is an abstract of his paper:

The blende concentrate, as received from Broken Hill, contains about 46% zinc, 8% lead, 30% sulphur and 13 oz. silver per ton. It is roasted in a Hegeler furnace, 79 ft. in length, with two tiers of seven hearths, each 6 ft. wide. The furnace was designed originally as a muffle furnace, the lowest three hearths being heated by gas firing. It not being desired to manufacture sulphuric acid, however, and it being found difficult to obtain a sufficiently high temperature for decomposition of zinc sulphate, the furnace was modified and is now operated as an ordinary reverbatory, the lowest three hearths being heated by gas obtained from Duff producers. The capacity of the furnace is 48 tons per 24 hours.

Retorts are made by hydraulic pressure in the usual way.

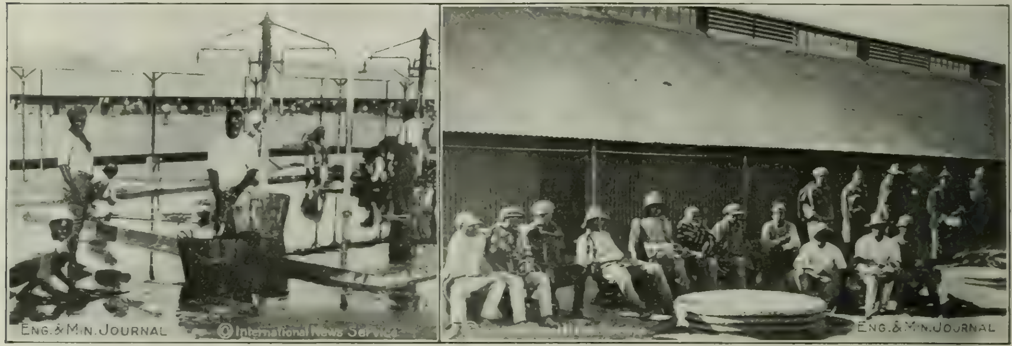
The distillation furnaces, 10 in number, are of the Rhenish type, with 144 retorts per furnace, arranged three rows high. The retorts are 66 in. long and 13x7 in. in cross-section. The furnaces are gas fired, and are of the counter-current, recuperative type.

The ordinary furnace charge is 10,000 lb. of ore, 3000 lb. of coke and 1500 lb. of coal, plus the condenser chippings and all the coarser powder of the previous day's work. The retorts are charged through the condensers.

In running the distillation furnaces, the temperature is taken at hourly intervals by means of a Wanner pyrometer. It is raised gradually until it reaches a maximum of 1325 to 1350° C. Spelter is drawn once per day, just before the day shift comes on. The retort residues are raked out. They are sent to the lead blast furnaces. Recovery of zinc in the form of spelter and marketable blue powder is said to range from 80 to 85%. The blue powder averages about 12% of the total product. It contains about 92.5% zinc. It is sifted through a 100-mesh screen and is boxed for export to San Francisco or Japan. The spelter contains 2 to 3% lead. It is refined by liquation in the ordinary way. The charge of the refining furnace is about 20 tons. The refined spelter contains less than 1% of lead.

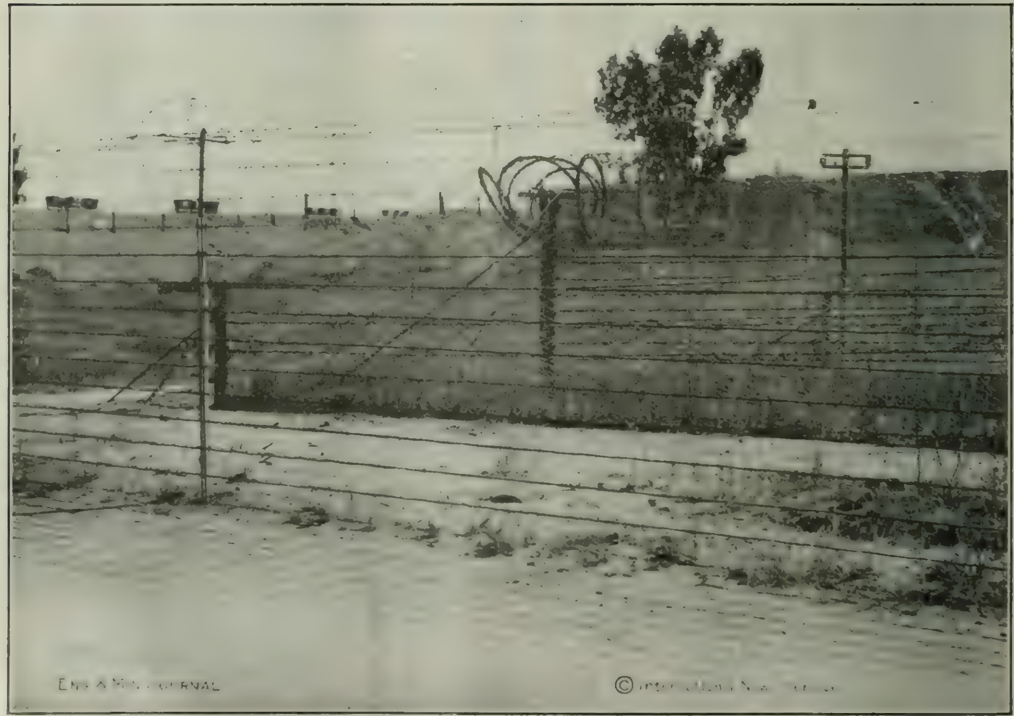
[It would be interesting to have all the data of the smelting of this ore. Apparently about 12% of the lead of the crude ore passes into the spelter. The lead tenor of the spelter is about what is to be expected in the smelting of such an ore at such a temperature. The latter is higher than some practice in the smelting of such ore, but is, of course, much below the temperature maintained in the smelting of some ores. The range of zinc extraction as stated is too wide to enable any good idea of the metallurgical efficiency to be formed.—Editor.]

# PHOTOGRAPHS FROM THE FIELD



Compounds at the De Beers Diamond Mines at Kimberley, South Africa

The various tribes are alloted sections of the compound and prefer to keep their own company. The photograph at the left shows Kafirs washing their clothes in the compound. At the right a group of Basuto boys is shown: the man at the extreme left is not a jockey in spite of the cap. Fires are kindled on the circular concrete platforms, the one at the extreme right is burning and a boy is about to warm up something to eat. Evidently these black boys are as fond of a fire as Mexican peons.

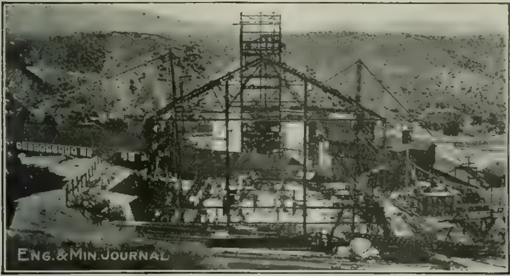


The Barricade of Wire That Incloses the De Beers Diamond Mines

About 4000 miles of barbed wire is used in this elaborate "cat teaser," one of the many guards against employees disposing of stolen diamonds.

New Concentrator of Old Dominion Copper Mining & Smelting Co., at Globe, Ariz.,

Site of new plant. Concrete ore bins 1000 tons capacity each.

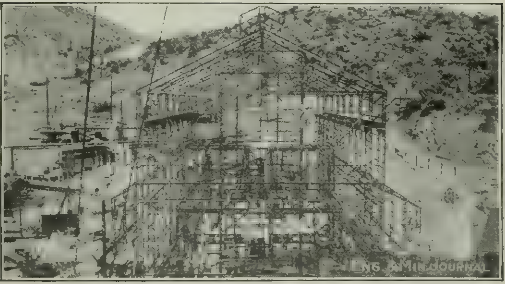


View through Crushing Plant

Crushing Plant and Sampling Mill

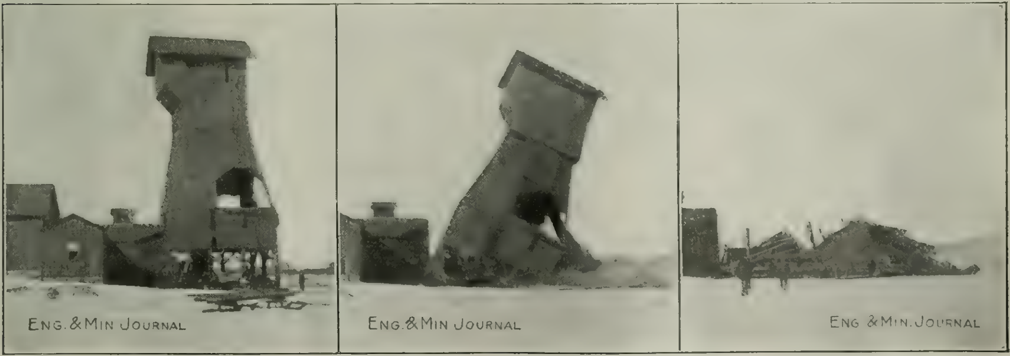
Both views are looking West; show plants in course of erection.

Sampling Mill, Conveyor and Crushing Plant



Crushing Plant in Course of Erection

This part of new works was lately completed.



Wrecking 15-Year Old Shaft House at Cleveland Iron Mining Co.'s No. 3 Mine at Ishpeming, Mich.

After cutting props on north and south sides six sticks of powder brought down the dangerously rotten structure.

# Coal Prospects in Matanuska Field, Alaska

The initial prospecting for coal in the Matanuska field, Alaska, inaugurated by the U. S. Bureau of Mines for the Navy Department has been completed, and Dr. J. A. Holmes, director of the bureau, under whose supervision the work was carried on, returned to San Francisco en route to Washington on Oct. 20. Doctor Holmes made the following statement to the JOURNAL representative at San Francisco:

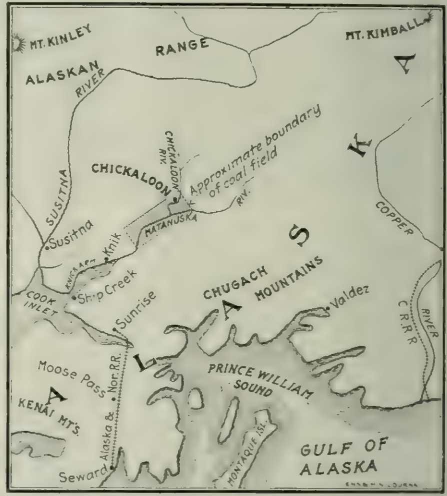
"Our special work in Alaska was with reference to finding a quantity of coal suitable for naval use and under conditions suitable for mining operations. We had 20 miners to aid the mining engineers and finally selected one opening on the Matanuska River that covered about 800 tons of coal, which is to be brought down the Matanuska River on the ice to tidewater during the coming winter. There it will be turned over to the Navy Department for actual ship test by one of the cruisers. The situation of the Matanuska field is about 45 miles northeast of the head of Cook Inlet. George Watkin Evans, mining engineer, of Seattle, was in immediate charge of the prospecting and extraction of the coal. He has just finished his part of the work and returned to Seattle.

"The work remaining to be done is to get the coal to tidewater; but this cannot be done until the river freezes solid. The bringing of the 800 tons of coal a distance of 45 miles over the ice is a more serious problem than prospecting for coal during the summer. The coal will be carried on No. 5 Common-sense bobsleds hauled by two or four horses to each sled as may be required. Double-ender sleds, each pulled by one horse, will be employed as supplementary to the larger sleds. The condition of the ice on Matanuska River is what makes the problem of haulage a serious one. The climatic changes are irregular. The ice breaks and the water overflows, freezes into ice and breaks again forming a rough surface, and the wear of the projecting ice quickly mixes with the snow and becomes slush. There is added to this difficulty the fact that the banks of the river are sandy and gravelly in so many places and the wind frequently drives the sand and gravel over the ice, forming a sanded floor instead of a smooth ice surface. These are the problems to be met and the hauling of this coal down the river will be an experiment, as it will be the first attempt made at hauling large quantities and heavy loads. The coal-carrying capacity of the single-horse double-ender sleds is about two tons. The capacity of the No. 5 bobsled is four or five tons. Bins or sled boxes will be built on the sleds and the coal loaded in as compact form as possible.

"There has been one experiment made, in hauling a small sawmill up the river by one of the mining companies using horses and sleds, but I understand it required more than one month of time to make the trip of 45 miles. During the past winter mining companies on Copper River, where the conditions are somewhat similar, were able to make an average of five miles a day with horses and sleds. They hauled over two or three tons on single-horse sleds. They solved the problem of smoothing the roadway by using a snow-plow which was pulled by eight horses. The snow-plow went ahead of the double-ender sleds. The purpose was to push all the rough ice and snow out of the way and leave a smooth road. They hauled their machinery, including steel pipe for hydraulic work, a distance of 260 miles into the interior of Alaska, following this method of haulage.

"The Matanuska River region never gets as cold as in the interior and the new ice that forms on top of the overflows on the river is not always very strong. The region is so isolated during the winter that we cannot take in either horses or supplies after early November and we cannot get them out before about the first of May. It is estimated that during that time the winter conditions will probably be favorable to hauling the coal for not more than two months of actual time; but whether it will be the first two or the last two months or scattered through the season one week at a time, nobody knows. So it required preparation in excess of what would ordinarily be required if good conditions were assured.

"The Matanuska region gives greater promise of agricultural development than any other part of Alaska that I have visited. It will be an easy region for the building of railroads and public highways, so that an agricultural population can easily develop there which would supplement the mining operations."



MATANUSKA, ALASKA, COAL FIELD

Doctor Holmes before going on to Washington arranged for the chartering of a steamer to carry horses and supplies to Alaska for the work of transporting the coal from Matanuska field to tidewater. The sleds to be used will probably be obtained in Alaska. The steamer will go in through Cook Inlet and dock at Ship Creek on the inlet. The horses and supplies will then be lightered over the tidewater flats of Knik arm to the mouth of Matanuska River at the head of Knik arm, a distance of about 15 miles. The coal camp is at Chickaloon, which is on the north bank of Chickaloon Creek, near its confluence with Matanuska River. The accompanying sketch map gives the approximate boundary of the coal fields and the geographical situation of the camp. The coal fields lie between Susitna River and Copper River. The situation is about 120 miles southeast of Mt. McKinley and about 100 miles north of Prince William Sound.

# CORRESPONDENCE AND DISCUSSION

## Butte versus Michigan

In reply to Mr. Guck in the JOURNAL of Nov. 8, I beg to suggest that the Cornish miner of Calumet (or the Cousin Jack, as he is more familiarly known) must have paid a very short visit to Butte and left before he had time to find out conditions, or else he is telling the story because "there's a reason."

I am living midst scores of Cousin Jacks who have been in both places. Mr. Guck states that one lived in an unsuitable house in Butte for which he paid $11.75, and for a good house he would have to pay nearly $20.

Quite so, but if he had stayed there as long as he has no doubt stayed in Michigan he would probably own a house.

He lived in a company-owned cottage in Michigan for which he paid $5. Does he not earn enough for the Calumet & Hecla in the mines, or does he want to pay more rent and allow them to pay $3,000,000 annual dividends from that source also? If he lives there long enough he will pay for the house but he will never possess it.

He states that in Butte, coal is $18.50 per ton and slab wood $8.50 a cord. Does anybody with a mind of his own believe that such prices exist in any city in the United States? My figures on the above are as follows: The best coal obtainable, which he termed Rock Spring coal, is $8 per ton, and Diamond coal is $7.50 per ton. There is also an inferior coal which can be had for $6. Wood is sold by the wagon load, slab wood $4 and log wood $6, and a load is considerably more than a cord.

Below is a rather vague comparison between the two places, and if one goes to the trouble of obtaining items one will find that I am giving Michigan the benefit of any doubt:

| Michigan | | Butte | |
|---|---|---|---|
| Average wage.......... | $65 | Minimum wage...... | $112.50 |
| General expense........ | 25 | General expense.... | 50.00 |
| Balance .............. | $40 | Balance .......... | $62.50 |

The highest a man pays for room and board is $1.50 per day or $45 per month, but it is obtained by hundreds of men for $1 per day or $30 per month. The lowest paid miner in Butte gets the above wage, and up to a few weeks ago he was getting a matter of $7.50 per month more.

There is a man sitting next to me at this writing who says he worked a few years ago at Tamarack as a shift boss for $2.25 per day, which was eventually increased to $2.50 per day.

The difference he makes in flour is $1 per sack, and a sack will last him well over a month; you have the extra price for flour in one day's wage, so you have still 29 days in which to make up the remainder of the excessive prices.

I am continually in contact with scores of miners of all nationalities who have mined all over the United States and Canada, but I have yet to meet the first one that prefers conditions in the state of Michigan to those in Butte, Montana.

WILLIAM LAKELAND.

Greenwood, B. C., Nov. 14, 1913.

[According to the report of the committee of the Copper Country Commercial Culb of Michigan, the average wages received by miners in the Lake Superior region, during the six months from Jan. 1 to June 30, 1913, was $3.20 per shift; of trammers, $2.63 per shift. These figures were arrived at by dividing the total amount of the pay rolls of the respective companies by the number of shifts worked. With respect to the relative cost of living in Michigan and Montana, the committee reported that "on a grocery and meat bill of $35, which is fairly approximate for an average miner's bill, there is a saving in Michigan of 25% over the Butte prices; in other words, the same articles in Butte would cost $8.75 more." The committee quotes hard coal in Butte at $16 per ton against $8@8.50 in Michigan. It quotes soft coal in Butte at $7@7.50 against $4.50@5 in Michigan.—EDITOR.]

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## Grinding Ores for Cyanidation

In H. A. Megraw's article on this subject, in the JOURNAL of Nov. 15, 1913, he states, following a quotation from an advertisement of a screening machine, "It certainly looks as if the product of the Hardinge mill had to be screened and the oversize returned, and if this is true, the cost of screening ought to be charged against the mill and not dropped out simply because a separate machine happens to be called upon to do the work." At the plant of the Miami Copper Co., which is the one under discussion, the 8-ft. by 22-in. cylinder Hardinge mills are followed by classifiers, various products from the spigots going to tables for concentration. No screening is done following these mills, and, therefore, no oversize is returned and the item of screening is not chargeable to Hardinge mill grinding. The above information regarding the flow sheet of the Miami plant has been obtained from an article in *Mines and Methods,* January, 1913.

Mr. Megraw also states, "It is seen that the amount of minus 200-mesh material, which is what the cyanide plant wants, is greater in the product of the chilean mill than in the product of the Hardinge." In this connection it may be worthy of note that the Hardinge mills in use at the Miami plant have cylinders only 22 in. long, which is a type designed for grinding for concentration where a minimum of slimes is desired. When the metallurgical treatment of the ore requires a greater proportion of slimes the method of operation of the mills is changed materially and the length of the cylindrical portion may be increased from 48 to 72 in., depending upon the character of the ore and other local conditions.

Another point which may be mentioned is the amount of water used in Hardinge mill grinding. At Miami the feed to the mill contains probably in the neighborhood of 60 per cent. water and if this were reduced to about 40 per cent., the proportion of slimes would be much greater. An excess of water in grinding will carry out the fine particles and prevent their being further disintegrated. The reverse is the case where a small amount of water is used, these small grains being allowed to remain in the mill for further comminution.

R. B. T. Kiliani.

New York, Nov. 25, 1913.

The discussion by Mr. Kiliani adds to the information on this interesting subject. Referring to the Miami mill, the explanation that the Hardinge-mill product is not screened must be accepted as correct. That such screening is required in other plants doing similar work, however, is probably true. Circumstances, principally the disposition of the product, will alter the methods followed. More data on the actual steps followed should be published.

The information that the form of the Hardinge mill is changed when more slimes are required is enlightening. Is it suggested that the nearer to tube-mill form the more slimes in the product? If so, why the cone? I would like to have some more data about the changed method of operating the mills when greater quantities of slimes are required.

As to moisture percentages, I agree with Mr. Kiliani. The facts conform to general experience.

H. A. Megraw.

New York, Nov. 29, 1913.

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## Companies Claiming to Want Mines on a Fair Basis—Faking

On p. 827, of the Journal of Nov. 1, are named a number of companies and individuals who are on the lookout to buy, or invest in good mining property.

The impression created by this article is wholly foreign to the facts in nine out of ten cases. I have had some occasion personally to see a number of the parties and companies you name in reference to a gold-mining property of the first character with a view of having them acquire an interest upon lines fully protecting them and upon the same basis I paid after I had taken the risk and proved it up. My experience justifies me in the claim that the most of these persons or companies are doing the spider-and-fly act like the public was fleeced on Nipissing some years ago by a deliberate conspiracy for that purpose by some of these persons and concerns you name. Not one of them could find any fault with my property, but still they were not inclined to deal on a basis more fair to them than myself. I was not to receive a cent of their money. What they put in was to go on the property only through their own agent.

At one place, which wears peacock feathers in its hat, some spruce young office engineer, who, in my view, knows as much of practical mining as a sick cat, wanted me to put up $5000 for an examination, and then $20,000 to enable him to duplicate some exploration work, after which, he said, "we will be prepared to talk."

No sane man would entertain such a proposal. It was a mere scheme of graft which, in my opinion, is actively going on in some of these offices, possibly behind the backs of the principals. To prove that the firm was a bunch of fakers and not looking for anything except on the spider plan, and to convince an intermediary that I was right, I finally agreed to it on the one condition, that they would buy the proved-up ground at a cost of about one-third of the net and pay for it as proved up. Any concern that really meant real business in any sense would have jumped at it and yet this was one of the so called big men or houses of the Street.

In various others, instead of finding representatives with some genuine mining knowledge and appreciation of the possibilities of a big and rich property, I found some youngster, who possibly is an E.M., yet needed a kindergarten course. Mining in a soft office chair, however, has its allurements, and to be sure of holding the job and convincing their employers that they are "highly conservative," these amateurs turn down everything.

From my observation of this alleged gentry and companies who are supposed to be looking for mines, I am quite convinced that that is the very last feature of their business; that their office representations are incompetent; that there is no likelihood of being able to get a square deal from most of them. Their principal business seems to be to "turn down" everything which is presented them, due to their siren song, and, of course, included formerly in the lot is Tonopah Mining, Calumet & Arizona, and dozens of other big producers. I doubt if one of these concerns would give a moment's attention to a "prospect" of the utmost promise, as they act as if they felt the real miner should deposit his bullion or metal on their office floors and then ask them to take it at 20% of the market price.

There seems to be a concert of action among them to discourage every sort of mining that doesn't originate with them. They want thoroughly proven or dividend-paying mines at the price of "prospects." The obstensible purpose of their existence or claims is not their real purpose by a long shot. To me their methods look like those of fakers.

Wilson M. Tylor.

103 Park Ave., New York, Nov. 17, 1913.

[After our receipt of the above communication, we happened to observe the following advertisement in the New York *Sun*, of Nov. 22.—Editor.]

**AN ENORMOUS PROPERTY**

**An Immense Money Earner**

A Wonderful Opportunity

Over 2,000 acres, over 20 miles of a gold lead with a known record of nearly 10 millions to the mile. Will begin to pay great dividends in 1914. Last development capital now accepted. Don't miss this chance. Cut this out. Write at once. Every $100 will earn a $1000 quickly. What can you invest if proposal suits you? First mortgage immediate income security. Address W. S. TYLOR, 103 Park Ave., New York.

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## Climate of Johannesburg

Referring to the statement in the editorial in the Journal of Nov. 1, entitled "Colonel Gorgas at Johannesburg," that "Johannesburg has been the center of one of the world's most renowned malarial districts." In reply to this I would like to state that the region around Johannesburg, known as the high veldt, is one of the finest and most exhilarating climates in the world and that the Transvaal and British South Africa, with the exception of a small portion of the Transvaal along the Limpopo River, is quite a healthful climate. The fact that invalids are sent from England to the Transvaal and Cape Colony, just as in this country they are sent from the East to California, will prove the above statements.

N. L. Calder.

New York, Nov. 1, 1913.

# EDITORIALS

## The Troubles of the Potash Industry

Somewhat over two years ago, at the time the so called American contracts were under discussion, the German potash industry was placed in a position which certain financiers and economists in this country apparently regard as ideal. A bill was passed by the Reichstag placing the industry under very close control. The business and production were to be carefully apportioned among the different companies and prices were to be closely regulated, a committee of the Imperial Council being given charge of the whole business. Companies were strictly prohibited from selling below the prices fixed by the governing committee, and it was provided that no new concerns were to be admitted to the allotment for a certain number of years.

While the immediate object of this legislation was to prevent certain companies from selling potash to their American customers at a lower price than was charged at home, the whole business of the industry was carefully gone over and it was thought that a permanent solution had been reached. Only two years have passed now, and the potash trade is in a thoroughly demoralized condition, which legislation has been entirely unable to prevent. In fact, government regulation, as a preventive of business confusion, seems to have completely broken down; and this is the more remarkable because Germany has a practical monopoly of potash production, and no trouble has arisen or is likely to arise from foreign competition.

The first cause of the trouble seems to have been that the industry was made apparently too sure and too profitable. Notwithstanding the limitations placed on new mines, the prospecting for deposits has gone on, with the result that new areas where potash can, in all probability, be profitably mined, have been discovered in Alsace, in Baden, in Hanover, and elsewhere. New mines have been begun and these under the law will be able to demand quotas of the production in two or three years, which, of course, will be deducted from those of the older mines, although there has been a large increase in production. It seems as though this increase had been rather forced and that very near the possible limit of profitable sales had been reached under present conditions. Until a further development of the use of potash in agriculture is realized, there will not be much room for further expansion.

One result of the present condition is that there has been a heavy fall in the prices of the shares of potash mining companies. The banks have become reluctant to advance money on these securities, and are also declining to advance money to the companies themselves, so that it is becoming difficult for them to raise the amounts necessary to develop their mines, or to increase production, and some of them are reported to be seriously embarrassed financially.

The Imperial government recognizes, apparently, the fact that something further must be done to help out the beneficiaries of the potash law. The law has certainly gone crooked somehow, but just what steps can be taken to amend it is a question which seems to have taxed the wisdom of the Imperial Council, for while the new bill was to have been submitted to the Reichstag six months ago, it has not yet been introduced in that body. It does not seem probable that anything much can be done beyond the further restriction of the opening of new mines and the holding down of production as nearly as possible to the limited demand. The question, however, is complicated by the fact that while a few years ago there was no state ownership of the potash mines, except by the Kingdom of Prussia, mines are now owned by several of the smaller states, such as Anhalt, Baden and Saxe-Weimar, and even in Germany, the minor states have some rights which they are not slow to claim. The Kali-Syndikat or potash trust, is in great trouble, and although some inconsiderate people have suggested that it be left to work out its own salvation, that proposition does not seem to meet with favor from the German authorities.

On the other hand, governmental control of industry does not seem to have been a sure panacea for all troubles, as certain economists would have us believe.

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## Some Reflections on Mexican Matters

There is a phase of the Mexican question which does not seem to be sufficiently realized. It is that the ownership and operation of the great industries of the country are under control of foreign corporations, and therefore the flow of dividends is abroad instead of being used at home for the further development of manufactures and commerce. In this respect Chile and the Argentine Republic afford a striking contrast to most of the other Spanish-American republics, and it can hardly be accidental. They were the poorest of the old Spanish provinces, producing little or none of the precious metals, which were the food upon which Spanish vices were fed. The Spanish bureaucracy was rampant with all its evil influences in Mexico and Peru, including Bolivia, where the enormous wealth in silver created degeneration, as wealth does everywhere. Chile fortunately escaped because poor; and we see the results today in honest government and active industry, carried on in great measure by the Chileans themselves. When Chile was at the height of its copper production in the '70s (occupying in the world relatively the same position, as regards copper production, as we do today), the big copper mines were owned and operated by Chileans, who used the profits for the development of the country instead of exporting them. The Mexican government, under Diaz, appreciating the necessity of controlling and owning the railroads, took perhaps the first step toward remedying this great national defect.

It is not the fault of foreign capital that the Mexicans themselves have not the courage to work their own mines and develop their own agricultural resources, for they have the ability and could employ, as the Chileans did, foreign skill. Conditions being as they are, the Mexicans can simply grumble, and vent their jealousy against the foreigner, who is doing what they ought to do themselves. But one sees no appreciation on the part of the wealthier classes in Mexico of the necessity of either combining with foreign capitalists or following their lead in developing their great mineral resources. They display even more disinclination to adopt modern methods of farming in utilizing the prodigious agricultural capabilities of the country south of the City of Mexico. If the revolution could stimulate Mexico, as the Civil War stimulated this country, it would mark an era of progress that would be a turning point in the history of the Republic. Unfortunately, however, the ideals of none of the parties who are struggling for supremacy are as elevated as those which inspired the dominant forces in this country in 1860.

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## Black Hills Lithia Deposits

The Black Hills lithia deposits, described in our leading article for this week, are of particular interest, inasmuch as they are, to the best of our knowledge, the only deposits in the United States at present worked for lithium, although California has some deposits of potential value. That the Black Hills deposits are ample for all demands for some time to come seems to be indicated by Professor Ziegler's article, since there are extensive spodumene deposits held in reserve against the exhaustion of the still large ambyigonite mines.

The greatest hope for this industry is in the success of the alkaline-electrolyte storage battery, in which, we are informed, lithium hydrate is used, presumably to precipitate the carbon dioxide taken up from the atmosphere.

As is noted in the article, one cannot but wonder under what conditions crystals of spodumene 42 ft. long are deposited. Perhaps some laboratory will some day acquire 50-ft. test tubes from the Carnegie Institution and endeavor to solve this problem.

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## International Atomic Weights

For the comfort of those chemists who desire accuracy, and hence go to the trouble of continually keeping the latest table of atomic weights at hand, it may be mentioned that this year there has been no change in the weights as approved in the report for 1913 of the International Committee.

Researches have been conducted on the weights of nitrogen, chlorine, bromine, phosphorus, iron, cadmium, tellurium, scandium, yttrium, ruthenium, palladium and radium. While in no case did this work warrant any change in the atomic weights as previously given, there seems to be some reason for believing that radium may have an atomic weight of about 226.0 rather than 226.4. Just what effect the acceptance of the lower figure will have on the present theory of the relation of niton, helium and radium, and the present accepted weight of niton, to say nothing of the lower disintegration products, is an interesting thought.

The whole question of the determination of these weights, when one considers the effect of inter-related errors in the atomic weights of the various substances in the compound used for analysis; errors due to impurities, both in the substance analyzed, in the reagents, and in the solvents; of the solubility of the precipitates; make one only hope the more that the day may come when the electron theory or its equivalent may have its Leverrier and that the atomic weights may be calculated once for all, to be later verified by observation.

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The question of iron-ore rates from the mines of Minnesota to the Lake Superior ports has been taken up again by the Interstate Commerce Commission and is to be carefully considered on its merits. The reduction of 25% made last year is not considered sufficient by many of the shipping interests who point out that the ore traffic is one easily handled, is carried without break from shipping point to the ore docks, and is delivered in large quantities, permitting heavy train loads and cheap operation of the roads. Undoubtedly, it is a traffic which should command low rates. Moreover, the ownership of the carrying roads by one of the shipping interests, gives that interest an undue advantage, since the cost of carrying its ore is really offset by whatever profit may be derived from the railroads. All these points will be considered by the commission and it is quite probable that a further cut in rates will be ordered.

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In the last two or three weeks there have been considerable exports of gold from England to India, notwithstanding the rather unfavorable reports as to the Indian crops. These, perhaps, have been too pessimistic, for the people of India themselves seem to have confidence in the future. The point is that they are taking gold, and to an almost corresponding degree, have been neglecting silver. The tendency of the Indian people to hoard gold rather than silver, seems to be on the increase, and it may be a matter of considerable importance in its relation to our gold supply. It may also be a matter of importance to the silver producers, whose market may be reduced to an appreciable degree. The silver market is rather weak, just now, owing to the lesser immediate demand, and also to the fact that China and Australia have been shipping silver to India, thereby reducing the amount required from London.

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Copper smelters, as well as zinc smelters, are troubled by the concentrates produced by the flotation process, especially by their excessive fineness. To begin with, the drying of this material, of pasty consistency, is no simple matter. When it is finally dried it begins to blow away. The real trouble commences, however, when it is put into the furnace—roasting furnace, reverberatory, blast furnace, or whatever it may be. We imagine, though, that the troubles of the zinc smelter are a good deal more serious than those of the copper smelter. However, the smelters of all varieties are philosophic about the matter. They recognize that the new class of furnace material is bound to increase in volume and importance, and that it is up to them, the smelters, to handle it.

## BY THE WAY

Rafael Lopez, a notorious man killer of the Rocky Mountains, had a great fight among the mines of Bingham, Utah, last week. First he killed a miner in Bingham, then three policemen who pursued and cornered him. Finally he was cornered again in a tunnel of the Minnie mine, where he killed three more deputies of the posse, who at last accounts were trying to bulkhead him in the mine.

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A director of one of our important mining companies called on Secretary Bryan not long ago to make some representations respecting Mexican affairs. This director had interests in Mexico, and, consequently in the opinion of Mr. Bryan, was one whose information and advise were of no account, and was one of those to be shooed away in the speediest fashion. The opinions of men who have lived and worked in Mexico are not valued in Washington in these days. In the course of this particular dismissal Secretary Bryan remarked. "Why, these men who are fighting for constitutional government in Mexico are patriots like our own who battled at Bunker Hill." Thus are Villa and Salazar and their fellow bandits appreciated.

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The Golden Rule was "galvanized" into the dealings of competitors in the steel-manufacturing business by the good example set by the U. S. Steel Corporation, according to C. C. Smith, of Pittsburgh, president of the Union Steel Casting Co., who was a recent witness at the hearing in the government's anti-trust suit against the Steel Corporation. "So before 1902 you were malignant enough to rejoice in your hearts over the misfortune of competitors to whom you were lying?" asked Judge Dickinson for the government. "It is really true," said the witness, "But I don't like the use of the word 'lying.'" Since the example of the United States Steel Corporation came to be a factor in the business, the witness said, competitors did not lie to each other about their business and openly visited the plants of rival concerns. Judge Dickinson classed this change as a "process of spiritual progression." "Did you follow the United States Steel Corporation's good influence by means of pools which existed in those years?" inquired Judge Dickinson. "Oh, no," said Mr. Smith. He added that he did not consider "those pools" an uplifting influence and that he separated the good influence of the Steel Corporation from the bad influence.

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The following advertisement appears in a Southern paper: "Lead and Ore Samples from the property of the Thornton Lead & Steel Corporation, formerly known as the Cottrell Farm, on the Tennessee River, just below Knoxville, are on display in the show windows of Hope Bros., Jewelers, 519 Gay St. This deposit of lead ore is confidently claimed to be the largest pure lead-ore deposit now known in the world. With the ore there is also a large percentage of red potash, which will make the finest natural fertilizer on the market. It is to be developed immediately by the Thornton Lead & Steel Corporation, a company just organized under a North Carolina charter at Hickory. Col. M. E. Thornton, the head of this enterprise, which is to be a very large one, will be in Knoxville a few days at the Atkin Hotel, and wishes subscriptions to the preferred stock of the corporation, which stock will yield 10% per annum, if not 14%. This affords an opportunity for investment in a home industrial enterprise, the like of which was never known before, here or elsewhere." It will be noted that this lead-ore deposit is the largest known. The surprising thing is the wholehearted generosity with which the gentlemen at the head of the enterprise are willing to share their remarkable find with the public. If we are ever fortunate enough to uncover a bonanza like this we shall hold on to it pretty tightly. Incidentally, what is red potash anyhow?

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Another lawsuit in Boston, that great arena of financial-mining litigation, has brought Thomas W. Lawson and the history of the Amalgamated Copper Co. once more into the spotlight. Asked what his business is, Mr. Lawson replied: "Farmer, author and banker." He said he participated in the original organization of the Amalgamated, being associated with the late H. H. Rogers and A. C. Burrage. Conferences had been held as far back as 1896. The consolidation was for the purpose of more advantageous and profitable conducting of the copper business. It was planned to purchase all producing companies, including the Rio Tinto mines, he said, wherever possible, through acquisition of a majority of the stock. Mr. Lawson related how the United Metals Selling Co. was formed by the Amalgamated company, saying in part: "Formation of this company was in line with the general scheme, continuing all the way through. It would have been very essential to have the marketing of the whole product of the mines controlled or owned by the consolidated company, as the very foundation and idea of the scheme was control of the price of the metal, as it would have enabled us to have established and held the metal at a fair price." Senator Walsh asked Mr. Lawson why, on formation of the Amalgamated company, it did not immediately acquire the Boston & Montana and Butte & Boston properties. Mr. Lawson replied: "We had intended to have the Boston & Montana and Butte & Boston the first stocks to be absorbed, but in the meantime Mr. Rogers had been able to acquire from Marcus Daly control of the Anaconda property, control of which had not been originally contemplated until after the Boston & Montana and Butte & Boston properties had been arranged for. That would have necessitated a larger amount of capital at the start, and Mr. Rogers and Mr. Rockefeller and other associates thought it inadvisable, so it was decided to bring the contemplated company to the public in sections, and what was to have been the first section was shifted to the second." "Had you and your associates acquired control of the Boston & Montana at that time?" asked Senator Walsh. "No," replied Mr. Lawson, "but we could speak for control of it." "Who was the master mind in the consolidation?" asked Senator Walsh. "H. H. Rogers," replied Mr. Lawson. "On whose suggestion did he become interested?" asked the senator. "On my suggestion," replied the witness. The present litigation pertains to an attempt to have the transfer of the control of the Alice Gold & Silver Mining Co. to the Amalgamated declared null and void on the ground that the Amalgamated was organized as a conspiracy in restraint of trade.

# Gold Production and Prices

The skepticism among British and French economists respecting the quantity theory of money, and in many cases their direct challenging of it, have weakened the position of our American economists who but a few years ago were teaching that the increasing gold production was the principal cause of increasing prices. Recent events have also been an object lesson. Anyway, there always were some American economists who took the opposite position. It is refreshing to find such a lucid expression of a clear perception as these words of David Starr Jordan:

> What shall we say of the theory that prices rise steadily because too much gold is produced to meet the needs of business? And what of the plan steadily to increase the size of each gold coin that its value may keep pace with the rise in cost of living?
>
> We shall say that there is no such redundancy of gold. The idea that the commonness of gold the world over is the cause of rising prices, finds little favor among bankers. It is indeed a patent fact that there is no such surplus of precious metal as to cheapen its actual or relative value. The business world is suffering from a scarcity of gold which goes with excessive borrowing and excessive taxation. Both of these conditions are due in part to the rush toward the cities and toward urban industries, but chiefly to the demands of actual war in the Balkans, and threatened war elsewhere in Europe; and to frustrate war, as shown in the relations of Germany, France and England. But other causes cooperate to make gold scarce while prices still rise. For example, the savings of four hundred millions of Hindus are represented by British coin. In default of banks, most of these savings are buried in the ground. It is estimated that in Asia as much gold is returned to the ground each year as is taken from the mines of the world. Assuming that each native of India saves £1 each year on the average, this would mean $2,000,000,000 withdrawn each year from circulation.
>
> Besides all this, millions of men are withdrawn by conscription and by enlistment from productive service, to become taxeaters on an enormous scale. The capital of the world is largely spent in waste, and this to a degree which is growing so rapidly as to excite alarm among all financiers who look more than ten years into the future.
>
> The remedy, then, is not larger coins, nor a higher charge for seignorage, but less waste. There is not gold enough to go around in the business of the world. There is not enough of food or useful things produced. Too many men are working at useless things, and the working and business world have too many soldiers, protecting the men who work, when the only protection the working men of the world need is defense from the necessity of fearing soldiers or of being soldiers.

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# Zinc Smelting in Kansas and Oklahoma

Special Correspondence

I have just returned from a trip through the Kansas-Oklahoma zinc-smelting district, and find the outlook gloomy and everybody pessimistic. The works at Dearing and Caney have been closed down, and all furnaces at Altoona have been put on dead-fire. The several works at Bartlesville and Collinsville are being operated at greatly reduced capacity.

It seems to be the general impression in Oklahoma that owing to the scarcity of gas no new improvements in the smelting works there will be made from now on. Probably there will be more new works built in the Eastern coal fields. However, new gas pools are discovered from time to time. For example, one has lately been found about nine miles southeast of Cherryvale, Kan., which promises to be of considerable importance. The conditions of this pool are perplexing, the gas sand being encountered at depth of 100 ft., and extending to depth of 500 ft. The initial rock pressure is about 280 lb. Wells have been drilled which have a volume of 15 to 30 million cubic feet.

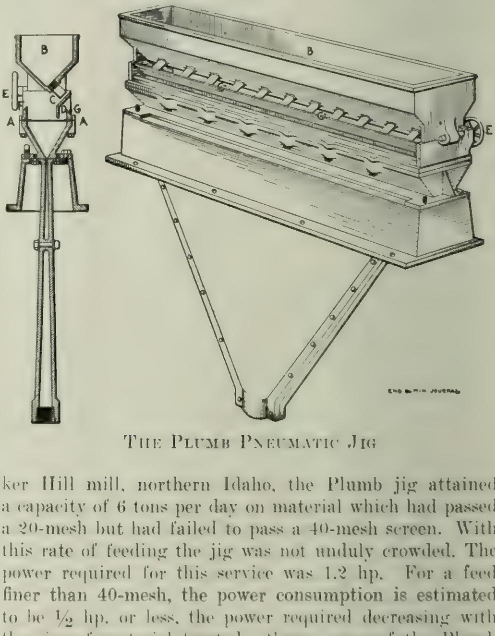
# The Plumb Pneumatic Jig

By Edward S. Wiard*

A new jig has recently appeared, the invention of A. M. Plumb, the striking characteristics of which are extraordinary capacity for the small screen area employed and lack of susceptibility to changes in the character and rate of feeding.

The machine has the general form of the hopper of a single-compartment Harz jig, and the body is made of cast iron. It has a screen area of but 3x24 in., and the overall dimensions are but little larger. It receives its pulsations from a rotating valve connected to an air-pressure supply system, the valve being similar to those on the Richards jig and classifier. The air is introduced from below, as is shown in the accompanying drawing.

In capacity the Plumb jig equals or exceeds that of a Harz for a unit of screen surface. In tests at the Bunker Hill mill, northern Idaho, the Plumb jig attained a capacity of 6 tons per day on material which had passed a 20-mesh but had failed to pass a 40-mesh screen. With this rate of feeding the jig was not unduly crowded. The power required for this service was 1.2 hp. For a feed finer than 40-mesh, the power consumption is estimated to be ½ hp. or less, the power required decreasing with the size of material treated. Screen area of the Plumb jig is 3x24 in., or ½ sq.ft., or the capacity per square foot of screen surface is 12 tons per day of 24 hr. The capacity of a Harz jig per square foot of the first compartment does not exceed 12 tons per day and for good work is probably much less.



The Plumb Pneumatic Jig

The screen of the Plumb jig is made up of two pieces of screen cloth, the upper or protective layer being 20-mesh, No. 24 wire, while the lower, which is the screen proper, is 150-mesh. The fines which accumulate in the hutch owing to imperfect screening can be removed at any convenient point at the lower part of the jig. It has been found by the inventor that with a constricted opening for the discharge of the hutch material it will be pushed out by the air pulses with very little loss of air. The opening for discharge of hutch is not shown in the drawings. Bolts for securing the screen-cloth pass through it at the points *A*. *B* is a hopper with feed pipes *C*, which play against the baffle *D*. By means of the handwheels *E*, at either end, the whole hopper can be moved sidewise, altering the space between the ends of the pipes *C*, and consequently the rate at which the feed will discharge upon the baffle *D*. The last is fixed; the clearance between it and the screen is $\frac{3}{16}$ in. Tailings discharge the whole length of the jig at the point *F* and concentrate the whole length at *G*.

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*Mining and metallurgical engineer, 122 Boston Building, Denver, Colo.

The mode of feeding and discharging concentrates and tailings is in marked contrast to Harz-jig practice. It would be desirable to have a somewhat similar arrangement on Harz jigs if it were not that the escape of water on the concentrate side of the machine would be so heavy as to be prohibitive. Since the concentrate-discharge lip *G* is a fixed integral part of the jig, the latter cannot be adjusted so as to yield concentrates of any grade desired, as on a Harz jig, by raising and lowering the concentrate gate. If the Plumb jig had an adjustable concentrate-discharge lip it would have to be raised and lowered with great caution for the reason that owing to the greater freedom with which air passes through the interstitial passages formed by the grains composing the bed, a very slight disturbance in the balance of the concentrate and sand columns would cause all the air to pass up one column or the other. The inventor has found that a slight lowering of the concentrate column will cause all the air to pass out on the concentrate side of the machine, carrying the bed with it. An adjustable gate is almost impossible for the further reason that it could not be made to fit with sufficient perfection to prevent a heavy loss of air.

In order to obtain successively leaner grades of concentrates and middlings a number of the jigs would have to be run in series, the tailings of one feeding the one next below it. The concentrates discharged by the machine are always the richest material in it. On pure galena ores the concentrates contain above 80% lead. This action of discharging only the richest concentrates is not peculiar to the Plumb jig. On the Harz jig, if the adjustments be left alone, the discharges will ultimately yield only the richest material fed to any compartment, the same action which attains in the Plumb jig with fixed concentrate-discharge lip.

The Plumb jig is not affected by changes in the rate or grade of feeding. If the grade diminishes, the concentrate stops discharging or discharges more slowly, and the reverse action ensues when the grade becomes better. The same actions take place when the rate of feed is diminished or increased. The concentrate and sand columns adjust themselves instantly to a change in feeding. The older air jigs did not attain this perfection of balance under varying conditions because the freedom of the grains passing into them was interfered with by various mechanical devices. In the Krom air jig concentrates were removed below the screen by a revolving roller which could not accommodate itself to changes in the rate at which concentrate was made and an increase in the rate or grade of feeding sent concentrate into the tailing or the concentrate became too lean if reverse conditions ensued.

The Plumb jig requires closer sizing than a Harz, and when jigging grains above 12-mesh size, the air consumption is so heavy as to be prohibitive. Pulsations vary from 400 to 800 per minute.

One of the important uses to which the machine can be put is the removal, before or after tabling, of the rich grains which occur in the overlapping sand and concentrate bands from Wilfleys or tables of the kind. At the Bunker Hill mill, where the Plumb jig has been tried, results have been so striking that they may lead to profound modifications in the flowsheet. The advantages indicated from the test work are a large decrease in the tonnage of concentrate made and an increase in the grade, or a decrease in freight and treatment charges, and the production of middlings and sand tailings devoid of free rich galena.

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## Rates on Lake Superior Ore

Washington Correspondence

The Interstate Commerce Commission has decided to hold an important hearing at Duluth, probably on Dec. 16. Commissioner B. H. Meyer will take charge of it, and it will involve the iron-ore rates from the Mesabi range to Duluth, which have been in controversy for some time past. Up to about two years ago the rate on ore was 80c. over this route. Subsequent to the publication of the report of the Commissioner of Corporations on the Steel Trust, the railroads reduced the rate to 60c. This was done at the same time that the ore contracts with the Great Northern were given up. Apparently it was a concession to public opinion. The 60c. rate, however, was not satisfactory and it was decided to make a protest. This was filed with the Commission and it was supposed that action would be taken almost immediately. Recommendations were made to the Commission by investigators in favor of a 40c. rate. These, however, were not deemed to rest upon sufficient facts and consequently the whole matter was deferred to the future. It has been under investigation ever since and the hearing at Duluth is intended to give the ore-carrying interests an opportunity to submit evidence in favor of the 80c. rate, so as to place all the facts before the Commission. Frank B. Kellogg is expected to appear for the railroads and other counsel well known in transportation cases will also be heard. Subsequently the proceedings will be shifted to Washington and at an early date there will be other public hearings. According to reports current here, the Commission still has in mind the ordering of a 35c. or 40c. rate in lieu of the existing rate. It is not supposed that the change would alter the traffic of the roads affected in any material degree, so that the change would be equivalent to that amount of reduction in the revenue of the lines and consequently to a corresponding cut in their earnings. This it is supposed would directly affect the United States Steel interests, which control the lines in question.

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**A Concrete Hardening Material** now being introduced contains 95% iron dust or iron flour, which is mixed with cement for finishing the surface of concrete floors, says "Engineering News." From 15 to 25 lb. of the material is mixed with 100 lb. of the cement while dry, and one part of this mixture to two parts of sand makes the slush for the top coat, which varies from ½ to 1 in. in thickness. It is said to make a hard and durable floor which is waterproof and not slippery. The hardening material is used also to make new concrete adhere to old concrete in repair work. This concrete hardener is made by the Globe Steel Co., of Mansfield, Ohio.

## PERSONALS

Prof. A. L. Walker is down with typhoid fever.

Robert Linton will return to New York in January.

H. V. Winchell, who has been visiting in New York, has returned home. He will soon go to Colorado.

James A. Roberts and R. L. Dimmick, of Denver, recently visited the Frisco mines, in Mohave County, Arizona.

T. J. Purdy and J. E. White recently examined properties in the Cerbat and Todd Basin districts, in Arizona.

David J. Pullinger, of the Butters' Salvador Mines, Ltd., San Sebastian, Salvador, was recently in New York.

A. B. Richardson, who has been sampling the Bi-Metals mine for the Mines Co. of America, is in Kingman, Arizona.

George H. Garrey, who has been engaged in the examination of zinc properties in eastern Tennessee for Illinois parties, was in Chicago last week.

Frederick W. Horton, of the Denver station of the U. S. Bureau of Mines, recently visited the molybdenite mines of Copper Cañon, near Kingman, Arizona.

A. L. Horr has been made general manager of the Vulcan Manufacturing Co., Fond du Lac, Wis., which is strengthening its position in structural fabrication.

Lawrence Addicks, superintendent of the works of the U. S. Metals Refining Co., at Chrome, N. J., is leaving on Dec. 6 for a tour of inspection in the West, which will occupy him several weeks.

William H. Storms, former state mineralogist of California, who has recently been making examinations of mines in the Mother Lode region, has been appointed general superintendent of the West Eureka mine, at Sutter Creek, California.

Albert H. Fay, of the United States Bureau of Mines, is making a trip through Montana, Idaho and thence southward to Arizona. His object is to facilitate the collection of information about mine accidents. He will return to Washington about the end of December.

J. C. Merriam, professor of paleontology in the University of California, has obtained six months leave of absence to begin Jan. 1. He will spend the time in geological research. Dr. L. N. Stephenson, of the U. S. Geological Survey, will occupy Professor Merriam's chair during that time, as already noted.

A. E. Crockett, general manager of the Standard Chain Co., Pittsburgh, has resigned, to become connected with the Roanoke Refined Iron Co., which has leased for a term of years the Loucks plant, Roanoke, Va. The new company will make melting bar for crucible steel-works practice and high-grade refined iron bars.

J. E. White, former manager of the Quartette Mining Co., and R. P. Wheelock, superintendent of the Enterprise Co., have associated themselves together for the purpose of conducting a general engineering business in Mohave County, Ariz., with headquarters at Kingman, where they expect to open up an office with complete modern equipment.

Leslie H. Webb, secretary Wedge Mechanical Furnace Co., sailed for Europe Nov. 29, on the "Carmania." During his trip abroad, Mr. Webb will visit England, France, Germany and Sweden for the purpose of investigating the various metallurgical plants in these countries, in the interest of his concern. Mr. Webb expects to be absent for a period of about two months.

J. W. Hutchinson, mill superintendent and assistant general manager of the Goldfield Consolidated and consulting metallurgist of the Buckhorn Mining Co., is in the hospital at Reno, Nev., as the result of an accident on the Eureka & Palisade R.R., Nov. 21. A hand car, on which he was riding, struck a steer. He was thrown in front of the car, which then ran into him.

J. F. Thorn has ben appointed general superintendent of Butters' Salvador Mines, Ltd., with headquarters at San Sebastian, Department of La Union, Salvador. This office is a new one and is intended to relieve M. F. Perry, managing director for Charles Butters & Co., Ltd., who will spend part of his time in the United States as well as having general charge of the Butters' Salvador Mines, Ltd., Butters' Divisadero Co., and Butters' Potosi Consolidated Mines.

## SOCIETIES

**Old Freibergers in America**—The next regular meeting of former students of the Freiberg Bergakademie will be held Dec. 20, at the Hofbrau Haus, Broadway and 30th St., New York. This meeting is the annual meeting and election of officers will take place. All former students of the old mining school should communicate with C. L. Bryden, 1701 Jefferson Ave., Scranton, Penn., the Secretary.

**American Society of Mechanical Engineers**—A special meeting was held at the Engineers' Club, in New York, on the evening of Dec. 3. The Grashof medal of the Verein Deutscher Ingenieure—the highest honor in the gift of that body—was presented to George Westinghouse, to whom the medal for this year has been awarded. This ceremony was followed by an address from John W. Lieb, Jr., on "Leonardo da Vinci—Engineer and Artist."

**American Institute of Chemical Engineers**—The sixth annual meeting will be held in New York, Dec. 10-13. The program offers papers on a considerable variety of subjects. One evening session will be devoted to welfare and safety in chemical works. A number of practical papers will be read and discussed. Visits will be paid to the American Museum of Safety and to the plant of the Sanitary Utilization Co., at Barren Island, where the garbage of Greater New York is disposed of. This, it is claimed, is the largest and best plant of its kind in the world.

**American Electrochemical Society**—The next meeting of the New York section to be held at the Chemists' Club, 52 E. 41st St., New York, on the evening of Dec. 12, will be a joint one with the New York sections of the American Chemical Society and the Society of Chemical Industry. Members of the Institute of Chemical Engineers have also been invited to attend. Dr. B. C. Hesse, of the American Chemical Society, will preside. The subject for the meeting is "Welfare and Safety Work in the American Chemical Industry," and the work done at various plants will be presented as follows: The New Jersey Zinc Co., Miss Florence Hughes, Palmerton, Penn.; The Welsbach Co., Howard Lynn; The National Lead Co., Charles P. Tolman; Harrison Brothers & Co., Inc., Dr. Francis D. Patterson.

**Utah Society of Engineers**—At a meeting held Nov. 21, an address on the "Water Supply of Salt Lake," was given by Sylvester Q. Cannon, city engineer. The chief sources of supply are City Creek, Emigration Cañon Creek, Parley's Creek and Cottonwood Cañon Creek. The fluctuation of the combined flow was shown by a chart, based on the minimum year on record. If Salt Lake acquires rights to water from all the mountain streams that feed the valley, builds reservoirs to store the surplus flood waters, and inaugurates a meter system, there will be an ample supply for a population of 660,000. The steps necessary for the construction of a storage system were explained, and mention was made of dams now being built at lakes near the head of Big Cottonwood Cañon. This work was shown by photos and lantern slides. Herman Harms, state chemist, read a paper dealing with the purity of the water. Few cities can boast of a better supply.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

PAPE PROCESS—Improvements in or Relating to the Extraction of Metals. Hermann Pape, Oker, Germany. (Brit. No. 22,715 of 1912.)

ZINC-LEAD ORE TREATMENT—Improvements in or Relating to the Treatment of Refractory Zinc-Lead Ores. P. C. C. Isherwood, Bushey Heath, Eng. (Brit. No. 22,855 of 1912.)

ZINC RECOVERY—Process and Apparatus for Recovering Zinc from Slags, Ores and Other Zinkiferous Materials. F. C. W. Timm, Hamburg, Germany. (Brit. No. 5438 of 1913.)

DRILL—Rock Drill. Charles A. Hultquist. Los Angeles, Calif. (U. S. No. 1,077,911; Nov. 4, 1913.)

DRILL-MAKING MACHINES FOR DIE. John George Leyner, Denver, Colo. (U. S. No. 1,078,295; Nov. 11, 1913.)

DRILL-SHARPENING MACHINE. John George Leyner, Denver, Colo., assignor to The J. Geo. Leyner Engineering Works Co., Littleton, Colo. (U. S. No. 1,078,294; Nov. 11, 1913.)

DRILLING MACHINE. Frank Stevens and Frederick Spicker, Roundup, Mont. (U. S. No. 1,077,649; Nov. 4, 1913.)

MINE SHOVEL. John Cabbott Cartmill, Lead, S. D. (U. S. No. 1,078,255; Nov. 11, 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Nov. 26

**The Farmers' Fight Against the Mammoth** will probably be renewed as the Shasta County farmers are reported to be preparing for a fight. For some time the farmers association has retained no legal counsel, but at a recent meeting negotiations are said to have been undertaken for retaining Charles H. Brainard and Theodore Bell. Brainard is the strongest man among the attorneys of Shasta County for this particular class of legal work, and Bell has a national reputation. So the farmers are fortifying themselves with the best legal talent available. It is evident that the farmers have reached the conclusion that if they are to be successful in a final effort to destroy the copper industry of Shasta County they must make a bold front and act promptly.

**Relinquishment of Land to Government** has been made by North California Mining Co. Land was in Plumas County and aggregated 100,000 acres, which has been surrendered to U. S. Government. Formal relinquishment and surrender has been filed with recorder of Plumas County. Company states that act is in accordance with its policy to segregate valuable and worthless mineral holdings and to relinquish title to latter. Number of claims relinquished totals more than 300. A number of these claims were known as the H. H. Yard claims. Yard was attacked in the courts a few years ago by Lewis E. Aubury, then state mineralogist. Aubury repeatedly charged that Yard was endeavoring to secure valuable timber lands for his company under pretense that they were mineral claims.

### SALT LAKE CITY—Nov. 28

**The Largest Lead Producer in Utah** is the Utah Apex mine at Bingham. The annual report for year ended Aug. 31, 1913, shows operating profits of $224,774. Amount charged off to depreciation was $94,585, leaving a balance carried to profit and loss of $130,189. The report of President F. A. Schirmer calls attention to the fact that operations have been very encouraging, notwithstanding several unavoidable setbacks. Labor was scarce early in the year, following the Bingham strike, and operations did not reach normal until March. The output was held back at times by the smelters; 400 tons per day were shipped for a time, but the company was obliged to reduce shipments to 100 tons. Later an increase to 300 tons was made, and 100 tons were being shipped again at the time the report was written.

### DENVER—Nov. 29

**In the Coal Strike** Governor Ammons has done his best to obtain a truce between operators and strikers. To this end he arranged for a conference between the two factions, Nov. 26, in which the union was to be represented by three miners and not by leaders, as it was thought that a meeting in which both sides would present their grievances and discuss them in a reasonable way, would do more toward wiping out misunderstandings, and reëstablishing peace than anything else that has been done. Object of meeting was to be either a settlement of the strike, or to declare a truce until next session of legislature when miners or operators may introduce such bills as they deem advisable. The operators and miners met at the State House for the first time after the strike was called two months ago. The result was disappointing. They wrangled all day and a half of the night without reaching any agreement, and adjourned at one in the morning without having taken any definite action. During the conference word was received of arrest by General Chase of E. L. Doyle, secretary-treasurer of the United Mine Workers for refusing to give information of whereabouts of McGrary, said to be an instigator of the plot to murder Detective Belcher a week ago. Miners then refused to go on with conference until Doyle was released, President Hayes, of the United Mine Workers, telegraphing Governor Ammons that he would call them out of the meeting unless this was done. So Governor Ammons wired General Chase to release his prisoner on grounds that peace was desired at any reasonable cost. The incident, however, showed clearly that the miners in conference were under the domination of their leaders. The release of Doyle by the governor's order, however, caused great dissatisfaction to the troops in the field, as belittling General Chase's authority and encouraging strikers. The committee of strikers had another conference with the governor the night of Nov. 27, and definitely refused to accept his suggestions, miners insisting on union recognition. Governor Ammons then sent Deputy Attorney-General Bouck to Trinidad with his order to protect the citizens of the state, preserve peace in strike district and enforce laws. This latter phrase is interpreted to mean that those wishing to go to work in the coal mines will be given the protection of militia. Meantime prices of coal are back to normal with plentiful supply and all danger of a fuel famine averted.

### BUTTE—Nov. 24

**The Shortest Railroad in Montana** is 16 miles long, running south from Chestnut on the Northern Pacific R.R., 8 miles east of Bozeman, to the Maxey coal mines. The road was constructed in 1899 by George W. Turner, of Spokane, and his brother, Col. W. W. Turner, to open up the coal district south of Chestnut. The Northern Pacific R.R. operated the road on a lease, but the mines were not developed on a successful scale and the traffic gradually fell off until, two years ago the Northern Pacific refused to renew its lease. It was however, persuaded shortly afterward to again run temporarily, and continued until about six months ago, since which time no trains have been run. The Maxey mines employing 60 men, and the mines at Hoffman employing 40 men, have been closed down during this time. The road, which is now owned by Charles Garnier, of Livingston, and W. J. Johnston, of Lewiston, will soon be operated again on a lease by Maxey Bros., owners and operators of the Maxey mines, and Anderson and Evans, operators of the Hoffman mines, the Northern Pacific to furnish the rolling stock. The mines will be reopened at once and worked to full capacity.

### CALUMET—Nov. 29

**Lawlessness and Disorder** prevailed in Keweenaw County to such a degree during the week that the supervisors called upon Governor Ferris to send additional troops; the small force being inadequate to patrol the district and maintain order. The situation is entirely beyond the civil authorities. An attempt was made Wednesday evening to destroy the large steel stacks of the No. 2 boiler house of the Ahmeek company. A charge of dynamite was placed on the concrete foundation but the damage done was comparatively slight; it only succeeded in breaking the windows in the compressor and boiler houses, which are close to the stack. Immediately after the explosion a fusilade of rifle shots was fired but no one was killed. Promiscuous shooting has been going on nightly; the houses of nonunion men have been hit and the bunkhouse and searchlight at Ahmeek were fired on. This outbreak started upon the arrival of two coaches of men imported for the Ahmeek. The men arrived at the property without serious trouble, but the continuance of disorder and rioting evidently has intimidation of those working as an object. An attempt was made to burn the residence of one of the Mohawk mine captains early in the morning. In the vicinity of Calumet and the South Range, the district has been comparatively quiet, with the exception of Wednesday morning, when parading strikers in Calumet became particularly abusive to men going to work and to mine guards. After the parade had broken up in front of the Western Federation headquarters, the officers arrested one of the men who had been particularly obnoxious. This started a general melée, in which a striker was shot by one of the mine guards. The guard had been knocked down and was being severely handled when he drew his revolver and fired two shots; one hit a striker going up the stairway into the union hall. Ahmeek started shipments to the mill Wednesday; about 600 tons were shipped. This was the first ore shipped from the mine since the strike started. Bunk houses are being built at the Allouez, Kearsarge and Centennial mines, and the Wolverine and Mohawk have let contracts for the erection of buildings for the men that will be brought in to work those mines. A change of venue has been granted and all strike cases that were called for the November term of the circuit court were deferred and will be tried in January in Baraga County. During the last few months hundreds of arrests have been made, but only a few convictions have been obtained, in which judgment was postponed and the guilty men allowed to go on their own recognizance. The mining companies have announced an eight-hour working day for all underground employees and nine hours per day for surface men, to go into effect Dec. 1. The Calumet & Hecla has announced that on each Tuesday afternoon the general manager will meet any employee who has a grievance or a complaint to make; it will be investigated and no employee will be discriminated against.

### BISBEE—Nov. 24

**A Lead Furnace in the Warren District** is still being considered by directors of Shattuck-Arizona, who have just returned to Duluth after a visit to the Shattuck mine. They will take up the subject at a future regular meeting. However, there is the possibility that others will provide a lead furnace with whom Shattuck-Arizona will be able to make advantageous contracts. It is presumed that this means either Calumet & Arizona or Copper Queen, both of which have large resources of lead-silver ores of their own, that they are not mining at this time.

### NEGAUNEE—Nov. 20

**Curtailments of Industrial Operations** have taken place in the Lake Superior iron region within recent weeks. Some of these have been due to the action of the mining companies in putting their properties on a winter basis and are, as a rule, customary at the close of the season of lake navigation. But other curtailments have undeniably been due to the less favorable conditions noted in the iron and steel trade, and there is apprehension that further measures of the kind will be recorded. It is certain that much less ore will be mined during the winter than was indicated a few months ago.

**Low Iron Prices and Slack Demand** are causing Lake Superior furnace men considerable concern. Large concerns, refusing to sacrifice their iron on an easy market, are carrying large stocks. One of these is the Cleveland-Cliffs company, which is well stocked at its Marquette plant and which recently put its Gladstone furnace out of blast. The Lake Superior Iron & Chemical Co. is carrying comparatively small stocks, but this condition results from sales of a large tonnage at low prices in the last few months, incident to a reorganization of the company's affairs. Another thing that causes concern to the furnace men of Lake Superior is the practical disappearance of the differential between charcoal and coke iron. Within comparatively few years the iron makers of this district could base their calculations on a price for their product $2 better than the prevailing quotation for coke iron. But the day of such a substantial differential has passed for the time. Lately standard pig irons have been quoted at from $15.25 to $15.75. Charcoal iron sells at $15.75, but even at that price, and with the differential practically obliterated it is now pressing for sale. A differential of $2 should prevail, according to the charcoal-iron men, not only because of the superiority of their product, but because of its increased cost. The plant of the Stephenson Charcoal Iron Co., at Wells, Mich., is, however, not only sold up, but has refused orders. This fortunate condition is due largely to heavy orders from the Milwaukee railway, which has been gradually increasing its purchases of the company's iron for its car-wheel foundries. Among the first contracts closed when the Wells stack was put in blast about a year ago was one with the Milwaukee railway, and the company has been buying more and more. The iron is smelted with the specifications of the Milwaukee company particularly in mind, and no shipment from the Wells stack has yet been rejected. The last order from the Milwaukee road exceeded the company's capacity to deliver within the time specified. The Wells stack makes about 20,000 tons of pig iron a year.

### PLATTEVILLE, WIS.—Nov. 26

**Encouraging Developments,** new types of mine equipment and good results in churn drilling mark the present situation. Where deposits prove small and yet profitable to mine, portable mills are built. These were introduced into the Platteville district by the Vinegar Hill Zinc Co. The hammer drill or water Leyner type are popular, being so well suited for drilling in limestone. A good strike was made at the Pittsburgh mine lately, a big body of ore was located near the shaft, though much water was encountered which is characteristic of the Galena basin. This company recently purchased the old Calvert mill at Benton, from the Vinegar Hill Zinc Co., and is moving it to its property. The mill is operated by steam. The Wisconsin Zinc Co. has opened the east end of the Wuskell mine which is looking good. Two shifts are being worked there and at the East End mine near Platteville. Two drills are working near New Diggings on the Champion property, and the results so far obtained are good. The Sara So[illegible] Mining Co., of Benton, has proved up a body of ore and is now making arrangements for building a mill. The Vinegar Hill Zinc Co. has completed the mill on the Martin property near Benton. Conditions underground are good and the mill is treating a satisfactory tonnage. The Midland Lead & Zinc Co., of Platteville, reports a good strike on the 120-ft. level of its mine, near Elmo. This property was reopened last summer when considerable repair work was done on the equipment and new machinery, including two 60-hp. Fairbanks-Morse gas engines, was installed. The Enterprise mine has recently been unwatered and plans for developing the underground workings are under way. This company is drilling a nearby property, and as far as known, the results are favorable to sinking. The Empire roaster, at Platteville, is running two shifts and the plant is being operated at full capacity, roasting most of the ore for the East End mine and others.

### DEADWOOD—Nov. 27

**New Change House at Ellison Hoist** of Homestake Mining Co., is described as one of the finest buildings of its kind ever erected. It has two stories, and is made of concrete and steel with perfect lighting, ventilation and sewerage. The interior dimensions are 40x80 ft. On the first floor are steel troughs, level with the window sills, on both side of the main room. The troughs are furnished with basins and soap, and equipped with 50 pairs of faucets supplying hot and cold water. At the rear on this floor are 8 shower baths, each compartment being 5 ft. square and provided with watertight lockers in which clothes may be placed at bathing time. Partitions and doors of these baths are of steel. In the northwest corner of first floor is a room 12x18 ft., provided for shift bosses. It is fitted up with showers, an enamel tub, lockers, chairs, mats, faucets, troughs and basins. In the main room are 186 steel lockers, large enough to accommodate two suits, shoes, lunch pails and other articles. Each locker is provided with individual keys. Leading to the second floor is a steel stairway. This floor is practically the same as the first, except that more space is given to lockers, there being 288, or a total of 474 in the building. Floors are of steel and concrete; heat comes from exhaust from hoisting engines.

### COBALT—Nov. 24

**The Bounty on Cobalt** under the terms of the metal-refining bounty act, is 6c. per lb. on the metallic cobalt contained in cobalt oxide made in the Province of Ontario. During the last year, three companies received bounties amounting to $10,000, namely, Deloro Mining & Reduction Co.; Coniagas Reduction Co.; and Dominion Refinery. The term for this bounty provided in the original act was five years from April, 1907, but in 1912 the legislature extended the time for another period of five years. Provision is also made in the act for bounties on refined nickel, nickel oxide, copper and arsenic made from mispickel ores not carrying cobalt. With the exception of the cobalt oxide, no claims have as yet been presented for bounties under this act. The market for cobalt ores has been decidedly improved by the decision of one of the American smelters to recommence the treatment of these ores. Several of the mining companies have sold to this smelter, ore that has been accumulating for some time. The action of the American Smelting & Refining Co. in putting a 7% arsenic limit on cobalt ore was responsible for the curtailing of the market.

**The Draining of Cobalt Lake Project** has reached the point where an application has been made by the Cobalt Lake Mining Co. to Mining Commissioner T. E. Godson, to fix an order for service for the time within which several defenses from draining the lake are to be filed. No date has been fixed by the commissioner, but it was intimated that the case will be heard in Toronto in the early part of December. Plans for the proposed draining project have also been filed and these plans show extensive operations in the vicinity of Cobalt Lake, and other lakes in the same basin. At Short Lake a dam is to be built to make a reservoir of that body of water as well as Brief Lake. From Short Lake, a pipe line will be laid along the bottom of Cobalt Lake to a large reservoir which will be built when the lake is pumped dry. This reservoir will give a supply of water to the various mines which are at present dependent upon Cobalt Lake. For the town, the plans submitted by the company show changes which it will endeavor to prove are improvements on present-day conditions. From the reservoir, water will be supplied for fire protection, giving greater head than at present exists. The draining of the lake will also involve a new sewerage system. In the plans, nothing is mentioned regarding taking care of the tailings at present flowing into the lake from the Northern Customs, McKinley-Darragh and Nipissing mills. It is expected that the hearing will take considerable time as the proposed draining of the lake affects almost every one residing on or owning property tributary to the various lakes which are affected by the scheme.

# THE MINING NEWS

## ALASKA

TIN IN THE TANANA DISTRIST has been discovered by A. O. Anderson, formerly of Butte. Ore was found near Hot Springs and is said to assay all the way from $10 per ton up to $147.

BIG PLACER STRIKE has been made at Andreafski near St. Michael and quite a stampede has been on from Nome. First stampeders to return to Nome reported that pay has been found to extend five miles along creek. About 40 miners are in new diggings now.

CANYON CREEK HYDRAULIC MINING CO. (Seward)—Articles of incorporation have been filed.

ALASKA TREADWELL (Douglas)—November tonnage, 79,961; yield, $233,406 or $2.95 per ton; estimated profit, $135,005.

NO. 10 BELOW, PEDRO CREEK—One of the largest mining plants ever taken in to Pedro Creek is being taken there by James McPike for operations next season.

MURPHY & PERRAULT (Fairbanks)—Quartz property on Fish Creek has been taken over by E. McConnell, who will start work at once. A stamp mill will be built next spring if winter's work justifies it.

ALASKA FREE GOLD CO.—This property in Willow Creek gold camp has been consolidated with all claims on Albert Creek in new Matanuska placer fields by William Martin, who has option to purchase for $250,000.

MOTHER LODE COPPER MINES CO. (Kennecott)—Completion of 7000-ft. tramway extending from Marvelous claim on top of mountain down to McCarthy Creek is officially reported. Company has mined, sacked and brought down to McCarthy Creek 500 tons of 65% copper ore containing 18 oz. silver per ton. Permanent quarters on top of mountain near outcrop have been erected and mining operations will be carried on throughout winter with 30 men. Before next April there will probably have been mined and shipped about 1000 tons of ore. Ore now mined and piled at McCarthy Creek will be shipped to smelter at Tacoma, about Dec. 15 or just as soon as ice on McCarthy Creek is sufficiently solid to permit sledding.

## ARIZONA

### Gila County

BLACK WARRIOR (Miami)—Operations for four days were suspended because of impassable condition of roads.

ARIZONA COMMERCIAL (Globe)—Cutting station at 1300 level has been almost completed and shaft is rapidly nearing 1400 level, at which it is to be bottomed temporarily. Work on raise on seventh level has been discontinued for present. Water on 1200 remains unchanged. No work is being done on 1200.

MIAMI COPPER (Miami)—Production is at rate of 3100 tons per day and this rate will be maintained, with possibly a slight increase, until about July, by which time it is expected that capacity of mill will be increased to 4000 tons. All ore being concentrated now comes from under ground, stockpile having been entirely cleaned up early last month. About 2000 tons have been derived from blasting pillars between large shrinkage stopes in both northwest and southwest orebodies. In northwest orebody are five stopes 50 ft. wide, 400 to 500 ft. long, and ranging in height according to dip of capping, highest being 125 ft. All these are full of broken ore. Between them are pillars 50 ft. wide, which are now being blasted from sublevels, spaced 25 ft. apart vertically, beginning at top sublevel and working downward. Only enough ore is removed to allow for increase in volume of broken rock, so that when bottom of pillar is reached space formerly occupied by solid pillar will be filled with broken ore. The entire orebody then will have been broken, above 370-ft. level, and ore will be drawn down through raises to 420-ft., or haulage level, and trammed to shaft. It will be drawn off at uniform rate over whole area, allowing capping to settle evenly and gradually. Pillars in southwest orebody, which is one-third size of northwest body, are being attacked in the same manner.

INSPIRATION (Miami)—American Bridge Co. is making good progress with riveting ore storage bins, riveting being about one-half completed. On account of insufficient material to start work on headframes at main east and west shafts bridge company has laid off a number of employees until such time as steel is received and work commenced on headframe. Several No. 8 gyratory crushers to be shipped by Allis-Chalmers are now on road and as soon as received will be put in place, as everything at coarse crushing plant is now in readiness for installation of machinery. Crushing plant at Scorpion shaft has been in operation for last few days crushing waste hoisted through Scorpion shaft, which is being loaded into cars and hauled to concentrator machine shop and warehouse and used for filling in. As this job has now been completed, waste is again being used in fill between dormitory and railroad. Portable tent houses recently purchased by company are being erected in Webster Gulch. Machinery is rapidly being installed in new test mill. Four Hardinge mills are in place and motors are being installed. Rolls and other crushing machinery, together with flotation machine, are being placed, and shortly Wilfley and Deister tables will be set up. Pipe line from ranch well has not yet been connected nor is there any electric power in sight. Concrete pouring is in progress on two lower retaining walls for concentrator, and forms are now being made, for upper retaining wall. Company has ordered 32 Ingoldsby ore cars, which will soon be on road, and which will be used for hauling ore between Scorpion crushing plant and test mill.

### Pima County

PHELPS, DODGE & CO. has been acquiring mining property in Old Hat district and a survey of a line to district has been made by El Paso & Southwestern. District is 26 miles north from Tucson. Faults in limestone, quartzite, gneiss and porphyry are well mineralized, carrying lead, silver and copper. Work to date has been confined to oxidized ores.

### Pinal County

RAY CONSOLIDATED (Ray)—Present operations are at rate of 8000 tons of ore per day but it is expected that concentrating plant at Hayden will later be able to treat 10,000 tons daily. Effect of caving is being noticed on surface. Original Ray mountain has been lowered at least 50 ft. and subsidence is apparent over greater part of mine, including Ray Central property. Underground workings have made it necessary to protect mines from surface water, and a tunnel extending all way from Ray Central in Copper cañon, passing under two mountains and emptying into Amanda Gulch, has been cut. Diversion dam will be constructed across Copper Cañon, after which present road between Ray and Sonoratown will be abandoned. Dangerous places at mines have been fenced off, and conspicuous signs warn public of danger of passing over caving ground. Company has adopted 'safety-first' idea and management is paying prizes to any employee who will suggest practical way of adding to safety of mines. Accidents have been reduced to minimum as mines have reached productive stage.

## CALIFORNIA

### Amador County

FREMONT CONSOLIDATED (Drytown)—Increased mining and high grade of Gover ore form an encouraging outlook for continued profitable mining. Company pays regular monthly dividends of two cents.

JOSEPH FIGONE VS. BUNKER HILL MINING CO. (Amador City)—Plaintiff, as administrator of estate of brother, Domenico Figone, sues for $40,000 on account of death of Domenico, who was Aug. 18, 1913, struck by a timber that fell from a raise at loading chute.

WEST EUREKA (Sutter Creek)—This old mine is being re-opened by San Francisco and Seattle men. It was formerly known as the Last Chance and is west of Old Eureka, owned by Hetty Green. W. H. Storms, former state mineralogist, has been employed as general superintendent.

ORO WATER, LIGHT & POWER CO. (Oroville)—Dredging ground is being drilled on Amador County side of Mokelumne River. Company is operating two dredges in Calaveras County, one on Mokelumne and one on Calaveras River. If present prospecting warrants dredge will be installed in Amador County.

KENNEDY (Martell)—Three miners were killed on 3100 level by powder explosion at noon Nov. 17. A fourth man was badly injured, losing sight of one eye. The four men were working about 800 ft. west of main shaft. Two were sawing, others were coming away from powder drift. Blasting time was 3:30. Accident happened about 12:40. Men were disobeying rule which does not permit their going after powder until time for blasting. Place where men had been drilling is about 1000 ft. from end of drift in which powder was stored. There were 5½ boxes of powder in magazine during forenoon and after explosion there remained 4 full boxes and a few loose sticks. No accounting for cause of explosion has been made. One of the men who went for powder borrowed a knife for priming. After his death knife was found closed in his pocket. The 12x12 timber which was being sawed for a cap was on a truck about 30 ft. from powder magazine. It had been sawed about two-thirds through. Explosion broke it in two, and split it into splinters. Bodies of dead men were found about 20 ft. apart..

### Butte County

THIRD ANNUAL FRUIT & MINING EXPOSITION in Butte County opened at Oroville, Nov. 24. W. P. Hammon, dredge operator and also largely interested in fruit growing on reclaimed dredged lands, officially opened exposition.

BUTTE LEDGE & MINING CO (Chico)—New company, capital $50,000, will engage in general mining, timber and building.

EMMA (Nimshew)—In opening up new ground that had been overlooked when mine was worked in early days by Nimshew Gold Mining Co., O. H. Rugh took out a nugget valued at $726.

### Calaveras County

CALAVERAS COPPER CO. (Copperopolis)—Mine is reported closed down and ore teams that have been hauling to railroad at Milton have been taken off. It is believed closing down is only temporary.

### Humboldt County

RED CAP (Eureka)—Development is being paid for by returns from arrastre. Work will continue during winter, with expectation that sufficient ore will be blocked out to warrant building mill. Tailings from arrastre are being stored and will probably be cyanided.

### Inyo County

SWANSEA (Keeler)—It is intended to prospect mine further with tunnel to be started below shaft. Preparations are being made for work during winter.

## COLORADO

### Chaffee County

LOYAL CO.—Company owns Belle of Granite mine. Having by two years' development work demonstrated that there is a large quantity of medium-grade ore on hand, a 10-stamp mill with cyanide annex is now contemplated. A compressor and new hoisting plant will also be installed. Excavation for mill has been commenced. It is estimated there are 20,000 tons of $15 ore above third level. Carload of ore has just been shipped to Salida.

### Clear Creek County

FRENCH FLAG—Mine has recently been unwatered and placed in working order.

JACKSON MILL—Plant at Idaho Springs has been leased by E. F. Gustafson, who is treating ore from Golden Edge property.

JOE REYNOLDS—A vigorous campaign of development will be commenced in near future. During last few months a force has been employed in cleaning out and retimbering many old workings and mine will soon be ready for operation. Some prospecting was recently done on fourth level with a diamond drill and results were sufficiently encouraging to justify driving a crosscut to open up and develop parallel veins. It is intention to operate part of property on company account and grant leases on rest. It is estimated that large quantities of low-grade ore will be made available for stoping by work now in progress. Working force will probably be increased to 50 men within next 30 days. R. B. Morton, of Idaho Springs, is part owner and manager.

### Lake County

Mt. CHAMPION (Leadville)—Mill is running night and day treating 100 tons daily.

### San Juan Region

SAN JUAN BUREAU OF MINES was organized at Silverton recently. Hinsdale, San Juan, Ouray, Dolores, San Miguel, Archuleta and Conejos Counties will unite for betterment of existing conditions.

BROWN MOUNTAIN SMELTER (Ouray)—This plant shut down for three weeks for repairs, has resumed operations with a good supply of ore.

### Teller County

CRESSON (Cripple Creek)—Recently published report that Maggie mine had been purchased is denied. Maggie is under lease to Carl Johnson, the "Lucky Swede."

EL ORO (Cripple Creek)—Company has unwatered Eclipse mine which has been drowned for 10 years, and at 400 level a vein of 2-oz. ore has been found. An 11-drill compressor has been installed.

STRATTON'S INDEPENDENCE (Independence)—Regular production of 10,000 to 12,000 tons of ore per month is being kept up under a liberal leasing system, and dividends of $10,000 per month or 20% on capitalization are being paid.

## IDAHO

### Cœur d'Alene District

C & R (Burke)—No. 3 tunnel is in 1300 ft., and there is a good mineral showing in face. In No. 1 tunnel there is good carbonate ore blocked out. In No. 2 tunnel, 235 ft. lower than the No. 1 tunnel, there is a large quantity of galena ore, but no shipments have been made. This oreshoot, which is found in upper workings, should be encountered by going 400 ft. farther in lower tunnel at an increased depth of 360 ft. Tunnel will be driven throughout winter. A new compressor will be purchased in order to make it possible to work a larger crew.

## MICHIGAN

### Iron

RICHMOND (Cascade)—This, one of few open pits in Michigan, has stopped work for 1913, after shipping 137,000 tons of ore. It will be reopened in spring if iron market is favorable.

McDONALD (Crystal Falls)—All work ceased a short time ago, management believing it better to close down than to stock ore that might not find a ready market. Decision of state tax commission to tax all ore stockpiles has caused many operators to go slow about stocking ore that might remain at mines for several years.

YOUNGS (Iron River)—Shipping of stockpile was completed a few days ago, task being done in record time. There were 55,000 tons to be loaded and work was finished in less than two weeks. Two shovels were used. It is said that actual time consumed in loading all ore amounted to 13 full days, or 312 hours, an average of 150 tons per hour.

REPUBLIC (Republic)—Penn Iron Mining Co. succeeded in shipping all but about 25,000 of ore which it had in stock at Republic property. Little that remains is lean and not readily sold. Mine laid off about 50 men a few days ago when shipping stopped. There are now 450 men employed on two shifts, and no further curtailment in working force is looked for.

ATHENS (Negaunee)—Work of sinking shaft is progressing satisfactorily, but it will probably be over a year before task is completed. Shaft will have to be sunk to depth of over 2200 ft. as diamond drills showed ore to exist at a depth of 2800 ft. At that depth drill holes were lost, so it is now known what ore is below. Shaft is 17 ft. in diameter, being one of largest on range, and is now down about 70 ft., being 10 ft. in ore. It will be lined with concrete, and steel sets will be used to the bottom. Engine house is about completed, and installing of machinery will soon be commenced. Equipment will be a 20-drill Nordberg compressor and a Lake Shore Engine Works hoist. Both will be operated by electricity. Engine house stands on a hill, far above collar of shaft and steel headframe is now in course of construction. When completed mine will be deepest on Marquette range and one of the best equipped in Lake Superior district.

## MINNESOTA

### Cuyuna Range

CUYUNA RANGE OUTPUT for 1914, according to careful estimates will range from 3,000,000 and 3,500,000 tons. The 1911 production was 147,000 tons; 1912, 318,000 tons, and 1913 will be somewhat over 850,000 tons. Next year's tonnage is estimated to be four times that of 1913. President J. M. Hannaford, of the Northern Pacific Ry., estimates that his road will have 750,000 tons, while President Pennington, of Soo Line, states that his road will haul 3,000,000 tons. Of present year's tonnage, 850,000 tons, Soo Line will have hauled 725,000 tons and Northern Pacific 125,000. O. W. Johnstone, in charge of the Soo Line's ore-traffic department, is preparing for at least 2,500,000 tons next season, of which amount Rowe mine, now stripping, is expected to contribute 800,000 tons. Cuyuna Range shipments over Soo Line during present season, to Oct. 28, amounted to 690,789 tons, as compared with 271,165 tons in 1912. The 1913 shipments are made up from following properties: Thompson, 47,652; Kennedy, 267,218; Armour No. 1, 105,086; Armour No. 2, 175,744; Pennington, 95,089; total, 690,789. The Northern Pacific tonnage of 125,000 tons (estimated) will com from the following properties: Cuyuna-Mille Lacs, 80,000; Cuyuna-Duluth, 25,000; Barrows, 15,000; Adams, 5000; total, 125,000. The Soo

CUYUNA-DULUTH IRON CO. (Ironton)—Total shipments for season approximate 10,000 tons.

ADAMS (Oreland)—Installation of electrical pump has been completed. Company buys current from Cuyuna Range Power Co.

BRAINERD-CUYUNA (Brainerd)—Shaft is over 65 ft. deep; boilers erected and surface plant all assembled. Shipments will be made before close of next season.

BARROWS (Barrows)—Mine has completed its order for 10,000 tons and is stockpiling; plans to produce 85,000 tons next year. Shipments were started in October this year.

DULUTH-BRAINERD MINING CO. (Ironton)—Shaft sinking continues. Northern Pacific is arranging to construct a spur to property from Ironton, a distance of several miles.

CUYUNA-MILLE LACS (Crosby)—Mine will make winter all-rail shipments to various places. Season's shipments were between 30,000 and 40,000, somewhat less than had been anticipated.

KENNEDY (Cuyuna)—It is reported that Northern Pacific interests have purchased fee to at least a part of the mine, and that future tonnage will be hauled via Northern Pacific instead of Soo Line as at present.

IRON MOUNTAIN (Iron Mountain)—Manganiferous iron ore is being hoisted daily. Stockpiling will continue throughout winter, or at least until Soo Line spur is completed in to property, at which time officials contemplate a trial shipment all-rail to some consumer.

### Mesabi Range

RUDDY (Biwabik)—Shaft sinking continues. Considerable trouble has been experienced from quicksand, but has now been overcome.

EUCLID (Chisholm)—Dam built by Euclid Mining Co. to keep back waters of Longyear Lake, broke, Nov. 14. Dam was built four years ago and enabled pit to operate, but breakage has filled mine with water. Water in pit is now up to lake level, and great expense will be entailed if mine is to be worked again.

## MISSOURI-OKLAHOMA-KANSAS

### Joplin District

CALAMINE FROM AURORA, MO.—Last week brought more than $3000. Old Methodist mine produced 41,000 lb. of ore.

WILBUR LAND (Miami, Okla.)—Zinc ore strike in drill hole shows 20% ore.

WRIGHT LAND (Miami, Okla.)—Third strike on tract made this week by Daugherty & Apple.

CONGRESS (Radersburg)—A dry concentrator has been installed at this property.

ELLIS LAND (Joplin, Mo.)—Drilling is in progress, with ore in sheet formation found at depth of 116 ft. Land will be prospected thoroughly.

H. L. & S. CO. (Lawton, Kan.)—Concentrator has been started making second mill for this new camp. A rich deposit of zinc ore is being mined at a depth of 140 feet.

TEXAS MINING CO. (Thomas Station, Mo.)—Concentrator will resume regular operations this week, ground having been retimbered and placed in better condition. Three drifts are producing.

FOSTER & CO. (Neck City, Mo.)—After going through 12 ft. of solid limestone, free zinc ore is being taken out. Shaft is down to 120 ft. Drill cuttings showed ore at considerably greater depth.

GRANBY LAND (Joplin, Mo.)—Lease has been granted to W. L. Perry, who will build sludge mill to treat sludge ores from Blackberry, Grace, Montana and other properties of Granby company.

MARION B. (Joplin, Mo.)—Property is producing carload of concentrates weekly, good orebodies being found in new ground. Operations once were suspended after mine had been wonderful producer.

DALLAS MINING CO. (Carl Junction, Mo.)—Pumping plant is being installed, to permit of operations below present level. Tests to determine extent of ore formations penetrated by drill are in progress.

DIPLOMAT MINING CO. (Galena, Kan.)—Greatest strike in years made by this company on Galena Lead & Zinc Co.'s land. Drill went into ore at 42-ft. level, continuing 15 ft. and still in ore when day's operations ceased. Cuttings run 30% zinc. Strike in virgin territory.

## MONTANA

### Butte District

A CONTRIBUTION TO MICHIGAN STRIKE FUND amounting to $10,000 was forwarded last week by Butte Miners' Union to striking miners in Michigan, bringing total amount contributed up to date to $41,000. This is exclusive of many thousand dollars raised and forwarded by other labor unions in Butte.

A MONUMENT ON GOLD CREEK is proposed, movement being on foot to erect the monument at spot where Granville Stuart, of Butte, discovered first gold on May 2, 1858. Discovery started rapid development of mining industry in Montana, which is chiefly responsible for present remarkable prosperity of state. Stuart is now librarian of Butte public library.

BUTTE & SUPERIOR (Butte)—Bond for $75,000 was filed with clerk of court by manager to comply with decision rendered recently by Judge Bourquin in suit brought by Minerals Separation Co., of London, against Butte & Superior. Filing of bond and of a monthly statement of operations has been ordered by court to prevent closing of plant and to secure plaintiff, in case its contention is upheld by a higher court.

BUTTE & LONDON (Butte)—A new 425-hp. Nordberg electric hoist has arrived at Butte, and will be put in place at once by Rainbow Lode Development Co., which is preparing to sink shaft at this property from 1100 to the 1600 level, preparatory to developing claim by crosscutting north and south to end lines. The foundations for the hoist are nearly completed, and unwatering shaft will probably be commenced Dec. 15.

BUTTE CENTRAL (Butte)—It is rumored that Boston officials owning defunct Ophir mine at Butte are contemplating a reorganization of company. Capitalization of the new company is to be $75,000, with sufficient money in treasury to pay off all outstanding debts and carry on operations on profitable basis. This basis, it is understood, will be for the present operation of mill as a custom plant for treating argentiferous ores from Butte and other mines, while mine is to be developed by lessees, earnings from mine and mill to be used for prospecting below 500-ft. level, where it is expected copper will be encountered.

NORTH BUTTE (Butte)—During first week of November directors awarded to Westinghouse Electric & Manufacturing Co. contract for what will be largest electric hoist in America, and one of the largest of its kind in the world. The Ward-Leonard system of control will be adopted. Hoisting drums 12 ft. in diameter will be driven by direct-connected electric motor running at 71 r.p.m. Power will be supplied to this motor from a motor-generator set equipped with a 50-ton Ilgner flywheel. Hoisting will be done in balance, but may also be done unbalanced. Skips will have a capacity of seven tons of ore. Round rope 1⅝ in. in diameter will be used and hoist is designed for normal rope speed of 2700 ft. and maximum of 3000 ft. per min. The hoist will be installed at new Granite Mountain shaft which at present is rapidly approaching 2800-ft. level. Hoist will raise 300 tons per hour from 2000-ft. level or 200 tons per hour from 4000-ft. level. The flywheel will be encased in steel housing and provided with self-lubricating bearings. Hoisting motor will be of type used in steel mills and will be of a heavy construction. Electrical equipment alone will weigh in excess of 250 tons. Special safety devices included in equipment, include electrically released brakes; automatic slow-down devices to prevent overwinding and a special controller to limit speed when hoisting men. Maximum rating of motor is 4500 hp.

ANACONDA (Butte)—Extensions of all ore bins at Butte mines of this company are nearing completion. Capacity has been nearly doubled, permitting storing 50,000 tons of ore, awaiting shipment to smelting works at Great Falls and Anaconda. This will obviate shutting down mines in future, when for any reason works are temporarily incapacitated to take their full quota of ore. This happens sometimes in severe winter weather due to freezing of ore in cars during transit, which prevents their being unloaded upon arrival at works. New bins at Belmont mine are built of steel and concrete. Steel for construction of new slime plant has arrived and is being put in place upon concrete foundations. In new leaching plant, sponge iron made from ore containing iron pyrites is being tried out as a precipitant in place of scrap iron. Experiments are also being carried on at smelting works with Cottrell smoke process, by which all solid particles in fumes are precipitated, only gases being allowed to escape. This will tend to do away with smoke suits in future. Development work at Nettie mine, recently taken over by Anaconda company is proceeding rapidly. It is proposed to sink shaft to 2000-ft. level to open old silver belt west of Big Butte, which in years past furnished thousands of tons of rich silver ore. Process of treating similar ores at Butte Central mill, has proved successful, and it is likely that this treatment, consisting of concentrating, followed by cyaniding, will be applied to Nettie ores. West Stewart mine in heart of city, was closed Nov. 22, and will probably remain down for two or three months. Hoisting engine and machinery will be overhauled and placed in good condition; shaft will be retimbered in a number of places where heavy shifting ground has thrown it out of alignment; and work upon addition to ore bins will be completed. About 475 men have been employed at the mine and most of these have been laid off during shutdown. Output of mine was about 600 tons per day. Berkeley mine, which has been closed during last two months for repairs, will be in readiness for operations within a few days, so men laid off at Stewart will be given work at Berkeley.

### Broadwater County

RADERSBURG DISTRICT mines being owned chiefly by Butte men, Butte is much interested in report of renewed activity in that camp. This is due to prospects of a railroad soon entering camp and connecting it with outside world.

BLACK FRIDAY (Radersburg)—One of the men interested in this mine has succeeded in raising money in St. Paul for resumption of operations. It is expected that work will commence about first of year.

## NEVADA

### Churchill County

SEVEN TROUGHS COALITION (Seven Troughs)—Ore has been discovered 50 ft. below 1000-ft. level by diamond drilling, and has been opened by 250-ft. crosscut. Drift has been driven 15 ft. on vein. Walls of shoot, width and assays same as shoot on levels above.

### Humboldt County

SILVER ORE NEAR RYE PATCH has been discovered, according to reports from Rock Creek.

OREANA MINING & MILLING CO. (Lovelock)—Company has filed articles of incorporation at Lovelock.

BALDWIN (National)—High-grade gold ore, it is stated, was struck recently on this lease in White Rock tunnel.

### Lyon County

EMPIRE-NEVADA (Yerington)—Churn-drill prospecting is to be done. One drill is on the ground.

BLUE JAY (Yerington)—A diamond drill will be installed at once in order to prospect to greater depth.

SMITH VALLEY MINES CO. (Smith Valley)—A 60-hp. gasoline engine, 6-drill compressor and 25-hp. hoist have been purchased and will be installed at once.

WABUSKA COPPER (Yerington)—Oreshoot cut at depth of 135 ft. will be developed at once. Levels will be run off at intervals of 100 ft. from the 480-ft. shaft. Electric power for hoisting, compressing, etc., will be obtained from Truckee River General Electric Co.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at smelting plant for week ended Nov. 20, 1913, were as follows: From Mason Valley mine, 1989 tons; from Nevada-Douglas, 1203 tons; from other mines, 732 tons; total, 3924, or a daily average of 561 tons. During same period three cars of matte were shipped. Seventh quarterly report for period ended Sept. 30, 1913, shows: Mason Valley mine ore produced, 25,986 tons; smelter treated, 47,455 tons; matte produced, 2947 tons; refined copper, 2,707,719 lb. Financial statement: Gross operating profit, $33,187; less depreciation, $28,296; deferred charges, $3645; bond interest, $14,040; total deductions, $45,980; net deficiency for quarter, $12,793.

### Mineral County

GOLD IN SONOMA PASS near Sweetwater has been discovered. A 10-ton lot of high grade is ready for shipment.

THORNDYKE-BLEY MINING CO. (Sunland)—Mill is nearing completion and will be in operation at an early date. Recent development has been satisfactory.

AURORA CONSOLIDATED (Aurora)—The 500-ton mill is now under cover and is expected to be ready for operation by Apr. 1, 1914. Force of 150 men now employed at mine and mill. Company houses have been built and club house is under construction. Machine and blacksmith shops, warehouse and assay office are completed. Main tunnel is in 3200 ft. Other development is progressing satisfactorily.

### Nye County

NEVADA CINNABAR CO. (Ione)—New electrical machinery will be installed. Plant is expected to be in operation early in 1914.

WAR EAGLE MILL (Manhattan)—Ample water supply is now being obtained from Big Four shaft by using return system in mill. It is reported that high recovery of gold is obtained on battery and tube mill plates.

### Ormsby County

A TAX ON PLASTER will be charged after Jan. 1, 1914, according to recent decision of tax commission at Carson City. No tax has previously been charged on gypsum products.

## NEW MEXICO

### Eddy County

HARTFORD OIL & DEVELOPMENT CO. (Carlsbad)—This company is operating nine miles south of Carlsbad, and has purchased a complete well drilling outfit which arrived a week or two ago. Geologists have advised drilling in the lower Pecos Valley.

## OREGON

### Baker County

BELMONT (Greenhorn)—Rich ore has been encountered at depth of 90 feet.

CORNUCOPIA (Cornucopia)—Two tube mills and cyanide plant treat 100 tons of ore per day.

VIRTUE (Virtue)—Capacity of cyanidation plant has been increased, and more leaching tanks have been installed.

BONANZA (Greenhorn)—Thirty-stamps will drop all winter on good milling and concentrating ore. Much development is being done in mine.

HIGHLAND MINES (Rock Creek)—New machinery has been added. Treatment includes amalgamation and concentration. Equipment now consists of 1 Dodge crusher, 2 rolls, 1 Wilfley table, 1 Bartlett table and 7 Deister tables.

### Clackamas County

OGLE MOUNTAIN (Elkhorn)—This mine, which has been idle for sometime, will soon be reopened and new machinery installed. Present equipment consists of a crusher and a 10-stamp mill. It has been idle on account of litigation which has now been settled.

### Curry County

LUCKY BOY (Marial Post Office)—This mine, now idle, will be reopened soon under new management and it is understood that the small plant will be enlarged.

### Jackson County

GOLDEN FLEECE (Ashland)—Property has been bonded to a company which plans building a mill.

## SOUTH DAKOTA

### Lawrence County

BISMARCK (Flatiron)—Company has published a letter in local papers, offering to give Wasp No. 2 company, which recently suspended on account of water shortage, about 120 tons of water daily, as Bismarck has about that excess over its requirements. This supply would be sufficient for the Wasp operations. It could be pumped to Wasp storage tanks at a nominal cost.

MOGUL (Bald Mountain)—Superstructure of new mill of this company has been completed, and machinery is now being erected. It is hoped to have plant running in January. Treatment will be fine grinding in cyanide solution, and continuous decantation, with Dorr thickeners, using countercurrent solution system. Unless it is found to be necessary, no filter will be used for slime, but it will go to dump as discharged from last thickener.

HOMESTAKE (Lead)—Announcement is made that bonus of 7% will be paid to employees at end of year, same as was done last year. Bonus will apply to regular employees, and will be paid in January, accompanying pay checks for December. With installation of new hoist at Old Abe shaft, cages will be replaced by skips for ore hoisting. This will be first of Homestake's shafts to be so equipped. Shaft is now 1400 ft. deep, with five compartments. Sinking is to be undertaken at Belt Development property, south and west of Ellison shaft, and machinery to be used is now being installed. Company recently purchased this property from owners, who had done considerable work, but failed to find ore, which is supposed to be at a greater depth. A large addition is being constructed at company's assay office, to relieve congestion of crowded quarters.

## UTAH

### Juab County

TINTIC SHIPMENTS for week ended Nov. 14 amounted to 145 cars, those for week ended Nov. 21 to 159 cars.

GRAND CENTRAL (Robinson)—Large ore reserves are reported assaying $7 per ton in copper, silver and lead. The best showing is on 2000 level.

### Salt Lake County

CAYENNE PEPPER AND SULPHUR were burned early this week to fill upper workings of Utah-Apex mine with smoke to drive out armed Mexican murderer who had sought refuge in workings and who had killed six men.

### Summit County

SILVER KING COALITION (Park City)—Work on large underground station in Alliance tunnel is progressing steadily. A hoist and compressor will be installed, and operations carried on from there to reach large ore reserves in Alliance section of property.

### Tooele County

SALT LAKE & MERCUR R.R.—Material from this company's road including 30-, 40-, 45- and 52-lb. rails, ties, miscellaneous tools, and machinery, and two Shay locomotives are being sold at receiver's sale.

INTERNATIONAL SMELTING & REFINING CO. (Tooele)—During early part of year company's operations at Tooele works suffered somewhat as a result of labor strike, but operations are now back to normal. Copper-smelting department at this plant has not been up to expectations, but it is understood that situation has shown improvement, and that number of custom shippers is increasing. Lead-smelting business at Tooele has been satisfactory. Last of new lead furnaces to be built was placed in commission early this autumn, and entire plant is now operating at capacity. These furnaces are rated at 250 tons daily, giving a total capacity of 1250 tons. Outlook for lead ores is said to be favorable, and judging from numerous contracts which have already been made, it would not be surprising if a further addition to this plant would have to be provided in future. During year new lead refinery at East Chicago, Ind., has been handling all lead bullion produced. At Raritan refinery enlargements which were under way have now been completed, giving plant a capacity of over 400,000,000 lb. of copper per annum.

## WASHINGTON

### Okanogan County

ORE PLACER Company has started operations on its placer claims at Rich Bar, near Canadian boundary.

### Stevens County

IRON CAP (Chewelah)—Preparations are being made for operations throughout winter. Work will be confined to 200-ft. tunnel.

ADMIRAL (Valley)—Company has been incorporated with T. H. Greenway, president. Considerable work has been done.

## CANADA

### British Columbia

BRITISH COLUMBIA COPPER CO. (Greenwood)—Engineers have been investigating power possibilities of Whipsaw Creek, tributary of Similkameen River, opposite Copper Mountain, and about 10 miles from Princeton. Company has made its third payment on its option on Eureka group of claims near Nelson, and has also put a force of men at work on its property in Wellington Camp, near Phoenix.

CONTINENTAL DEVELOPMENT CO. (Butte, Mont.)—This company, holding a two-year lease on upper workings of Rocher de Boule mine, Hazelton, has started to equip property with machinery. D. J. Williams, formerly assistant superintendent of Pittsmont mine and smelting plant at Butte, will be manager, with F. W. Cochrane as electrical engineer. Williams states that there are upward of 10,000 tons of shipping ore in sight in upper workings of Rocher de Boule.

GRANBY (Grand Forks)—Reports from Hidden Creek mine indicate that construction work is proceeding rapidly and management believes that everything will be in readiness to blow in new works by Jan. 15. All buildings are roofed over with exception of sampler and all work has been put under cover. Arrival of boats with additional machinery required is reported, and blast-furnace construction will now be pushed to completion. Converter flues are in place. Crushing machinery is up and smelter stack 135 ft. high is well along and will be completed in two or three weeks. In other departments, work is equally advanced, hydro-electric plant is nearly finished, and Pelton wheels and generators are being set in place. Railway between mine and smelter and coast is finished and arrival of two locomotives and a number of ore cars is reported.

### Ontario

LA PALME (South Porcupine)—A meeting of shareholders will be called shortly to ratify a by-law, permitting directors to sell property.

DOME LAKE (South Porcupine)—At a meeting Nov. 28 shareholders ratified proposal to sell 205,000 shares, which is balance of treasury stock, to Timiskaming & Hudson Bay Mining Co., at $17\frac{1}{2}$c. per share. This block of stock, together with 200,000 shares, formerly purchased from General Assets, gives Hudson Bay company control of property.

JUPITER (South Porcupine)—P. A. Robbins, manager for the Hollinger a short time ago, made an examination of this property at request of a number of large shareholders and it is stated that his report did not bear out figures given by company's engineer. Mine, which was being financed by the Drummonds, has been closed down for some time on account of insufficient funds.

## MEXICO

### Baja California

IN THE SAN ANTONIO DISTRICT mining interests are more active than they have been for some time, and outside influence is decidedly marked by number of new denouncements.

MINAS DEL TRIUNFO (Triunfo)—Amalgamation of Progreso Mining Co. with Compañia Metalurgica de la Baja California, has made a great improvement regarding output, and when new power plant of 400 hp. is completed, results will be excellent. Suction-gas engines drive electric generators. Power will be distributed to various properties of company to drive hoists, pumps and old plant at Triunfo. This company has large and valuable holdings, and many of the properties are big producers.

SAN JUANES REDUCTION CO.—Roasters have been started up in full blast. Besides cyaniding roasted product a quantity of oxidized ore is being treated. Many mines of this company have a fine showing and ore reserves are considerable. At present "Parral" mine is producing greater portion of sulphide ore for roasters. This ore is being successfully hauled from mine to plant in a 5-ton Pierce-Arrow truck. Hardinge mill that was installed lately to regrind oversize from rolls is proving a success. Two large masonry tanks for leaching have been added to increase capacity of plant.

### Neuva Leon

AMERICAN SMELTING & REFINING CO. (Monterey)—All smelting plants in Mexico will probably be shut down as a result of governments demands for funds to maintain army.

## COLOMBIA

LORD COWDRAY RELINQUISHED CONCESSION of oil territory Nov. 26. He took this course, he said, because of political feeling that had been engendered by negotiations. The concessions sought from Colombian government apparently would have given Pearson concern indiscriminate right to construct harbor works and canals in connection with exploitation of Colombian oil deposits.

## SOUTH AFRICA

PREMIER MINE—Three natives were killed and 22 wounded, Nov. 24, by police during a riot. Of 22,000 natives employed, 5000 got out of hand, looted stores, and attacked natives of another compound. Police were unable to disperse them, and fired two volleys before they could succeed in getting negroes to return to their habitations.

## ANGOLA

BENGUELA RY. CO.—The railroad reached a point 520 km. (323 miles) measured along completed railway from Port of Lobito, Sept. 23. Railhead is now at an altitude of 6000 ft. above sea level, and railway follows summit of "Great Divide," watershed of Congo and Zambesi Rivers. As railway climbs up from sea level to plateau, a section of about 3 km. at 1 in 16 is fitted with a rackrail. For rest of line maximum gradients of 1 in 50 and curves of 100-m. radius have been adopted. Gage is 3 ft. 6 in. Line is now completed and fully equipped with rolling stock of uptodate South African standards for nearly half distance to Congo frontier, near Lake Diloto. It will there form an end-on junction with railway being constructed by Belgians through Elizabethville, Kambove and Ruwé, serving copper fields of Tanganyika Concessions Co.

## CHOSEN

ORIENTAL CONSOLIDATED—October production $144,137 from 27,178 tons of ore. A dispatch dated, Nov. 28, states: During latter part of October we had a couple of light showers, which have enabled us to keep mills running up to date, but country is still dry, and unless we get heavy rains soon, we shall not be able to keep all stamps dropping during winter. Okura & Co. have completed their power plant, and commenced giving us a supply of electric power, Nov. 2, starting with Tabowie mill. This mill is now driven by Okura's power as is Maibong mill, and all of machinery at Charabowie mine, with exception of surface hoist, on which we are training the Koreans to do electric hoisting. We shall operate Tabowie and Taracol mine pumps on Okura's power in three days from now, and expect to drive all plants at Taracol camp on Okura's power some time next week. Delay at Taracol camp is occasioned by one of Okura's transformers breaking down during 50% overload test.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Dec. 3

The metal markets have been variable and rather uncertain, but the general tendency seems to be a declining one.

### Copper, Tin, Lead and Zinc

**Copper**—During the last week the market has been dull, weak and without any special feature. The little increase in activity that we reported at the end of the previous week proved to be only a flash, which did not amount to much anyway. Since then consumers both in this country and in Europe have continued to hold aloof, and the impression is beginning to prevail that on account of the decrease in consumption the statistical position is becoming worse and that a lower level will have to be reached before buyers will be interested in resuming purchases. Some small quantities of electrolytic copper were sold on Nov. 28 and 29 on the basis of 14½@14⅝c., cash. Since Dec. 1 there have been some small transactions—100,000 lb. lots—at 14½c., delivered, usual terms, and few points lower. Metal has been offered quite freely at such prices.

The Lake copper situation remains quite unchanged and quotations are purely nominal. In casting copper also the situation remains unchanged—a relatively large accumulation of stock and free offers to sell at concessions.

At the close we quote electrolytic copper in cakes, wirebars and ingots at 14.25@14.35c. Casting copper is quoted nominally at 13.95@14c. as an average for the week.

The London standard market on Thursday, Nov. 27, was £66 17s. 6d. for spot and £65 12s. 6d. for three months. On Nov. 28 it declined 5s., and on Monday, Dec. 1, developed considerable weakness, declining £1 5s. On Tuesday it reacted a little, spot going to £65 15s. and three months to £64 10s., and on Wednesday, Dec. 3, it closes at £65 12s. 6d. for spot and £64 5s. for three months.

Base prices of copper sheets on Dec. 1 was reduced 1¾c. and is now 20¼c. per lb. for hot rolled and 21¼c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16@16¼c. per lb. carload lots at mill.

Copper exports from New York for the week were 8105 long tons. Our special correspondent gives exports from Baltimore at 138 tons for the week.

**Visible Stocks of Copper in Europe** on Nov. 30 are reported as follows: Great Britain 11,990; France, 2490; Rotterdam, 2500; Hamburg, 1780; Bremen, 990; other European ports, 1050; total, 20,800 long tons, or 46,592,000 lb.; an increase of 610 tons over the Nov. 15 report. In addition to the stocks above, 2050 tons are reported afloat from Chile and 4950 tons from Australia, making a total of 27,800 tons.

**Brass Prices** have been fixed as follows, dating from Dec. 1: Sheets, high brass, 16c. net lb.; low brass, 17⅞c. Wire, high brass, 15¾c.; low brass, 17⅞c. Rods, high brass, 15¾c.; low brass, 18⅝c. Angles and channels, 20½c. Tubes, 20½c. for brazed and 20½c. for open seam. Scrap allowances are 10½c. net per lb. for high brass, and 11⅞c. for low brass.

**Tin**—Statistics for the month of November showed a considerable increase in stocks, and this fact induced the leading bears in London to attack the market. A very weak tone developed, and prices gave way easily. Sellers in this market followed closely the lead of London, but due to an almost entire absence of demand were unable to effect business. The close is somewhat steadier and firmer at £177 5s. for spot, and £178 2s. 6d. for three months, and about 39c. for December tin here.

**Visible Stocks of Tin** on Nov. 30 are reported as follows: London, 7246; Holland, 2505; United States, excluding Pacific ports, 4719; total 14,470 long tons, an increase of 2613 tons during November.

Straits shipments of tin in November are cabled as 5560 long tons, a decrease of 40 tons from last year.

**Lead**—The market is quiet and weak. The demand is poor and there is some pressure to sell. On Tuesday, Dec. 2, the American Smelting & Refining Co. reduced its price to 4.10. At the close New York is quoted at 4.05@4.10c., and St. Louis at 3.90@3.95 cents.

The London market is also weaker, Spanish lead being quoted at £17 10s., and English lead 2s. 6d. higher.

**Spelter**—On Nov. 28 and 29 some moderate transactions occurred at 5.05@5.10c., with one reported at 5⅜c. Since then there has been pressure to sell and a sharp decline in price, with the market decidedly weak. Buyers are believed to be not well covered, but such as have to buy pursue a hand-to-mouth policy. The principal consumer does not figure in the market at all. On the other hand stocks at smelters' works are increasing. There has been some pressure to sell and offers of tonnages at diminishing prices. At the close we quote St. Louis at 4.90@5c. and New York, 5@5.05 cents.

The London market is slightly lower, good ordinaries being quoted at £20 12s. 6d., and specials at £21 10s. per ton.

Base price of zinc sheets in carload lots is $7.50 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

### DAILY PRICES OF METALS

NEW YORK

| Nov.-Dec. | Sterling Exchange | Silver | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 27 | ..... | .. | ... | ... | ... | ..... | ..... | ..... | ..... |
| 28 | 4.8510 | 57⅞ | *15 @15¼ | 14½ @14⅝ | 39⅝ | 4.20 @4.25 | 4.05 @4.10 | 5.20 @5.27½ | 5.05 @5.12½ |
| 29 | 4.8520 | 57⅛ | *15 @15¼ | 14.50 @14.60 | 39⅝ | 4.20 @4.25 | 4.05 @4.10 | 5.20 @5.25 | 5.05 @5.10 |
| 1 | 4.8500 | 56⅛ | *14¾ @15 | 14.30 @14.35 | 39⅛ | 4.10 @4.20 | 4.00 @4.05 | 5.10 @5.20 | 4.95 @5.05 |
| 2 | 4.8535 | 57⅜ | *14¾ @15 | 14.25 @14.35 | 38¾ | 4.10 | 3.95 | 5.10 @5.15 | 4.95 @5.00 |
| 3 | 4.8545 | 57½ | *14¾ @15 | 14.25 @14.35 | 39 | 4.05 @4.10 | 3.90 @3.95 | 5.05 @5.15 | 4.90 @5.00 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Nov.-Dec. | Silver | Copper | | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spot | | | | | | | | | |
| | | £ per Ton | Cts. per Lb. | 3 Mos. | Best Sel'td | Spot | 3 Mos. | £ per Ton | Cts. per Lb. | £ per Ton | Cts. per Lb. |
| 27 | 26¾ | 66⅞ | 14.53 | 65⅝ | 71¼ | 180½ | 181¾ | 18⅜ | 3.99 | 20¾ | 4.48 |
| 28 | 26¾ | 66⅝ | 14.47 | 65⅜ | 70¼ | 180⅜ | 181⅝ | 18¼ | 3.97 | 20⅝ | 4.51 |
| 29 | $26\frac{7}{16}$ | . | . | . | . | | | | | | ... |
| 1 | $25\frac{15}{16}$ | 65⅜ | 14.20 | 64⅛ | 70 | 178⅜ | 179⅜ | 18 | 3.91 | 20⅝ | 4.51 |
| 2 | 26½ | 65¾ | 14.28 | 64½ | 70 | 176½ | 177½ | 17¾ | 3.86 | 20⅝ | 4.51 |
| 3 | 26⅝ | 65⅝ | 14.26 | 64¼ | 69¾ | 177¼ | 178⅛ | 17½ | 3.80 | 20⅝ | 4.51 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0 21¾c.

**German Imports and Exports** of metals other than iron and steel and the precious metals, and of ores other than iron, are reported as below for the nine months ended Sept. 30, in metric tons:

| | Metals | | Ores | |
|---|---|---|---|---|
| | Imports | Exports | Imports | Exports |
| Gold and silver | ... | ...... | 1,559 | 1 |
| Copper | 193,785 | 81,845 | 19,876 | 18,669 |
| Tin | 10,693 | 7,763 | 14,802 | ... |
| Lead | 64,187 | 45,304 | 104,479 | 3,699 |
| Zinc | 43,120 | 94,991 | 236,467 | 30,174 |
| Nickel | 2,381 | 1,687 | 9,364 | .... |
| Aluminum | 10,902 | 6,539 | .... | .... |
| Minor metals | 1,384 | 15,665 | 21,728 | 9,186 |
| Chrome ore | | | 20,811 | 383 |
| Pyrites | | | 809,086 | 22,913 |

Exports of metals include alloys and manufactures of the several metals. Imports of slag and slag products of all kinds were 998,707 tons; exports, 123,745 tons.

## Other Metals

**Aluminum**—The market continues dull, with light sales and moderate demand. Quotations are still uncertain and rather weak. We quote 18¾@19¼c. per lb. for No. 1 ingots, New York. The foreign market is quiet.

**Antimony**—The market is quiet, with moderate business only. Quotations show little change. Cookson's is 7.50@7.60c. per lb.; Hallett's, 7.25@7.35c.; while 6.25@6.50c. per lb. is asked for Chinese, Hungarian and other outside brands.

**Quicksilver**—Demand continues fair and prices are steady. New York quotation is $39@40 per flask of 75 lb. San Francisco, $39 for domestic orders and special terms for export. London price is now £7 10s. per flask, with £7 5s. quoted from second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Cadmium**—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

**Nickel**—Quotations for ordinary forms, shot blocks, or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders. Exports from Baltimore for the week included 882 lb. selenium to Hamburg.

## Gold, Silver and Platinum

**Gold**—There was no special demand on the open market in London, and prices of gold were unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. In New York about $4,000,000 additional was taken for Canada. This movement is apparently about over.

Imports of gold into France nine months ended Sept. 30 were 507,468,000 fr.; exports, 52,477,000 fr.; excess of imports, 454,991,000 fr., against 160,816,000 fr. last year.

Imports of gold in Great Britain 10 months ended Oct. 31 were £49,846,369; exports, £40,238,692; excess of imports, £9,607,677, against £4,661,767 last year.

**Iridium**—Conditions are unchanged and prices are unchanged at $80@81 per oz. for pure metal

**Platinum**—Business is fair and prices are unchanged. Sales are made at $43@44 per oz., according to quantity. Hard metal brings $47@50 per oz., according to proportion of iridium.

**Silver**—Speculative conditions having forced silver down to 25$\frac{15}{16}$d. good buying orders have come in during the last two days and market closes on Wednesday at 26$\frac{11}{16}$d. with prospect of higher prices.

Shipments of silver from London to the East, Jan 1 to Nov. 20, as reported by Messrs. Pixley & Abell

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| India | £9,456,500 | £9,195,500 | D | £261,000 |
| China | 1,449,000 | 753,500 | D | 695,500 |
| Total | £10,905,500 | £9,949,000 | D | £956,500 |

Imports of silver at New York for the week were $151,-[illegible]2. Exports were $678,581 chiefly to London

Imports of silver into France nine months ended Sept. 30 were valued at 279,807,000 fr.; exports, 265,133,000 fr.; excess of imports, 14,674,000 fr., which compares with an excess of exports of 2,352,000 fr. last year

Imports of silver in Great Britain 10 months ended Oct. 31 were £12,586,606; exports, £13,896,188; excess of exports, £1,309,582, which compares with an excess of imports of £961,371 last year.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Nov. 29

The base price paid this week for 60% zinc ore was $40@41 per ton. Lead price for 80% ore remained the same as last week, $52@53 per ton.

SHIPMENTS WEEK ENDED NOV. 29

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,466,320 | 126,000 | 1,029,770 |
| Year to date | 136,355,310 | 5,123,080 | 185,580,610 |

Shipped during week to separating plants, 2,398,640 lb. zinc ore.

### JOPLIN, MO.—Nov. 29

The high price offering of zinc blende this week is $43, the base per ton of 60% ranging from $38.50 to $41, the culmination of a decline that has been expected and feared for several weeks by producers, knowing the smelters have been losing money on prices current for many weeks. A further drop is feared next week to a $38 base. Few offerings were made until Saturday and consequently purchases were light. Calamine remains strong at $21@23 per ton of 40% zinc. The average price of all grades of zinc is $37.24. Lead sold as high as $54 per ton on an assay basis of $52 for ore of 80% metal content. The average of all lead is $51.74 per ton.

SHIPMENTS WEEK ENDED NOV. 29

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week.. | 8,934,570 | 1,249,560 | 2,075,580 | $243,375 |
| Totals 48 weeks... | 524,529,620 | 40,237,000 | 88,115,320 | $14,278,464 |

Blende value, the week, $175,255; 48 weeks, $12,326,145.
Calamine value, the week, $14,410; 48 weeks, $516,439.
Lead value, the week, $53,710; 48 weeks, $2,335,889.

# IRON TRADE REVIEW

### NEW YORK—Dec. 3

The trade continues generally quiet so far as new business is concerned. Operation of mills is still on a fair basis and there has not been as much closing down as might have been expected.

Structural steel has been rather quiet outside of the large Seaboard orders for subway and other municipal work. The trade in bars, plates and other forms has been rather better.

Pig iron is quiet and rather depressed. Steel-making irons have not been in much demand, but there has been more call for foundry pig.

### PITTSBURGH—Dec. 2

Steel-mill operations have suffered but a slight decrease in the past week, and are now at about 55% of full capacity. The rate is declining slowly and it is improbable that it will go below 50% this month. Considering that all buyers are holding off as much as possible, and are endeavoring to draw upon stocks, the showing as to steel shipments is regarded as relatively favorable. The rate of buying is indicated quite closely by the rate of shipping, since not more than about 15% of current shipments are based directly upon old orders. There is some business nominally moving under old contracts, but it is practically new business as the price is readjusted to secure specifications for shipment.

Prices are showing somewhat more resistance to decline all along the line. Unfinished steel is off only a trifle, while in finished steel there are no marked declines to record. The mills now insist that the cost of production is higher, by $1 to $2 a ton, than when very low prices were made two years ago, and that the old level is not to be expected in this decline. Plates and bars remain quotable at 1.25c. and shapes at 1.30c., but on attractive orders these prices are frequently shaded.

Under date of Dec. 1, the National Tube Co. reduced 2-in. line pipe 1c. per foot, or about 10%, this being the only size of line pipe affected

**Pig Iron**—The market has been absolutely stagnant, so that prices have been under no particular pressure. We quote former prices as representing the market generally: Bessemer, $15; basic, $13; No. 2 foundry, $13.50; forge, $13.25; Valley furnace, 90c. higher delivered Pittsburgh. W. P. Snyder & Co. announced their November averages, compiled from the actual sales reported in the trade of 1000 tons or over at $15.125, Valley, for bessemer and $13.013, Valley, for basic.

showing declines from October of 57.8c. in bessemer and 69.6c. in basic.

**Ferromanganese**—The market is quiet and unchanged except that prompt German material is offered occasionally at 50c. less than formerly, or at $49, Baltimore. English continues at $50 for prompt or forward.

**Steel**—While some of the mills insist they will not shade $21.50 on sheet bars there is some steel offered at $21, putting the market down 50c., while billets remain at $20.50, maker's mill, Pittsburgh or Youngstown. It is rumored that the December tonnages on monthly adjustment contracts were adjusted at a slightly lower level in some cases.

**Foreign Trade of Germany** in iron and steel nine months ended Sept. 30, metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel | 4,807,873 | 472,381 | Exp. 4,335,492 |
| Machinery | 418,354 | 72,522 | Exp. 345,832 |
| Total..... | 5,226,227 | 544,903 | Exp. 4,681,324 |
| Total, 1912... | 4,778,705 | 563,322 | Exp. 4,215,383 |

The exports this year included 52,653 tons of ferroalloys of various kinds.

## IRON ORE

Lake Superior shipments are practically closed for the season. The shipments for last week were light. The last shipments from Lake Superior were made Nov. 30. The shipments for the season are estimated at 49,300,000 tons.

Imports at Baltimore during the past week included 38,827 tons iron ore, all from Cuba.

**Imports of Iron Ore in Germany** nine months ended Sept. 30 were 10,629,812 tons; exports, 1,355,882; excess of imports, 9,273,930 tons. Imports of manganese ore were 510,254 tons; exports, 6362 tons.

## COKE

**Connellsville Coke**—A few operators have been endeavoring to close contracts, and have quoted $1.85 on furnace coke for 1914, if not less. Most operators regard $2 as the proper price and are not making any effort as yet to sell. Prompt furnace coke has been sluggish and has sold down 10c. a ton to $1.75. Foundry coke remains at 2.50@2.75 for prompt or contract.

**Coal and Coke Tonnage Pennsylvania** lines east of Pittsburgh and Erie 10 months ended Oct. 31, short tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Anthracite | 8,358,717 | 8,711,723 | I. 353,006 |
| Bituminous | 38,227,609 | 42,662,163 | I. 4,434,554 |
| Coke | 10,882,963 | 12,012,363 | I. 1,129,400 |
| Total | 57,469,289 | 63,386,249 | I. 5,916,960 |

The total increase this year was 10.3%. The largest proportional gain was in bituminous coal. Coke has been falling off for two months past.

**Spanish Imports of Coal** eight months ended Aug. 31 were 1,818,354 metric tons, an increase of 332,243 tons over 1912. Imports of coke were 239,507 tons, a decrease of 2848 tons.

**Austrian Coal Production** for the nine months ended Sept. 30, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal mined | 11,656,476 | 12,234,247 | I 577,771 |
| Brown coal mined | 19,490,252 | 20,710,901 | I. 1,220,649 |
| Coke made | 1,716,143 | 1,909,236 | I. 193,093 |
| Briquettes made | 296,108 | 326,681 | I. 30,573 |

Of the briquettes reported this year 175,502 tons were made from brown coal or lignite.

# CHEMICALS

## NEW YORK—Dec. 3

General business continues rather quiet and not much improvement is expected before the turn of the year.

**Arsenic**—Supplies are good, but buying is light. Canadian and American producers seem to be increasing output. Prices are nominally $3 per 100 lb., but might be shaded on a good order.

**Copper Sulphate**—A moderate business is reported. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—The market has been excited by the advent of a new distributing agency, which is disposed to compete for business. Sales have been good as buyers are disposed to put in supplies at the sharp cut made by the new sellers, who quote 2.15c. per lb. for all deliveries next year.

## PETROLEUM

California oil production for the nine months ended, Sept. 30, was 73,125,142 bbl., an increase of 6,590,952 bbl. over 1912. The shipments or deliveries were 72,069,182 bbl., an increase of 11,150,796, bbl., over last year.

The monthly statement of the "Oil City Derrick" shows new oil wells completed in November as follows: Pennsylvania grade, 726; Lima-Indiana, 137; Kentucky, 14; Illinois, 165; Kansas-Oklahoma, 1129; Texas-Louisiana, 177. A grand total of 2348 wells was completed, with an initial production of 52,743. There were 350 dry holes and 162 gas wells.

Exports of mineral oils from the United States in October were 220,280,075 gal. For the 10 months ended Oct. 31 the total exports were 1,522,548,961 gal. in 1912, and 1,725,148,639 gal. in 1913; an increase of 202,599,678 gal., or 13.3%, this year.

## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | July | August | September | October | November |
|---|---|---|---|---|---|
| Alaska shipments | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 | |
| Anaconda | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 | 25,250,000 |
| Arizona, Ltd. | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 | |
| Copper Queen | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 | 7,115,991 |
| Calumet & Ariz. | 3,800,000 | 4,500,000 | 4,000,000 | 4,500,000 | |
| Chino | 4,746,525 | 5,788,572 | 4,196,296 | 4,767,466 | |
| Detroit | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 | 1,922,352 |
| East Butte | 1,060,257 | 1,162,007 | 1,233,018 | 1,040,997 | |
| Giroux | 584,546 | 524,953 | 198,178 | 156,084 | |
| Mason Valley | 908,892 | 867,060 | 918,000 | 1,052,000 | |
| Mammoth | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 | 1,700,000 |
| Nevada Con. | 5,403,919 | 5,989,973 | 4,441,671 | 5,898,046 | |
| Ohio | 601,700 | 689,000 | 685,900 | 698,691 | |
| Old Dominion | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 | |
| Ray | 4,097,000 | 4,269,519 | 4,336,434 | 4,725,419 | |
| Shannon | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 | |
| South Utah | 140,000 | 223,498 | 241,843 | 232,269 | |
| Tennessee | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 | |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 | |
| Utah Copper Co. | 9,849,043 | 10,302,251 | 11,463,905 | 9,929,478 | |
| Lake Superior* | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 | |
| Non-rep. mines* | 6,200,000 | 6,200,000 | 6,000,000 | 6,200,000 | |
| Total prod. | 101,669,653 | 96,427,264 | 91,835,075 | 88,102,302 | |
| Imp., bars, etc. | 29,029,990 | 22,474,471 | 35,703,660 | ........ | |
| Total blister | 130,699,643 | 118,901,735 | 127,538,735 | ........ | ... |
| Imp. ore & matte | 8,527,046 | 9,171,351 | 10,800,162 | ........ | |
| Total Amer. | 139,226,689 | 128,073,086 | 138,338,897 | .. | |
| Miami† | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 | 3,230,000 |
| Shattuck-Arizona | 1,019,388 | 1,001,634 | 1,163,237 | 993,224 | ..... |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,379 | 647,905 | 621,120 | ...... | |
| Granby | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 | |
| Mexican Cos.: | | | | | |
| Boleo† | 2,240,720 | 2,264,640 | 2,369,920 | 2,424,800 | |
| Cananea | 3,328,000 | 3,186,000 | 3,148,000 | 3,682,000 | |
| Moctezuma | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 | 3,517,800 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 | |
| Cape Cop., S. Af | . | ....... | 607,040 | 712,320 | |
| Kyshtim, Russia | 2,500,000 | 1,585,000 | 1,187,000 | | |
| Spassky, Russia. | 660,800 | 1,048,320 | 1,025,920 | 983,360 | |
| Exports from | | | | | |
| Chile | 9,856,000 | 8,736,000 | 5,600,000 | 6,160,000 | |
| Australia. | 10,304,000 | 7,720,000 | 6,944,000 | 7,728,000 | |
| Arrivals–Europe‡ | 11,728,640 | 14,624,960 | 9,661,120 | 18,040,960 | |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

## STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| XI, '12 | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII. | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ....... | ....... | ...... |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV. | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V. | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI. | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX. | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X. | 139,070,481 | 68,173,720 | 68,123,473 | 29,793,094 | 53,625,600 | 83,418,692 |
| XI | ....... | ..... | .... | 32,566,382 | 48,787,200 | 81,353,582 |
| XII. | | | | | 46,592,000 | ........ |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq | Sale | Amt |
|---|---|---|---|
| Alta Cons. Utah | . | ... | 0 05 |
| Blue Star, Ida | Nov. 25 | Dec. 17 | 0 03 |
| Caledonia, Nev. | Nov. 24 | Dec. 18 | 0 05 |
| Cardiff, Utah | Nov 20 | Dec. 10 | 0 01 |
| Clear Grit, Ida., postp'd | Nov. 18 | Jan. 2 | 0 0025 |
| Coeur d'Alene Invest., Ida | Nov. 7 | Dec. 8 | 0 003 |
| Comet Placer, Nev | Dec. 6 | Dec. 22 | 0.03 |
| East Hercules, Ida | Nov. 15 | Dec. 15 | 0 0015 |
| Emerald, Utah | Nov. 15 | Dec. 13 | 0 005 |
| Empire, Ida., postp'd | Oct. 30 | Jan. 2 | 0 005 |
| Federal Ext., Nev | Nov. 10 | Dec. 10 | 0 005 |
| Great Eastern, Ida | Nov. 18 | Dec. 18 | 0 0015 |
| Laclede, Ida | Nov. 24 | Dec. 15 | 0 003 |
| Nabob, Ida | Nov. 17 | Dec. 15 | 0 005 |
| Nevada Silver Reed, Ida | Nov. 17 | Dec. 18 | 0 0017 |
| North Franklin, Ida., postp'd | Oct. 16 | Jan. 29 | 0 005 |
| Raymond-Illinois, Utah | Nov. 28 | Dec. 15 | 0 005 |
| Scranton Ext., Utah | Nov. 17 | Dec. 17 | 00025 |
| Silver Cliff, Ida. | Nov. 20 | Dec. 10 | 0 005 |
| Silver Star, Ida. | Nov. 22 | Dec. 22 | 0 002 |
| Snowstorm, Ida | Nov. 13 | Dec. 12 | 0 002 |
| South Hecla, Utah. | ...... | ....... | 0.06 |
| Utah Fertilizer, Utah | Nov. 8 | Dec. 9 | 0.15 |
| Wasatch, Utah | Dec. 22 | Jan. 8 | 0.05 |
| Wisconsin, Ida. | Nov. 10 | Dec. 10 | 0.002 |
| Wonder Pine Cr'k, Ida., postp'd | Oct. 3 | Dec. 10 | 0.001 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York |  |  | London |  |  |
|---|---|---|---|---|---|---|
|  | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53.795 | 56 260 | 62 938 | 24 865 | 25 887 | 28.983 |
| February | 52.222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March | 52.745 | 58 375 | 57 870 | 24.324 | 26.875 | 26 669 |
| April | 53.325 | 59 207 | 59 490 | 24 595 | 27.284 | 27.416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24 486 | 28 215 | 27.199 |
| July | 52 630 | 60 654 | 58 721 | 24 286 | 27.919 | 27.074 |
| August | 52 171 | 61 606 | 59 293 | 24 082 | 28 375 | 27.335 |
| September | 52 440 | 63 078 | 60 640 | 24 209 | 29 088 | 27 986 |
| October | 53 340 | 63 471 | 60 793 | 24 594 | 29 299 | 28 083 |
| November | 55 719 | 62 792 | 58 995 | 25 649 | 29.012 | 27 263 |
| December | 54 905 | 63 365 | ... | 25 349 | 29.320 | . |
| Year | 53 304 | 60 835 | .... | 24 592 | 28.042 |  |

New York quotations, cents per ounce troy, fine silver. London, pence per ounce, sterling silver, 0.925 fine

### COPPER

| Month | New York |  |  |  | London Standard |  |
|---|---|---|---|---|---|---|
|  | Electrolytic |  | Lake |  |  |  |
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14 094 | 16 488 | 14.337 | 16.767 | 62.760 | 71 741 |
| February | 14 084 | 14 971 | 14.329 | 15.253 | 62 893 | 65 519 |
| March | 14.698 | 14 713 | 14 868 | 14.930 | 65 884 | 65 329 |
| April | 15 741 | 15 291 | 15.930 | 15.565 | 70 294 | 68 111 |
| May | 16 031 | 15 436 | 16.245 | 15.738 | 72.352 | 68 807 |
| June | 17 234 | 14 672 | 17 443 | 14 871 | 78 259 | 67.140 |
| July | 17 190 | 14 190 | 17 353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | 16 328 | 17 698 | 16 799 | 78 762 | 73 125 |
| October | 17 314 | 16 337 | 17 661 | 16 913 | 76 389 | 73 383 |
| November | 17 326 | 15 182 | 17 617 | 16 022 | 76 890 | 68 275 |
| December | 17 376 | ... | 17 600 |  | 75 516 |  |
| Year | 16 341 | . | 16 560 |  | 72 942 |  |

New York, cents per pound, London, pounds sterling per long ton of standard copper

### TIN

| Month | New York |  | London |  |
|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 410 | 223 762 | 193 074 |
| October | 50 077 | 40 462 | 228 353 | 184 837 |
| November | 49 891 | 39 810 | 227 619 | 180 869 |
| December | 49 815 |  | 226 875 |  |
| Av. year | 46 096 |  | 209 322 | . |

New York in cents per pound. London in pounds sterling per long ton

### LEAD

| Month | New York |  | St Louis |  | London |  |
|---|---|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4 435 | 4 321 | 4 327 | 4.171 | 15.597 | 17 114 |
| February | 4 026 | 4 325 | 3 946 | 4 175 | 15 738 | 16 550 |
| March | 4 073 | 4.327 | 4 046 | 4 177 | 15 997 | 15 977 |
| April | 4 200 | 4 381 | 4 118 | 4 242 | 16 331 | 17 597 |
| May | 4.194 | 4 342 | 4 072 | 4 226 | 16 509 | 18 923 |
| June | 4 392 | 4 325 | 4.321 | 4.190 | 17 588 | 20 226 |
| July | 4 720 | 4 353 | 4 603 | 4 223 | 18 544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4 550 | 19.655 | 20.406 |
| September | 5 048 | 4 698 | 4 924 | 4.579 | 22 292 | 20 648 |
| October | 5 071 | 4 402 | 4 894 | 4.253 | 20 630 | 20 302 |
| November | 4 615 | 4 293 | 4 463 | 4 146 | 18 193 | 19 334 |
| December | 4 303 |  | 4 152 |  | 18 069 |  |
| Year | 4 471 |  | 4 360 |  | 17 929 |  |

New York and St Louis cents per pound London, pounds sterling per long ton

### SPELTER

| Month | New York |  | St Louis |  | London |  |
|---|---|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6 442 | 6 931 | 6 292 | 6 854 | 26 642 | 26 114 |
| February | 6 499 | 6 239 | 6 349 | 6 089 | 26 661 | 25 338 |
| March | 6 626 | 6 078 | 6.476 | 5 926 | 26 048 | 24 605 |
| April | 6 633 | 5.641 | 6 483 | 5 491 | 25.644 | 25 313 |
| May | 6.679 | 5.406 | 6 529 | 5 256 | 25 790 | 24 583 |
| June | 6.877 | 5.124 | 6 727 | 4.974 | 25 763 | 22 143 |
| July | 7.116 | 5.278 | 6 966 | 5.128 | 26.174 | 20 592 |
| August | 7.028 | 5.658 | 6 878 | 5 508 | 26 443 | 20 706 |
| September | 7 454 | 5 694 | 7 313 | 5 544 | 27 048 | 21 148 |
| October | 7.426 | 5 340 | 7 276 | 5 188 | 27 543 | 20 614 |
| November | 7.371 | 5 229 | 7 221 | 5 083 | 26.804 | 20 581 |
| December | 7.162 |  | 7 081 |  | 26 494 | .. |
| Year | 6.943 | . | 6 799 |  | 26 421 | . . |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer |  | Basic |  | No. 2 Foundry |  |
|---|---|---|---|---|---|---|
|  | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15 12 | $18.15 | $13 32 | $17.35 | $14 00 | $18 59 |
| February | 15.03 | 18.15 | 13 28 | 17 22 | 14.01 | 18 13 |
| March | 14.95 | 18.15 | 13 66 | 16.96 | 14.10 | 17 53 |
| April | 15.13 | 17 90 | 13.90 | 16.71 | 14.15 | 16 40 |
| May | 15 14 | 17.68 | 13.90 | 15.80 | 14.12 | 15 40 |
| June | 15.15 | 17.14 | 14 11 | 15 40 | 14.22 | 15 10 |
| July | 15 15 | 16 31 | 14 38 | 15 13 | 14.38 | 14 74 |
| August | 15 43 | 16 63 | 14 90 | 15 00 | 14 85 | 14 88 |
| September | 16 86 | 16 65 | 16 03 | 15 01 | 15 63 | 14 93 |
| October | 17 90 | 16 60 | 17 18 | 14 61 | 17 22 | 14 80 |
| November | 18 07 | 16 03 | 17 09 | 13 91 | 18 00 | 14 40 |
| December | 18 15 |  | 17 45 |  | 18 73 |  |
| Year | $16 01 |  | $14 93 |  | $15 28 |  |

## STOCK QUOTATIONS

**COLO. SPRINGS** Dec. 2

| Name of Comp. | Bid |
|---|---|
| Acacia | ‡ 02½ |
| Cripple Cr'k Con. | ‡ 01 |
| C. K. & N. | ‡ 08 |
| Doctor Jack Pot. | 06 |
| Elkton Con | .52½ |
| El Paso | 2.80 |
| Findlay | 01½ |
| Gold Dollar | 07 |
| Gold Sovereign | ‡ 02½ |
| Golden Cycle | ‡2 00 |
| Isabella | 10 |
| Jack Pot | 04 |
| Jennie Sample | ‡ 04 |
| Jerry Johnson | ‡ 03 |
| Lexington | ‡ 03 |
| Old Gold | 02 |
| Mary McKinney | 57 |
| Pharmacist | ‡ 01 |
| Portland | .97 |
| Vindicator | 83 |

**SALT LAKE** Dec 2

| Name of Comp. | Bid |
|---|---|
| Beck Tunnel | .03 |
| Black Jack | 05 |
| Cedar Talisman | 00¾ |
| Colorado Mining | 10½ |
| Columbus Con | ‡ 01 |
| Crown Point | 00½ |
| Daly-Judge | 5 10 |
| Grand Central | 50 |
| Iron Blossom | 1 12½ |
| Little Bell | ‡ 15 |
| Lower Mammoth | 01 |
| Mason Valley | 3 25 |
| May Day | 05½ |
| Nevada Hills | 15 |
| New York | ‡ 02½ |
| Prince Con | 18 |
| Silver King Coal'n | 3 25 |
| Sioux Con | 01 |
| Uncle Sam | 04 |
| Yankee | ‡ 06 |

**TORONTO** Dec 2

| Name of Comp | Bid | Name of Comp | Bid |
|---|---|---|---|
| Bailey | 05½ | Foley O'Brien | .17 |
| Coniagas | 7 00 | Hollinger | 17 25 |
| T. & Hudson Bay | 90 00 | Imperial | ‡.02 |
| Timiskaming | 14 | Jupiter | .07½ |
| Wettlaufer-Lor | 07 | Pearl Lake | 12 |
| Apex | ‡ 01 | Porcu. Gold | 10 |
| Big Dome | 12 00 | Preston E. D | 01½ |
| Crown Chartered | 01 | Rea | 10 |
| Doble | ‡ 10 | Swastika | 02 |
| Dome Exten | 04 | West Dome | 05 |

**SAN FRANCISCO** Dec. 2

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks |  | Misc. Nev. & Cal. |  |
| Alta | 06 | Belmont. | 7 40 |
| Belcher | 40 | Jim Butler | 69 |
| Best & Belcher | .04 | MacNamara | 09 |
| Caledonia | 1 80 | Midway | 34 |
| Challenge Con. | 10 | Mont.-Tonopah | .91 |
| Chollar | 02 | North Star | 39 |
| Confidence | ‡ 35 | West End Con. | 1 27½ |
| Con. Virginia | 09 | Atlanta | 09 |
| Crown Point | 30 | Booth | 02 |
| Gould & Curry | 03 | C.O.D. Con. | 03 |
| Hale & Norcross | 06 | Comb. Frac. | 06 |
| Mexican | 1 05 | Jumbo Extension | 08 |
| Occidental | 70 | Pitts.-Silver Peak | 35 |
| Ophir | 18 | Round Mountain | .34 |
| Overman | 34 | Sandstorm Kendall | 06½ |
| Potosi | 02 | Silver Pick. | 03 |
| Savage | 10 | Argonaut | 3 25 |
| Sierra Nevada. | 06 | Bunker Hill | ‡2.00 |
| Union Con. | 11 | Central Eureka | 23 |
| Yellow Jacket | .32 | So. Eureka. | ‡2.00 |

**N. Y. EXCH.** Dec. 2

| Name of Comp. | Clg |
|---|---|
| Amalgamated | 69½ |
| Am. Agri. Chem | 43½ |
| Am.Sm.&Ref.,com | 62½ |
| Am. Sm. & Ref., pf | 98½ |
| Am. Sm. Sec., pf. B | 81¼ |
| Anaconda | 33½ |
| Batopilas Min. | ¾ |
| Bethlehem Steel,pf | 69 |
| Chino | 37¾ |
| Federal M. & S., pf | 31½ |
| GreatNor.,ore.,ctf. | 31¾ |
| Guggen. Exp. | 46 |
| Homestake. | 118 |
| Inspiration Con. | 14 |
| Miami Copper | 21¾ |
| Nat'l Lead, com | 43½ |
| National Lead, pf | 103½ |
| Nev. Consol. | 15¼ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf | 87¼ |
| Quicksilver, pf. | 3 |
| Ray Con. | 17¼ |
| Republic I&S,com | 19 |
| Republic I&S, pf. | 78½ |
| SlossSheff'd,com. | 26 |
| Sloss Sheffield, pf | 86 |
| Tennessee Copper | 28½ |
| Utah Copper. | 47¾ |
| U. S. Steel, com. | 55½ |
| U. S. Steel, pf | 104½ |
| Va.Car.Chem.,pf. | 93 |

**N. Y. CURB** Dec. 2

| Name of Comp. | Clg. |
|---|---|
| Ariz. Belmont | ‡ 04½ |
| Barnes King. | ‡1¼ |
| Beaver Con. | 30 |
| Big Four. | 09 |
| Braden Copper | 6¾ |
| B. C. Copper. | 2¾ |
| Buffalo Mines | 1¼ |
| Can. G. & S | .12 |
| Caribou | 62 |
| Con. Ariz. Sm | $\frac{3}{16}$ |
| Coppermines Cons | 1¼ |
| Davis-Daly | 1¾ |
| Diam'field-Daisy | ‡ 03 |
| Ely Con | 02 |
| Florence | 20 |
| Gold Hill Con | 20 |
| Goldfield Con | 1½ |
| Greene Cananea | 29¾ |
| Greenwater | 05½ |
| Internat. S. & R | ‡115 |
| Kerr Lake | 4½ |
| La Rose | $1\frac{15}{16}$ |
| McKinley-Dar-Sa | 1¾ |
| Min. Co. of A. new | 2 |
| New Utah Bingham | 40 |
| Nipissing Mines | 8 |
| Ohio Copper | $\frac{7}{16}$ |
| Pacific Sm. & M | ‡ ¾ |
| Puebla S. & R | 2 |
| South Utah M&S | ‡ $\frac{3}{16}$ |
| Stand'd Oil of N.J | 387 |
| Stewart | $1\frac{5}{16}$ |
| Tonopah. | 5¼ |
| Tonopah Ex | 1 |
| Tonopah Merger | 56 |
| Tri-Bullion | $\frac{1}{16}$ |
| Tularosa | $\frac{7}{16}$ |
| Union Mines | ‡ 08 |
| United Cop., pfd. | 3 |
| Yukon Gold | 2 |

**LONDON** Nov 22

| Name of Comp | Clg |  |  |
|---|---|---|---|
| Camp Bird. | £0 | 13s | 6d |
| El Oro | 0 | 14 | 0 |
| Esperanza | 0 | 16 | 3 |
| Mexico Mines | 5 | 7 | 6 |
| Oroville | 0 | 8 | 6 |
| Santa Gert'dis | 0 | 16 | 3 |
| Stratton's | 0 | 0 | 6 |
| Tomboy. | 1 | 6 | 3 |

**BOSTON EXCH** Dec. 2

| Name of Comp. | Clg. |
|---|---|
| Adventure. | 1¼ |
| Ahmeek. | 245 |
| Alaska Gold M. | 19¾ |
| Algomah. | .95 |
| Allouez. | 30 |
| Am. Zinc. | 15½ |
| Ariz. Com., ctfs. | 4¾ |
| Bonanza. | .60 |
| Boston & Corbin. | .50 |
| Butte & Balak | 4½ |
| Calumet & Ariz. | 60½ |
| Calumet & Hecla | 387 |
| Centennial. | 12¼ |
| Cliff. | ‡1 |
| Copper Range. | 32½ |
| Daly West. | 2¾ |
| East Butte. | 9½ |
| Franklin. | 2½ |
| Granby. | 67¼ |
| Hancock. | 12 |
| Hedley Gold. | ‡30 |
| Helvetia | .25 |
| Indiana | 3 |
| Island Cr'k, com. | 45½ |
| Island Cr'k, pfd. | 82 |
| Isle Royale. | 17 |
| Keweenaw. | 2 |
| Lake. | 5½ |
| La Salle. | $3\frac{9}{16}$ |
| Mass. | $2\frac{1}{16}$ |
| Michigan. | ‡.75 |
| Mohawk. | 39 |
| New Arcadian. | 1¼ |
| New Idria Quick. | ‡2½ |
| North Butte. | 24 |
| North Lake. | 1 |
| Ojibway. | .75 |
| Old Dominion. | 47 |
| Osceola. | 69 |
| Quincy. | 54 |
| Shannon. | 6 |
| Shattuck-Ariz. | 25 |
| Superior. | 21½ |
| Superior & Bost. | 2½ |
| Tamarack. | ‡25 |
| Trinity. | 3¾ |
| Tuolumne. | .75 |
| U. S. Smelting. | 36½ |
| U. S. Smelt'g, pf. | 46½ |
| Utah Apex. | 1½ |
| Utah Con. | 7½ |
| Victoria. | 1¼ |
| Winona. | 1½ |
| Wolverine. | 40 |
| Wyandot | .40 |

**BOSTON CURB** Dec. 2

| Name of Comp | Bid |
|---|---|
| Bingham Mines. | 5 |
| Boston Ely. | 46 |
| Butte&Lon'nDev | .32 |
| Cactus. | .02 |
| Calaveras. | 1¼ |
| Chief Cons. | 1½ |
| Corbin. | ‡1 |
| Cortez. | 20 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | 93 |
| First Nat. Cop | $2\frac{3}{16}$ |
| Houghton Copper | 2½ |
| Majestic. | .22 |
| Mexican Metals. | .33 |
| Moneta Porc | 01 |
| Nevada-Douglas. | 1½ |
| New Baltic. | .50 |
| Oneco. | 80 |
| Raven Copper. | 10 |
| Rhode Island Coal | 01 |
| Smokey Dev | 25 |
| So. Lake | 2½ |
| S. W. Miami | ‡1½ |
| Tonopah Victor | 25 |
| Tretheway | .30 |
| United Verde Ext | 40 |

‡Last Quotation.

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# Lucky Bill Lead-Vanadium Mine

By Paul A. Larsh*

*SYNOPSIS—Lead-carbonate and lead-vanadate ores, in a filled fault fissure, can be readily sorted into lead and vanadium classes, but better vanadium prices are obtained by melting out the lead and selling the vanadium-bearing slag.*

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The Lucky Bill mine is one mile from Bayard, Grant County, N. M., a station on the Santa Rita branch of the Santa Fé railroad. Freight to El Paso, Tex., the nearest custom reduction works, is $1 per ton for ores of less than $100 per ton value.

The mine was located 12 or 15 years ago, the discoverers working it themselves, and leasing from time to time, until they finally sold out to the Bogue & Wensley Mines Co., which operated the mine for some time and later leased it. In May, 1911, I crossed the property and was impressed by the presence of large amounts of lead vanadate in the dumps, which, up to that time, had been called "lead oxide" or "yellow carbonates." In June, 1911, having secured a lease and option, I began operations under the partnership of Ross, Larsh & Co., and in June, 1912, the deed for the property was taken up.

Surface Plant at Lucky Bill Lead-Vanadium Mine

## Ore Occurs in a Fault Plane

The vein is a filling of a contact quartz fissure in one of the largest, if not the largest faulting planes in the district. The fault has a throw of 300 ft. The overlying rocks where not removed by erosion are rhyolite and tufa several hundred feet thick. The underlying rock that contains the vein is quartz monzonite porphyry forming both walls. A crosscut from the vein on the 100-ft. level passes through 50 ft. of quartz porphyry, 14 ft. of tufa, and is being driven through a soft red porphyry. In the vicinity of the vein as far as the quartz porphyry has been explored, it is traversed by numerous quartz seams or veinlets highly impregnated with lead vanadates as fine canary-yellow, needle-like crystals. The overburden, tufa, in the vicinity of the vein, is also mixed with both vanadates and carbonates of lead. The smaller seams or cracks in the porphyry are filled with an asbestos-like lead vanadate, the whole, especially near the vein, comprising a stockwork probably of commercial value.

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*Mining engineer, Albuquerque, N. M.

The vein or fault trends 35 to 40° northeast (magnetic), and can be traced several miles in both directions from the Lucky Bill. To the north the San José and Ivanhoe mines are on this fault. The extreme north portion passes into the Chino Copper Co. property, at Santa Rita, five or six miles distant, and the southern portion into the Lone Mountain silver-lead district.

The vein covered by the Lucky Bill claim is at the center of the fault. The formations from the southeast pitch strongly into the fault, from the northwest gently into the fault and a fold to the southwest and northeast makes the Lucky Bill oreshoot the center of a geological basin. The vein filling ranges from 8 to 50 ft. wide and dips about 60° to the southeast. The ores of shipping grade are on the hanging-wall side and range from 2 to 12 ft. in width; the average stoping width being between 4 and 5 ft. On the foot-wall side between the quartz and porphyry there is several feet of soft altered porphyry, assaying from 1 to 4% lead and from 1/10 to 1% vanadium.

The vein is very irregular, making short curves resembling the course of the Rio Grande River, but, as a whole, throughout any considerable distance it holds to its true course. The quartz filling is hard, box-car-red silica where not entirely displaced by lead ores on the hanging-wall side, and a hard, porous red quartz on the foot-wall side. The latter shows unmistakable evidences of leaching. The entire vein and both walls for some distance from the vein show much alteration and are saturated with red oxide of iron and oxide of manganese.

### ORE CONTAINS 28% LEAD

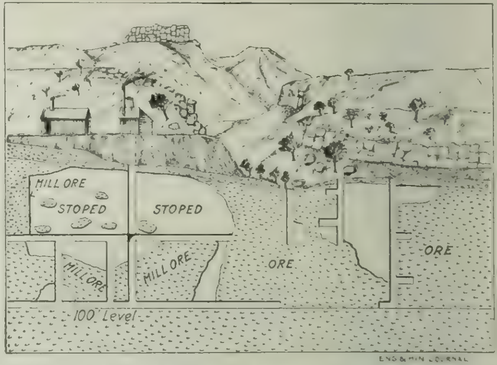
The oreshoot from which shipping ores come is 600 ft. long on the vein. It is explored and opened only to the 100-ft. level. There is a block of ground 175 ft. long from the Bogue shaft to the south end-line, which shows good ore in small drifts started from the Bogue shaft. A shaft is being sunk in this block which struck the vein at 14 ft. and is in good ore. Both north and south drifts on the 100-ft. level are (Mar. 24, 1913) in high-grade ore and the breasts are 450 ft. apart. Some 800 ft. of the vein is unexplored.

The average lead assay of all shipments made by Ross, Larsh & Co. is 27.72%. In this vein, as in most all orebodies, extremely rich shoots are opened. Here they consist of almost pure lead carbonates or lead vanadates. The largest shoot of this kind opened under Ross, Larsh & Co. operations was discovered on the 100-ft. level and produced $11,095 net in 37 days with two miners. This shoot was 12 ft. wide at the 100-ft. level and narrowed, going up, to 1 ft. at the upper level, where it connected with a shoot on the upper level that produced $6000 worth of ore in about 30 days with two miners. This upper shoot was 8 ft. wide and the drift was carried 8 ft. high. Afterward several cars of high-grade ore were stoped from above this drift. In many places on the 100-ft. level these high-grade ores are from 2 to 4 ft. wide in the bottom of the drift. When these ores narrow or are not present throughout the entire zone of enrichment, this zone will generally be filled with mine-run ore, assaying from 15 to 25% lead, which can be shipped at a profit. If below 18% lead, it is left in the mine, or, if necessary to remove for drifts or raises, is kept separate in the milling-ore dump. This dump contains several hundred tons and there are several stopes of this ore available in the mine.

### CARBONATE AND VANADATE ORE EASILY SEPARATED

The ores consist of hard lead carbonate with some galena, and hard lead vanadates, the carbonates and vanadates predominating. These minerals are thoroughly cemented with silica, making them hard and glassy, and do not slime much when crushed. They are segregated from the primary or gangue quartz-filling from which they separate on crushing. They will consequently concentrate easily, the final product carrying from 50 to 60% lead and from 14 to 18% silica.

The carbonates on the 100-ft. level naturally carry more galena than the ores above. The galena on this level carries numerous crystals of chalcopyrite, assays higher in silver and is no doubt the primary ore which may be expected in the lower levels. The carbonates and vanadates are almost completely segregated and can easily be mined separately or can be hand sorted if mined together. In drifting one is sometimes in all-carbonate ore and sometimes in all-vanadium ore. Frequently a small streak of either may exist with several feet of the other mineral.



LUCKY BILL VANADIUM MINE

The ore is mined and classified for shipment in two grades, high and mine-run. They are dumped from a car at the top of the mine upon a grizzly and a sorter picks out any waste or rock that may get in from the oversize. All fines go direct to cars. Ores from the high-grade shoots go direct to cars and assay from 50 to 60%.

This deposit is the only one yet discovered in the United States wherein large bodies of lead-vanadate ores occur. These ores are sufficiently segregated from the other ores and gangue to allow sorting or mining them separately. Like the carbonates they are intimately mixed if not chemically combined with secondary silica. This, however, is a desideratum, as this condition will permit better concentration by eliminating the gangue silica without excessive sliming.[1]

A 15-ton lot of sorted ore, which was shipped to Germany, consisted of two-thirds of the highest-grade and one-third of the second-class vanadium ores, and assayed 9.16% vanadium pentoxide. This lot brought $56 per ton, f.o.b. Bayard, or twice the El Paso price for the same ore for lead. No pay was given for the lead in this shipment. This ore was evidently satisfactory as requests for regular shipments were made.

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[1] "A small production of vanadium ore was sold as such from the Lucky Bill mine near Bayard station. Specimens of the ore sent to the U. S. Geological Survey are yellow with green blotches and are peculiarly massive. In microscopic section the rock is seen to be made up of vanadinite crystals in quartz, which apparently replaces a brecciated porphyritic rock. The green color is probably due to descloizite." "Mineral Resources," Part 1, 1911, p. 950.

The Vanadium Mines Co., of Pittsburgh, Penn., with properties at Cutter, N. M., examined these ores and their metallurgical chemist determined an economical process for extracting the vanadium at their plant. The English reduction plants offer a higher price per unit for the vanadium pentoxide in a slag if the lead and silver are melted out. This would be a simple furnace process, for which plenty of iron and lime flux are at hand. The shrinkage, based on an ordinary type of slag, would produce a slag assaying in vanadium one-half as much again as the ores. Laboratory tests gave a concentration in the slag to 16% vanadium.

As a vanadium producer the large stockwork in the porphyry on both walls of the vein is important. This is more in the nature of the deposits in other New Mexico and Arizona mines, and consists of fine crystals of lead vanadates. They are of high degree of purity, but their tendency to slime would introduce a metallurgical problem quite different from the ores in the vein.

### PRODUCTION

The production by the Bogue & Wensley Mines Co. was worth approximately $18,000. The total production up to June, 1911, was probably between $20,000 and $25,000. The production by Ross, Larsh & Co. from Sept. 23, 1911, to Dec. 26, 1912, was 4174.11 tons, which brought net smelter returns of $50,009; average lead content, 27.72%, in addition to which one 15-ton lot of vanadium ore shipped to Germany brought $847, f.o.b. Bayard. Out of 141 smelter lots, 20 assayed between 50 and 60% lead, and 17 between 30 and 50%. All lots under 30% lead carried a silica penalty of about $6 per ton with additional freight, hauling and treatment charges of about $3.50 per ton.

The mine is equipped with necessary top construction, blacksmith shop and hoisting building complete, gasoline hoist, steam hoist, boiler, station pumps, pipe lines, buildings, etc. The accompanying photograph was taken during the early operations of Ross, Larsh & Co. The cross-section shows the formations.

## Dynamite Explosion in Kennedy Mine

On Nov. 17 there was an underground explosion of dynamite in the Kennedy mine, at Jackson, Amador County, Calif. Three men were killed and one more was seriously injured. As usual in such cases, there is no telling how the thing happened.

According to the newspaper reports, each working level of this mine has a powder magazine, which is in a blind drift, remote from the shaft. Only enough powder, caps, and fuse are supposed to be stored for the day's operations. The priming of cartridges is done within the magazine. The company supplies crimpers but the miners usually employ a pocket knife.

The only thing definite respecting this explosion that is known is that a pair of miners went to the magazine to prepare cartridges and were last seen standing at the bench where the caps and fuse were kept. There were $5\frac{1}{2}$ boxes of powder in the magazine shortly before the explosion. Afterward, there remained four full boxes and some sticks in an open box.

[The priming of cartridges in a powder magazine is, of course, bad and dangerous practice.—EDITOR.]

## Fuel Oil for the Navy

WASHINGTON CORRESPONDENCE

Secretary of the Navy Daniels takes up the question of fuel oil for the Navy in his annual report sent to Congress Dec. 2, and deals with it in part as follows:

I desire to recommend to Congress the immediate consideration of providing fuel oil for the Navy at reasonable rates, and the passage of legislation that will enable the department to refine its own oil from its own oil wells and thus relieve itself of the necessity of purchasing, what seems fair to become the principal fuel of the Navy in the future, at exorbitant and ever-increasing prices, from the private companies that now completely control the supply. This matter has been given thorough consideration by the department, and, while I am not prepared at this time to recommend the exact shape this legislation should take, it is my earnest wish that the subject receive immediate and serious consideration, as it is a matter, in my judgment, of paramount importance. I will be pleased to communicate further with Congress on this subject at any time it may desire. It is sufficient to point out at this time that the superiority of oil over coal for naval purposes has already been demonstrated and is no longer a matter of experiment; that Great Britain is equipping her navy with oil-burning vessels of the first class; that the English Government is already spending a total of $1,871,750 in the erection of enormous oil tanks; that, in addition, the scantily yielding oil-shales of Scotland are to be preserved for the use of the navy, and that in Mexico and elsewhere English firms are reaching out for oil fields from which to supply the demands of the English Navy. On the other hand, the price of oil is steadily creeping upward, so that today the United States Navy is paying over twice as much for its oil as it did in 1911. The only relief possible from what will be a staggering item in the expense account of the Navy in the future is in the control of oil wells, and refining of its own oil by the Navy Department. This has been clearly foreseen by the English Government, and Hon. Winston Churchill, first lord of the admiralty, recently declared in the House of Commons that it is necessary for the Royal Navy to establish refineries and handle its own oil transportation in order to secure the kind of oil it wants and reduce the burden of expense. If England, geographically handicapped, and with no large sources of supply within her own borders, has concluded that this is the wise and economic policy, how can the United States, with bounteous flowing oil wells on Government lands already existing, and with fields near to both the east and west coasts, escape the charge of willful waste of public money if it continues to purchase oil at prices which may fatten the pockets of a few oil companies, but which increases the burden of the taxpayer? With only a portion of our fleet equipped to burn oil, the Navy uses this year 30,000,000 gallons. There is every likelihood that this amount will be increased to 125,000,000 in the future. Every gallon of this must be purchased from the oil companies at their own price until Congress relieves the department by proper legislation.

The United States Navy has the enormous advantage enjoyed by no other nation, in that great oil fields exist in our own country close to the Atlantic Ocean, Gulf of Mexico, and Pacific Ocean, so that the supply of oil is assured. It is natural, for this reason, that the United States should take the lead in adopting the exclusive use of oil fuel and thereby reap the benefits of its many advantages in ship construction and in reliability of operation, a lead no other great naval power can follow with security. The great demand for petroleum and its products, however, has resulted in practically doubling the price of fuel oil in the last two years, and everything seems to indicate a further increase rather than a decrease in price. The large cost of fuel bills has thus become one of much concern to the department and to the country.

It is advisable from every point of view that the Navy should become producer and refiner of oil for its own use. By the time the Panama Canal is opened and the fleet begins frequenting the Pacific the Navy should be producing its own oil from the Navy petroleum reserves in the Elk Hills and Buena Vista fields of California, and its refinery should be in operation. Prompt steps should also be taken to lease oil lands in the Mid-Continent fields and to erect a refinery for the supply of oil-burning vessels on the Atlantic coast. This proposed step is no new departure, for the Navy now builds some of its own ships, maintains large industrial navy yards, a gun and a clothing factory—all of which are indispensable to the supply of superior articles for the Navy, and for the control of prices from commercial concerns furnishing similar articles.

A well-digested plan for the establishment of oil-fuel tanks at various ports and strategical points has been adopted, and the tanks will be erected well ahead of the time their usefulness may be expected to begin.

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# Fuel and Ore Consumption in Making Pig Iron

The annual report of the American Iron & Steel Association gives some interesting figures as to the use of ore and flux and the consumption of fuel in making pig iron during 1912. A full comparison with previous years is not possible, as only part of these figures was collected and reported before last year.

### Consumption of Fuel

In 1912 there were consumed in making the 29,726,937 gross tons of pig iron produced in that year about 35,721,127 net tons of coke, about 47,022 net tons of bituminous coal, about 73,794 gross tons of anthracite coal, and about 35,436,017 bu. charcoal. The average consumption of coke and bituminous coal per ton of pig iron made with these fuels in 1912 was about 2436.5 lb.; of anthracite coal and coke mixed, about 565.2 lb. anthracite coal and about 2341.6 lb. coke per ton; of anthracite coal alone, about 2954.7 lb. per ton; and of charcoal, about 102.1 bu. per ton of pig iron made. Details of fuel consumption were not collected for previous years.

### Consumption of Ore

The Statistical Bureau estimates the total consumption of domestic and foreign iron ore, ore briquettes, etc., not including mill cinder, scale, scrap, etc., in the manufacture of pig iron in 1912 at about 55,656,000 gross tons, as compared with about 43,980,000 gross tons in 1911. The average consumption of iron ore in 1912 per ton of pig iron made was about 1.872 tons, as compared with about 1.859 tons in 1911. About 850,000 tons of iron ore are also annually consumed by rolling mills and steel works.

In addition to the 55,656,000 gross tons of iron ore, ore briquettes, etc., consumed in 1912 by blast furnaces in the manufacture of pig iron about 4,319,000 tons of mill cinder, scale, scrap, slag, zinc residuum, etc., were also used, as compared with about 3,761,000 tons in 1911. Adding these figures to the ore reported gives a total consumption in 1912 of about 59,975,000 tons, or an average of about 2.017 tons of ore and other metallic material used per ton of pig iron made, as compared with a consumption of about 47,741,000 tons, or an average of 2.018 tons, in the previous year.

Of the total consumption of ore, mill cinder, scale, etc., by blast furnaces in 1912 about 92.8% was iron ore, briquettes, etc., and about 7.2% was mill cinder, scale, scrap, etc., against about 92.1% of iron ore and about 7.9% of mill cinder, scale, scrap, etc., consumed in the previous year.

The average consumption of limestone and dolomite per ton of pig iron made was 1137.2 lb. in 1912, against 1114.8 lb. in 1911. By anthracite and bituminous furnaces the consumption in 1912 was 1146.1 lb., against 1153.6 lb. in 1911, and by charcoal furnaces it was 381.6 lb. against 405.4 lb. in the previous year.

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# Kern Trading & Oil Co's. Fire

After burning a couple of weeks, the gusher fire of the Kern Trading & Oil Co., at Taft, Calif., was subdued by chemicals early in November. Steam from 26 boilers had been applied but with no success. The fire was visible for 30 miles, and illuminated the country all around by night. It was a great day for the "movies," and several companies were on hand with ready-made scenarios to fit a fire-fighting scene in the oil field. Spectators came from miles around, and "an enjoyable time was had by all" with the exception of the owners. Their loss is estimated at $10,000 for every day the fire burned.

Kern Trading & Oil Co.'s Fire

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**Electric Steel Ingot Output** is steadily growing in France, and increased from 13,445 tons in 1910 to 15,922 in 1912, says the "Mining Journal." Germany produced 36,188 tons of electric steel in 1910 and 74,175 in 1912. The yield of this steel in Austria was 22,867 tons in 1911 and 19,891 in 1912. Hungary produced about 2000 tons. It is proposed to put up two large electric furnaces at Triquac y Caen.

# Leaching Shannon Copper Ores

By Francis S. Schimerka*

*SYNOPSIS—A description of some of the results obtained in experiments made to find a practical leaching system for low-grade ore and tailings. The basic character of the ore makes sulphuric-acid leaching impossible on account of the high consumption of acid. Treatment with roasting gases gave successful results.*

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The problem of establishing a commercial leaching process for the treatment of low-grade ores and tailings, with which the Shannon Copper Co. is confronted, is rendered difficult by the considerable basicity of the material to be treated, resulting in a high consumption of acid per pound of copper extracted if sulphuric acid is used as the leaching agent.

In the following paragraphs will be presented the means which have been employed so far in the effort to surmount the obstacles in the way of leaching directly with acid; also some of the working results obtained in actual practice.

The investigations on the subject are by no means closed, and the publication of the information given herein is prompted by the desire to give an account of the progress of the work which is being carried on by the company in its attempt to solve a problem which holds the attention of a large part of the metallurgical profession.

The three classes of material which it is desired to treat by a hydro-metallurgical process are low-grade oxidized ores, low-grade sulphide ores and tailings from the concentrating mill. Of these, the oxidized ores—on account of the vast amount of this low-copper material owned by this company, which does not allow of profitable extraction by smelting—are the most important. Also, by virtue of their complicated nature, they present the most difficult metallurgical problem.

### Oxidized Ores Basic in Character

The copper occurs in oxidized ores as malachite, azurite, and, to a small extent, as silicate, in a gangue of decomposed porphyry and altered limestone, the average composition of which is:

AVERAGE CONTENT OF OXIDIZED ORE

| | Per Cent | | Per Cent. |
|---|---|---|---|
| Cu. | 1.90 | MgO | 9.60 |
| $SiO_2$ | 40.80 | Zn | 1.30 |
| Fe | 16.50 | Mn. | 0.70 |
| $Al_2O_3$ | 8.40 | S | 0.55 |
| CaO | 5.80 | Au<br>Ag | Minute Traces |

From the analysis it is seen that the ore is basic, and in addition to the oxidized copper compounds contains a considerable amount of basic constituents partly soluble in dilute sulphuric acid. Consequently the consumption of acid, if the ore is subjected directly to leaching, is much greater than a profitable working practice will permit, and ranges from 7.5 to 8.8 lb. per lb. of copper leached, with a possible extraction of 81% of the total copper in the ore. Numerous tests have shown that for each pound of copper soluble in dilute sulphuric acid, 4.3 lb. of other metallic oxides are dissolved along with it. In order to overcome the difficulty, an attempt has been made to convert the copper and other bases in the ore into sulphates by cheaper methods than direct addition of sulphuric acid. To accomplish this the following process has been adopted:

### Ore Subjected to Roasting Gases in Heaps

The ore, crushed to about 2-in. size and piled upon a heap of burning iron pyrite, is subjected to the action of the sulphurous acid and sulphur-trioxide gases resulting from the oxidation of the pyrite underneath. Simultaneously a solution of ferrous sulphate (the effluent liquor from the launders in which the copper has been precipitated by scrap iron) is sprinkled upon the heaps. By the reactions which take place between the roasting gases and the sulphate of iron, the latter becomes an essential factor in the process of converting the oxides and carbonates in the ore into sulphates. Under the influence of heat, air, moisture, roasting gases and iron sulphates, the reactions taking place in the ore pulp are probably of a very complex nature and can be reduced to simple equations only if their ultimate results alone are taken into consideration. Sulphur trioxide combines with the bases directly to form sulphates. Sulphurous acid and moisture forms sulphites with them, which readily change to sulphates. Interesting is the action of the ferrous sulphate, which under the influence of heat, sulphurous acid, sulphur trioxide and excess of air, is alternately oxidized to ferric sulphate, which is again reduced to the ferrous salt by the action of more sulphur dioxide. This process of oxidation and reduction may be expressed by the equations:

$$2\ FeSO_4 + SO_2 + O_2 \text{ (excess of air and catalytic action of ore pulp) } = Fe_2(SO_4)_3$$

and

$$Fe_2\ (SO_4)_3 + SO_2 = 2\ FeSO_4 + 2\ SO_3$$

It can be seen that in the reduction of the ferric to the ferrous sulphate a proportionate amount of sulphuric acid is set free and made available for combining with the bases in the ore. At the end of the heap-treatment period, the ore contains a considerable amount of ferric sulphate, which is an effective solvent for such combinations of copper in the ore as have escaped complete conversion into water-soluble sulphate, for example, basic sulphates, and unaltered carbonates. Water only is used for the leaching operation.

### Oxide Ore Covers Burning Pyrite

Working on a practical scale, 1000 tons of oxide ore are piled upon 100 tons of iron pyrite, in circular heaps. Ore fines are used as a cover—about 1 ft. thick. The pyrite is allowed to burn but slowly over a period of from five to six months. Flues at the bottom of the heap, and old stove pipes which penetrate the layer of oxide ore and rest upon the top of the pyrite, provide the required draft for its oxidation. Of the sulphur in the pyrite, 50% is utilized for the conversion of bases in the ore into sulphates. After the pyrites cinders are uncovered, they form a valuable flux in the smelting operations.

In such places of the heap where the treatment is most effective from 85% to 96% of the copper can be leached by water alone. The difficulty encountered is to effect a uniform treatment throughout the heap of ore by having the roast gases penetrate it in all its parts. The argillaceous nature of the gangue under the influence of moisture (from the ferrous-sulphate liquors) promotes clogging and prevents the gases from striking freely through the ore in every section of the heap.

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*Metallurgical chemist, Shannon Copper Co., Clifton, Ariz.

The ore is leached in large circular tanks, 25 ft. diameter and 5 ft. high, 75 tons constituting one charge. At the bottom of the tanks, strips of wood 2 in. high and 1 in. wide, are placed at a distance of 1 in. from each other, and covered with coco matting; this provides a good filtering contrivance. No trouble arises from slime formation, the material being almost all of 2-in. size. No agitation, other than repeated percolation by means of air lifts, is employed.

Besides the copper, the leaching liquors contain the sulphates of manganese, lime, zinc, magnesia, iron in the ferrous condition, alumina, and a large amount of ferric sulphate. The presence of the last is objectionable if precipitation of the copper by iron is resorted to; on the other hand, it is a very powerful solvent for copper compounds. To make commercial use of the ferric sulphate, and eliminate it from the liquors previous to sending them into the precipitating launders, the copper solutions containing it are passed over raw oxide ores, or mill tailings; the copper in them is dissolved, and the ferric sulphate reduced to the ferrous salt by the sulphides in the tailings, or eliminated by being precipitated as a mixture of hydrated oxides and basic sulphates of iron by the bases in the raw oxide ore.

### Extraction Is Good and Cost Low

From the leaching tanks the copper liquors are run into launders (with a suitable fall) 300 ft. long, 5 ft. wide, and 2 ft. deep, filled with cotton ties and scrap iron from the reduction works. The copper-free solutions issuing from the end of the launders, containing up to 3.5% Fe (9.5% anhydrous $FeSO_4$) are returned to the burning heaps by means of a pump. On account of the comparatively short run, no figures are as yet available concerning the consumption of iron in the precipitation of the copper.

Working with 75-ton charges, the extraction of copper from well treated ore ranged from 72.6% to 82.2% without the use of acid in the leaching operation. It fell, however, considerably below these figures for ore from sections of the heaps which were either far removed from the pyrite or inaccessible to the roast gases by reason of insufficient draft in their particular direction. It is expected to overcome the difficulty of a uniform treatment by resorting to a different construction of the heaps, especially by spreading the pyrite over a larger area than has been done in former operations.

The advantages of the process are: Coarse crushing, cheap installation, elimination of sulphuric-acid plant and the commercial usefulness of the ferric-sulphate solutions produced in the process in excess of the requirements for a single operation.

### Sulphide Ore Roasted in Muffle Furnace

In sulphide ores the copper occurs in a porphyrytic gangue as chalcocite mixed with iron pyrite, and a small amount of oxide of copper (cuprite) and native copper is also present at times.

Approximate analysis of this ore is as shown in the table.

ANALYSIS OF SULPHIDE ORE

| | Per Cent. | | Per Cent. |
|---|---|---|---|
| Cu. | 2.37 | $Al_2O_3$ | 13.90 |
| S | 3.02 | CaO | 2.10 |
| $SiO_2$ | 58.60 | MgO | 2.38 |
| Fe | 8.90 | Traces of zinc and manganese | |

Silver and gold are not present in such quantity as to justify an attempt at their recovery. To convert the copper, of which, in the green ore, 27% to 31% is soluble in dilute sulphuric acid, and therefore present in oxide combination, into water- and acid-soluble form, the ore, after being crushed to pass a 40-mesh screen, is roasted in a muffle furnace, the temperature not rising above an incipient red heat. The result of the calcination is: Green ore, 2.14% Cu and 2.85% S; calcines, copper soluble in water, 1.03%; $FeSO_4$ soluble in water, 0.10%; $Fe_2(SO_4)_3$ soluble in water, slight trace; sulphur, as sulphates, 0.88%; total sulphur in calcines, 1.12%. Taking into account the shrinkage of the pulp, 1.03% copper in the calcines equals an extraction by water of 46.5% of the total Cu. By the roasting operation 30% of the total sulphur in the green ore had been rendered soluble in water as sulphates, 6.8% of the sulphur remained insoluble, and 63.2% had been volatilized.

On leaching the calcined ore with a 5% solution of sulphuric acid, 86.4% of the copper could be extracted with a consumption of 3.19 lb. sulphuric acid per pound of copper leached, an amount which is permissible in commercial practice.

It was intended to decrease the acid consumption by a more thorough sulphatization of the ore pulp, which it was thought could be accomplished by the addition of some cheaply available sulphur-bearing material, and it was decided to use for this purpose ferrous sulphate, which salt is recovered from the foul solutions leaving the tanks in which the copper has been precipitated by scrap iron. If the ore is mixed with crystals of ferrous sulphate, and the mixture calcined in a muffle furnace, the following change takes place: heat, sulphurous-acid gas from the burning sulphides in the ore, excess of air, and the catalyzing action of the ore pulp, oxidize the ferrous to ferric sulphate, which at an incipient red heat (535° C.) is decomposed into ferric oxide and anhydrous sulphuric acid; the latter becomes available for sulphatizing purposes and combines with the bases in the ore to form sulphates.

The result of a calcination carried out with the above purpose in view was that the green ore contained Cu 2.01% and S 2.58%, and to it was added 1.2% of its weight of Fe in the form of ferrous sulphate. This percentage is below the amount of iron which can be recovered as sulphate by precipitating on scrap iron the copper leached from an equal weight of ore.

The calcines contained copper soluble in water, 1.18% (57.9% extraction); $FeSO_4$, 0.14%; $Fe_2(SO_4)_3$, 0.04%; sulphur, 1.05% (as sulphate), and total sulphur in calcines, 1.29%. Allowing for a slight shrinkage in the pulp (1% of weight of ore) the sulphur balance sheet shows that of the total sulphur in the mixture of ore and sulphate of iron, 31.8% appears as water-soluble sulphur, 7.2% remained insoluble, and 61% had been volatilized.

There is but little change from the above results if the ore is calcined without the addition of ferrous sulphate. The amount of water-soluble copper had been increased by about 11%, but the consumption of acid per pound of copper leached remained the same—3.19 lb., with an extraction of 84.5%.

None of the sulphuric acid contained in the ferrous sulphate was lost in the calcination at the temperature employed. From the small amount of iron soluble in water, it can be seen that the conversion of the ferrous sulphate to ferric oxide had been almost completely accomplished, and by parting with its sulphuric acid radical had contributed toward the sulphatization of the bases in the ore. That the consumption of acid was not decreased is explained by the fact that after the roast with ferrous sulphate, on treatment with dilute sulphuric acid a large amount of iron (and magnesia) goes into solution than is the case if the ore is calcined without the addition of the ferrous salt. It was expected that the acid consumption would be lower if the temperature during calcination is raised sufficiently to render the ferric oxide completely insoluble. In cases where this theory has been applied, the extraction was decreased, probably by the formation of insoluble ferrites during the roast.

At this point the application of some other reagent than sulphuric acid for the lixiviation of the copper had been taken into consideration, and the powerful solvent action of ferric sulphate upon copper compounds suggested its use for the purpose of provision for the cheap manufacture of this reagent could be made.

The production of the requisite amount of ferric sulphate, and the conversion of a certain percentage of the copper in the ore into water-soluble sulphate, can be accomplished in one operation by mixing the ore with ferrous sulphate and calcining the mixture at a temperature below incipient red heat, insufficient to decompose the ferric sulphate that is being formed. The ferrous sulphate is obtained by crystallization from the liquors leaving the precipitating launders, and its recovery presents no special difficulty. It is intended to increase their contents of ferrous sulphate by using the liquors, freed from copper, repeatedly in place of water on fresh charges of calcines, until the proper enrichment in iron promotes speedy crystallization.

### Iron Is Lost As Basic Sulphate

The object of the calcination is now to produce the largest possible amount of soluble ferric sulphate in the mixture; the conversion of the copper into sulphate, although it is enhanced by the presence of ferrous sulphate, is of second importance, because any unaltered sulphides are effectively attacked by the ferric sulphate in the liquors. In the conversion of $FeSO_4$ into $Fe_2(SO_4)_3$ by heat and air, without supplying free acid, 40% of the iron is lost in the shape of basic sulphates, insoluble in water. If mixed with sulphide ore, however, the sulphurous acid of the burning pyrite which by the excess of air and by catalytic action is partly converted into sulphur trioxide supplies the proportionate amount of sulphuric acid needed to form normal ferric sulphate from the ferrous salt, and with proper regulation of the temperature the yield of soluble ferric sulphate reaches 80% of the ferrous iron added to the ore.

The experiments have been carried out in a small muffle furnace. The ore (passing a 40-mesh screen) was mixed with a quantity of ferrous sulphate corresponding to 2.8% Fe of its weight. This is below the amount which can be recovered from the leaching liquors of an equal weight of calcines. The temperature must not be higher than well below incipient red heat, and is best kept at about 480° C. The calcines from an ore with 2.01% copper and 2.58% sulphur, treated as above described, contained copper soluble in water, 1.20% (61.9% extraction); $FeSO_4$ soluble in water, 0.34%; $Fe_2(SO_4)_3$ soluble in water, 1.94 per cent.

The extraction of 61.9% (taking into account the increase of bulk) represents the copper present in a water-soluble sulphate proper. If the calcines are treated to twice their weight of water, a liquor carrying 0.97% $Fe'''$ as sulphate is obtained. Under the influence of this solvent, the leached copper, after 16 hr. digestion with cold water, amounted to 76.14%, and on treatment with 10% sulphuric-acid solution in place of water an extraction of 82.5% was obtained with a consumption of only 1.2 lb. $H_2SO_4$ per lb. of total copper leached.

The liquors, like those resulting from the leaching of oxide ores treated in heaps, contain an excess of ferric sulphate, and its elimination is effected by the same means as have been described for this purpose in the preceding paragraph.

### Tailings Basic in Character

Tailings are the product of the concentration of sulphide ores in porphyritic gangue, and are of the following average composition:

AVERAGE ANALYSIS OF TAILINGS

| | Per Cent. | | Per Cent. |
|---|---|---|---|
| Cu. | 0.83 | $Al_2O_3$... | 13.70 |
| S | 0.88 | CaO.... | 2.20 |
| $SiO_2$ | 65.00 | MgO..... | 2.10 |
| Fe | 5.30 | Au<br>Ag | None |

They pass through a 20-mesh screen (1 mm.) and 55% of their weight is slime (under 200 mesh). They contain much (49%) of the total copper as oxide and carbonate, directly soluble in dilute sulphuric acid. The rest of the copper is present as chalcocite mixed with iron pyrite.

The tailings are quite basic in nature, which is but little changed after subjecting them to a sulphatizing roast.

After 12 hr. digestion with cold dilute sulphuric acid of 5% strength, the raw tailings neutralize 4.8%, and after calcination 4.37% of their weight $H_2SO_4$ with an acid consumption of 12.6 and 10.9 lb. respectively per pound of copper gone into solution. The amount of copper which could be converted into water-soluble sulphate by roasting in a muffle furnace never exceeded 25% of its total and cold digestion of the calcined product with dilute sulphuric acid resulted in an extraction of only 63% with a consumption of 8.1 lb. $H_2SO_4$ per pound of copper leached. In calcination the temperature was kept well below the point at which the basic sulphate of copper is formed, or re-formation of copper oxide from the sulphate takes place. As the result of such a calcination, the balance sheet for sulphur shows:

SULPHUR BALANCE IN CALCINED TAILING

47.3% of total sulphur converted into water-soluble sulphates
13.9% of total sulphur remained insoluble
38.8% of total sulphur had been volatilized

Of the sulphur made soluble in water by the roast, 18.7% combined with copper to form $CuSO_4$ (or only 8.84% of the total sulphur in the tailings). The balance of 81.3% entered into combination with other bases to form soluble sulphates. The addition of iron pyrite in a quantity permissible for a profitable working practice, and subsequent roasting increased the percentage of water-soluble copper to 51%, but leaching with dilute acid was accompanied by a still high consumption of acid (7.41 lb. per lb. of copper dissolved) without giving a higher extraction than 60 per cent.

### Tailings Treated Like Sulphide Ores

The unfavorable results pointed toward the use of some other dissolving reagent, and it was decided to treat the tailings like the sulphide ores; i.e., roasting them with the addition of ferrous sulphate to form soluble ferric sulphate, and leach them in the liquor which is obtained on treating the calcines with water, avoiding the use of sulphuric acid altogether.

With the tailings was mixed an amount of iron sulphate equal to 1.1% Fe of their weight, and the roasting conducted well below incipient red heat. The calcines contained 50.8% of their total copper soluble in water as $CuSO_4$ and 1.01% Fe‴ as soluble sulphate. If treated to an equal weight of water, the liquor contained very near 1% Fe as ferric sulphate, which after 12 hr. digestion in the cold decreased to 0.19%; the extraction was 71.7% of the total copper in the tailings.

It is the intention of the management of this company to verify the experimental results obtained by applying them on a practical scale, with a view to ascertaining their commercial possibilities.

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## The Administration of a Great Mine

Dr. James Douglas, president of Phelps, Dodge & Co., in the last bulletin of the Institution of Mining and Metallurgy, described the administration of the Copper Queen mine, in the following words:

For many years after the Copper Queen mine was opened, the technical staff consisted of a superintendent, an assistant superintendent (who was also metallurgist), a mining engineer, who did the mine surveying over the comparatively small area worked underground, with the assistance of a boy as rodman, and one chemist, who was simply competent to make determinations of copper, gold and silver.

Today the case is far different. The introduction of electricity above and underground for lighting, power and transportation purposes has involved the employment of a staff of expert electricians. The replacement of the old-fashioned steam engine by those of higher grade with compound cylinders, condensers and economizers, require the services of a very different grade of mechanics to the old-fashioned engine driver. Their higher salaries reduce, undoubtedly, the economical advantage of the machinery they install and operate, and there is a limit beyond which expenditure is not economical for equipment for only transitory use, as is so often the case in mining and metallurgical works. The chemical and physical staff cannot be omitted now that traces of deleterious metals must be detected and eliminated, and the physical properties of the metal we put upon the market, as for instance its electrical conductivity, are scrupulously watched. These are duties which have become obligatory upon every large metal manufacturing concern.

On the other hand, the utility of such theoretical advisers as the geologists rest upon a less unquestionable ground. Personally, I have the highest admiration for their skill, their accurate observation, and above all, their brilliant imagination, but I do not think they should be given too free a hand in directing exploratory work.

What may be considered our scientific staff consists at present, outside of the accounting staff and the administrative heads; at the mine of a mine superintendent; an assistant; a consulting geologist; a chief resident geologist and three assistants; three chemists; a chief consulting electrician; a chief operating electrician, and 10 assistants; a chief engineer and 13 assistants.

In the smelting department are the superintendent, assistant superintendent, and two understudies; mechanical engineer, electrician and 12 assistants; and five experts engaged exclusively in experimental work, and in the assay office a chief chemist and three assistants.

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## Mining Companies and the Corporation Tax

Washington Correspondence

At an unexpectedly early date, the Supreme Court of the United States handed down on Dec. 1, the decision in the case of Stratton's Independence, Ltd., the important mining case which was certified to the court not long ago from the United States Circuit Court of Appeals for the purpose of ascertaining whether mining concerns are warranted in charging certain things to depreciation and whether they are subject to the corporation tax on the basis that has heretofore been required.

Stratton's Independence, Ltd., is a foreign mining corporation doing business in Colorado and in its contest in the lower courts it practically put before the judicial authorities three distinct questions as embodying the points at issue. These were accepted by the United States attorneys as containing the gist of the matter. They were as follows: (1) Does the corporation-tax law actually apply to mining corporations in the same sense that it applies to others having a "net revenue" from operation? (2) Are the proceeds of ores mined by a corporation on its own premises such an "income" in the sense in which that term is used under the law? (3) Supposing that such proceeds are to be regarded as income, is not the corporation entitled to deduct from its gross revenue the value of such ore in its place before being mined as a depreciation under the corporation tax?

In answering these questions, the Supreme Court renders the following responses: (1) Mining corporations are not different from other concerns in the application of the law. (2) The proceeds of ore sales resulting from mining operations conducted on a corporation's own premises are income just as is the case with any other income. (3) The value of the ore before being mined cannot be regarded as subject to depreciation and treated as such.

The decision in the case in its final form will not be available for some days. It is regarded as of very great importance inasmuch as it gives to the Government the proceeds of the corporation tax upon all companies which mine ore or coal, this being otherwise lost if the contentions of the corporation had been upheld. The Treasury Department's interpretation of the law as heretofore applied is therefore sustained, as are the findings of the lower courts. Much of the argument in the case is likely to be regarded as furnishing a precedent in other cases involving similar issues under the corporation-tax act.

# Winding Accidents on the Rand

### Johannesburg Correspondence

The report of the government mining engineer contains particulars of winding accidents which are of more than local interest. During 1912, there were 75 accidents reported due to overwinds or runaways; of these, 19 caused serious injury or death, and in 15 cases the certificated engine drivers were held to be at fault. The worst accident was at the New Comet mine. The skip containing 25 persons was being lowered and the steam-operated gear of the friction clutch of the drum was thrown over properly, but owing to some undiscovered cause, there was some sticking in the steam or the cataract cylinder and the clutch had not engaged (this was proved by the gear acting in the same way after the accident, but no cause could be found). The brakes could not hold the skip and it went down 3000 ft. at 52°. It is difficult to believe that even four of those in the skip escaped with injuries. The following regulation has been drafted to prevent any possible recurrence of such an accident. When the winding engine is fitted with friction clutches or drums the engine driver, when clutching in, shall test the holding power of the clutch against the engine before releasing the brake in corresponding drum, the other drum brake being off.

Winding accidents were due chiefly to: (1) By starting to lower with the reversing lever in position for raising. Phillips overwinding device makes this impossible by arranging that when the skip is at the surface, the change-gear levers and indicator make electrical connection with an electric bell, until the lever is put over in correct position for lowering. There were six cases of this mistake during 1912. (2) By changing from skip to cage, on the surface, and the engine driver forgetting that persons are being raised also in the skip. There were two cases of this mistake. (3) When lowering unbalanced with the large electric winders on counter current, and obtaining too great speed, by applying the reverse current too suddenly, which caused a failure in the resistance control of the rotor or a tripping of the switch of the stator current, with a failure of the brake to control the runaway drum. There were five cases of this accident. Four were caused by flash over in the starter tank and one by flash over at stator terminals. The application of reverse current to the descending skip has the effect of enormously increasing the voltage across the rotor terminals. The usual 600 volts goes up to 2000, periodicity increases from 50 to 150, and the liquid starter tank fails and causes an open circuit. These tanks have now been improved to stand the higher voltage. (5) By lowering on compression with reversing lever against the motion causing too much compression and slowing or stopping the skip. The driver puts the reversing lever over to the forward position and neglects to control adequately the drum by the brake, causing a runaway or a bump into shaft bottom or penthouse. There were two cases of this occurrence.

The most unforeseen accident happened at Kimberley. There were two men in the cage just below the 2520 ft. level. The native in the engine room took a lighted lamp into the pit below the winding drums in the engine house and set fire to the oil there. This heated the ropes and caused them to fail. The skip dropped and one man was killed.

# Labor Conditions at Fairbanks, Alaska

### By Hubert I. Ellis*

The isolation of the Fairbanks district and the fact that most wage working is confined to five or six months of the year combine to make the labor problem one of great difficulty. Thanks, however, to the high wages of the district and the comparative quietness of industry in the United States proper during the last six years, there has never been a serious shortage of labor. Indications are that men will be less plentiful this season than formerly, due to the Balkan war and to increased industrial activity on the Pacific coast. It is hoped, however, that the arrival of the first through passengers from the outside will relieve the present tendency to a labor shortage.

In the placer mines there is little demand for skilled labor. With the exceptions of the hoistmen, the pointmen and the timbermen, the majority of the laborers are foreigners, chiefly Russians, Slavs, Montenegrins and Greeks. A few Italians, Swedes, Danes, Finns and other Europeans are employed principally for shoveling the thawed gravel into wheelbarrows and running the barrows to the shaft or to the car, as the case may be—work that corresponds to "mucking" in the Western metal mines. Except for the shovelers, American or Americanized labor is the rule.

## Wages Not So High as They Appear to Be

At first sight, wages appear to be high, but a little analysis shows that they are no higher than is just. Shovelers and other unskilled laborers are paid $5 per day and board; pointmen receive $6 to $7 and board; timbermen, $6 to $7; dump-box men, $6; firemen, $6; hoistmen, $7; blacksmiths, $7. The wage scale is well fixed in the district, and it is only in exceptional cases that there is any variation. When it is considered that the average of employment does not greatly exceed 120 days per year, and that the men must support themselves during the long winters out of their summers' wages, it is seen that high wages are entirely justified.

All of the men in the placer mines work 10 hr. per day. In 1907, the miners' union demanded $6 per day of 8 hr.; the operators offered to compromise on $5 for 8 hr., but the union refused their terms, and a strike was called. An association of operators was formed to fight the union, for which purpose laborers were imported wholesale from the outside. The strike was lost, following which many of the members of the union departed for more attractive fields. The union, discredited in the eyes of the public because of its tactics during the strike, simultaneously passed out of existence. Up to the time of the strike, most of the men employed in the placer mines were from the mining camps of the West, but since then the foreign element imported during the strike has been in the majority. The loss of the strike was due, aside from the prompt but questionable action of the association of operators, to the unreasonable demand of the union for $6 for an 8-hr. day, and to the fact that little skill and no previous experience is required of a common laborer in a placer mine. The men are worked side by side, usually in groups of eight or more, and supervision is a simple task. During the strike, the association of operators advertised widely in the Pacific Coast cities the many advantages of emigrating to Fairbanks. What their statements lacked in truth they made up in color. The same performance was repeated annually even as late as the spring of 1911, with the result that many more men were attracted to the district than there was work for. This caused much hardship and suffering, especially among those that were unable to get away from the camp before the coming of winter. In 1912, however, the supply and the demand became about equal, and this year promises to witness a still greater improvement, from the standpoint of the laborer.

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*Mining engineer, Fairbanks, Alaska.

### Losses through Failure of Mines to Pay Wages

One of the greatest evils in connection with the oversupply of labor was the appalling loss of wages through the failure of various mines to pay operating expenses. Hundreds of thousands of dollars have thus been lost to the laboring men of the camp. Most of the placer ground of the North is worked under lease, the usual royalty being 20 or 25%. All the lessee, or layman, needs is a large stock of optimism and the ability to hypnotize others into seeing visions as highly rose-colored as his own. The owner of the ground cares little whether it pays expenses as long as he gets his royalty regularly. The layman, having little or nothing to start with, feels that he has a world to gain and nothing, of his own, to lose. It was customary in the past to pay the banks and the merchants what was due them first, and to pay the workmen afterward—if there happened to be anything left. During the last few years, however, it has been recognized that the laborer is entitled to prior consideration. This has been due partly to better and more explicit laws and partly to the effect of aroused public opinion. In the last two or three years, the loss of wages in the Fairbanks district has been comparatively slight.

There is no place where men work much harder than they do in the placer mines of Fairbanks. During the short season when sluicing is possible, it becomes necessary to use every available second, and to use it to the fullest. Much of the ground worked is so low grade that the slightest let-up on the part of the laborers would cause the closing of the mine. Thus it is one continuous rush, 10 hr. per day, seven days per week. The man that cannot keep the pace is quickly found out and sent on his way, for, in the eyes of the operator, he not only fails to do the work for which he is paid, but he interferes with his speedier fellow workers. Formerly it was the custom to pay some man of exceptional strength and endurance $1 per day or more extra to set the pace. This is rarely done at present, however.

### Increase in Farming Helps Miners

The men are usually as well fed as the isolation of the camp and the consequent difficulty of obtaining fresh foods will permit. The great increase in farming in the vicinity of Fairbanks in recent years has been a great help to the miners. In the bunkhouses little attempt is made to add to the comfort of the men. Not infrequently as many as 20 are quartered in a single room. Ventilation in the mine is entirely from a central shaft, though a fan is sometimes used. In some cases it is necessary to use electric lights at the face, candles either refusing to burn at all, or else burning with such a smoky flame as to be practically useless. The failure of the candles, however, seems to be due more to excessive water vapor than to the vitiated condition of the atmosphere. In view of the extremely hard work and the poor working and living conditions, it is not difficult to credit the saying of the North that four or five seasons in the placer mines renders a man unfit for hard labor during the rest of his life. While there are some men that do the work year after year without apparent harm, yet there is no denying that the average man is able to stand it only because of the short season.

### Winter Spent in Prospecting

The sluicing season, which begins about May 1, is practically over by Oct. 1. By that time the last boats have departed for the outside, and the man that finds himself out of work is faced by three alternatives: He may go to the coast by way of the government trail to Chitina and the Copper River & Northwestern Ry., and take a boat from there to the States; he may stock a cabin with food and spend the winter in idleness; or he may purchase an outfit of food and clothing and put in the winter in the hills prospecting, hunting, or trapping. To the fact that so many men in Alaska choose to spend the winters prospecting is due the many discoveries of pay gravel that annually start new camps and rejuvenate the old ones.

The development of lode mining during the last three years has introduced a new factor into the labor situation. Skilled men of considerable experience are essential to successful lode mining, especially in new mines where the veins are small and irregular, but comparatively rich. It is probable, however, that at present less than 8% of the laboring men of Fairbanks are engaged in lode mines, but when it is considered that they work about three times as many days in a year as do the placer miners, their relative importance is considerably enhanced.

The skilled miners from the mining camps of the West never took kindly to the 10-hr. day. Since the unskilled foreigners that supplanted them in the placer mines were of little use in the quartz mines, it was natural that the 8-hr. day should early be established in the lode mines. Though several mines attempted to force the 10-hr. day on the men, they met with such poor success that they soon abandoned all efforts in that direction. While the quartz miners of Fairbanks work harder than the men in the average western metal mine, they do not work so hard, even leaving out of consideration the difference in hours, as the placer miners of Fairbanks.

### Eight-Hour Law Probable

About a year ago, Alaska was granted territorial government. The first legislature, which met during the last winter, took up the labor problem. A bill making the 8-hr. day compulsory in all mines was introduced, but it failed to become a law. A similar bill, but applying only to quartz mines, fared better, and is now on the statute books. At the next meeting of the legislature, the same question is sure to be brought up again, and it is probable that the clauses of the bill will be extended to apply to placer mines also. In that event, the placer operators of Fairbanks plan to reduce wages to $4 and board. In view of the high cost of living in Fairbanks and the short season of employment in the placer mines, such a wage will not prove attractive to the miners. Then, it seems likely, Fairbanks will experience its first real shortage of labor.

# Salted Mines

By G. L. Sheldon*

While the practice of mine salting is not as common as it was 20 years or more ago, it is still occasionally done, and in Mexico with particular skill. One of the most successful large-scale operations of this nature was perpetrated at Juneau, Alaska, about 20 years ago. The story was told to me, while on the trail in Mexico, by an engineer who had it from one of the schemers he befriended when he was dying.

Three partners owned a ledge 200 to 300 ft. wide on an island near Juneau. They had done a great deal of work in tunnels, drifts and raises, but the ore was too low-grade to make the property of any value. The owners, however, proceeded to work up a sale on a basis of a total price of $450,000, a 25% payment to be made after examination.

The prospective buyers sent two different corps of engineers, one following the other. One of the owners met the first party in San Francisco, worked into its good graces and assisted in the sampling. He was able to salt the samples so that they represented a value of $4 per ton. The second party was met by another of the owners and the same scheme successfully worked. The samples checked nicely.

Wishing to make assurance doubly sure, the purchasers sent out a third party, but the engineer in charge of this one would have nothing to do with the owners and required them to turn the mine over to him and leave the island. He took two or three tons of samples and the lot, in large sacks, was brought to Juneau and remained on the wharf for several days while waiting for a San Francisco boat, in charge of a watchman night and day.

While the samples were on the wharf, three fellows dressed as travelers or tourists, with their little dude canes, strolling around would come to these sacks, ask the watchman a lot of foolish questions about them, and all the time they would be stabbing and punching the sacks with their dude canes, which were loaded with chloride of gold. This was repeated several times, each time changing the disguise. It was so well done that the third engineer's report was satisfactory and the schemers received their first payment, all that they expected.

About 15 years ago a property on Signal Hill, Cripple Creek, within less than a mile from the town, was salted by using chloride of gold in a shot gun, shooting it into the breasts of the drifts and bottom of the shaft. It was so well done that the swindlers received the first payment, amounting to $10,000.

In boom days of a camp, it is quite common for a prospect hole to be salted with rich ore from some other mine. It was generally worked off on the tenderfoot, the practical mining man being avoided. When chloride of gold is used it can be easily washed off with water, and most of its efficiency destroyed.

About 25 years ago the Mulatos mine in western Chihuahua, Mexico, was salted for a large operator of San Francisco. The mine is a large low-grade property, having a 10-stamp mill on it.

The engineer and assistants representing the purchaser took out their own ore and ran it through the mill, made their own cleanup, with no help except the old Mexican mill man, who had always been on the property, and who looked after the machinery and oiled it.

The returns were satisfactory, the owner went to San Francisco, received his first payment of $100,000, and placing it in one of the banks there, proceeded to have a good time. He wrote and instructed his nephew, at home, to pay the old mill man 10,000 pesos. This seemed too much to the nephew, and he only gave the mill man 1000 pesos. This made the old man mad; he went to the American in charge of the mine, who was doing development work, and told him how, showing his hands, he had let his thumb and finger nails grow out long, and had filled under them, using wax to hold it there, fine placer gold. Every time he went near the battery he worked the gold out into it and thus increased the values satisfactorily.

The American in charge immediately notified the San Francisco purchaser, who obtained an injunction, holding the first payment in the bank, eventually recovering it all except a few thousand that had been joyfully spent. The old Mexican mill man was paid his 10,000 pesos, and procured a little home of his own, living at Sahuaripa, Sonora, 15 years ago when I saw him there.

Three or four years ago a large 50-ft. vein, a recent discovery in central Chihuahua, Mexico, was salted for one of our largest American operating companies. The second corps of engineers had been sent to examine it. The rock was hard and several Mexican miners were employed to assist in taking the samples, breaking them up fine and quartering them down, before being taken to the assay office. They were working under the supervision of an American.

The samples had been averaging $7 to $8 per ton, which checked with the first examination. One of the engineers, a friend who told me of it, one day put a piece of good-looking rock in his pocket and assayed it later. He got nothing and became suspicious. At night, after all had gone to bed he went to the mine alone, took a lot of samples from the main works, took them to the assay office, locked himself in, assayed them and obtained practically nothing. It was found that the Mexicans employed were paid by the Mexican owner to salt the samples, the owner furnishing cigarettes loaded with fine placer gold, the ashes being dropped into the samples.

Nine or ten years ago, when located at Choix, Sinaloa, Mexico, a 40-lb. sample of a new 20-ft. ledge was brought me by an American. We took a general sample ground fine and obtained $20 per ton, by panning in the horn spoon. Knowing well one of the Americans who had had access to the sample, we separated the coarse rock from the fines, washed and dried it, ground and horned it, obtaining practically nothing. We examined the fines with a glass and found that it showed placer gold.

Later another American, claiming to be an engineer, joined the one that salted the sample brought me. They obtained some rich samples from a mine a few miles distant, and with these the E. M. went to Boston, where he had some acquaintances, organized a company on this 20-ft. ledge, sold stock and sent some money to the American on the ground, who then located it and commenced work, doing several hundred feet. A complete 10-stamp mill was purchased, but only a part of it ever reached the mine, which was no good and would not assay $2 per ton. The E. M. stayed in Boston selling stock, the money being sent to the party on the ground, who kept it, cleaning up $40,000 and beating his partner out of his share of it.

This same party a few years previous had salted a placer in Sonora, for an American from Cripple Creek, who was sent to examine it. He assisted in the taking of and panning of the samples, thus being able to drop placer gold into them. The Cripple Creek man admitted to me later that he know the samples were salted, excusing himself by saying that the company sent him to examine only paid his expenses and $2 per day, promising a liberal stock interest contingent upon his reporting favorably. He said this was the only way he could make a dollar out of it. The company spent $28,000, took out $1200 in placer gold, and quit, neither American making anything.

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*Ely, Nevada.

Within the past year two friends, both good, practical mining men of experience, lost $7500, the first payment on a gold prospect in Sonora, even after they had sent a third engineer to check up their examination. A little work demonstrated that it was no good; had been salted.

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## Chino Copper Co.

Report of the Chino Copper Co. for the third quarter of 1913 shows a production of 15,187,003 lb.: 4,893,325 lb. in July; 5,967,600 lb. in August; and 4,326,078 lb. in September. Production for first and second quarters respectively were 12,021,872 lb. and 11,990,832 lb. Average monthly production for three quarters is 4,355,523 lb.

Ore milled during the quarter was 507,650 dry tons, an average of 5518 tons per day, 17% of the material coming from the Hearst orebody.

Average copper content of the ore was 2.23%, and the average extraction 66.98%, a recovery of 29.92 lb. of copper per ton of ore milled. Average grade of concentrates was 14.16% copper.

Cost per pound of copper produced was 8.11c. after allowing for smelter deductions but without making credits for miscellaneous revenue. The latter, amounting to 0.03c. per lb., would reduce the net cost to 8.08c. per pound.

Financial results for the quarter are: net profit from milling, $951,293; miscellaneous income, $43,596; total, $994,889. Deducting dividends paid, net surplus was $351,011. Earnings are based on a copper price of 15c. per lb. Copper on hand at the close of the quarter, sold and unsold, amounted to 19,540,748 lb. Unsold copper inventoried at 13.3c. per pound.

During the quarter additional first mortgage bonds were converted to the amount of $484,000, leaving only $210,500 par value of the original issue of $2,500,000.

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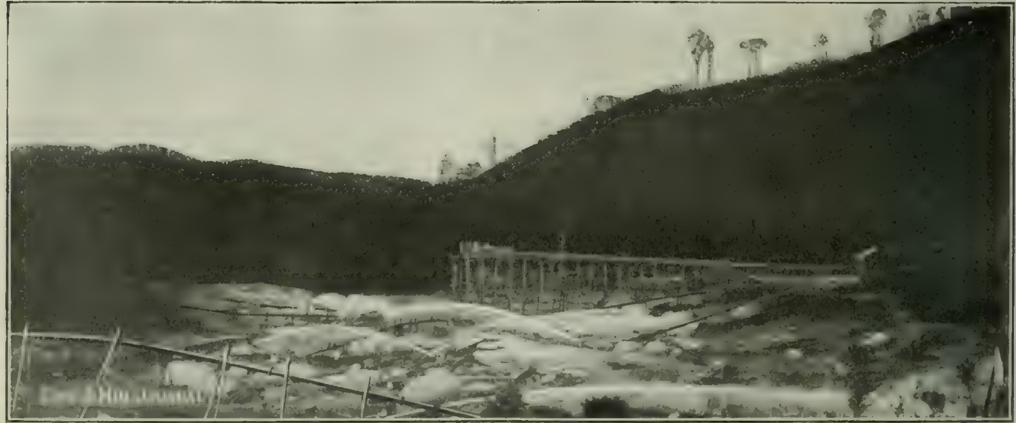
## La Clara Hydraulic Mine, Colombia

Some interesting pictures are presented herewith of a successful hydraulic mine operated in Colombia, South America, by McGuire brothers, of Medellin, Colombia. This property, La Clara mine, is about 50 miles from Medellin. It has been operated for several years by the three McGuire brothers, under lease from J. T. O'Brien, of Medellin.

La Clara mine lies along the Porce River, and is so situated that it is frequently flooded during the freshets. The alluvial deposit contains boulders of large size, some of them measuring 15 ft. in diameter. Therefore, there was no possibility of dredging this property, and as the bedrock has insufficient grade for hydraulicking and no room for tailing dump, it was decided to equip the mine with hydraulic elevators. The deposit varies from 18 to 35 ft. in thickness and the bedrock is hard and uneven, but the present method of working enables the operators to clean practically all this bedrock by hand and also by means of hand nozzles to wash and clean bedrock around the base of the large boulders. Some idea of the size of the boulders may be obtained by noting in comparison the men in an accompanying picture. The present equipment of the mine includes a flume about a mile and a half long, and about one-half mile of main pipeline, beginning with 22 in. and ranging down to 18 and 16 in., with 13 in. branches to two hydraulic elevators, and 11-in. branches to the monitors.



La Clara Hydraulic Mine on the Porce River, Colombia

Water is brought to the property under a head of 280 ft. and the gravel is sent to the elevator pits by three No. 1 giants, which are supplemented by several hose lines used principally in cleaning around boulders and bedrock. The boulders are not blasted or removed, as in many placer operations, but the gravel is carefully cleaned out around them. On account of native labor being the only type available, the equipment as far as possible has been kept of the simplest type. The monitors are No. 1 size, without deflectors, and with the labor available and the type of gravel, they have proved most satisfactory.

Cleaning Out Hole in Bedrock, Small Hydraulic Elevator Pumping to Larger One

Cleaning the Bedrock at La Clara Mine—Monitors Not Working

Hydraulic Elevators Working in Tandem, Giants Playing to Large Elevator and a 1½-In. Nozzle Feeding the Smaller

La Clara Camp, Showing the Pipeline, the McGuire Residence and Farm Adjoining the Mine

One of La Clara Flumes after Working Out the Gravel under It to a Depth of 35 Ft.

Native Miners in Front of La Clara Mine, and Part of the Rock Breakwater

The two hydraulic elevators with 12- and 8-in. discharge, respectively, were furnished by the New York Engineering Co., which also supplied the monitors, and in fact, practically the entire La Clara equipment. The elevators are interesting in that they are equipped with manganese-steel lining plates on the wearing faces, which can be readily replaced when worn. The elevator housing and the throat housing are made of wrought steel, with all joints welded. The nozzle butt is made of forged steel and is finished all over to reduce friction of the water and gravel. The nozzle tip is made of tool steel, and the sizes used range from 1½ to 4 in., depending upon the character of the service desired; the mine being subject to flood, it is occasionally necessary to pump water before gravel washing is attempted.

One of the elevators that was put in service during the last year was reported upon by the owners at a certain date as having dug a hole approximately 200x300x18 ft., or about 36,000 cu.yd., without having given any sign of trouble due to wear; a great improvement over the old type of cast-iron elevator. The depth of the gravel varies frequently. When a deep hole is found in the bedrock and the elevation to the sluice is too great, the two hydraulic elevators are hitched in tandem with the discharge of the one leading into the suction of the other, as shown in one of the accompanying views.

Two sluices are used, one being 3 ft. wide by 18 in. high, the other being 2 ft. 6 in. wide by 24 in. high. Both of these sluices are equipped with riffle bars, consisting of 2-in. square wood strips topped by a special 2x⅜-in. cold-rolled steel strip. The riffles are spaced 2 in. apart and there is no overhanging lip, or projection of the steel top piece. These riffles have proven most efficient for this particular work. The head boxes of these sluices are all inclosed and lined with a manganese-steel striking plate on the top; the discharge from the hydraulic elevator is delivered directly against the manganese-steel striking plate. Formerly a 3-in. wrought-steel striking plate was used, which wore out rapidly, and the use of a 1½-in. manganese-steel striking plate has proved far more durable and economical.

The operating season is usually between December and April. In May the river usually becomes so high that La Clara mine is flooded and no further attempt is made to operate until the latter part of the year. The property, however, is situated in a beautiful and healthful country, at an elevation of 2500 ft., and the McGuire brothers devote themselves to the raising of cattle and sugar cane during the period of the year when "gold farming" is impracticable. They expect to erect during the coming season a sugar mill to handle the cane raised on their ranch.

McGuire brothers cleaned up about $60,000 during the 1912-13 season of about four months, operations being somewhat curtailed by litigation relating to water rights. They have operated this property successfully for several seasons, and one factor in the success has been the fact that the three brothers all remained "on the job" during the season, besides having had practical experience as placer miners in the Western United States. Since the last season's operations were completed, four more hydraulic elevators have been purchased, together with other supplementary equipment. The McGuire brothers are preparing to open another mine across the river from the present operation, and have built a wire-rope suspension bridge to carry a 13-in. pipeline to that property.

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## Mineral Production of New Zealand in 1912

The mineral production of New Zealand for the year ended Dec. 31, 1912, was as follows, according to the official report of the Minister of Mines, the items being arranged in order of descending values: Gold, 343,163 oz.; coal, 2,177,615 tons; kauri gum, 7908 tons; silver, 801,165 oz.; scheelite, 135 tons. Other minerals (greenstone, pumice stone, pyrites and stone) to the value of £7224 were produced. The total value of the mineral production was £3,042,221, a decrease of £150,179 from that of 1911. This decrease was due to the disastrous strikes at Waihi, Reefton and Blackwater.

Six companies are drilling in search of petroleum in the North Island. The second government bonus of £2500 was won by the Taranaki Oil Wells, Ltd., upon their producing 500,000 gal. of crude petroleum from their Moturoa wells. A refinery has recently been built for the treatment of their crude oil.

The works of the Waihi-Paeroa Gold Extraction Co. for treating tailings discharged into the Ohinemuri River by the Waihi and Karangahake mines, has given satisfactory results, which enabled the company to pay a substantial dividend. Fifteen dredges were operated on the West coast and 72 in Otago and Southland. The total production of gold from dredges amounted to £257,333, and dividends paid by registered dredging companies were £38,841.

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## Argo Mill's New Treatment Schedule

Idaho Springs Correspondence

The Argo Reduction & Ore Purchasing Co., of Idaho Springs, Colo., has issued Schedule "D" covering the purchase of ores for treatment in the Argo Mill at the Newhouse Tunnel. This company's mill has been shut down on account of shortage in ore supply but is now operating, the sampling plant starting on Nov. 15. The treatment rates in the new schedule are higher than in the former schedules, because the company found it impossible to operate at a profit under the old rates.

SCHEDULE FOR PURCHASE OF ORE, F.O.B. ARGO MILL

GOLD: Pay $19 per oz., if 0.05 oz., up to 1.5 oz. per ton.
Pay $19.50 per oz., if 1.5 oz. or over per ton.
SILVER: Pay New York quotation, date of assay, for 60% of the silver assay, if 1 oz. or over per ton.
LEAD: Deduct 2 units from the fire assay and pay 25 c. per unit for the balance
COPPER: Deduct 1.5 % from the wet assay and pay $1 per unit for the balance.
ZINC: No pay No penalty
SAMPLING: No charge

TREATMENT CHARGES

| Value of Ore | Charge per Ton |
|---|---|
| Up to $5.00 gross value per ton | $3.50 |
| Over 5.00 to $6.00 | 3.75 |
| Over 6.00 to 7.00 | 4.00 |
| Over 7.00 to 8.00 | 4.25 |
| Over 8.00 to 9.00 | 4.50 |
| Over 9.00 to 10.00 | 4.75 |
| Over 10.00 to 11.00 | 5.00 |
| Over 11.00 to 14.00 | 5.25 |
| Over 14.00 to 20.00 | 5.50 |
| Over 20.00 to 25.00 | 6.25 |
| Over 25.00 to 30.00 | 7.50 |
| Over 30.00 to 35.00 | 8.00 |
| Over 35.00 to 40.00 | 9.00 |
| Over 40.00 to 45.00 | 9.50 |
| Over 45.00 to 50.00 | 10.00 |
| Over 50.00 to 75.00 | 11.00 |
| Over 75.00 gross value per ton | 12.00 |

Note:—Subject to change without notice. No lots less than 10 tons received.

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## Ore at Depth on the Mesabi

Virginia Correspondence

A well hole recently put down in the city of Virginia, on the Mesabi Range, is reported to have disclosed unsuspected features in the geological formation. The hole, something over 700 ft. deep, was drilled with a standard well-drilling outfit and since its object was to obtain a water supply, a rather careless record was kept of the formations traversed. The statement is current, however, that the hole, after passing through the green slates, encountered ore formation again, the drillings showing abundant paint rock with some layers of hematite, and that the hole was bottomed in magnetite running 65 to 70% iron. The significance of this will appeal to those familiar with the Mesabi formation. The green slate is supposed to mark the bottom limits of the ore horizon and magnetite as an ore is unknown on the Mesabi proper. The importance of the discovery depends on its authenticity and this cannot be vouched for. It is unfortunate that a better record was not kept, but it is believed that on another projected hole, arrangements will be made for thorough sampling.

# DETAILS OF PRACTICAL MINING

## afety Alarm for Slack Hoisting Rope

Devices are used at the Harold mine on the Mesabi nge which will automatically signal the engineer, hould a hoisting rope become slack. They consist essenally of cradles of electric conductors stretched under the oisting ropes and arranged to ring a bell in the hoist oom when contact is made with a rope. The accompanying rawing shows the arrangement diagrammatically and the etail of one of the four fastenings. As is general pracice on the Mesabi, the hoist is some distance from the haft and the ropes are supported over this interval by ulleys on wood towers. Two insulated copper cables of wisted wires are stretched between two towers a few feet nder each rope and about 18 in. apart. The ends of the ables are held by turnbuckles and porcelain insulators.

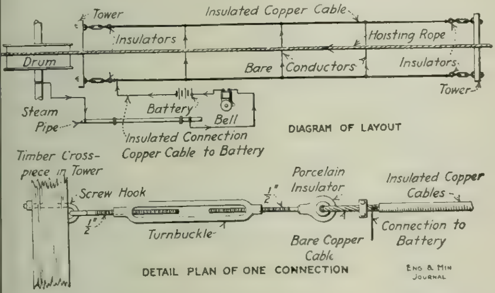

DIAGRAM OF LAYOUT

DETAIL PLAN OF ONE CONNECTION

Several cross-pieces of naked copper wire are connected to the cables and one cable is connected through a battery to the hoist-room bell and grounded to the main steam pipe. The slack rope falling on the naked cross-wires completes the circuit through the hoist and rings the bell.

The hoist room being inclosed, the engineer cannot see what is going on at the headframe. Slack rope indicates trouble from two possible sources. The skip just dumped may get hung up, especially during freezing weather when ice and snow will often jam it; then when the engineer starts the next trip, the skip cannot pull out the rope, which becomes slack and rings the warning. Or the skip may have been hoisted too high, in which case the bottom skip lands and fails to pull out its rope and the slack rope rings the bell again. In either case the engineer will stop his engine and investigate.

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## Blasting the Overburden in Winter

It is considered good practice on the Mesabi to conduct stripping operations through the winter, when possible, for the sake of holding together the mine force. Winter stripping, however, is more difficult and expensive, largely from the necessity of handling frozen ground. To minimize this difficulty, it is often advisable to keep the blasting as close behind the shovel as is safe. The reason for this lies in the fact that the blasted ground does not freeze so readily as that left untouched. Suppose the shovel to make a cut, leaving a fresh face of material behind it exposed to the weather. This, unblasted, will freeze solid before the shovel returns for the next cut and will have to be treated practically as rock. If blasted at once after being exposed, it will remain practically unfrozen until the shovel makes the second cut and can then be easily handled.

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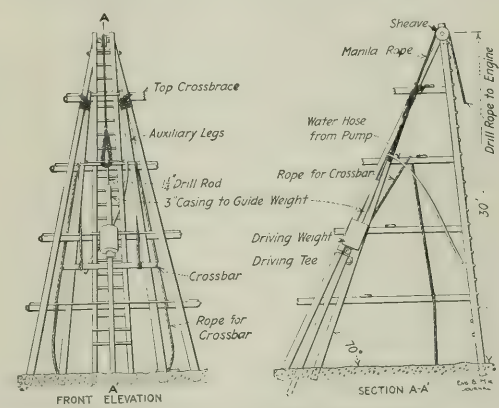
## Churn-Drill Angle Holes on the Cuyuna

By Percy W. Donovan*

The Cuyuna orebodies, while more or less tabular in form, differ from those of the Mesabi in lying at steep angles, being often almost vertical. When drilling began on the range it soon became evident that vertical holes, such as has been standard practice on the Mesabi, were at a disadvantage here. Not only was there danger of missing altogether the somewhat narrow lenses of ore but also after ore had been found, misleading results were often obtained as to the amount existing.



FRONT ELEVATION

SECTION A-A'

Churn-Drill Rig, for Angle Holes

It was clear that it would be more satisfactory to drill holes inclined in a direction opposite to the dip of the ore lenses and their inclosing formation, thus exploring a greater variety of formation with the same length of hole and penetrating an orebody of given thickness with less drilling than if a vertical hole were used. This inclined or angle-hole method is largely used at present, especially on the south range where dips are steeper. Another circumstance favorable to its use, is the fact that the formations are known to dip almost uniformly to the southeast, varying from 45° to 85°. Thus holes started to the northwest have the best chance of intersecting ore.

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*Superintendent of the Cuyuna range, E. J. Longyear Co., Brainerd, Minn.

Whereas diamond-drill holes can be driven at almost any angle, the Lake Superior type is probably the only churn drill that will put down inclined holes and even its use in this connection means the adoption of special devices. This typical Lake Superior outfit differs particularly from those in use in other sections of the country in having a rigid line of drill rods from the bit to a point above the ground. The drilling tool is a chisel bit on the end of a hollow bar, with a perforation on each side a few inches above the cutting edge, which gives the drilling water a passageway from the inside of the bar to the hole. To the tool are screwed successive lengths of 1-in. or 1¼-in. pipe, extending to a point above the casing and constituting the drill rods. The only rope used runs from the end of these rods over the sheave to the engine.

The rod end is also connected by a hose to a boiler-feed pump, which forces water to the cutting edge and washes out the cuttings through the casing around the rods. Drilling is performed by tightening and slacking the rope on the capstan head of a constantly running engine, thus alternately raising the bit and allowing it to fall, the operator meanwhile rotating the end of the rods. Casing is always used; it is driven with a cylindrical weight which strikes on a tee screwed to the top of the casing; a short length of casing extends up from the tee and serves as a guide for the striking weight which slides along it. In general, a hole is begun with 3-in. casing and finished with 2-in.

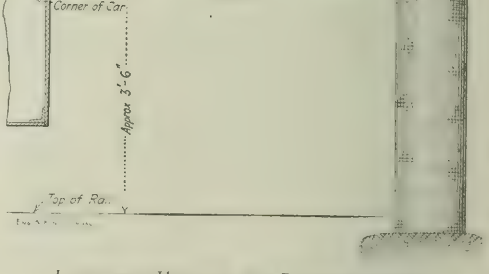
The particular feature in angle-hole drilling to which it is desired to call attention here, while simple, has resulted in a great saving of time and increased efficiency in operation. It consists in the use of two auxiliary legs or poles on the front of the tripod, as indicated in the accompanying illustration. The tripod itself may be set up in the ordinary way, the position and angle of the legs being so disposed as to give the necessary stability and the proper line for the rope over the sheave. The two auxiliary poles are then set up and their upper ends lashed to the tripod legs at the highest of the crossbraces. They are placed to stand at whatever angle it is desired to start the hole. A crossbar is hung on the face of the poles. It is notched in the middle and the 3-in. casing is leaned against it, fitting in the notch. The lower ends of the ropes which hold this crossbar are fastened within reach of the helpers on the ground so that the bar can be quickly lowered or raised as the position of the casing demands. Since the auxiliary legs stand at the correct angle for the hole, the casing will be maintained at its proper angle, no matter where the crossbar is held. When the first 20-ft. length of casing is to be started, the shoe is placed at the point designated for the hole and the upper part is leaned against the crossbar, which is hung about one-third or one-quarter of the way down from the upper end of the casing. As the casing is driven, the bar is lowered and the operation is repeated for the successive lengths.

The advantages thus secured are as follows: (1) Time is saved in setting up the tripod, the main legs being independent of the weight of the casing and its exact angle so that less care in adjustment becomes necessary; (2) greater stability in the set-up is obtained; (3) the correct angle of hole is always maintained above the ground, thereby lessening the danger of deflection below the surface; (4) most important is the fact that the chopping rods do not bind and their action is unimpeded.

It is interesting to note the increased skill and efficiency of the drill men themselves in getting down these angle holes. They were nearly all recruited from the Mesabi range, where their experience had been confined entirely to vertical holes. Accordingly, when drilling was first assuming importance on the Cuyuna range, about seven or eight years ago, angle holes were regarded by the men, and to a certain extent by the contractors themselves, with some apprehension. The rate of progress was 6 to 8 ft. per shift for surface drilling and a depth of overburden of 140 to 150 ft. was considered the limit through which it would be practicable to attempt to sink with angle holes. In fact, the 3-in. casing not infrequently became hopelessly stuck at depths not exceeding 100 ft. Increased experience with the ground, however, and the adaptation of methods to conditions was not long in developing much higher efficiency, until at the present time angle holes are sunk through 200 ft. of overburden quite as a matter of course. Not infrequently the 3-in. casing has been driven through 240 ft. of overburden at the rate of 12 to 15 ft. per shift for the entire distance.

# Latch for Holding Car During Loading

At the Kennedy mine on the North Cuyuna range, the device herewith represented is in use for holding cars while loading from a chute, in cases where the grade might otherwise cause the car to run away. The drawing is an elevation taken diagonally across the drift. The bar is held to a drift post by a staple and is of such a length that when it is caught in a corner of the car, the latter is properly positioned for loading from the chute.



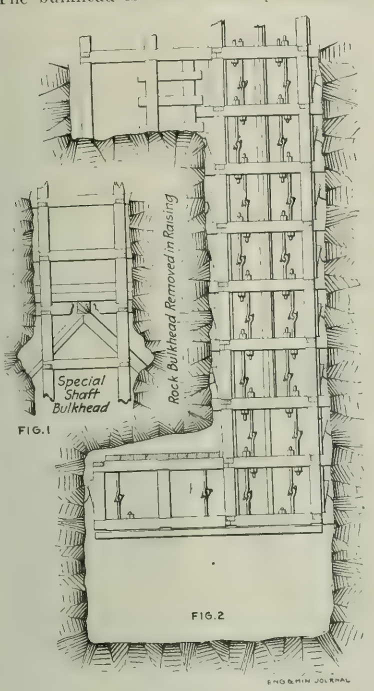
Latch for Holding Car During Loading

* * *

**A Red Light Signal for the Hoisting Engineer** is provided at the Kennedy mine on the north Cuyuna range, to serve as a memory help. A red electric bulb is placed in front of the engineer's stand in line with the center of the drum. At the end of a trip the reverse lever is supposed to be always thrown over. This operation flashes the red bulb and thus impresses itself on the engineer's memory. It is well known that overwinding accidents are often caused by the fact that the engineer thinks he has thrown his reverse for the next trip when, in fact, he has not so that on starting he pulls the conveyance at the shaft collar up into the sheave. The use of a simple device like this ought to help to prevent such accidents.

# Types of Shaft Bulkheads

Shaft continuation is always likely to be going on at several shafts in Butte. Bulkheading is, of course, universal in such cases. Usually a bulkhead is extended under the hoisting compartment of the working portion of the shaft and at a point several hundred feet above in the auxiliary compartment, through which the sinking is conducted ("Bull. A.I.M.E.," August, 1913.) Between these two bulkheads a vertical lining of 2-in. or 3-in. plank is run, separating the two portions of the shaft. The bulkhead is often made by crossing a shaft with several layers of 10x10-in. timber, removing the shaft lagging for several sets above this point and filling the entire space with rock. A specially framed bulkhead is shown in Fig. 1. Another good method is to leave a block of ground, as shown in Fig. 2, for about 30 ft. under the hoisting compartment of the working portion of the shaft. and then take this out by raising when the shaft is finished.



TWO TYPES OF BULKHEADS

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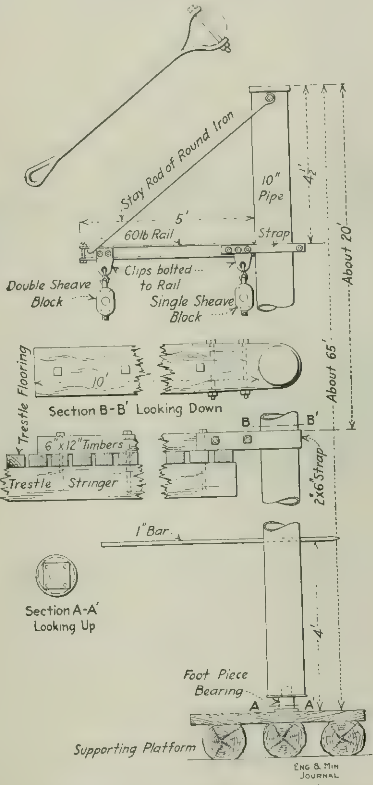
**Machine Drilling in a Caisson** is carried on under rather unusual conditions. With the caisson itself under a pressure of, say, 40 to 60 lb., if compressed air were piped in at the ordinary drilling pressure of 90 lb. and exhausted into the caisson, the net working pressure would be only about 45 lb. If the drilling pressure were only about 75 lb., as frequently is the case, the working margin becomes still less. The same or greater pressure is obtainable, by using the caisson air itself for the machine and exhausting to the atmosphere. This was the method followed in at least one of the concrete drop shafts put down on the Mesabi, when material was encountered which required drilling. The machine inlet was merely opened to the caisson air and a long pipe carried the exhaust through the caisson top to the outside. This method obviated the necessity of generating compressed air of a higher pressure than that required for caisson work but a machine drill with cylinder especially proportioned to the pressure was required.

# Ginpole of 10-In. Pipe

A ginpole used by the Oliver company in the Chisholm district in constructing its stockpile trestles is herewith illustrated. It is built of 10-in. pipe reinforced against possible buckling by pieces of round fir about 3 ft. long inserted three to a length of pipe and bolted to keep them from slipping. The stockpile trestles run from 40 to 50 ft. in height usually and the ginpole will reach perhaps 20 ft. above the floor of the trestle. About 5 ft. from the top a horizontal arm is rigidly attached; it is made of a stout T-rail and is held to the pole by an iron strap and also by an inclined stay-rod of round iron, yoked at the top to embrace the top of the pole, to which it is bolted, and looped under the head of the rail at its lower end. The web of the rail is cut away to permit this looping and the head and base held together by a bolt. Near each end of the rail a clip is bolted, the upper part being a clevis to embrace the web and base of the rail and the lower part pierced to allow blocks to be hung. One double and one single block are used for hoisting.

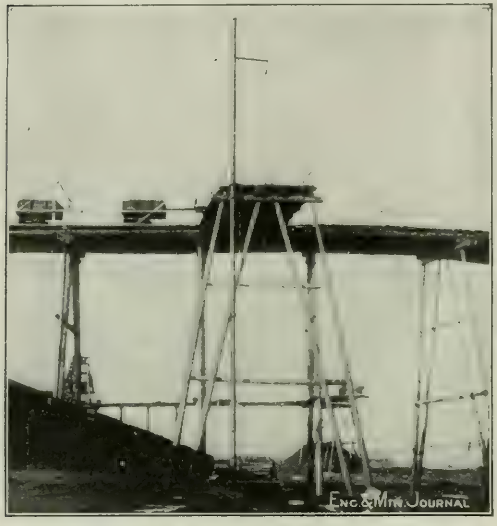


DETAILS OF GINPOLE RIGGED FOR HOISTING

About 20 ft. down from the top the pole is held against the trestle by a horizontal timber, 6x10 in. in section and about 10 ft. long, tapered somewhat at the end next the pole and framed to fit the pole; the bearing is completed at this point by a ½x6-in. strap bolted to the timber and passing around the pole, thus permitting rotation. The timber is fastened to the decking of the trestle.

The lower end of the ginpole is closed with a plate having a hole in the center to fit a foot-piece bearing. This bearing piece is a casting with a square base containing four bolt holes and a vertical cylindrical portion. About 4 ft. above the bearing two opposite holes in the pipe permit the insertion of a bar with which the pole is turned on the bearing described. A rough supporting platform is built of heavy planks and hewn timber.

This ginpole is not used for erecting the trestle bents which are framed on the ground and hoisted with a wooden pole, but a great deal of material goes into the trestle, such as flooring, rails, railings, trolley-wire supports, etc., and there is no way of getting this up from the ground except by the use of some special device, since the shafts are not equipped with cages and the skips are inconvenient as well as being usually otherwise engaged. The details of the pole are shown in the drawing and a pole in position at the end of a trestle, in the halftone.



Gin Pole in Service at End of Stockpile Trestle

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## Sand Filling of Mines

In the annual report of the Central Mining & Investment Co., Johannesburg, S. A., H. F. Marriott states that in 1912, on seven mines of this group, 984,650 tons of sand were lowered into worked-out stopes for filling. The system of operation, described by W. A. Caldecott, in Journ. Chem., Met. and Min. Soc., S. A., September, 1913, consists of transporting sand residue to a cement bin at the shaft head and sluicing it through a pipe into the stopes to be filled.

Usually only dump sand was used because of the presumable danger of poisoning by cyanide contained in fresh tailings, but experience has shown that with proper precautions current sand residue can be employed without danger, and is, in fact, preferable. The use of dump residue usually necessitates the use of considerable lime to neutralize the sulphuric acid formed by the weathering of pyrite, as well as the cost of loading and transporting from dump to shaft. Older dumps also contain considerable amounts of colloidal slime which is undesirable in material deposited underground.

Current residue is already moist and is more easily and cheaply transported to the shaft and sluiced underground. The danger of poisoning from cyanide, either in water or as a gas, is practically obviated by proper procedure, and so conducted is considered quite safe. Such methods are now being widely practiced.

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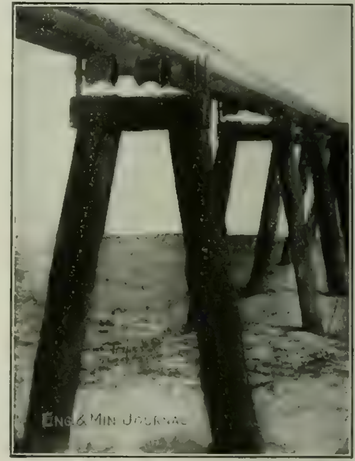
## Supporting Bents for Steam Line

Certain conditions at the Pettit mine on the Mesabi range made it necessary to locate the power plant some distance away from the shaft. A 5-in. and a 4-in. steam line for the pumps and a 4-in. return water line are carried over this interval on supports as shown. The bents are of varying height according to the ground, the higher ones with battered posts, the shorter with straight. The posts are of 8-in. round timber and the caps are 6x6x26 in. The posts shown have a batter of about one in seven. To the end of each cap two brackets of $\frac{5}{8}$x$2\frac{1}{2}$-in. iron are fastened by lagscrews as shown, the upright portion being about 8 in. high. These support a transverse piece of $1\frac{1}{4}$-in. round iron on which three rollers are threaded. The rollers are 5 in. in their greatest diameter and 5 in. long, with the faces curved to fit the pipe approximately.



Wooden Bents and Rollers for Long Steam Line

The round bar is held in the brackets by cotters through holes in the ends.

The lines are about 1000 ft. long but have no other provision for expansion than the bends at the three turns that are made. It will be noticed that the rollers permit lateral motion as well as longitudinal so that the necessary movement at the corners is possible. The two steam lines are jacketed in insulating material and painted. The water pipe is bare but is painted, as is the other iron work and the bents as well.

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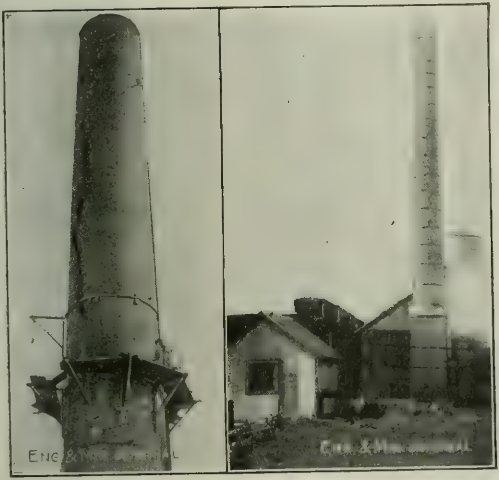
**As a Site for the Proposed Government Armor Plant,** the old works of Milliken Bros. on Staten Island are being urged for consideration.

# DETAILS OF METALLURGICAL PRACTICE

## Repairing a Cracked Chimney

The brick chimney at the Monroe mine on the Mesabi was struck by lightning and cracked for some distance down from the top. While the crack did not threaten the immediate destruction of the stack, it permitted the smoke to issue near the top, blackening the outside, as can be seen in Fig. 1. The management felt some anxiety as to the stability of the structure and decided to have it repaired. The job was done by the Custodis company, the original builders. It consisted of closing the crevice with new material and binding the chimney from top to bottom with iron straps. The method of work, while not unique, is interesting. The man engaged in the task worked from a platform supported on eight wood brackets, as shown in Fig. 1, the brackets themselves being hung from a cable thrown around the stack. Wire rope, ¾ in. in diameter, was used for this and was wedged out from the chimney so as to be tight and at the same time permit the brackets to be hung with the iron hooks attached to their necks. The bottoms of the brackets were also wedged out so that the slant of the top pieces was toward the chimney, thus making the platform somewhat more safe. A duplicate cable was placed above the one supporting the platform and on this was hung another bracket with a block for hoisting material. After the work at one point was finished the brackets were lifted off the lower cable one at a time and hung on the upper, the platform raised to the new level and the lower cable changed to a point above the other. The top of the chimney was reached in this way. The bands are spaced 6 ft. and are of ½x3-in. iron, made in three sections and bolted together for convenience in handling.



The Cracked and Repaired Chimney

Fig. 2 shows the chimney completely repaired. It is now equipped with two lightning rods tipped with platinum.

⁂

## Safety Rules—Tracks, Cars, Trestles, Etc.*

(1) All railroad crossings shall be planked over.

(2) When possible, all material shall be piled at least 4½ ft. from the track. Where this cannot be done, a sign should be provided, "No clearance for man on side of car."

(3) Scrap and other material should be kept cleaned up when lying along track.

(4) Litter boxes should be placed, wherever necessary, to keep the plant clean.

(5) All switches, guard rails and frogs should be blocked.

(6) The levers on switch stands should be thrown parallel with the track if possible.

(7) Wires, etc., should be placed at least 22 ft. above tracks, or tell-tales should be provided.

(8) Suitable bumpers should be placed at the ends of all stub tracks and track ends should be elevated.

(9) Tracks should be located, wherever possible, so as to give at least 4½-ft. clearance between the rail and any obstacle.

(10) Doors should not open out on the tracks; wherever doors do so open out, they shall be provided with a safety gate or otherwise guarded.

(11) Railings should be provided on walls along depressed tracks, provided they do not interfere with loading material on cars.

(12) To prevent persons from stepping on tracks in front of moving trains at corners of buildings, and all other places where vision is obstructed, a guard rail should be erected.

(13) There shall be placed a blue flag (or at night a blue light) at the end of all cars where men are working. Care should be taken in loading material on cars to see that no portion will project over the sides or fall off in transit. See that the weight of the load is properly distributed on the cars and that large pieces are braced to prevent shifting.

(14) When dropping cars on inclined tracks, great care should be taken to see that no one is struck by the car. Warn all persons and keep a good lookout ahead.

(15) Test all brakes before dropping cars and do not use pipes to turn brakes when riding at the front end of a car, as there is danger of the pipes slipping and throwing you in front of the moving car; use a rough stick for this purpose. If a brake is defective, never attempt to ride on the front end of a car; get off the car as soon as possible.

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*From Inland Steel Co.'s book of rules.

(16) Where cars are liable to run down inclined tracks or where men are working in cars on tracks, a stop device to fit on rails should be provided.

(17) All locomotive engines should be equipped with headlights at each end.

(18) Suitable fenders should be provided on push cars, transfer cars, etc., to prevent men from getting their feet under the wheels.

(19) When opening cars, exercise great care that the dumping lever does not fly and strike you. Do not block up side-dump gondola-car doors, as they may fall and strike you.

(20) Keep off all railway tracks, except at regular crossings provided for that purpose. Use great care, before crossing any tracks.

(21) Guy lines must not be fastened to railroad tracks until after the switches are spiked on the tracks and the tracks abandoned. All guy lines fastened near tracks must be carefully examined to see that there is $4\frac{1}{2}$ ft. side clearance and 22 ft. top clearance for passing trains.

(22) Trestles should be equipped with walks, the outer edge of which should be at least 6 ft. from the rail and extend to within 4 in. of ends of ties, wherever practicable.

(23) Wherever there is a driveway or passageway under a trestle, it should be completely covered over at that point.

(24) Substantial bumpers should be placed at end of all trestle tracks.

(25) Do not work under overhead trestles when they are in use and keep from under them as much as possible.

⁂

## A New Bromocyanide Reagent

A new reagent for generating bromocyanide and similar haloid compounds without waste of either cyanide or halide salt is proposed by Hans Foersterling, of the Roessler-Hasslacher company (U. S. pat. 1,076,006). He melts sodium cyanide and bromide (to take a specific case) in equal molecular proportions. There is no loss or decomposition in this process.

The solidified reagent, thus produced, is then used for the production of bromocyanide by treatment in acid solution with a soluble peroxide (hydrogen peroxide may be used).

$$NaBr + NaCy + H_2O_2 + H_2SO_4 = BrCy + Na_2SO_4 + 2\,H_2SO_4$$

An alkaline solution cannot be used, since

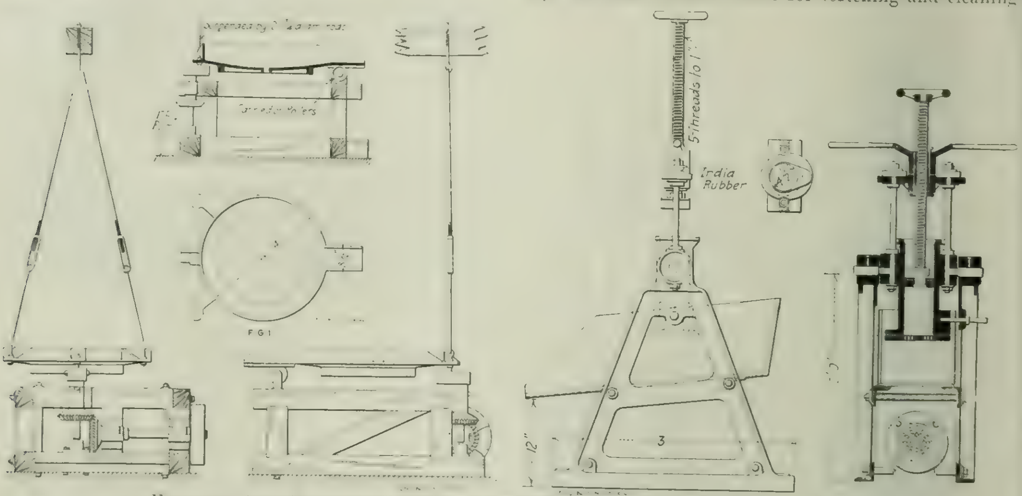
$$NaBr + NaCy + H_2O_2 = NaBr + NaCyO + H_2O$$

The new reagent avoids the difficulty of the old bromocyanide process, of loss of reagent due to unintelligent mixing.

⁂

## A Batea and Amalgam Press

Several devices have been gotten up for cleaning and squeezing the amalgam taken from the copper plates of gold mills, wherein the pulp is subjected to amalgamation at any stage in the process of ore treatment. Perhaps the most common device for softening and cleaning this amalgam is the cylindrical amalgam barrel. In Australia the Berdan pan is in great favor for this work, and is also used in many mines in the United States, such as the North Star in California.



End and Side Elevation of Batea and Amalgam Press Used on the Rand

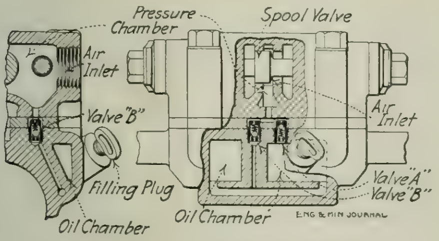
In the gold mines of the Rand, the batea is sometimes used for cleaning amalgam, but it is not frequently seen in the gold mines of the United States. The batea there in use is described by C. O. Schmitt, in "A Textbook of Rand Metallurgical Practice," Vol. 2, and is illustrated by the accompanying drawing. The only feature calling for remark about this batea is that rim of the pan is made rather higher than usual. The motion of the batea is obtained from a crank driven through a set of bevel gears by a countershaft. The usual speed of the crank is 125 r.p.m. It is usual to suspend the batea as shown in the accompanying illustration.

After softening and cleaning the amalgam from the plates, either in an amalgam barrel, Berdan pan, or batea, some sort of press is necessary for squeezing out the excess mercury. This is also illustrated above.

# MINING & METALLURGICAL MACHINERY

## Automatic Air Drill Lubricator

The accompanying drawing shows sections of a new pulsation lubricator applied by the Sullivan company to its latest piston-drill models. The device consists of an oil chamber cast in the top of the cylinder shell below the valve chest, from which the lubricating oil is sent to the valve by the pulsations of the actuating air, and thence to the cylinder of the drill. The chamber is connected with the valve chest by means of two small valves *A* and *B* screwed in the top of the cylinder shell. The method of operation is as follows: When the spool valve of the machine reaches its middle position the inlet ports to both halves of the cylinder are cut off for an instant and the pressure in the chamber surrounding the valve undergoes a momentary rise. The spring of valve *A* is so adjusted that this increase in pressure overcomes its resistance, depressing the ball from its seat, and permitting the injection of a small amount of highly compressed air into the oil chamber. When the spool valve reaches the end of its stroke, uncovering the port to one side of the cylinder, there is rush of air from the pressure chamber of the valve to the cylinder, which lowers the pressure in the valve chamber to such a point that the spring in valve *B* is overcome by the pressure of the air previously admitted to the oil chamber, allowing the ball in this valve to rise from its seat, and permitting the passage of a small amount of oil to the pressure chamber of the valve, whence it is distributed to the cylinder of the drill.



Sullivan Pulsator Oiler for Piston Drills

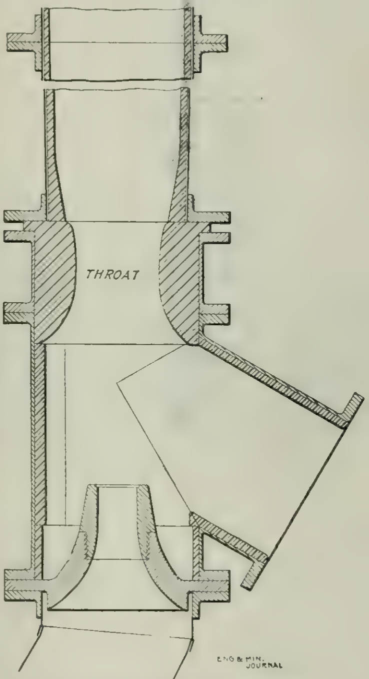
This would seem to be a compact, simple, reliable and theoretically correct method of lubricating air drills. The amount of oil admitted varies directly with the amount and rate of drilling, which is not ordinarily the case with automatic lubricators. The springs in the valves *A* and *B* are so adjusted as to work satisfactorily for a variation in pressure of 15 lb. in the air employed. The oil chamber will hold about a pint of lubricant and is filled through an opening stopped with a thumb plug, which is so placed as to permit filling whether in horizontal or vertical position.

The use of a valve of this type ought to be conducive to speed and economy, and besides relieves the operator from the bother of attending to the lubrication.

## Empire Hydraulic Elevator

Where the alluvial deposit lies below the general drainage level of the country, or where the grade is insufficient to provide room for stacking the tailing, the hydraulic elevator may be used with success. It is also applicable where the ground contains exceedingly large boulders and the bedrock is too hard and rough for dredging. An ample supply of water, however, is essential.

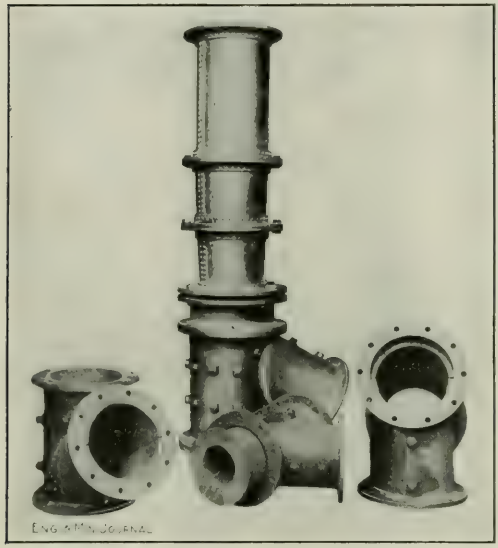
The elevators are generally arranged in a sump cut in the bedrock, and the gravel from the bank is washed by monitors through a ground sluice to this sump. The elevators pick up the gravel and water from the sump and raise it to the sluice box. This leaves the bedrock exposed, so that it may be readily cleaned by hand; exceptionally large boulders may be left in place and the bedrock around the base can be cleaned with a small hand nozzle.



Empire Hydraulic Elevator

The hydraulic elevator consists of a tube into which a jet of water is introduced under pressure; the velocity of the moving mass of water from this jet acts on a larger body of water introduced at the suction end of the tube and causes it to be discharged at the other end with force sufficient to lift it to a certain height, proportionate to the pressure and volume of the jet stream. This mass of moving water with its great velocity will carry along with it a certain proportion of sand and gravel, including any large stones that can pass through the suction.

Sand and gravel are an ideal abrasive material, therefore one of the principal points in the design of an elevator is to overcome or take care of this excessive wear. Another point is the matter of efficiency, which must be carefully regarded. The shape of the interior must permit the large stones that enter the suction to pass through the elevator without clogging. The ready renewal of wearing parts in the elevator is another feature. All of these points have been carefully considered in the designing of the Empire hydraulic elevator, built by the New York Engineering Co., of 2 Rector St., New York.



Empire Hydraulic Elevator, Showing Steel Lining

The body housing of the Empire elevator is made of ½-in. steel, and all the forged-steel flanges, as well as the suction branch, are connected by welding. The flanges are faced true with the body after welding. The throat housing is made in the same manner. Welded housings combine the advantages both of the cast and riveted housings without having their defects. The nozzle butt, which is bolted to the lower flange of the body housing, is made of a rolled-steel forging turned and polished on the inside. This construction affords strength and because of the absence of blow-holes or other imperfections inherent in most cast nozzle butts, it will resist wear and thus retain its most economic shape for a long time. The nozzle tip is attached to the nozzle butt by means of a coarse thread (four threads per inch), and is made of tool steel hardened in oil; the inside is polished and the discharge edge of the nozzle is counterbored to prevent chipping of this edge and consequent "brooming" of the jet. Around the circumference, at the top of the nozzle tip, holes are drilled for insertion of a spanner wrench or bar.

The throat is a solid manganese-steel casting of such shape as to give greatest hydraulic efficiency, but at the same time to prevent the jamming of material at the throat. The throat piece is held in position by means of a projecting flange between the top flange of the throat housing and the bottom flange of the discharge reducer.

The lining of the body of the elevator consists of manganese-steel liner bars which may be reversed and interchanged when worn. They are fastened by means of square-head countersunk bolts, countersunk on a bevel the entire thickness of the liner bar. The washers under the nuts of the bolts on the outside are milled cylindrical to fit the housing. The liners in the suction branch are two half-cylindrical shells made to fit the intersection line of this branch and the vertical housing. They are kept in place by means of countersunk bolts, in the same manner as the body liners. The construction is shown in the accompanying illustrations.

The reducer housings are riveted up in sections and are lined with manganese-steel half shells, fitting tight into same, no other means of fastening being necessary. This lining extends four to eight feet above the throat, varying with the size and the duty of the elevator. The uptake pipes are made in 4- to 8-ft. sections; the flanges of the uptake pipes are fastened by calking or peening the pipe end into a recess in the flange. This method results in obtaining the same thickness of wall at the flange connections as in the rest of the pipe, and also assures a proper butting of the uptake sections. None of these advantages can be obtained by threading the flanges and the pipe or by riveting the flanges to the pipe. When the uptake pipe is worn out, the flanges can be easily detached and used again.

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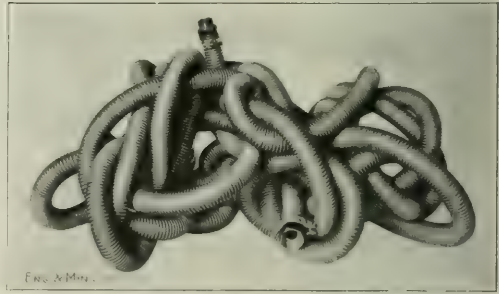
## Kantkink Metallic Hose

Kantkink flexible metallic hose is a radical departure from the regular protected hose introduced by the Goodyear Tire & Rubber Co., Akron, Ohio. It is a high-quality hose with an almost indestructible armor of high-carbon wires so interlocked as to admit of marvelous flexibility and great strength. One may tie a length of Kantkink into the fantastic series of knots shown in the picture presented herewith without sign of injury whatsoever. Of course, it can be injured by willful abuse, but not in actual service. There are no sharp, rough edges, and it cannot be kinked.



Section of Kantkink Hose

Service tests have shown its ability to withstand a pressure in excess of 1000 lb. per square inch. Kantkink flexible metallic hose is exceptional in rendering service for compressed air, air drill, flue cleaner, gas, spray, pneumatic tool, boiler, test water and steam.

# Assay of Gold and Silver by Iron-Nail Method

By E. J. Hall[1] and C. W. Drury[2]

*SYNOPSIS—A report on a series of tests on the accuracy of the iron-nail method of assay. The conclusion is reached that with high sulphide sulphur, the silver loss is excessive on all ores, the gold loss too great on rich ones. On gold ores under 1 oz. the method seems generally applicable.*

⁂

The advantages and shortcomings of the nails method of assaying are more or less appreciated, but there is no available data on its accuracy under varying conditions, and the following results of experiments conducted in the Department of Metallurgy, Columbia University, are presented to elucidate this point.

It is well known that the fusion obtained in the lead assay is far more satisfactory than that in the nails method for gold and silver. The principal difference in the charges, as a class, is the presence of much reducing agent in the lead charge and a limited oxidizing action of the nails charge, due to PbO. The possibility of improving the nails fusions by simulating the lead charge was the reason for using argol in some tests, even though there were reasons for expecting this would have an objectionable effect on the results.

## Experiments on Prepared Material

The gold- and the silver-bearing material for these tests was prepared by impregnating cupels, made from pulverized quartz, with gold and silver solutions and then converting the gold to the metallic, and silver to the sulphide, state. The gold-bearing material contained 24.05 mg. of gold per ½ gram and the silver-bearing material 73.77 mg. silver per gram.

RESULTS OF TESTS BY THE NAIL, NAIL-ARGOL, AND NITER METHODS

| Test No. | Pyrites (88.9% FeS₂) grams | Charge Argol grams | Charge Niter grams | Assay Gold mg. | Assay Silver mg. | Sulphur in iron pyrites grams | Weight of slag grams | Sulphur in Slag Total % | Sulphur grams | Sulphide % | Sulphur grams | Oxidized[3] % | Sulphur grams | Sulphur % | Removed grams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. 1 | | | | | | | | | | | | | | | |
| A | 0.96 | . . | ..... | 24.14 | 73.78 | 0.455 | 43.7 | 1.1 | 0.48 | 0.095 | 0.043 | 1.01 | 0.43 | | ..... |
| B | 0.96 | 5 | ..... | 23.68 | 71.46 | 0.455 | 36.5 | 1.0 | 0.365 | 0.33 | 0.117 | 0.66 | 0.248 | 19.7 | 0.09 |
| C | 0.96 | 1 | ..... | 24.08 | 74.10 | 0.455 | ..... | ..... | .... | . | . . | ..... | | . | ... |
| No. 2 | | | | | | | | | | | | | | | |
| A | 2.08 | ..... | ..... | 24.18 | 73.42 | 0.982 | 45.0 | 2.0 | 0.90 | 0.48 | 0.216 | 1.52 | 0.69 | 8.1 | 0.08 |
| B | 2.08 | 5 | . .. | 23.65 | 72.09 | 0.982 | ..... | 1.9 | ... | 0.84 | . . | 1.06 | | . | ... |
| (1) | | | | (1) | (1) | | | | | | | | | | |
| C | 2.08 | ..... | .. .. | 23.92 | 72.96 | 0.982 | ... | ... | | | . | . | | | . . |
| No. 3 | | | | | | | | | | | | | | | |
| A | 3.2 | .. .. | .. .. | 23.97 | 72.92 | 1.52 | 48.2 | 2.6 | 1.25 | 0.97 | 0.467 | 1.63 | 0.79 | 17.7 | 0.27 |
| B | 3.2 | 5 | . ... | 24.10 | 72.96 | 1.52 | 38.5 | 2.9 | 1.1 | 1.9 | 0.731 | 1.0 | 0.37 | 26.9 | 0.41 |
| C | 3.2 | ..... | 2 | 24.12 | 74.88 | 1.52 | ..... | .. . | | . | | | | . | ... |
| No. 4 | | | | | | | | | | | | | | | |
| A | 6.4 | ..... | .. | 23.88 | 71.02 | 3.03 | 50.7 | 5.4 | 2.73 | 3.07 | 1.55 | 2.33 | 1.18 | 10.0 | 0.3 |
| (2) | | | | (2) | (2) | | | | | | | | | | |
| B | 6.4 | 5 | . | 21.36 | 60.78 | 3.03 | 37.5 | 5.7 | 2.13 | 3.7 | 1.61 | 2.0 | 0.52 | 29.7 | 0.9 |
| C | 6.4 | .... . | 9 | 24.14 | 73.82 | 3.03 | . . | . . | . | | .. | . | . | | .. |
| No. 5 | | | | | | | | | | | | | | | |
| A | 9.6 | .. . | . . | 23.98 | 70.14 | 4.55 | 52.8 | 7.6 | 4.0 | 4.87 | 2.57 | 2.73 | 1.5 | 12.1 | 0.55 |
| B | 9.6 | 5 | ..... | 23.92 | 66.10 | 4.55 | 42.5 | 7.5 | 3.28 | 5.3 | 2.25 | 2.2 | 1.03 | 27.9 | 1.27 |
| C | 9.6 | .. | 17 | 24.16 | 74.84 | 4.55 | . | | . | | | | | . . | .... |
| No. 6 | | | | | | | | | | | | | | | |
| A | 12.8 | . | ... . | 23.83 | 67.45 | 6.02 | 57.5 | 8.8 | 5.06 | 6.01 | 3.45 | 2.79 | 1.61 | 16.5 | 0.96 |
| B | 12.8 | 5 | ... | 24.00 | 63.68 | 6.02 | 48.5 | 8.4 | 4.15 | 6.71 | 3.25 | 1.69 | 0.90 | 31.0 | 1.87 |
| C | 12.8 | .... | 24 | 24.18 | 74.18 | 6.02 | .. . | . | . | . | . | | | . | .... |
| No. 7 | | | | | | | | | | | | | | | |
| A | 14.5 | | .... | 23.99 | 66.13 | 6.86 | 62.4 | 6.8 | 4.25 | 5.5 | 3.43 | 1.3 | 0.82 | 38.0 | 2.61 |
| B | 14.5 | 5 | | 24.12 | 62.56 | 6.86 | 46.0 | 8.8 | 4.0 | 7.6 | 3.49 | 1.2 | 0.55 | 40.5 | 2.80 |
| C | 14.5 | | 32 | 24.09 | 73.90 | 6.86 | . . | | | | | | | ... | .. |

Uncorrected results of gold material, 24.08 mg.
Uncorrected results of silver material, 73.77 mg.
Tests marked A Nail Assay.
Tests marked B Nails Assay + 5 grams argol.
Tests marked C Niter Assays.

Note 1. Bead No. 2C froze
Note 2. In assay No 4B a little lead was lost
Note 3 Oxidized sulphur obtained by difference.
Tests No. 1, 2, 3, 4, 5, 6, 7, corresponded to 6, 13, 20, 40, 60, 80, 89.9% respectively of pure pyrites on ½ A T

The pyrite ($FeS_2$) used was ground to 120 mesh and the sulphur determined as 47.4%, equivalent to 88.9% $FeS_2$.

The following experiments were carried on with varying mixtures of pyrite and silica, to which were added definite amounts of the gold and silver material. The mixtures contained, 6%, 13%, 20%, 40%, 60%, 80% and 88.9% of pure pyrite, or, 6.7%, 14.6%, 22.4%, 44.9%, 67.4%, 90% and 100% of the impure pyrite (88.9% pure), enough silica being added to the pyrite to make ½ assay ton.

While these tests were made primarily to determine the value of the nails charge, it was thought advisable to run niter fusions on the same series, particularly in view of the oft repeated statement, that charges requiring more than 20 grams of niter were not satisfactory. The nails charges were (tests A and B):

| | |
|---|---|
| Pyrite mixture | 0.5 a.t. |
| Sodium carbonate | 30 grams |
| Litharge | 25 grams |
| Borax glass | 10 grams |
| Nails, 10-penny | 4 grams |

Test A contained no argol, while test B contained five grams in each assay. For the niter tests (tests C), the following charge was used:

| | |
|---|---|
| Pyrite mixture | 0.5 a.t. |
| Sodium carbonate | 15 grams |
| Litharge | 105 grams |
| Silica | 5 grams |
| Borax glass | 7 grams |
| Niter or argol to give the required amount of lead. | |

The silica and so large an amount of flux are not required in the lower pyrite mixtures, but were used to make the flux charge uniform. The number of grams of pyrite in ½ assay ton of mixture is indicated in the large accompanying table.

The fusion of the nail charges which contained no argol were of the usual character, those containing small amounts of pyrite were fairly satisfactory, but as the percentage of pyrite increased there was less complete dis-

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Note—Abstract by the authors from their article, "Bull.," A. I. M. E., June, 1913.

[1] Assistant professor, department of metallurgy, Columbia University.

[2] Lecturer in mining and metallurgy, School of Mining, Kingston, Ontario.

solution of constituents; the nails were badly corroded, and in some cases, to such an extent that they sank beneath the slag. The lead did not collect perfectly in all cases, leaving small particles in the crucible on pouring.

### Argol Improved Results

The charges containing argol were much better, but showed the same general effect with the increased amount of pyrite. Complete dissolution seemed to take place and in no case were the nails corroded to such an extent that they disappeared. The charges poured much better, showing a good collection of the lead. This improved condition is unquestionably due to the decrease in oxidation of constituents in the charge. As this charge is highly basic, containing large amounts of sodium carbonate, the sulphides are readily soluble, but, if the iron present is converted to oxide, this will not be readily taken into solution. It is not permissible to make this slag highly acid to take these oxides into solution, as the sulphides would then fail to dissolve.

It was noticed in the different fusions that the character of furnace atmosphere, whether oxidizing or reducing, had considerable effect on the charge. If the atmosphere was strongly oxidizing the fusion was not nearly so good as when it was reducing. This was apparently due to the same causes as where argol is present in one case and absent in the other.

The large increased weight of slag in charges high in pyrite is due partly to the greater amount of iron dissolved, and partly to the material corroded from the crucible on account of the much more basic character of these slags.

It was considered probable that the amount of sulphur in the slag and its state of oxidation had a decided effect on the results. Therefore, the slags were analyzed for sulphur compounds. The results are included in the accompanying table.

### Sulphur as Sulphide Causes Silver Loss

From the results, it will be noted that the silver losses increase with the sulphur content. Also, that in charges containing argol, the loss is somewhat greater than where argol is omitted. The principal difference in the slags of these two methods is in the percentage of sulphide sulphur present, particularly in the early stages of fusion when oxidation is prevented in the charge containing argol. This indicates that the silver losses are due to sulphide sulphur.

This explanation seems quite reasonable as the slags are somewhat of the nature of a matte, particularly where sulphide sulphur is high, and it is well known that mattes are good solvents for silver. For the same reasons, it was expected that the gold loss would also increase to a condesirable extent. It will be noted from the table that the increased loss is not proportionate to the silver loss, nor does it seem to increase progressively with the sulphur.

It may be interesting to note that the iron dissolved from the nails is considerably in excess of that required to form iron sulphide (FeS), and that the scale or coating on nails after fusion was iron oxide and not iron sulphide. It was demonstrated that metallic iron will reduce sodium sulphate formed by oxidation, in these charges, with the production of sulphide, itself being oxidized. The sulphide is subject to atmosphere reoxidation and again reacts with the iron, giving a continuous cycle at the expense of the nails. It is the production of this large amount of iron oxide in a high-soda, low-acid charge which accounts for the unsatisfactory fusion and poor slag in this assay.

### Results of Nails and Niter Methods

The nails method gives low results for silver with ores containing above certain amounts of sulphide sulphur, this loss increasing with the percentage of sulphur in the ore, reaching a maximum of about 10 per cent. in the straight nails charge under the conditions of this test. In the case where argol was used, giving increased sulphide sulphur in the slag, the maximum loss was about 15%. The gold results are irregular and somewhat lower, possibly 1%. The loss does not appear to be affected by the addition of argol to the charge. Silver determinations in high sulphide ores should not be made by the method, except for approximate results. When the sulphur in the ore is not much greater than will be oxidized by the PbO, a fair approximation may be obtained. The method will give fairly good results on medium- and low-grade gold ores, say one ounce, as the loss is less than the accuracy of ordinary work. The niter method gives good results, even with as much as 30 grams of niter present in the charge, and a 30-gram button is necessary in assays containing a large amount of niter.

A portion of the iron nails which project into the lead is converted to sulphide, but the greater amount of iron, that in contact with the slag, is removed as iron oxide. The scale on the iron nails is not iron sulphide, but a mixture of ferric oxide, magnetite and slag. To obtain a good slag by the nails method with slight corrosion of nails, it is necessary to protect fusion from oxidation. This, however, will lower silver results.

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## Natural Gas in Austria and Hungary

The natural-gas occurrences lately discovered at Wels, in Upper Austria, have been the subject of very careful examination by Mr. Werndl, who publishes the results in the *Berg- und Hüttenmännische Rundschau.* As regards chemical composition the gas is almost identical with that of Neuengamme, near Hamburg, the methane contents being in both cases 91.5%. Though the discovery of the gas is of comparatively recent date, several manufacturing concerns in the neighborhood of Wels are already supplied with power by the existing wells. Its calorific value is high, the cubic meter being equal to 8321 cal., which means that the gas would be suitable for metallurgical purposes. The Austrian government is actively engaged in further exploring the ground.

The boreholes pierced in Hungary in search of potash have proved barren of that substance, but have, as is known, resulted in the discovery of large volumes of pure natural gas, says the *Mining Journal,* Sept. 13, 1913. M. Herbing, in *Zeitschrift für Angewandte Chemie,* imparts the ensuing particulars. The first borehole was sunk at Kissarmus, in Transylvania, and continues to discharge gas with the same energy as during the past two years, which appears to confirm the opinion of the existence of an extensive area of productive strata. Geological investigations have shown that the presence of gas is associated with an anticlinal 50 miles long, and that the strata, so far from being undisturbed, as was supposed, are considerably folded. Escapes of natural gas from streams and ponds are frequent, and the occurrence at Kissarmus may not be singular, since tectonic considerations render it probable that rocks throughout the province are permeated by the gas. From the commencement the first bore yielded about 800,000 cu.m. of gas with 99% of $CH_4$, but after a gas explosion in a neighboring work it increased to a million in 24 hr. From five other boreholes, whose depths varied from 220 to 720 ft., were obtained from 36,000 to 210,000 cu.m., or a total of 431,000 in 24 hr., which, with other wells, reached 440,000 per diem. As the abundance of gas is in relation to depth, the yield can be enhanced by deepening the bores should they show symptoms of abatement. The output of the principal borehole could be conveyed by piping—280 miles—to Buda-Pest for an estimated outlay of £846,000. This city burns 300,000 cu.m. of gas daily, and the cities situated along the route would easily absorb the surplus. Observing what is taking place with natural gas in America, there is no doubt that Hungary will profit by the use of this fuel during a long future.

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# Patience and Cheap Labor in Mexican Mining

By William H. Yeandle*

Many of our friends would have us believe that Mexico still presents a fertile field to the sober and industrious prospector. Their error lies in their failure to realize that several million patient, if not sober and industrious, prospectors have been investigating Mexico for nearly 400 years. Should you stumble unassisted across an outcropping showing surface values, you will usually find, on inquiry, that Timotéo's great-grandfather drove the narrow little tunnel on the hanging-wall streak, which you overlooked, or that Juan Sánchez brought in sorted ore from the same outcropping week before last.

Perhaps the most common problem which confronts the examining engineer in Mexico, is as to whether the old mine can be made profitable by extensive development and the application of modern methods. Alas, too often the old opencuts are taken as *prima facie* evidence in the affirmative, with entire omission of the factors of time and personality from the great mining equation. I believe that it is almost safe to say that 50% of the mining failures in Mexico are due to these omissions, and not as we are often told, due to lack of capital or poor management. The remaining 50% being due (in case the question be raised) to an absence of ore.

I wonder if there is a mine, near-mine or prospect hole in Mexico, concerning which a report has not at some time been written, setting forth under special caption in italics certain data concerning the cheapness of the labor. This report, however, usually omits the data concerning the amount of work accomplished each day, so that you are not in a position even to guess whether that amount will net you at the end of the year 100 ft. of drift or 1000 ft. If, to your sorrow, you find that the amount is approximately 100 ft., what are your feelings on the subject? Why you immediately try to increase the efficiency of your men. First, you raise wages a little—no results; a little more—and no results; then a compressor and drills—but now you have modernized and you are either ready to compare costs with the best of them or your mine is closed down and you are out of a job. In either case your 50-centavo peon and your 75-centavo miner are things of the long ago. You will never find modern methods and cheap labor in the same canoe; if you do, you will probably find them under the thwarts with a strangle hold on each other's necks. Not that Mexican labor is absolutely inefficient, but to the man in a hurry, it is not cheap.

I do not feel called upon to add anything to the long catalog of what modern men, methods and machinery have accomplished in Mexico; it is a truly remarkable story set forth in annual reports, cost sheets and dividends, and if this account is not sufficiently replete with fine writing to suit your individual fancy, our friend the promoter, who is trying to dispose of the *antigua*, will inform you of the 1500-lb. stamps, the 40-ft. stopes of 450-gram ore from which the old operators extracted 3 ft. of high-grade, and the 50 to 60 tons of fine bullion which the Pachuca camp is shipping monthly. I do feel, however, that we give too little credit to the old Mexican miner, with his cheap labor and his abundant store of patience, and I would like to add one to the story that each engineer of Mexican experience has already gathered along these lines.

### The Development of the Santa Gertrudis

It is well known that the orebodies of the Pachuca district, which have attained present-day fame, did not come to the surface; also, that the Santa Gertrudis is a much advertised and truly great mine. To whom do we owe it? The vein lies entirely off the belt which covered the original area of production. The outcroppings came to the surface over only a short distance and though well marked, were entirely barren. In 1879, a small group of Pachuca miners began sinking the old San Juan shaft. Funds were scarce and capital hard to interest in an unproved section of the camp, but rich strikes in other portions of Mexico, especially in Sierra Mojada, and an unfailing faith in their own judgment kept things slowly moving. Shares were issued on which assessments of 10, 15 or 25 centavos per week were accepted. The employees of the active mines in the camp subscribed and a small boy on a burro was sent from mine to mine on each payday to collect the assessments. Even the watchman and the *malacatero* on the Santa Gertrudis itself paid in weekly a small portion of their wages. At the end of 1885, the shaft had reached a depth of about 200 m. and a crosscut had encountered a narrow streak of ore in the vein. This oreshoot was only 75 ft. long and pinched out entirely in depth, but it kept things going until a drift east finally found the apex of the San Guillermo orebody, which has been going down ever since until today at a depth of 500 m. its lateral extension has been proved from the Santa Gertrudis, through the Barron and into the La Blanca mines; a truly wonderful body of silver ore. This, however, is the story of a bonanza.

### Iron and Gold at Comanja de Corona

About 25 miles east of the city of Leon, Guanajuato, in a fertile valley, lies the old mining camp of Comanja de Corona. It is said that the principal mine of the district was worked before the discovery of the mines of the Guanajuato district. The valley is studded with the ruins of dwellings, arrastres, etc., attesting the importance of the camp in some previous epoch. One of the most interesting ruins is that of an old iron-furnace plant which includes within its adobe walls some two or three acres. The ore for this plant was obtained by most careful selection from a small deposit of ore lying on the contact between some shales and an underlying granite dome which has been exposed by erosion. The fuel used was charcoal, while the limestone was packed a distance of about 5 km. from a thin bed which overlies the shales at an elevation of about 1000 ft. above the plant.

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*United States Smelting, Refining & Mining Co., 411 Edificio de la Mutua, Mexico, D. F., Mexico.

The product from the plant was converted on the ground into rude agricultural implements, which found a ready sale in the neighboring valleys. The business is said to have been profitable, so much so that it was sold at a comfortable figure to one of the pioneer Englishmen of Mexico, who purchased with the idea of a consolidation of several similar industries which had been established in the central portion of Mexico. With the construction of the Mexican Central Ry., the profits automatically ceased and the plant was abandoned.

The granite dome mentioned is traversed through its greatest length by a series of north and south veins dipping at an angle of 38° to the west. In the granite the veins are constant and the mineral content remarkably uniform. In width the veins average about 2 ft. Fracturing was due to intrusions of andesite and the veins extend through from the granite into the shales, where they lose, however, their continuity and the ore deposition assumes the form of small and irregular lenses of somewhat higher value. These lenses have received but little attention, due to the encountering, in the only attempt at exploitation, of large quantities of extremely acid water, the acidity being caused by pyrite in the shales.

The principal mine of the district, Los Remedios, was located on the veins in the granite dome. The original workings started from the summit of the dome and evidently reached a considerable depth before the Remednios crosscut tunnel was driven from near the base of the dome. This tunnel leads east for a distance of 2300 ft. and cuts the Remedios vein at a depth of 750 ft. on its dip. The tunnel also cuts three other veins, all carrying values, but on account of the presence of variable quantities of chalcopyrite and blende they have not been so extensively worked as the Remedios, which shows the base metals only below the tunnel level. The lateral extension of the workings on the Remedios vein is 850 ft. The entire mass of the vein was extracted from this block of 850x750 ft., the ore after sorting underground being packed a distance of 6 km. to a small stream where it was treated in arrastres. The discard from the sorting was left underground where it has mixed with wall rock, broken in mining a hanging-wall streak of the vein, which was probably of higher grade than the vein itself. It is estimated that there are some 70,000 tons of these fills in the workings on the four veins, of which amount 75% is barren granite, thus indicating that the percentage of payable ore in the vein was high. The average value of the fills, after sorting to remove only the white granite, is 2 grams of gold and 200 grams of silver. The average value of the vein in place, including small pillars in the stopes, is 4 grams of gold and 300 grams of silver. Even taking into consideration the fact that most of the samples from solid ground represent the outskirts of the orebody, it is doubtful if the average value of the entire block exceeded 6 grams of gold and 400 grams of silver and probably did not quite reach this figure. The period of activity on this mine probably extended over the insignificant interval of 100 years.

It is axiomatic that the old Mexican miner worked nothing from which he did not derive a profit and the evidence in this case points to the fact that not only the Remedios mine but the entire district paid dividends, even if they were probably separated by rather extensive intervals.

It is a case, I believe, of, "Hats off to the *antiguo*"; for I rather question the advisability of attempting to mine this grade of ore from a 2-ft. vein even under modern conditions. This opinion is strengthened by two interesting modern ruins, i.e., a stamp mill on the surface and a wire-rope tram in one of the richest of the old, filled stopes. This tram is complete with its sheaves and terminals, the buckets having a capacity of 25 lb. each, the track rope being of ½-in. diameter and the traction cable of galvanized bell cord.

In case anyone thinks that I am in error on this subject, I would say that there are five other known veins in the mountain and that the labor is almost as cheap today as it was 50 years ago; also that excess baggage on his patience should be quite an item in his expense account.

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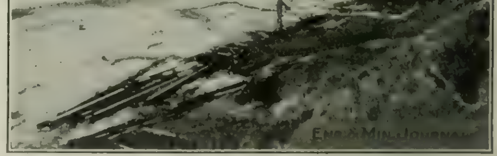
# Oil Field in the Ocean

BY L. M. EDHOLM*

Unique among the oil fields of the world is the Summerland group of wells in California, which extend out into the Pacific Ocean. There are 141 producing wells in this group which is situated about 18 miles from Santa Barbara. These wells are drilled out in the ocean just off the coast and 100,000 barrels are taken from the oil sands underlying the ocean bed every year. This interesting spectacle of derricks built out into the sea is visible from the train on the way from Los Angeles to San Francisco.



A SUBMARINE OIL FIELD

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*1624 Figueroa St., Los Angeles, Calif.

## Ontario Mineral Production

Returns made to the Bureau of Mines under the Mining Act show that the production of metals and metalliferous substances from the mines and works of Ontario during the nine months ended Sept. 30, 1913, was as follows. The changes as compared with the corresponding period of 1912 are also noted.

| Product | Quantity | Value | Inc. or Dec. |
|---|---|---|---|
| Gold, oz. | 159,962 | $3,281,027 | I $2,163,692 |
| Silver, oz. | 23,171,536 | 12,967,138 | I 259,312 |
| Copper, tons | 9,237 | 1,311,681 | I 169,605 |
| Nickel, tons | 18,233 | 3,825,633 | I 457 196 |
| Iron ore, tons | 143,979 | 314,590 | I 213,306 |
| Pig iron, tons | 440,954 | 5,792,022 | D 259,956 |
| Cobalt ore, tons | 71 | 12,917 | D 44,697 |
| Cobalt and nickel oxides, lb. | 740,089 | 290,597 | I 113,811 |
| Lead ore, tons | 882 | 3,000 | I 3,000 |

Gold production is chiefly from Porcupine, where the Hollinger and Dome are the leading mines. The latter is adding 40 stamps which will double its milling capacity. Porcupine Crown and McIntyre Porcupine also contributed considerable bullion. The total yield from the Porcupine mines was $3,106,250, leaving $174,777 as the product of outside areas. These were Long Lake (Canadian Exploration Co.), Swastika (Swastika Mining Co.), Kirkland Lake (Tough-Oakes), Larder Lake (Goldfields Ltd.) and Sturgeon Lake (Northern Gold Reef).

Silver production was slightly greater, both in ounces and value, than for the same period last year. The number of producing mines was 31, of which 27 are in Cobalt proper, one in Casey township, two in Gowganda and one in South Lorrain. Nipissing led with a total output of 4,387,765 oz., followed by Coniagas with 2,662,678, La Rose with 1,903,345 and Cobalt Townsite with 1,826,422 oz. Kerr Lake, McKinley-Darragh, Buffalo and Crown Reserve were also well up. Of the product 10,512,396 oz. were in the shipments of ore, 6,184,271 in concentrates, and 6,444,099 in bullion. By camps, Cobalt proper 21,956,561 oz., Casey 607,212, Gowanda 342,380 and South Lorrain 234,613 oz. From auriferous ores 30,770 oz.were obtained.

Nickel and copper production was in excess of that of any previous nine months. There were raised 535,265 tons of ore and smelted 569,898 tons. The bessemer-matte product was 34,343 tons, the estimated contents of which were 18,233 tons nickel and 9237 tons copper. The Canadian Copper Co. remains the principal producer, but the new and well equipped smelter of the Mond Nickel Co. at Coniston, which is now in operation, will doubtless increase that company's output.

There were five iron-ore mines in operation, the Helen and Magpie, Moose Mountain, Bessemer and Belmont. The Canada Iron Corporation concentration plant at Trenton is now at work on ore from the Bessemer and Childs mines. At the Magpie mine the roasting plant is treating siderite, from which it expels the carbonic-acid gas and sulphur, thus producing a first-rate material for the blast furnace. If the process proves commercially successful, it will turn to account a large quantity of sideritic material, hitherto but little regarded as a possible source of iron.

Four blast-furnace companies produced 11,967 tons less pig iron than was made during the corresponding term of 1912, and the average value per ton declined from $13.36 to $13.16. At Port Colborne the new furnace of the Canadian Furnace Co., a subsidiary concern of the Buffalo Union Furnace Co., was blown in on Sept. 27. The plant has a capacity of 300 to 325 tons of pig iron per day.

The output of cobalt and nickel oxides, being refined byproducts of the Cobalt silver ores, is steadily increasing, and had a value $176,786 greater than in the first nine months of last year. A bounty is paid by the Ontario Government of 6c. per lb. on the metallic contents of refined cobalt oxide and nickel oxide.

## Utah Copper Co.

Report of the Utah Copper Co. for the third quarter of 1913 shows that 32,287,452 lb. of copper were produced: 9,849,043 lb. in July; 10,640,981 lb. in August and 11,817,428 lb. in September. Production for the first and second quarters was 7,961,489 lb. and 10,595,149 lb. respectively.

Both plants treated a total of 2,035,391 tons of ore, the Magna plant handling about 56% of the total and the Arthur plant 44%. The average grade of the ore was 1.2459% copper.

Average cost per pound of net copper was 9.068c. after allowing for smelter deductions but without crediting miscellaneous income. If the latter were credited, the cost would be reduced to 8.187c. per lb. of copper. Low grade of ore treated was responsible for the comparatively high cost of production.

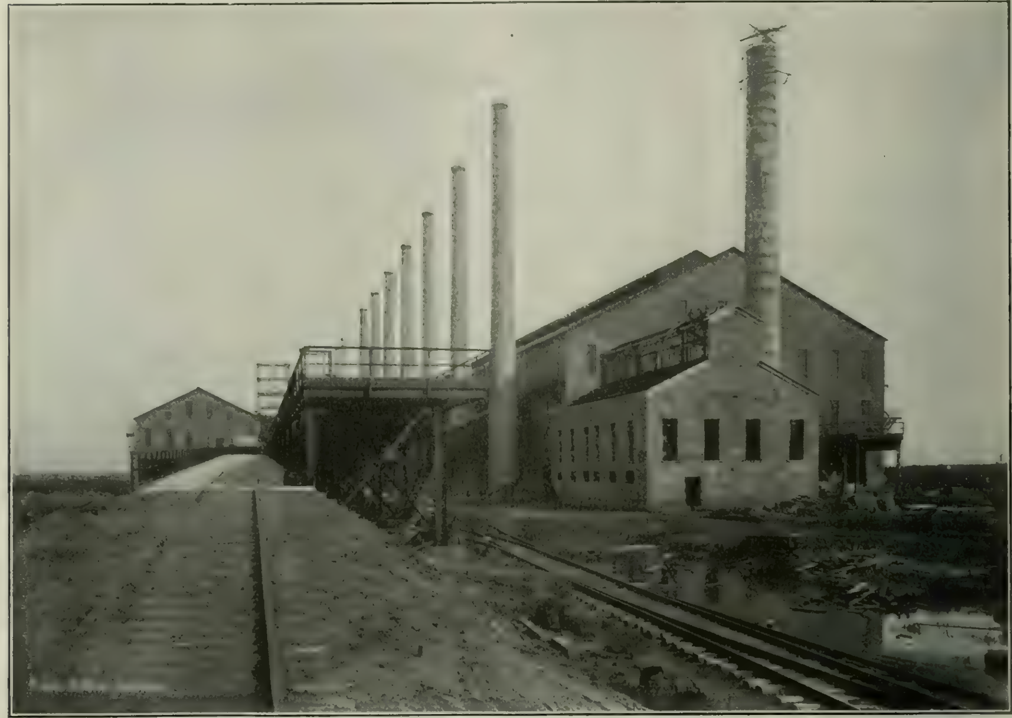
Net profit from milling operations was $1,819,354; other income in Utah, $11,857, and income from Nevada Con. Copper Co. dividends, $375,188, a total of $2,206,399. Dividends of $1,186,695 were paid, leaving a net surplus for the quarter of $1,019,704. Earnings are based on copper at 15c. per lb. Total copper on hand and in transit, sold and unsold, was 32,053,789 lb. Unsold copper is inventoried at slightly less than 12½c. per lb. Both plants were in continuous operation and exceeded all previous records as to tonnage, averaging a little more than 22,000 tons per day.

The Bingham & Garfield Ry. handled its largest tonnage of ore and commercial freight, an average of 16,018 tons of ore and 2336 tons of other freight having been transported daily.

## Withdrawal of "Copper" Lands

Within the last year a public-land withdrawal of an unusual type, designated "mineral-land withdrawal No. 1, Arizona No. 1," was made at the instance of the U. S. Geological Survey. The withdrawal covers an area in the Warren mining district (Bisbee, Ariz.), in which investigations by the survey revealed geologic conditions favorable to the occurrence of deep-seated deposits of copper, on which no surface discovery, as required by the lode law, can be made. As discovery and hence valid location of such deposits must depend on expensive deep drilling or deep shafting and will require time, there was danger that before prospecting of this kind could be completed attempts would be made to obtain title to the lands by means of state selections or other nonmineral entries. Accordingly the President directed that an area including approximately 9787 acres be withdrawn. The lands in the withdrawn area are open to exploration and purchase under the mining laws, so far as they apply to metalliferous minerals, but are not subject to other forms of entry. Later 1280 acres of this reserve were restored to entry.

# PHOTOGRAPHS FROM THE FIELD



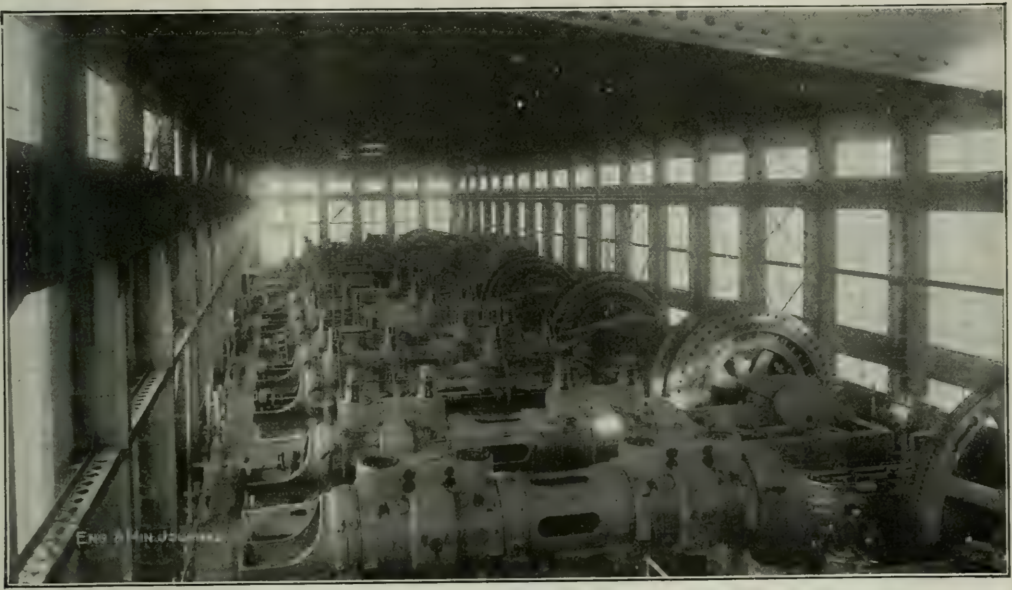
Openhearth Building at Minnesota Steel Co.'s New Plant

Company is a subsidiary of the United States Steel Corporation.

Panorama of the Minnesota Steel Co.'s New Blast Furnac

Plant has been under construction for nearly four years and it will be another 18 months before it is ready for operation
covers an area of 1500 [illegible] with two miles of water front on the lake, a widened basin of the St.
erected, built entirely of concrete even to floors and with steel

Stoves and Furnaces at Minnesota Steel Co.'s New Works
Each of the two blast furnaces will have capacity for smelting 500 tons of ore per day.



Gas Engines at Minnesota Steel Works Will Drive Compressors and Generators
Besides the blast furnaces, 90 coke ovens will supply gas.

D Steel Plant at Head of Lake Superior, near Duluth
is to be a much more extensive works than was originally planned. Plant is on Spirit Lake, nine miles from Duluth,
uis River. The "model" town is shown at left of view, where 157 houses (57 are completed) will be
ors and window frames. Plant has cost $7,000,000 to date.

## Chronology of Mining for November, 1913

*Nov. 2*—Fire in Rio Tinto mine, Spain, killed seven men.

*Nov. 12*—Mond Nickel Co. purchased a part of the Levack group of nickel properties in the Sudbury district, Ontario.

*Nov. 13*—Electric light and power rates hearing at Butte, Mont.

*Nov. 14*—Judge Bourquin, in Minerals Separation case against Butte & Superior, rendered decision in favor of plaintiffs—Smoke lawsuit instituted by Montana farmers for relief from fumes from Anaconda company's reduction works, dismissed.

*Nov. 15*—Salt Lake & Alta R.R. from Midvale to Wasatch, completed.

*Nov. 17*—Rio Tinto strikers resume work—Explosion of dynamite in Kennedy mine, Jackson, Calif., killed three men and injured one.

*Nov. 18*—Explosion in mine of Alabama Fuel & Iron Co. killed 40 men.

*Nov. 19*—General strike order issued to French miners by the national federation, with the object of obtaining an eight-hour workday, failed as only a few of the 200,000 miners in France walked out.

*Nov. 22*—Reduction of 10% in wages in Joplin, Mo., district.

*Nov. 24*—Riot of natives, at the Premier diamond mine in South Africa, in which three were killed and 22 wounded.

*Nov. 27*—S. Pearson & Sons abandoned attempts to secure oil concessions in Colombia.

*Nov. 31*—Government removes restrictions so that Indian laborers may enter British Columbia.

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## Rand Mining Notes

### Johannesburg Correspondence

The effect of the strike on the labor supply of the mines is shown by the returns from the W. N. L. A. There were 222,057 natives in the employ of the mines in May, 1913, and in August, the number had fallen to 180,631, showing a decrease of 42,429. The normal decrease for this season when natives return to their homes to plow, is 20,000, so that the strike caused a loss of about 22,000 natives; 1100 whites were dismissed. The output of the mines was fairly well maintained by stopping development work and drawing on the large reserves. A commission has been appointed to investigate any grievance the native laborers may have, and Colonel Gorgas is expected to arrive in November to report on general health conditions. The Rand Water Board is preparing a scheme to place a dam on the Vaal River and to spend £1,250,000 in increasing the water-supply by 10,000,000 gal. per day.

At the Meyer & Charlton mine all blasting is now being done from the surface when all men are out of the mine. The ratio of white to colored workmen last year was 1 to 8.1, showing a fall compared with 1912 (1 to 7.7). The efficiency increased somewhat. The tons raised per annum per white employee rising from 1030.9 to 1106; per native from 132.5 to 136.3 and per person from 117.4 to 121.3. The collieries showed only 50 tons per person. In the Transvaal, 471,850 tons of coal were raised.

The reef was struck in No. 3 shaft of the State mines at a depth of 3650 ft., assaying 3.8 dwt. on 30 in. New development work is confined almost entirely to the East Rand and the "State mines." Modder Reefs, Van Ryn Reefs, Geduld mines and Springs mines continue to develop well. Labor matters are quiet and there seems no fear of any future outbreaks.

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## Ray Consolidated Copper Co.

The report of the Ray Consolidated Copper Co. for the third quarter of 1913 shows a production of 12,969,120 lb. of copper, divided into 4,097,004 lb. in July, 4,401,565 lb. in August and 4,470,551 lb. in September. In addition to the copper from concentrates, 84,440 lb. were produced from ores shipped to the smeltery, making a total production of 13,053,560 pounds.

Total ore milled was 575,190 tons, averaging 1.72% copper, a daily average of 6252 tons of ore milled. Average mill recovery was somewhat lower than for the previous quarter, due to shortage of water.

Increase of costs was due to improvements which were included in operating expenses. Average mining and coarse crushing was 76.43c. per ton. Of this amount about 4c. is chargeable to coarse crushing.

Underground development amounted to 19,160 ft. No. 1 shaft hoisted 67% of the output, No. 2 shaft 29% and No. 3 shaft, 4%.

Average cost of copper was 10.155c. per lb., after smelter deductions and applying earnings of the Ray & Gila Valley R.R. as a credit to costs.

Operating profits were $651,660, and miscellaneous income, $9425, a total of $661,085. Earnings are based on copper at 15c. per lb. Copper on hand and in transit, sold and unsold, amounted to 14,660,228 lb. Unsold copper is inventoried at 13.15c. per pound.

Second quarterly dividend was paid Sept. 30, 1913, amounting to $543,903, making total disbursements to date this year $1,087,559.

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## The Bureau of Mines

### Washington Correspondence

President Wilson is expected to take strong ground during the current session of Congress in favor of an enlargement of the powers of the Bureau of Mines. The statements made in his message are taken as good evidence of this disposition. The enlargement of powers is expected to be a grant of greater authority toward the enforcement of regulations designed to protect workers and also in applying the principles of what is ordinarily known as "conservation." That the Bureau will also be given an active share in the conduct of mining matters in Alaska, if the new bill designed to provide for a Government-constructed railroad line in Alaska should pass, is also predicted and there seems to be no question that distinct steps in that direction will be taken. Official legislation representing the views of the Administration has been prepared and will be introduced from time to time as occasion permits. It is believed that a new era of influence from the Bureau of Mines is about to open in consequence of the attitude of the administration in the particulars already referred to.

# CORRESPONDENCE AND DISCUSSION

## Revision of the Mining Law

I have addressed a letter, of which the following is a part, urging the President to use his influence to cause the General Land Office to issue clear directions as to the necessary requirements in doing the location work after discovery of a vein:

The pamphlet, now issued by the General Land Office, does not give this information, and I know from correspondence with the general and local land offices in several Western states, that information is refused on the ground that the matter may come before them and we are advised to see a lawyer. Many good mining claims have been lost to the honest and painstaking prospector through different opinions of lawyers as to what constitutes valid discovery work. I suggest a general law to cover all the states and territories, viz.: After notice of discovery of a vein or lode that 240 cu.ft. of earth be removed along the strike thereof, 4 ft. deep, 6 ft. wide and 10 ft. long; or, 6 ft. deep, 4 ft. wide and 10 ft. long; or a shaft 10 ft. deep, 6x4 ft. wide, whichever may be preferable to the prospector.

My 33 years' experience as a prospector and mining man in many camps throughout the West, warrants me in saying that such a law or ruling by the Secretary of the Interior would be most satisfactory to all honest prospectors.

Theodore A. Woodruff.

Parker, Ariz., Nov. 20, 1913.

## Speculator Shaft Accident

Mr. Emmons, in the Journal of Nov. 8, takes exception to a "By the Way" item about the death of a miner from a falling rock in the Speculator shaft at Butte. The argument seems to be a fallacy, which may be expressed "Do not clean your shaft sets, because in that case a falling rock may lodge." What harm in that? Why, it might fall off and hurt somebody. In the first falling, then, it would not hurt anybody, only a secondary fall is dangerous. Now, it seems to me that a falling rock is a falling rock, and if it falls from the skip dump, it is somewhat more dangerous than if it falls from a set part way down.

When all the sets once become covered with fine dirt at the angle of repose, all material falling thereafter must fall to the bottom. If the sets be periodically cleaned, then practically no material will ever fall to the bottom. Which is safer? The covering of fine dirt on the sets protects the timber, but are we protecting timber or men?

Examination of many shafts will show the upper sets full of débris and the lower sets comparatively clean. Mr. Emmons considers these lower sets a menace. Then why wait for the slow accumulation of material accidentally spilled? Why not at once cap every plate with a slanting board, which would direct all falling rocks to the very bottom and attain the acme of safety?

The letter is along the line of the old and still frequently heard arguments, such as, that safety dogs should not be used on cages because they seldom work; that automatic stops on hoists are dangerous because they take away the sense of responsibility of the engineer, etc., without number. The inspiring motive to such talk is, of course, the disinclination to expend the time, thought, care and money that real safety measures require. Here on the Mesabi the opposite attitude prevails; extraordinary precautions are taken to conserve the lives of the miners and "Safety First" is emphatically safety first and not a poor second.

It does not seem to me that there was any intent in the original article to criticize any individuals for the accident. The practice is too common to justify individual criticism. Letting dirt accumulate on the shaft sets is country-wide if not world-wide. But it is not right, nevertheless.

Chisholm, Minn., Nov. 10, 1913. A. Minor.

## Slater Lixiviation Process

Under the above caption, the Journal of Sept. 27, 1913, contained a review of the specifications of pat. No. 1,066,855, covering a process of lixiviation of copper-bearing ores. Barring the small mistake as to the silver being converted into "sulphide," which should have been "chloride," it was a fair review. In the last paragraph, however, it is suggested that the process might "serve as a hint to more practical development." The editor was not aware, when he wrote that review, that further and more practical developments had already been made, having especially in view the recovery of the copper from the solution. This further development was reserved for another application for patent.

The method adopted for the recovery of the copper from the solution is by precipitation as cupric hydroxide, and this is accomplished by the use of the sodium hydroxide, which is produced in the cathode compartment of the electrolyzer in the decomposition of the sodium chloride. A further improvement lies in the recovery of the iron of the lixiviant as ferric hydroxide and its use again as a catalyzer in the production of hypochlorous acid in the anode compartment of the electrolyzer. A still further improvement is the use of a part of the cupric hydroxide, obtained from the ore, as cathodes in the electrolyzer, where it does duty as a depolarizer and at the same time is reduced to metallic copper.

I may or may not use ferrous chloride in forming the original solution preparatory to electrolysis. And I may or may not add sodium hydroxide to the anolyte during electrolysis. These details of manipulation will depend upon the nature of the ore and whether or not it is preferable to have some alkaline hypochlorates present or only hypochlorous acid.

If both compartments of the electrolyzer be charged with a solution of sodium chloride, and if, during electrolysis, ferric hydroxide be added to the anolyte, to furnish oxygen to the chlorine, hypochlorous acid will be formed in the anolyte and it will be found that a large amount of this powerful oxidizing agent can be accumulated and held in solution, ready to give up both oxygen and chlorine as soon as brought into intimate contact with the ore.

As to the separation of the iron and copper from the solution, it will be found that if a hot solution of sodium hydroxide be added to the mixed solutions of iron and copper, and the sodium hydroxide is added in equivalent proportion to the iron content of the solution, and the whole be agitated, the iron alone will be separated and will be precipitated as ferric hydroxide. The copper will be left in solution, and, when the ferric hydroxide has been filtered off, a further addition of a hot solution of sodium hydroxide, in excess, will precipitate the copper as cupric hydroxide. It will be found that the copper is precipitated as a dense black mass having the composition $3\,CuO, H_2O$; three molecules of cupric oxide to one of water. The sodium chloride is, in this way, regenerated for use again in another cycle of operations.

The reactions in the decomposition of a solution of sodium chloride are too well known to require explanation here, but the reactions in the anode compartment of the electrolyzer, when ferric hydroxide is added thereto, may not be so well understood. The ferric hydroxide, being in suspension in the solution of sodium chloride, is attacked by the chlorine, being liberated at the anode with the resultant formation of ferric oxychloride and hypochlorous acid as follows:

$$2\,Fe\,(OH)_3 + 4\,Cl = Fe_2O_2Cl_2 + 2\,HClO + 2\,H_2O$$

Ferric oxychloride and chlorine will react to form ferric chloride and chlorine monoxide as follows:

$$Fe_2O_2Cl_2 + 8\,Cl = Fe_2Cl_6 + 2\,Cl_2O$$

The chlorine monoxide, with water, will form more hypochlorous acid as:

$$2\,Cl_2O + 2\,H_2O = 4\,HClO$$

It thus appears that we may have six units of hypochlorous acid formed in the anolyte through the intervention of two units of ferric hydroxide.

The lixiviant thus formed seems to have a peculiar selective action on the copper in such ores as those from Cananea and others of like character. Roasting or calcining is not necessary as the oxidizing action of the solution is such as to liberate a part of the sulphur in a free state. Some sulphuric acid is formed and also sulphate of copper, but the presence of sodium chloride results in a change therefrom to cupric chloride and sodium sulphate. The latter reacting with whatever lime is present renders it insoluble as calcium sulphate. Some alumina will go into solution as chloride. Arsenic will be left with the tailing as insoluble chloride and antimony, if present, will also be left in the tailing as an insoluble basic antimonious oxychloride. But very little of these will be acted upon unless there be a large excess of chlorine available over that required for the copper. The ferric chloride will be reduced to ferrous chloride, but will be precipitated from the solution as ferric hydroxide. Chalcocite goes into solution very readily; chalcopyrite more slowly. Pyrite is but very slightly attacked, if at all.

This process is a development from work done along similar lines, in Leadville, Colo., in the '80s. The work was then directed to the extraction of zinc. The present process is quite as applicable to zinc ores as to those of copper. It was devised, however, with special reference to the porphyries. It is also well adapted to that class of ores, chiefly silicates, which, while amenable to cyanidation for the gold and silver values, contain copper in such amount as to nullify the economic efficiency of the cyanidle process. The removal of the copper by this process leaves the ore in very suitable conditions for cyanidation, especially after a wash with a solution of the sodium hydroxide produced in the cathode compartment of the electrolyzer.

As to cost of treatment, it can readily be seen that the principal cost will be that of the production of the chlorine. The handling of the ore will be practically the same as in the cyanide process. The cost of generating the chlorine will depend upon the cost of electric energy at the place of operation. Here in California we can figure liberally at one cent per kilowatt-hour. One and one-third kw.-hr. will suffice for the generation of 1 lb. of chlorine. One pound of chlorine is sufficient for 1¾ lb. of copper as cuprous chloride and it is as cuprous chloride that the copper appears, in a clear water-white solution, after the removal of the iron. Sodium chloride is a cheap substance almost anywhere and in the cycle of operations but little of it is lost, and that incidentally. The process will, I believe, have wide application and patents have been procured in Mexico, Chile and Peru, as well as in the United States. Provisional protection has also been procured in Canada.

Riverside, Calif., Oct. 23, 1913. H. B. SLATER.

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# The Parral Tank

In the reference to the Parral tank which appears in the JOURNAL of Nov. 15, the following sentence may be the subject of misconstruction, viz.: "The Parral tank has had satisfactory experience in some places though it has occasionally failed to justify expectations."

I wish to say in reply to this that every installation designed by me when the character of the pulp was known has fully justified expectations so far as known to me. My confidence in the superior efficiency and economy of my system of agitation is evidenced by the fact that I do not ask anybody to pay anything until the system has been in commercial operation for 60 days, and if found unsatisfactory the system will be discontinued without any responsibility whatever. Of course this is predicated on my design of tanks and apparatus being followed in the installation.

BERNARD MACDONALD.

South Pasadena, Calif., Nov. 19, 1913.

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# Motor Trucks in Mining

With reference to the article on motor trucks in mining service, appearing in the JOURNAL of Sept. 18, 1913, I note that there is no mention of anyone trying them out in a district where the snowfall is heavy. I have seen suggestions by the manufacturers of fitting them with snow-ploughs, and clearing the roads after each storm, but do not know of it having been tried out in actual service. Any information your readers may have on the subject would be of interest.

F. CHARLES MERRY.

Ferguson, B. C., Oct. 31, 1913.

# EDITORIALS

## The Copper Statistics of November

The report of the Copper Producers Association for November, showing an increase of about 15,000,000 lb. in the stock, was about what was expected. The production was materially smaller than in the previous month, but still was not very much short of what the smelters, as distinct from the refiners, have been reporting on the average. Foreign deliveries increased a little, but domestic deliveries fell off largely.

The domestic deliveries reflect the filling of old contracts, and the falling off in their aggregate shows how those contracts are running out. It has never been at any time supposed that they ran extensively into December, and at this writing the sales books of the producers are believed to be pretty nearly bare. If no large buying movement should develop between now and the end of this month, the next report of the association might be expected to show domestic deliveries very small indeed. The great concern is as to just how much domestic consumption has fallen off and how long their previous overanticipation of requirements is going to carry the copper manufacturers along. The mere fact that manufacturers have been able to stay out of the market for so long implies the probability of some buying movement soon unless the contraction in real consumption is much greater than anybody now supposes.

The statistics of foreign deliveries do not tell very much. There is suspicion that some of the copper that has been shipped abroad has gone on consignment, i.e., that it has not been sold for consumption, but has been shipped by the producers to European warehouses to be available subsequently when needed. The last statistical report from Europe showed an increase in the stock over there. However, none of our statistics include the copper afloat between America and Europe, nor do they indicate the "invisible supply" into which copper sent abroad on consignment sometimes goes.

A definite thing about the November report is that statistics and sentiment have fallen once more into step.

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## The Recession in Business

All of the current commercial statistics are telling the now familiar story of increasing decline in business in the United States. Building expenditures are falling off, furnaces are going out of blast, the number of idle railway cars is increasing, men are being laid off in the factories, and so on. This condition of affairs naturally produces an atmosphere of gloom. There is, however, the consoling thought that it does not follow an economic crisis; nor does it portend one, according to financiers of experienced judgment.

On the contrary, the falling off in business appears to be due to perfectly natural and thoroughly understood causes. About this time last year, or a little earlier, conditions in Europe led to a great liquidation of American securities held over there, which we had to buy back, using up much of our capital in the process. Concurrently, there has been the distressing situation in Mexico, which has rendered hundreds of millions of dollars of our capital temporarily nonproductive. We have made a radical change in our tariff system, which inevitably caused some dislocation and disturbance of industry, although its final effect may be good, and probably will be good. We are even now confronted with prospective legislation remodeling our banking and currency system and other legislation affecting our corporation interests. This legislation may also be eventually for the good; there is ground to suppose that it will be, but the mere fact of an impending change cannot fail to be a disturbing factor. Any of these things would be alone sufficient to affect business. Operating together, they have had a cumulative and severe effect. The basis of encouragement is that these adverse factors are not of a nature to prevent a relatively quick recuperation from them.

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## The Situation in Spelter

All of the metals have been weak, owing to the slackening in the demand for them, while in the case of copper, certainly, and in the case of lead probably, production continues undiminished. Somewhat different conditions prevail in spelter, which is rather more sensitive to changes in the market than are either copper or lead. The recession in the brass and galvanizing industries has of course reduced the consumption of spelter. For some time past, the largest buyers have been conspicuous in the market by their absence. In the meanwhile, the unsold stock in the hands of smelters has increased materially. Several interests have apparently uncomfortable accumulations.

Conditions are, however, being corrected in a natural and salutary way. The price has come down to a point where consumers may feel that they are safe in contracting for supplies, and sooner or later they will no doubt do so. The price for spelter may go lower yet, or may not, but the consumer who does not figure that he is enough of a prophet to discern the absolute bottom, and is content merely to buy cheaply when he can do so. finds his opportunity now. Experience and observation point to 5½c., St. Louis, as being about the average price for spelter, reasonably to be expected under existing conditions. When spelter falls a half a cent under that price it is cheap; at a half a cent above that price it is dear. When those limits are passed it becomes either very cheap or very dear.

The way in which the present position is regarded is best evidenced by the extent to which the smelters are putting their furnaces on dead fire, or closing their works entirely. It has been estimated by a well informed interest that at present not more than two-thirds of the total American smelting capacity is in use. Such a drastic restriction of production as is indicated by this will rapidly correct the present bad features of the spelter market and put it in a position to respond promptly whenever a considerable buying demand develops.

From Europe we hear that the situation continues unsatisfactory over there, in spite of the restriction of production that has been going on for several months under the terms of the convention. The present convention expires early next year. Negotiations for its renewal have lately been going on, and it is considered probable that there will be a renewal. However, it is not considered likely that there will be any alteration of conditions that will permit a material advance in price in the near future. Anyway, that is the present view. If correct, we cannot, of course, have any great advance here. However, we may reasonably expect before long a rally to a figure that is nearer our normal average.

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## Opportunities in Mexico

A correspondent in the City of Mexico, a well known mining engineer, writes us that he thinks there will probably be a great deal of mining business done in Mexico during the next year, inasmuch as many properties are now being picked up, chiefly by well informed men who are not alarmed at temporary troubles.

It has always been foreseen that sooner or later there will be great opportunities for investments in Mexico on very advantageous terms, taking a long view of the future. There has been, necessarily, during the last two or three years, a liquidation of mines, real estate, and almost all kinds of property, which anybody wanting to buy could have almost at his own price. If there were a sure prospect of the restoration of a stable condition in Mexico, there would, of course, be a rush to buy. No such thing is to be anticipated right away.

The questions that bother the prospective investor are, whether the bottom of the depression has now been reached, or whether things will go still lower; and, finally, whether, after all, he has the nerve to take the chances, which now loom big, and the patience to wait.

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## Slime Tables

The concentration of ores by means of buddles and shaking tables is one of the oldest metallurgical arts and in its practice invention ought to be exhausted. But not so. About five inventors out of every ten have some new design in their heads, or so it seems, and scarcely a year passes without the production of some novelty, or may be some revival of an old idea, which proves to be worth while.

Just now the fashion seems to be running in the direction of multiple deck tables. This is no new idea, to be sure, the two-deck and three-deck round tables being familiar in the days of our youth, but nobody suggested anything so progressive as the 20-decker at Anaconda. That impressive construction is believed to be a great step toward the successful treatment of the Anaconda slimes.

Nor did anyone until lately, so far as we know, conceive a multiple-deck shaking table. These are now installed by the Deister and Wilfley, and perhaps other manufacturers. The Deister and Wilfley are six-deckers. In the Miami mill the Deister has been a successful and valued feature, the plans for increasing the capacity of the plant being based largely upon the saving of room that it effects.

Not even has the best form of riffle yet been devised. At Miami and at Morenci, Arizona, experiments have lately been made with improved arrangements, which are reported as giving wonderful results. Manifestly the design of ore-concentrating tables is far from being an exhausted art.

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## Lake Superior Wages

It has been reported during the last week that the mining companies of the Lake Superior region have granted their employees an 8-hr. day at a $3 minimum wage. Recognition of the union is, however, refused. In taking this course, the companies have bowed to the inevitable. The basis of the strike was always an economic condition. It was not so much a question as to whether the miners of the copper country were being paid a fair wage, or were in the enjoyment of good living conditions, as it was that the demand for mining labor was such that the best men could earn more money elsewhere. Labor is notoriously immobile, and naturally so. No man of family can lightly pull up his stakes and move elsewhere in order to take immediate advantage of market conditions. Unless the market conditions are recognized at home, however, he will be dissatisfied, will be disposed to join in a strike, and eventually will move out of the district if the strike be prolonged. The employers may carry their point, may break the strike, but they will find themselves short of labor in the end, and will have to meet the market in order to obtain the supply that they need.

This was the experience in the Bingham strike, and it is now the experience in the Lake Superior strike, just as we have repeatedly remarked that it would be. The mistake of the companies was in not recognizing the basic economic condition in the first place. In all other respects, the right was on their side, but it has been learned once more from this experience, as it has been from many previous experiences, that benevolence is not an asset in labor disputes. No matter how altruistically an employer may seek to improve living conditions, no matter how extensive may be his endowments of schools, hospitals and public improvements, the employee will reject them all and prefer to live amid conditions of discomfort, even of squalor, for the sake of a few cents more in the daily wage. In the Lake Superior dispute, altruism was on the side of the companies, but economics was against them, and economics prevailed as it always does.

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The reduction in the tariff on most classes of iron and steel has had no appreciable influence on the trade so far, though it will undoubtedly have some influence in preventing an advance in prices when business begins to improve. There has been some offering of German iron and steel on the Atlantic Coast by foreign agents, but no actual selling of any amount. Conditions in the trade abroad are not as active or prosperous as they have been, and there is more surplus for export, but it does not seem to be coming this way. The only place where there has been any selling of foreign iron and steel, is on the Pacific Coast, where importers have always had their best chance, owing to the cheapness of water transit as compared with rail. Eastern manufacturers of bars and shapes have cut prices in California to points as low—in some cases lower than at Pittsburgh, to meet this German competition. On the whole, it does not seem as if any large imports need be expected.

## BY THE WAY

This is from a New Zealand mine inspector's report: "J. Brown had his leg broken by a truck of mullock being tipped on top of him while he was in a pass." Apparently, as Alice remarked after listening to the story of the Jabberwock's fate, "something happened to somebody."

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In addition to the chemical elements usually recognized, *Science* states that Dr. A. Wegener has attempted to prove the existence of a gas "coronium" in the earth's atmosphere. According to his calculations it forms 0.00058% of the atmosphere at sea level; practically 100% at 400 to 500 km. altitude.

⁂

There has been formed in the city of Chicago and vicinity, an organization composed of men following the engineering profession, for the purpose of finding ways and means for the advancement of engineers' salaries and standardizing of positions. The organization is affiliated with the American Federation of Labor. Enough said.

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In a recent strike of miners in a Western district, the platform of the strikers was tersely summed up in the following placard:

THE BOSSES SAY: SPEED UP.
WE SAY: SLOW DOWN.
*Then there will be work enough for everybody.*

This is the philosophy of trade unions, and it has something to do with the high cost of living.

⁂

We have plenty of fiction in mining, but mining does not figure very well in fiction. It is a pity that Kipling never tried his hand at a mining story. Up to date Mrs. Foote's "Led Horse Claim," a story of Leadville, written in the '80s, is the best, we think. Mrs. Foote, by the way, is the accomplished wife of the general manager of the North Star mine, of California. Several new mining stories have lately come to our attention.

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"The Twins of Suffering Creek," by Ridgwell Cullum (George W. Jacobs & Co.), is a tale of a Montana placer mining camp, which is mainly concerned with the raising of twins, aged four, whose mother has bolted, leaving them with an incompetent father. The miners form a syndicate to furnish aid and advice. Of course, everybody becomes rich and happy in the end. There is some humor and some pathos in the story. The author might have done something worth while if he had had a consulting engineer and a competent editor. In the absence of such aid and advice, his work has rather a silly air and absurdity comes to a climax when a 10-ft. hole in a gold placer digging produces a petroleum gusher.

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Another new story is "Gold," by Stewart Edward White (Doubleday, Page & Co.). Mr. White has already, in his "Westerners," displayed real knowledge of mining conditions in the West. Perhaps he will yet write the great American mining romance. "Gold" is a story of the rush to California in '49, and early experiences in San Francisco and the diggings. Mr. White describes the spread of the gold fever in New York, the slow filtering of the news of the discovery by roundabout channels, and the excitement that followed the first authentic announcement in a Baltimore newspaper. He takes a party of four adventurers from New York to California, via Panama, and describes their experiences on the way and in the gold diggings. He has manifestly studied history and contemporaneous authorities, for his work is characterized by simplicity and has every air of verisimilitude. It is the epic of California. We wish there had been more of it, and that it were not quite so sketchy.

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A branch of the mineral industry that is seldom considered is the ice business. What has the ice business got to do with the mineral industry? will ask some of our readers. Well, ice is a mineral, is it not? See Dana. And was it not the late James D. Hague who remarked that the finest mine he knew of was the Hudson River, which had a vein of mineral, 1 ft. thick, 100 miles long, and half a mile to a mile deep, laid out flat, and yielding a concentrated product worth $3 or $4 per ton, with the further advantage that this sheet of mineral renews itself every year. Our remarks are prompted by reading somewhere that the manufacture of artificial ice in the United States now amounts to upward of 12,000,000 tons per annum.

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Mr. Mellen's remark that he never thought about his salary but just took what was given him led *Life* to make some characteristically pertinent remarks: The best workers do the work they like, and take the pay as it comes. Obviously, Mr. Mellen was far more interested in his job than in his salary, and the same is true of his successor, Mr. Elliott, and true of most men who are worth hiring at high wages. All the same it is better that valuable men should be liberally paid. It helps them to do their work and extend their influence, and that is worth while; it helps to make usefulness respected and popular, and that, too, is very suitable. It looks something like a toss-up whether salaries, big or small, will continue to be paid after this year. The difficulties of finding out how much is due on the income tax are so great, and the disputes about the processes of payment so fierce, that lazy people will be disposed to drop their incomes into Uncle Sam's hat and live on their principal while they still have it.

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The Mimbres Valley has about all metals that can be dug out of the rocks, including a huge mountain of tin that has recently been discovered by R. N. Hale, of Cameron, Tex., and William O'Toole, of Battle Creek, Mich., the latter having a parcel of land near Mirage, the first station out of Deming northeast on the Santa Fé. The boys were prospecting when they discovered the mountain of rock, which they supposed to contain tungsten. They sent samples for assay and found that instead of having tungsten they had a good proposition in tin, according to Texas newspapers. Further investigation was made, when it was found that there were practically three mountain peaks, embracing several hundred acres, that were composed mostly of heavy ore-bearing tin, which would produce not less than $100 worth of tin per ton. One or two other samples were sent for assay and the result is all the same. According to the experts who have examined the properties there seems to be enough tin there to pay for a large smelter on the ground. The ore is also rich in manganese and silica. The black topped peaks can be readily singled out for five or six miles. At the present time there have been about two dozen claims filed and people are becoming interested every day. There are a few more claims that could be profitably filed upon. Hurrah for the ore rich in silica!

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Some time ago we reported that the Constitutionalists were coining money at Parral. Now it is said that a regular mint has been established, coining *pesos,* half *pesos* and *centavos* of intrinsic value greater than those of the Government mint. The rebel coins contain more silver and some even have a percentage of gold, refining facilities not being good. The rebels have melted all the trolley wires to make copper *centavos.*

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The Eastern Steel Co., Pottstown, Penn., is experimenting with the use of pulverized bituminous coal as fuel in its openhearth furnaces, says the *Iron Trade Review*, but the company advises that these tests have not progressed sufficiently to warrant any positive statements being made as to their economic value. It will be probably some months before the adaptability of this fuel method to openhearth furnaces can be ascertained.

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A British Columbia newspaper reports that F. B. Allan, of Toronto, has told the Nelson Board of Trade that the problem of the treatment of complex zinc ores had been solved and that he is willing to demonstrate the process, which will save all the metals in the ore, at a cost of about $2 a ton. He suggests that from $15,000 to $20,000 should be raised to erect a plant on a commercial basis. This is important if he can do it. We don't believe, though, that any $20,000 plant is going to treat much ore at $2 per ton and extract all the metals.

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A few weeks ago we made some remarks about the deadly crosshead. A little while thereafter we observed the following press dispatch from Negaunee, Mich:

> Thomas Garrett, Ishpeming, was killed and Fred Borlace was injured while being lowered to work in the new Breitung shaft. Garrett and Borlace were riding in a bucket and were down about 100 ft. when the cross-head fell, knocking Garrett to the bottom of the shaft and striking Borlace on the head

This was apparently one of the loose variety and so ill-proportioned as to permit of its sticking between the guides.

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It is no new trick to keep compressed air from freezing at the exhaust of a machine by using salt. A similar method slightly more expensive, but involving certain advantages, has been tried for automatic riveting hammers used on outside work in winter. It consists in feeding small quantities of alcohol into the pipe line. The exhaust from machines thus treated is said to be in high favor with the riveters. Whether it has an exhilarating effect and whether this results in more work or in erratic work is not stated. When labor is scarce and particular, some device of this nature might help to keep machinemen on the job. Instead of using pure alcohol, equally good results should be obtainable with some of the aromatic distillates which contain alcohol in high percentages.

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John Hays Hammond, speaking at the closing session of Clark University Conference on Latin America, declared that he would not invest a cent in a foreign country as long as William J. Bryan is Secretary of State. "A nation that does not protect its citizens and investors is unworthy of the name of a nation," said Mr. Hammond, after remarking that honest workingmen, encouraged to locate in Mexico, are forced to throw away the savings of a lifetime. "They are told to get out, flee the country where their all is located," said he. "As an argument against protection for some property, it has been claimed that concessions have been secured dishonestly. I have never known of bribes being offered or taken for concessions. Investors ought to be backed and protected as long as they prove honest."

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According to Mexican dispatches the Constitutionalists are now operating trains on the lines of the National road from Santa Rosalia to Torreon, Torreon to Durango, Durango to Tepehuanes, Durango to Llano and Durango to Lodemena. They have no coal or oil, so they are using wood as fuel and the service is good, although many difficulties have to be contended with. We are glad to hear that all the mines around Durango are in a flourishing condition and work is being continued. As money is scarce, the mine owners are giving notes to the workers which will bear interest until the reëstablishment of regular railroad traffic. The miners report that the large properties of the American Smelting & Refining Co. near Velardeña have not been touched by the rebel forces operating in that region. The smelters are not working because of a lack of coal.

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At the Alaska Gold Mines Co. property some operating records are being made which have amazed the mining fraternity—those who know what a slow and tedious process is the driving of a tunnel in solid rock, says the *Boston News Bureau.* The general manager of the Alaska Gold Mines Co. is driving an 8x10 opening at the rate of 600 ft. per month and in so doing has devised a schedule of hours for his underground men which is most ingenious in that it provides for 48 hours' work every week and yet the miner does not work more than six hours per shift. It is six hours on and 12 hours off right through the week. The miners seem as enthusiastic as their superintendents in making new records and work under what approaches military discipline. A drill man, for instance, does not release his hand from an air-drill at the end of a shift until his successor has actually taken hold of the same machine, and is ready to take up the work where it is left off. This may seem like drawing the lines pretty fine, but in the end it means maximum efficiency. The scheme referred to follows:

| | On Duty | Off Duty |
|---|---|---|
| Monday | 6 a.m. to 12 noon | 12 noon to 12 midnight |
| Tuesday | 12 midnight to 6 a.m. | 6 a.m. to 6 p.m. |
| Tuesday | 6 p.m. to midnight | 12 midnight to 12 noon |
| Wednesday | 12 noon to 6 p.m. | 6 p.m. to 6 a.m. |
| Thursday.. | 6 a.m. to 12 noon | 12 noon to 12 midnight |
| Friday .. | 12 midnight to 6 a.m. | 6 a.m. to 6 p.m. |
| Friday... | 6 p.m. to 12 midnight | 12 midnight to 12 noon |
| Saturday.... .............. | 12 noon to 6 p.m. | 6 p.m. to Monday 6 a.m. |

## Report of the Geological Survey

Washington Correspondence

The annual report of the Geological Survey made public on Dec. 8 covers all of the usual topics customarily dealt with by the Bureau and in addition offers a general discussion of the question of efficiency in the survey. On that subject the director speaks as follows:

> In the Geological Survey, as in other bureaus of the Government, the endeavor to administer public funds economically is distinctly hampered by statutory and other limitations. In the thirty-third annual report detailed mention was made of the loss of efficiency, as well as danger to life and property, resulting from the crowding of a large office force and a great accumulation of technical records in utterly inadequate quarters. Since that report was published Congress has authorized the erection of an office building of modern type to accommodate the Geological Survey, Office of Indian Affairs, Reclamation Service, Bureau of Mines, and other offices of the Department of the Interior, with a cost limit, exclusive of site, of $2,596,000. On June 13, 1913, the Secretary of the Treasury included in the current deficiency estimates an item of $25,000 to provide for technical and engineering services in the office of the Supervising Architect in preparing plans for the building and for beginning its construction. It is to be noted that the same estimates include an item of "$99,261.83 to replace property and equipment destroyed by the fire of May 18, 1913, in the basement of the building now occupied by the Survey."
>
> Another efficiency limitation of quite a different type from that imposed by inadequate and dangerous quarters is presented in the restrictions placed in one way or another upon the selection of personnel. Under "lump sum" appropriations there is a fair opportunity to obtain high-grade service in the scientific and technical positions, yet even here the restraining influence of precedent prevents attaching to the higher positions salaries that are more than a fraction of those which the well trained specialists best fitted for those positions can obtain for similar work in the service of corporations. This condition has resulted in many of the members of the Geological Survey leaving Government service at the time when they have become most valuable as public servants.

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## Goldfield Consolidated

During October, 1913, the Goldfield Consolidated produced 30,486 tons of ore from which $146,918 was realized. Development work amounting to 3088 ft. was accomplished. The combined operating costs were as follows:

COST PER TON

| Mining: | Mines Co. | Milling and Trans. Co. | Total |
|---|---|---|---|
| Stoping | 3.02 | | 3.02 |
| Development | 0.56 | | 0.56 |
| Shipping expense | 0.23 | | 0.23 |
| Dump moving | 0.04 | | 0.04 |
| Transportation | | 0.08 | 0.08 |
| Milling | | 1.75 | 1.75 |
| Marketing | | 0.04 | 0.04 |
| General expense | 0.28 | 0.05 | 0.33 |
| Bullion tax | 0.13 | | 0.13 |
| Construction | | | |
| Flood damage | 0.01 | | 0.01 |
| Total costs | 4.27 | 1.92 | 6.19 |
| Miscellaneous earnings | 0.07 | 0.01 | 0.08 |
| Net costs | 4.20 | 1.91 | 6.11 |

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## The Rio Tinto Strike

The British and Spanish newspapers now coming to hand are beginning to give us some details of the late strike in the Rio Tinto mines. It appears that the strike was engineered by professional agitators who had been sowing seeds of dissatisfaction in the district for many months previous. The strike which began on Sept. 15 affected not only the mines, but also the railway, shops and the docks of Huelva. Altogether, about 17,000 men quit work. The demands of the strikers were an 8-hr. day for everybody, a general increase of 25% in wages with a minimum of 4 *pesetas* per day, and an abolition of contract work.

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## Status of Oil Land Prosecutions

Washington Correspondence

Attorney-General McReynolds in his annual report sent to Congress on Dec. 10 gives a review of the situation with reference to the oil-land prosecutions which the government has been carrying on for some time past and which are now in a somewhat difficult position on account of claims under the mining laws. The attorney says in part on this subject:

> On Sept. 27, 1909, and on several dates subsequent thereto, but prior to the approval of the act of June 25, 1910 (36 Stat., 847), which expressly declares the authority of the President to make temporary withdrawals of public lands for public purposes, a number of Executive orders were promulgated by direction of the President reserving immense areas of public petroleum lands in California, Wyoming, and other States from location, settlement, selection, filing, entry, or disposal under the mineral or non-mineral public-land laws. These reservations were generally disregarded in California, also in Wyoming, and perhaps elsewhere. It is charged that a large part of the most valuable public oil lands sought to be reserved has been entered upon and is now being claimed by individuals and corporations under the mining laws. Much of the land has been exploited for its oil, and large quantities have been extracted and are being extracted from day to day in the State of California. To remedy this condition, three suits were begun against important operators in that state and a fourth in Wyoming, and many others are in prospect. The suit in Wyoming, being free from disputes of fact and other complications which embarrass the California litigation, was selected for the purpose of securing a speedy judicial determination of the President's authority to make the withdrawals. The bill was filed in February last; a motion to dismiss was interposed by the defendants late in March; the motion was argued and submitted in May; and on June 14 the district court rendered its decree dismissing the bill, upon the ground, as set forth in an accompanying memorandum, that the order of the President was ineffective to prevent the lawful location of the land in controversy under the mining laws. An appeal to the Circuit Court of Appeals for the Eighth Circuit was promptly sued out, and that court, early in October last, certified the principal questions to the Supreme Court for answer. Upon motion of the Solicitor General the Supreme Court directed the sending up of the whole record, and has advanced the cause for hearing in January next.
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> Special counsel have been employed to conduct the cases pending, and other cases it may be necessary to institute in California, Wyoming, or elsewhere, for the protection of withdrawn areas of oil land and also to secure accountings for oil wrongfully converted.
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> The principal suit concerning lands situated in the Elk Hills in the southern district of California, mentioned in the report for the last fiscal year, is almost ready for final hearing. Substantially all of the defendants' testimony and the Government's testimony in rebuttal has been taken, and it is hoped that in the very near future it will be possible to argue the case on its merits and obtain an adjudication.
>
> The last report spoke of prospective litigation of great importance respecting oil lands in California claimed by the Southern Pacific Railroad Co. under patents containing express exceptions of all mineral lands other than iron and coal lands. The work of preparation then referred to was completed during the last fiscal year, as to one of the patents, which affects more known oil land than any of the others, and on Dec. 20, 1912, suit was instituted asserting title to approximately 46,000 acres. This suit is pending on motions to dismiss the Government's bill of complaint upon the general grounds that were urged in the private suit of Burke v. Southern Pacific Railroad Co. et al., now pending in the Supreme Court, and referred to in the last annual report. Suitable provisions have been made to expedite the litigation to bring new suits, and to protect in every practicable way the Government't rights in the land and to the oil which has been and is being extracted from certain parts of it.

# PERSONALS

Kirby Thomas, of New York, is making examinations in Tennessee.

M. L. Requa, of San Francisco, spent a few days in New York this week.

B. B. Thayer has been nominated to be the next president of the American Institute of Mining Engineers.

Allen H. Rogers has gone to Tennessee on professional work. He will return about the middle of December.

F. Danvers Power, of Sydney, Australia, who has been visiting in the United States, proceeded to London last week.

Herbert Haas, of San Francisco, has been appointed metallurgical engineer to the United States Bureau of Mines.

George W. Conant has returned to Lowell, Mass., after spending a year as electrician to the Arctic Coal Co., on the Island of Spitzbergen.

W. J. Hilands has returned to New York from Paris, where he has been in connection with the financing of a western iron development project.

Henry C. Carr has returned to New York from Ontario where he has been engaged with the Canadian Mining & Exploration Co., of New York and Toronto.

H. C. Hoover will arrive in New York per "Mauretania" about Dec. 13. He will remain in New York a week or 10 days and then will proceed to California.

C. C. Ferguson, lately with the Oliver Iron Mining Co., has been engaged as consulting engineer of the Iron Mountain mine on the Cuyuna range, Minnesota.

A. A. Hassan has left for Arizona to study and examine placer gold deposits and other mines in Mohave County. His headquarters will be in Kingman for some time.

Prof. H. O. Hofman's new treatise on "General Metallurgy" is to be translated into German. The manuscript of his new treatise on the "Metallurgy of Copper" goes to the publishers this month.

J. R. Finlay expects to be in New York during December but will return again to the lead district of Southeastern Missouri where he is engaged on important work for the St. Joseph Lead Co.

George Blow has opened an office at Knoxville, Tenn., for the general practice of mining engineering with special reference to examining and reporting upon the mineral and natural resources of the South.

Philip H. Moore, lately manager of the mining, crushing and cement machinery department of the Canadian Allis-Chalmers, Ltd., has been appointed general manager of Rock & Power Machinery, Ltd., with head offices at Toronto.

Stanley C. Sears, consulting mining engineer and metallurgist, has opened an office at 705 Walker Bank Building, Salt Lake City, Utah, and is prepared to examine and report upon mining properties and to undertake their management.

Thomas C. Keefer, of Ottawa, Canada, who a short time since entered his 93d year, has been elected an honorary member of the American Society of Civil Engineers, of which he was at one time president. A few months since the Institute of Civil Engineers of England also made him an honorary member.

# OBITUARY

Samuel H. Gilson, for over 30 years a miner and prospector in Utah, died at Salt Lake City, Dec. 2. Mr. Gilson, while prospecting on the Uintah reservation in Utah some 25 years ago, discovered the mineral which was named gilsonite after him, and which has since been of considerable importance.

David A. Harris died Dec. 1 at Johnstown, Penn., aged 70 years. He was born at Hollidaysburg, Penn., and when still a young man entered the service of the Cambria Steel Co., with which he was connected over 40 years. For more than 20 years past, he had been head of the time and production departments.

John McMahon, formerly a prominent mine operator of the San Juan district, Colorado, died at Los Angeles, Calif., Nov. 16. He was born in Orange County, N. Y., and went West in 1871, locating at Georgetown, Colo., where he became associated with the Pelican-Dives mine, which at that time was one of the famous mines of the West. In 1876, he journeyed by horseback from Denver to Lake City, going by way of Cañon City, Salida, Poncho Pass and Del Norte. In the fall of 1877 he undertook the management of the Aspen mine at Silverton and remained in charge until the following spring; from there he went to Leadville and returned to Lake City. He was appointed special deputy to take charge of the notorious criminal Packard in 1884 and shielded him from the hands of mobs bent upon lynching. At various times he was at some of the famous producers of the San Juan district and was in charge of the Humboldt in 1902. He was an honest man in his dealings and was fearless in his duties, and was held in highest esteem by all his friends and acquaintances.

Dwight A. Jones died in St. Louis Dec. 7. He was a resident of New York, but was stricken with apoplexy while visiting St. Louis on business. He was 59 years old, and was born at Utica, N. Y., graduated from Yale, and studied law at the Columbia Law School in New York. He was a practicing laywer for a number of years, devoting himself chiefly to corporation law, on which he wrote several works which are accepted as authority. In 1904, he succeeded his father, the late J. Wyman Jones, in charge of the important lead interests which the latter owned in Southeast Missouri. He was president of the St. Joseph Lead Co., the Doe Run Lead Co., and the Mississippi & Bonne Terre Ry. At the time of his death, he was arranging for a consolidation of his companies. Mr. Jones lived at Englewood, N. J., and was a member of a number of clubs. He leaves a widow and three daughters.

Maurice B. Patch died Dec. 2, while on a visit to his son-in-law at Derby, N. Y. His residence was in Buffalo. He was born at Otisfield, Maine, in 1852, and in 1872 graduated from the Massachusetts Institute of Technology as a mining engineer. His first appointment after graduating was as deputy U. S. engineer for the territory of Colorado. In 1874, however, he went to the Lake Superior copper country, and from that time on was engaged in the treatment of Lake Superior copper ores. For eight years he was chemist of the old Detroit & Lake Superior Copper Co. In 1882, he was made assistant superintendent and constructing engineer for that company. In 1886, he was appointed superintendent of the smelting works of the Calumet & Hecla Copper Co. at Lake Linden, Mich. In 1891, he was placed in charge of the Buffalo Smelting Works of the Calumet & Hecla as superintendent, retaining that position ever since. It need hardly be said that he was thoroughly versed in the treatment of lake ores and that his opinion on all questions connected with copper smelting was highly considered. He leaves many friends in the Lake Superior country and elsewhere. He leaves a widow, three daughters and two sons.

# SOCIETIES

**Mining and Metallurgical Society**—The New York Section will hold its regular monthly meeting at the Engineers' Club, Thursday, Dec. 18, at 8 p.m. The meeting will be preceded by a dinner (informal) at the Club. At the meeting the subject of discussion will be the "One Man Drill." R. M. Catlin, general manager of the Franklin mine of the New Jersey Zinc Co., will open the discussion.

**University of Toronto Engineering Society**—A dinner under the auspices of this society was given in Toronto, Dec. 5, in celebration of the 50th anniversary of the entrance to the University of Dr. John Galbraith, dean of the Faculty of Applied Science, and the 35th anniversary of his founding the School of Practical Science. F. C. Mechin, president of the Society, occupied the chair and about 500 engineers and others from all parts of Canada and several from the United States were present. The speakers included Hyndman Irwin, President Falconer of the University, G. M. Smythe, Col. W. N. Ponton, and Eric Phillips, who spoke in terms of high appreciation of the work accomplished by Dean Galbraith in the cause of scientific education and research.

**American Museum of Safety**—The jury of award, consisting of Professor F. R. Hutton, W. H. Nichols, B. B. Thayer, Dr. N. E. Ditman, and Arthur Williams, announces the annual medals of the Museum for 1913, as follows: The "Scientific American" medal for safety devices invented within three years to the Welin Marine Equipment Co. The Dr. Louis Livingston Seaman medal for progress in hygiene and sanitation and mitigation of occupational diseases, to the United States Steel Corporation. The Rathenau medal to the General Electric Co. The Travelers' Insurance Co. medal to the American employer who has done the most for the protection of his workpeople, to the New York Telephone Co. An additional special medal is awarded the Allgemeine Elektricitäts Gesellschaft of Berlin. The jury has not yet decided on the award of the E. H. Harriman memorial medal.

## INDUSTRIAL NEWS

The main sales office of the Carbo Steel Post Co. will, from Dec. 1, be in the Rand-McNally Building, Chicago.

Pacific Tank & Pipe Co. announces the removal of its San Francisco sales office from Fifth and Bryant Streets to 318 Market St., San Francisco, Calif.

The Remington Arms-Union Metallic Cartridge Co., of Bridgeport, Conn., has started work on its new Canadian plant at Windsor, Ont.

The Sullivan Machinery Co. desires to announce that John Oliphant, for many years president of the Harris Air Pump Co., of Indianapolis, has joined its engineering staff and will have charge of its pneumatic pumping department.

A new company, the Eastern Car & Construction Co., under the leadership of W. E. Farrell, has purchased the business of the Ernst-Wiener Co., and will hereafter sell that well known line of industrial railway equipment under the new name.

Harold D. Tompkins, formerly associated with the Niles-Bement-Pond Co., of Philadelphia, has accepted the position of mechanical engineer with the Smooth-On Manufacturing Co., Jersey City, N. J. He has charge of the concrete-waterproofing department.

Hardinge Conical Mill Co., 50 Church St., New York, N. Y., reports the order of two 6-ft. Hardinge Pebble Mills from the Bunker Hill & Sullivan Mining & Concentrating Co., of Kellogg, Idaho. This company is already operating four units of this size. This company also reports the order for two sectionalized mills for the interior of South America and two of the largest size 8 ft. by 30 in. mills for the Silverton Mines, Ltd., of Silverton, B. C., which company is installing the flotation system.

## TRADE CATALOGS

John A. Roebling's Sons Co., Trenton, N. J. Catalog. The Wire Rope at Panama. 10 pp.; illus.; 9x12 in.

Wood Drill Works, 30-36 Dale Ave., Paterson, N. J. Catalog. Rock drills. Illus., 32 pp., 6x9 inches.

The Gardner Governor Co., Quincy, Ill. Circular P-8. Gardner duplex power pumps. Illus., 8 pp., 6x9 inches.

The Lunkenheimer Co., Cincinnati, O., Booklet, Lunkenheimer Regrinding Valves: 24 pp. Illus. 6x3½ inches.

Crocker-Wheeler Co., Ampere, N. J. Bulletin No. 160. Induction motors for general use. Illus., 20 pp., 7x10 inches.

Allis-Chalmers Co., Milwaukee, Wis. Bulletin No. 1805. Hoisting cages, skips, landing dogs, etc. Illus., 28 pp., 8x10½ inches.

C. O. Bartlett & Snow Co., Cleveland, Ohio. Catalog No. 42. Triumph crushers, feeders, pulverizers. Illus., 32 pp., 6x9 inches.

Sprague Electric Works, 527-531 W. 34th St., New York. Bulletin No. 247. Round type direct current motors. Illus., 24 pp., 8x10½ inches.

Bernard MacDonald, 1005 Fair Oaks Ave., South Pasadena, Calif. Booklet, The Parral Tank System of Slime Agitation: 36 pp. Illus. 9¼x6 inches.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 34-D. "Chicago Pneumatic" Corliss steam driven compressors. Illus., 32 pp., 6x9 inches.

Smooth-On Mfg. Co., 572-574 Communipaw Ave., Jersey City, N. J. Circular. Smooth-On Iron Cement No. 7 for surfacing and stopping leaks in concrete. Illustrated.

The Cincinnati Milling Machine Co., Cincinnati, Ohio. Catalog. Cincinnati Semi-Automatic Millers with Intermittent Feed and Power Quick Return. 16 pp.; illus.; 7½x11 in.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

OIL-BURNING FORGE. John George Leyner, Denver, Colo., assignor to The J. Geo. Leyner Engineering Works Co., Littleton, Colo. (U. S. No. 1,078,154; Nov. 11, 1913.)

CRUSHING—Improvements in Mills or Apparatus for Reducing Ore or Other Materials. R. Rodger, Knigersdorf, Transvaal. (Brit. No. 21,069 of 1912.)

ORE SEPARATOR. Fritz Oscar Stromborg, Seattle, Wash. (U. S. No. 1,078,520; Nov. 11, 1913.)

BRIQUETTES—Process of Making Briquettes of Fine Ores. Otto Kippe, Osnabrück, Germany. (U. S. No. 1,078,544; Nov. 11, 1913.)

COPPER-SMELTING FURNACES, Improvement in. W. G. Perkins, London, Eng. (Brit. No. 27,869 of 1912.)

AMALGAMATOR. Jacob Isaac Anderson, Prescott, Ariz. (U. S. No. 1,079,534; Nov. 25, 1913.)

CYANIDING — Filter-Leaf. Charles Butters, Oakland, Calif. (U. S. No. 1,078,993; Nov. 18, 1913.)

CYANIDING—Process of Dislodging Slime Cakes from Filter Media. Charles Butters, Oakland, Calif. (U. S. No. 1,078,-994; Nov. 8, 1913.)

REGENERATIVE FURNACES—Improvements in and Relating to the Operation of Regenerative Furnaces Adapted More Specifically for the Manufacture of Steel. N. E. Maccallum, Phoenixville, Penn. (Brit. No. 30,079 of 1912.)

SINTERING—Method of Treating Materials for Sintering. Quincy Bent and Edwin Barnhart, Sparrows Point, Md., and James B. Ladd, Ardmore, Penn. (U. S. No. 1,078,988; Nov. 18, 1913.)

TENSILE STRENGTH OF IRON—Method of Treating Iron to Increase Tensile Strength. John Kirby, Pittsburgh, Penn. (U. S. No. 1,079,129; Nov. 18, 1913.)

ALUMINUM—Improvements in the Production of Aluminous Compounds. H. Spence, W. B. Llewellyn and Peter Spence & Sons, Ltd., Manchester, Eng. (Brit. No. 22,590 of 1912.)

ALUMINUM-BEARING MATERIALS, Treatment of. Harry P. Bassett, Catonsville, Md. (U. S. No. 1,079,589; Nov. 25, 1913.)

ALUMINUM NITRIDE—Process for the Manufacture of Aluminum Nitride. Ottokar Serpek, Paris, France, assignor to Société Générale des Nitrures, Paris, France. (U. S. No. 1,078,313; Nov. 11, 1913.)

LEAD OXIDE—Improvements in or Connected with the Production of Lead Oxide and in Means or Apparatus Employed Therein. W. Innes, Liverpool, Eng. (Brit. No. 15,664 of 1912.)

MAGNESIUM—Process for the Preparation of Metallic Magnesium. ~~Roger William~~ Wallace and Eugène Wassmer. London, England. (U. S. No. 1,079,079; Nov. 18, 1913.)

BLASTING—Mine-Shot-Firing System. Grant I. Rawson, St. Louis, Mo. (U. S. No. 1,078,463; Nov. 11, 1913.)

DRILL—Hammer Drill. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,078,952 and 1,078,953; Nov. 18, 1913.)

DRILL—Percussive Tool. William Clement, Phillipsburg, N. J., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,078,188; Nov. 11, 1913.)

MINE PUMP. Lewis Chadwick, Nelsonville, Ohio. (U. S. No. 1,078,126; Nov. 11, 1913.)

CENTRIFUGAL SCREEN AND CLASSIFIER. Christ Bartholomai, Los Angeles, Calif. (U. S. No. 1,078,819; Nov. 18, 1913.)

CONCENTRATING JIG. Marshal C. Seagrave, Oakland, Calif. (U. S. No. 1,079,905; Nov. 25, 1913.)

CONCENTRATOR—Multiple-Deck Concentrator. Albert E. Wiggin, Anaconda, Mont., assignor of one-third to Ulysses A. Garred and one-third to Frederick Laist, Anaconda, Mont. (U. S. No. 1,078,977; Nov. 18, 1913.)

ORE CONCENTRATION. George Albert Chapman and Stanley Tucker, London, England, assignors to Minerals Separation, Ltd., London, England. (U. S. No. 1,079,107; Nov. 18, 1913.)

ORE FEEDER and Sampler. Walton Lake Morehouse. Madera Mexico. (U. S. No. 1,079,184; Nov. 18, 1913.)

ORE SEPARATOR. Albert M. Plumb, Platteville, Wis. (U. S. No. 1,079,362; Nov. 25, 1913.)

PULP DISTRIBUTOR. Wilton E. Darrow, Sutter Creek. Calif. (U. S. No. 1,078,775; Nov. 18, 1913.)

SAMPLER-OPERATING DEVICE. Laban E. Jones, Anaconda, Mont. (U. S. No. 1,079,010; Nov. 18, 1913.)

CHARGING—Apparatus for Charging Furnaces or Ovens. Utley Wedge, Ardmore, Penn. (U S. No. 1,079,081; Nov. 18, 1913.)

COMPLEX ORE TREATMENT—Process for the Treatment and Separation of Complex Sulphide Ores. Tormod Reinert Forland, Broken Hill, New South Wales. (U. S. No. 1,078,779; Nov. 18, 1913.)

GAS PURIFICATION—Purification of Gases Containing Sulphur Dioxide. Rudolph Messel, London, England, assignor, by mesne assignments, to General Chemical Co., New York, N. Y. (U. S. No. 1,078,937; Nov. 18, 1913.)

PREHEATER and Furnace Shield. Walter S. Rockwell, New York, N. Y. (U. S. No. 1,079,266; Nov. 18, 1913.)

REFRACTORY MATERIAL. Frank J. Tone, Niagara Falls, N Y., assignor to the Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,078,525; Nov. 11, 1913.)

# EDITORIAL CORRESPONDENCE

### DENVER—Dec. 6

**In the Coal Miners' Strike** the operators and the United Mine Workers are practically agreed on all controversial points except two, wages and union recognition, and these two are properly and indisputably subjects for arbitration and this is now absolutely essential to the settlement of the trouble. The coal operators have agreed to all the other points in the controversy, supported by their assurance to Governor Ammons that they will conform to them in good faith as follows: The employment of a check weighman as provided by law, giving the miners themselves the right to choose their own check weighman. The carrying out in good faith, the statute making it unlawful to use or employ, directly or indirectly, the so called "truck" or "scrip" system in the payment of men. The enforcement of the law for an eight-hour day at all underground mines and coke ovens, as provided in Chapter 95 of the session laws of 1913. That all employees shall have the right to buy where they will, without interference or coercion of any kind whatsoever. That all employees shall be paid semi-monthly, according to the custom now prevailing in coal mines over most of the state. That all employees shall have the right to board where they please. The enforcement of all the provisions of the coal-mine inspection law of 1913, providing for the safety of the mines and the protection of the life and health of the employees. That all employees now on strike shall be given employment except where their places have been filled or where they have been guilty of violence or other unlawful acts; and that where they have been guilty of violence or other unlawful acts, and that where places have been filled, other work will be furnished as soon as practicable. But the mine workers continue to reject all propositions and to make recognition of the union a paramount demand. However, Nov. 28, as a supplemental proposition Governor Ammons and Secretary of Labor Wilson joined in the following request: That the proposition of the coal operators, as contained in the memorandum of Governor Ammons, dated Nov. 27, be agreed to by the miners. That the following disputed questions be referred to a board of arbitration: (a) The question of an increase in wages. (b) In lieu of the proposition of recognition of the union, the question of devising a method by which future grievances and disputes may be adjusted without resorting to strikes. The board of arbitration is to be composed of seven members, three to be selected by the operators, three by the miners, and the six to select the seventh member of the board. Should the six fail to agree on the seventh then President Wilson shall select him. This board, should it be organized, is to render its decision within 60 days, its findings on the question of wages to be effective from the date of resuming work. Pending the decision of the board work will be resumed in the mines. In view of the great distress that this industrial war is causing to thousands of citizens and of the fact that it is injuring the property of the state, it was hoped that both sides would accept this counsel of the governor of the state and Secretary of Labor. On Dec. 1, however, after a conference with Governor Ammons, Secretary Wilson sent a letter to the miners and operators withdrawing the joint proposition for arbitration of the strike situation, pending a referendum vote by the miners on the proposition of the governor, which the miners' committee then assured Secretary Wilson would be called out of courtesy to him as soon as possible, wage increase and recognition of the union to be excluded on the proposal for referendum test. The United Mine Workers and the State Federation of Labor, and Mother Jones, who has returned here from Washington, are busy, and it is announced from union headquarters that prominent speakers have been engaged to carry on an active campaign for a state-wide sympathetic walk-out. Mother Jones, abusive and violent as usual in her talk, characterizes Governor Ammons as a "moral coward" and "a time server for the interests." Twenty-five indictments against national and state officers of the United Mine Workers were returned by the federal grand jury Dec. 1, at Pueblo. The charges against them were for "maintaining a monopoly of labor," and "for conspiracy in restraint of trade." The criticism of the jury was strong, the report declaring that their methods are "an insult to conservative and law-abiding labor." "They have brought experienced strike agitators into the state," the report says, "and have armed hundreds of irresponsible aliens, who have become a menace to the peace and prosperity and even the lives of our citizens." "They created open insurrection in southern Colorado and have resorted to measures which all fair-minded labor organizations repudiate." No arrests were made and they will be given reasonable time to furnish bonds. On Dec. 3, the call for a convention to be held in Denver to issue the order for a state-wide walk-out of all organized craftsmen in support of the striking coal miners, was issued by the president of the State Federation of Labor, and it will be held Dec. 16. Every union in the state will be represented, including trainmen. The proposition of Governor Ammons for a settlement of the coal strike was rejected Dec. 2 by nearly a unanimous vote of the striking miners; 9000 men balloted on the question. The next step is for the secretary and governor to resubmit jointly their arbitration proposal, which was temporarily withdrawn that the vote on the terms offered by the governor might be taken. It is expected that a vote on the arbitration question will also be asked.

### BUTTE—Dec. 3

**In Northern Pacific Minerals Rights Case** an oral opinion was handed down Nov. 26, at Helena, to the effect that the railway company will have to pay taxes in Montana on the mineral rights which it has reserved in its deeds to agricultural lands.

**The Anaconda and Butte-Ballaklava Settlement** of their differences, of three years' standing, concerning a vein adjoining the Mountain Chief claim of the Anaconda company, is believed to be an important step toward the abandonment of the complex apex system of vein ownership in Montana in favor of vertical-plane ownership of orebodies within claim boundaries. By the terms of the agreement made out of court the Ballaklava property, which has been idle under injunction for three years, ~~may~~ begin mining ore immediately. All charges and claims made by the Anaconda company have been dismissed and the Ballaklava company is allowed undisputed possession of all veins and portions of veins inside a vertical plane dropped from the surface boundary between the Butte-Ballaklava, and adjoining Mountain Chief claim on the north. It gives the Butte-Ballaklava company as much of the vein in question as a favorable court decision would have, and also the downward extension of the vein to an estimated depth of 3000 ft. or more. The Anaconda company agrees that any portion of the Mountain Chief vein lying north of the Ballaklava vein, if at depth is found to dip inside the latter's ground, shall, within the vertical-plane boundary, be the property of the Butte-Ballaklava company.

**The Montana Power Co. Hearing**, which had been postponed from Nov. 13, was resumed Nov. 29 before the state public service commission at Helena. L. O. Evans, attorney for the defendant, stated that his client took the same stand in the matter as outlined at the former meeting, namely that it was not prepared at this time to introduce evidence bearing upon the reasonableness or unreasonableness of the rates, as the valuation of the company's property, now being made, would not be completed for six months yet, but expressed the hope that the investigation of the company's books by the commission's accountant and engineer, which had been under way for the last two weeks, would be convincing proof of the fairness of the company's request for additional time. Commissioner Morley, in behalf of the commission, stated that from the findings of the accountant and engineer, they believed the rates to be excessive and felt they had sufficient evidence on which to base an order for a reduction. He went on to say that the commission had prepared a new schedule which it would like to have go into effect Dec. 1, but first wished to know if it would demoralize the company's accounting department to order them in so abruptly. Attorney Evans replied that although the company was not enthusiastic over any change, still if the rates were to go into effect in a month or two anyway it was immaterial whether it was done at this time or later. In introducing the new schedule which calls for a considerable cut in electric-lighting rates in 31 cities and towns in the state, the commission stated that the greatest reductions were made on business and residence rates, as the old power rates were for the most part considered reasonable and fair. It further stated that from records of investigations made by other public service commissions it is shown that it does not follow that the power company's earnings will be decreased proportionally to the reduction of the rates, as the commission was of the opinion that the reduced rates will result in some increase in the amount of business done. In four of the larger towns of the state, Butte, Great Falls, Livingston and Bozeman, an average reduction of a little over 19% will be made. In Butte the old rate will be reduced from gross, 13.5c.; net, 11.8c. per kw.-hr.; to gross, 10c.; net, 9½c. per kw.-hr., the gross reduction being 26% and net, 19½%.

### SALT LAKE CITY—Dec. 3

**A Metallurgical Research Station** at Salt Lake City is provided for in a bill introduced by Congressman Howell, of Utah. It is to be maintained jointly by the Federal Government and the state, and is already in operation, though the organization has not been completely effected. Under the arrangement with the Government, the state will furnish $7500 annually for the maintenance of the station, and the Government will pay the salary of the director, which will be $4000. Examinations for this position were held Nov. 10, and applications are being considered by the Bureau of Mines.

**Suit of the Majestic Mining Co.,** operating in Beaver County against the Miners' Smelting Co., controlled by F. A. Heintze, was settled Nov. 28, by the payment of $21,000 to the plaintiff. Judgment was awarded the Majestic company and execution issued last June. Following the recent payment, the case was dismissed from the Federal Court. In the suit the Miners' Smelting Co. was characterized as a dummy corporation. This company leased the Majestic smelter near Milford, and secured a favorable contract on Silver King Coalition ores, which it later turned over to another smelting company.

### CALUMET—Dec. 9

**An 8-Hr. Day and $3 Minimum Pay** for underground employees has now been granted to the striking copper country miners so that all the demands made by the federation at the beginning of the strike have been conceded except recognition of the union. On Dec. 7 two strike breakers were shot to death and a third was so seriously wounded that he died that night in an attack made on a non-union boarding house at Painesdale by the strikers. A 14-year old girl was seriously wounded as she lay in her bed. The miners, armed with guns and carrying much ammunition, surrounded the house at 4 a.m., while everybody inside was asleep and opened fire. They riddled the sides of the house with bullets. Some of the clapboards looked like sieves when the firing ceased. Those who were shot were either wounded in their beds, the strikers taking particular care to fire into bedrooms, or they were seeking shelter in halls and closets. At a meeting Dec. 7, of the Citizens Alliance, a resolution was adopted calling upon Sheriff Cruse to relieve the district of strike agitators. A threat was made that the alliance would "take other means" unless the sheriff acted. The impeachment of Judge O'Brien, Sheriff Cruse and Prosecutor Lucas was also threatened for what the speakers called the dilatory handling by these officials of the strike situation. There were several meetings of union miners that afternoon at which agitators told the strikers to use force of arms against any officers of the law who should attempt to arrest them in their homes. Indeed it is thought that Sunday was an eventful day and probably developed conditions which will go a long ways toward restoring law and order. In the morning several of the Houghton business men met at the Houghton Club and formulated plans of action; after this meeting they adjourned to the Houghton fire hall, sounded fire alarms for several minutes at a time, gathered together all of the citizens who could be reached for the purpose of getting the views of citizens in all walks of life. Many speeches were made and result was chartering of a special train over the Copper Range railroad and the whole party going to Calumet, where they planned a similar meeting for the citizens there. When the Houghton party reached Calumet few Calumet people knew anything of the plan, but after meeting got well started the armory, where the meeting was held, was crowded. Result of the meeting was that next Wednesday is to be a half holiday with full pay and patriotic meetings will be held in the several copper country towns. Good speakers will be engaged and it is thought that before the week is over the agitators will find things too much against them to warrant their remaining. After they go it will be a simple matter, comparatively, to adjust differences between men and mining companies. Workmen at Painesdale broke up the strikers' parade Dec. 8, and then held an indignation meeting. They threaten the lives of the agitators, and trouble is feared. At Baltic 150 strikers were ordered to stop when crossing mine property.

### NEGAUNEE—Dec. 6

**Water Power on the Menominee River** at Quinnesec Falls is being further developed by the Steel Corporation, supplementing a hydraulic plant that for many years has supplied compressed air to the Chapin mine at Iron Mountain. Work on the new hydro-electric plant has been in progress for several months. The power building, which is of concrete, as is the dam, is reinforced with steel. It is 55x61 ft., and three stories high. More than 25 carloads of machinery have arrived and been delivered at the site, hauled from the railroad yards to the river by teams of horses. The steel towers which will carry the transmission lines have been erected. The workings of the Chapin mine which pierce limestone are exceptionally wet. The property not only makes water regularly, but at times is afflicted with excessive flows. Necessarily, the mine has a powerful pumping equipment and it has as well bailers for use in emergencies. It was principally to offset the extra expense of pumping that it was decided by the Chapin's original management, the late Senator M. A. Hanna, of Cleveland, who was president of the company at the time of its acquisition by the Steel Corporation, to harness the Quinnesec Falls and procure cheap power. The hydraulic plant was established in 1883 and has since been improved from time to time, one of the principal betterments being the substitution of turbines for undershot wheels. There are four turbines at present, each geared to a duplex air compressor. The plant has a capacity of 20,000 cu.ft. of free air per minute. The air is forced through a steel main 16.666 ft. long at a pressure of 65 to 70 lb. at the river and reaches the mine at a pressure averaging 5 lb. less. Power drills and small underground pumps are operated by the compressed air, as is much of the surface machinery. The installation of the hydro-electric plant will provide the Chapin with all the power it needs. Supplementing it will be a steam plant for use in contingencies such as may be caused by ice conditions in the river. The generating station at the falls will be equipped with two 2800-hp. Allis-Chalmers turbines, each directly connected to an 1875-kw. 2300-volt, 3-phase, 60-cycle generator. Stepped up to 13,200 volts, the electricity will be transmitted to the No. 2 Hamilton shaft at the mine. Electricity will be used in pumping, in underground tramming, in lighting and in driving motors at the stock piles and in the shops. In the sixteenth or bottom level of the mine there will be installed two motor-driven centrifugal pumps, each of a capacity of 3000 gal. per min. under a head of 450 ft. These pumps will elevate the water to the twelfth level, whence it will be forced to the surface by two six-stage motor-driven pumps of a capacity of 3000 gal. The hydro-electric plant of the Chapin will be the third installation of the kind on the Menominee iron range. The others are the plant of the Peninsula Power Co., at the Twin Falls of the Menominee River, whence electricity is transmitted to mining properties as far distant as Iron River, and the plant of the Penn Mining Co., a subsidiary of the Cambria Steel Co., at the Sturgeon Falls.

### IRON RIVER—Dec. 6

**Attention to Lawns and Gardens** has been stimulated by the proffer of prizes to the employees at the Baltic and Caspian properties of Pickands, Mather & Co., in the Iron River field on the Menominee range. This year more than usual attention has been devoted to lawns and gardens. It is estimated that the total value of the vegetables grown in 66 gardens at the Caspian and 38 at the Baltic was close to $4000, an average of approximately $40, and $1000 in excess of the value of the crops raised the preceding year. The many well kept lawns and flower gardens have greatly improved the appearance of the mining locations. A system of awards similar to this Menominee range enterprise of General Superintendent Charles E. Lawrence, is in effect at the Marquette range mines of the Cleveland-Cliffs Iron Co.

### TORONTO—Dec. 6

**The Oil Rush to Alberta,** where at Athabasca Landing, claims covering approximately 300,000 acres, have been staked out, was due to the operations of O. T. Ross, a California oil expert, who has been making investigations for several months. He has secured the backing of Dr. W. T. Shillington, who has been associated with mining enterprises in Cobalt, and has taken up claims on the Athabasca River, 50 miles northwest of Athabasca Landing. A standard oil-drilling outfit will be taken in over the ice this winter to be ready for the commencement of work in the spring. Ross states that he will be prepared to drill 4000 ft. if necessary, but does not expect to have to go down so far. It is not intended to put stock on the market.

# THE MINING NEWS

## ALASKA

SUSPENSION OF 1913 ANNUAL ASSESSMENT WORK is asked for in an appeal sent to Congress by miners of Nome district. Last season was a most disastrous one. Scarcity of water during entire summer prevented miners from making cleanups, and output was only 50% of what it would have been under favorable circumstances. Recent disaster at Nome destroyed many miners' homes and their winter outfits were lost.

ALASKA MEXICAN (Douglas)—October milling, 18,606 tons, yielding $24,650, or $1.34 per ton; estimated profit, $3262.

ALASKA TREADWELL (Douglas)—Tailings from mills having so filled up channel that big boats could not land at low water; wharf has been extended 50 ft. At Nugget Creek near Juneau work has been started on tunnel to divert water while foundation of dam is joined to bedrock. Work on earth and timber dam will commence next spring and will be completed next year.

## ARIZONA

### Gila County

IRON CAP (Globe)—Raise from 800 to 650 level broke through Nov. 26. Drift on 650, which is being driven to make connection with old Eureka shaft of Arizona Commercial, is expected to "hole through" at each round.

SUPERIOR & BOSTON (Globe)—Vein on sixth level, which was abruptly cut off by mass of diabase, has been relocated through diamond-drill hole which was started some time ago. Hole was drilled southerly at an angle of 60° with strike of vein. At a distance of 187 ft. it encountered vein and at 210 ft. is still in lode.

INTERNATIONAL SMELTING & REFINING CO. (Miami)—Survey for site of new smelter, which is being erected by International Smelting & Refining Co. at Miami, has been completed and work of grading is in progress. Construction will be under supervision of Repath & McGregor. According to present plans new plant will contain three reverberatory furnaces, with probably one blast furnace and six or seven converter stands. Site is in same valley as Inspiration concentrator, directly north of Miami mine and approximately equidistant between it and Inspiration mill. In addition to smelting Inspiration concentrates, Miami concentrates will be treated. Combined annual copper production of Miami and Inspiration should approximate 110,000,000 lb. Ores from numerous small mines in Miami district will probably be treated in new plant, also those adjacent to Globe, and other Southwestern properties which have been sending their ores to El Paso with a long freight haul.

### Maricopa County

RED ROVER (Phoenix)—Work has been resumed. Ore will be shipped to smelter at Douglas.

MAMMOTH (Mesa)—Stamp mill and cyanide plant are in commission. Much ore is ready for milling and plant may be enlarged.

VULTURE (Wickenburg)—During the last nine months gold bullion worth $276,772 and concentrates worth $152,643 were produced.

MAX-DELTA (Phoenix)—Probably a gravity tramway will be built and as good milling ore has been blocked out by recent development a mill may be built.

### Mohave County

C. O. D. (Kingman)—Mine has been taken under option by Qualey Bros., of New York. A large mine-pumping plant is to be installed. This is considered one of the largest base-metal mines in county.

### Pinal County

CALUMET & ARIZONA (Superior)—High-grade silver ore is being sacked and shipped. Great improvements have been made in roads between Ray and Superior. Automobiles and teams make trips daily now and travel has reached a stage to warrant establishment of a roadhouse between Ray and Superior, this on a road where W. D. Fisk only a short time ago put first automobile through with ropes and a cow pony.

### Santa Cruz County

R. R. R. (Patagonia)—Considerable difficulty is being experienced in securing enough cars to transport ore. Loading platform at Bloxton is filled to limit and considerable ore is being stored in drifts at mine. Since property was taken over by N. L. Amster 530 cars of high-grade ore have been shipped.

### Yavapai County

HAYES (Turkey Creek)—J. P. Cleator and William Parker are operating mine under lease, treating free-milling ores in Parker mill.

COPPER-GOLD ZONE MINES CO. (McCabe)—New English company having taken over Henrietta and Nigger Brown mines has already begun operations. New company will complete lower tunnel on Henrietta, which is 1300 ft. long but lacks 200 ft. of cutting oreshoot. This will give additional 200 ft. of backs. The 200-ft. shaft on Nigger Brown property will be sunk several hundred feet, it being plan to thoroughly develop mines before attempting milling. A force of men is putting camp in order, preparatory to extensive work.

## CALIFORNIA

### Nevada County

GASTON (Gaston via Washington)—Mine and upper mill will be operated during winter. Lower mill will be enlarged next spring.

ETHEL (Washington)—Judgment in favor of B. Goodwin and Citizens Bank of Grass Valley has been rendered and property ordered sold in satisfaction of $13,737. Ethel Gold Mining Co. was obliged to mortgage mine in order to satisfy creditors and was unable to pay off mortgage.

SULTANA (Grass Valley)—Working shaft has been abandoned, but mine is to be worked through Orleans shaft, which will be reopened. It was through operation of Orleans that vein was disclosed that resulted in expenditure of a large amount of money in Sultana and Prescott Hill mines.

### Shasta County

BALAKLALA CONSOLIDATED (Coram) — Precipitation tanks for recovering copper from mine waters have been installed, system resembling installations at Iron Mountain mine. Precipitant is scrap iron. It is reported that saving will be $1500 per month. Construction of new lighting plant is progressing well.

FIELD PROCESS—Plant for desulphurizing copper ores is being installed at Redding. Roasting furnace is completed. Steel flue, 300 ft. long, to receive fumes from roaster is being built. Invention is by A. U. Field, of Stockton. Cost of installation is being borne by sale of stock chiefly to residents of Shasta County.

### Sierra County

RAINBOW (Alleghany)—Property which had been sold to state for taxes has been redeemed by payment of a total of $4687, including taxes and interest.

SIERRA DEL ORO (Downieville)—Nissen mill, lately installed, is crushing lower-grade ore which has accumulated during several months' development work. A complete plant has been erected, with snow sheds, compressor plant, electric lights, and every convenience for a busy winter in this altitude. Frequent shoots of high-grade ore have been encountered during last year.

KATE HARDY (Forest)—Compressor plant has just been installed, and a shaft has been started on south side of Oregon Creek, to be sunk on east wall of vein to connect with a raise from lower tunnel at a point where rich ore was recently taken out. Vein is from 6 to 30 ft. wide, and ore mills $5 per ton gold, exclusive of high-grade shoots, which are frequently encountered in development.

TIGHTNER (Alleghany)—Twenty stamps are dropping and output of over $60,000 per month, established in August, is still being maintained, with an operating expense of but $6000 per month. A two-compartment winze is being sunk on a developed payshoot. All necessary machinery is on hand for continuing sinking all winter, and this development will be carried to a depth of at least 500 feet.

NORTH FORK (Forest)—Collapsed air pipe in this gravel mine has been repaired and operations are proceeding both in North Fork and Wisconsin adjoining. New machinery for surface plant has been installed preparatory to an all-winter campaign of development. Drifting is being continued on Uncle Sam vein, and it has been found that strike has changed from northwest with a western dip to northeast with an eastern dip. Raises are being drifted with hope of encountering bonanza believed to exist in Uncle Sam, and failing in that, winze will be sunk to greater depths, and levels driven.

### Trinity County

LA GRANGE (Weaverville)—New siphon of 12-in. pipe is being installed. It will supplement present system bringing water from the Trinity River. Siphon will take water across cañon of Stewart's Fork. Main arm is 1300 ft. long and second section 1100 ft. long.

## COLORADO

### Clear Creek County

LAMARTINE—Development by lessees on 160-ft. level below Lamartine tunnel is meeting with success. East drift has encountered shoot of smelting ore.

GOLD FISSURE—Mine is being developed through Empress tunnel. Several drifts have been driven and it is reported that high-grade gold ore has been struck in lower workings.

OGALALIE—Mine located on Columbia Mountain near Joe Reynolds and American Sisters properties, has been developed with encouraging results. Adit has been advanced 450 ft. and has opened 10-in. vein of silver ore. Company proposes to carry on development work throughout winter.

LITTLE GIANT—In near future scheme of development of this group of mines on Red Elephant Mountain will be enlarged. Drifts will be driven on White vein to increase reserve of milling ore already developed and with view of prospecting unexplored territory. Development on this vein has disclosed several pockets of high-grade ore. Company plans to advance Tabor tunnel about 1000 ft. This tunnel is about 300 ft. above Commodore tunnel which was apparently driven in a barren zone. One of most important veins to be intersected by new development is Little Giant. Company is seriously considering erection of a modern mill during summer of 1914. Proposed site is Lawson on Colorado & Southern Ry. so that old Commodore compressr plant buildings may be utilized, capacity 50 tons per day.

### San Juan Region

SUNNYSIDE (Silverton)—A fire burned upper tramway terminal and several other buildings Dec. 1. Mine and mill will be shut down for several weeks. Loss is estimated at $75,000, with $40,000 insurance.

### Summit County

COLORADO DREDGING CO. (Breckenridge)—Gold bullion was recently shipped to Denver mint. It was result of 10 days' work and shows a cleanup of $1000 worth of gold for each 24 hours of actually dredging.

CORA BELLE MINING CO. (Montezuma)—Property on Collier Mountain is developed by six tunnels from 600 to 1000 ft. long. Silver-lead ore is product and average grade shipped to Leadville smelter is 26 oz. silver and 40% lead. Milling ore goes to Sutton, Steele & Steele Co., in Denver.

### Teller County

CRESSON (Cripple Creek)—Output has been increased to 150 tons per day of low- and medium-grade ores coming from 300- down to 1100-ft. level.

GOLDEN CYCLE (Goldfield)—Caving in the stopes occurred Dec. 1, five men being entombed. Two were rescued. On morning of Dec. 2 another slide occurred, and all day 200 miners working in 25-min. shifts, attempted to reach other men, but hope has been abandoned of finding them alive, even if they escaped being crushed. More than 100 carloads of rock will have to be moved before miners can be reached. All mine work has been suspended, and adjoining Vindicator mine has curtailed work for fear that blasting may occasion further slides.

## IDAHO

### Cœur d'Alene District

THE SUNSET PEAK DISTRICT seems to have impressed favorably mining men who visited that region recently. Interstate-Callahan is developing into a producer, capable of an output of 300 to 500 tons daily. W. A. Clark's property is well developed, and with Idora, Amazon-Manhattan and others in almost the same advanced state question of transportation arises. Mills are to be built and opinion now favors erecting them on Beaver Creek, constructing a branch railroad down creek to North Fork and there connecting with the main line, a distance of eight miles. Probably 500 miners are now employed in Sunset district, and when regular shipping operations are under way this force will be increased to more than a thousand.

FEDORA (Murray)—Contract just finished failed to reach vein. Crosscut will be continued, however, until vein is struck. Property adjoins Jack Waite mine.

CARBONATE HILL (Mullan)—New water power plant is installed and sinking of shaft has been begun. Ore showing is best of any property south of river in Mullan district.

CALEDONIA-BUNKER HILL (Wallace)—Final step in settlement of litigation over apex of Caledonia orebody was taken Dec. 1, when capital stock was increased from $1,500,000 to $2,605,000. Threatened injunction of minority stockholders to prevent increase in capital stock failed to materialize. Bunker Hill will be represented on board of Caledonia and will receive approximately 1,300,000 shares of stock. Caledonia gets use of Kellogg tunnel through which it will haul its ore and one unit of old east mill of Bunker Hill company. Caledonia workings will be connected with an incline raise from Kellogg tunnel. Work on raise is now nearly completed. Crosscut to connect with top of raise is also being driven. It is expected that by first of year Caledonia will have a force of men stoping and mine will again be a steady producer.

### Idaho County

YELLOW PINE (Clearwater)—A company of Kellogg men has taken a lease on this group on Clearwater River, about 45 miles from Stites. A 5-stamp mill will be built. Ore is rich in gold, vein is 4 ft. wide and has been traced 3000 ft. across claims. There is abundant mining timber on claims and sufficient water power can be developed to operate 100 stamps.

## MICHIGAN

### Iron

MILLE (Iron Mountain)—This property, which at one time produced higher grade ore than any other Menominee range property, is to be sold at public auction this month. Mine has not been worked steadily for a number of years, and lease of present operators does not expire for several years, but they are anxious to relinquish their claims. There is considerable low-grade ore left and small pockets of high-grade ore.

NEGAUNEE (Negaunee)—It is believed that this mine is the only one on Marquette range, if not in district, which has added to its mining force this autumn. Most properties are compelled to lay off men when shipping comes to an end, but Negaunee did the opposite and took on 50 miners this week. Most of them were men who had been let out at Lake mine at Ishpeming and Princeton at Gwinn, all Cleveland-Cliffs properties. There is little ore in stock at present.

CLEVELAND LAKE (Ishpeming)—One shift was laid off Dec. 1 by owners, Cleveland-Cliffs Iron Co. Lake is one of largest producers of iron ore on Marquette range, and most of the ore that was stocked last winter was sent out this summer. Weakness of iron market is given as cause for curtailment. Many men who were thrown out of work were given employment at other mines owned by company. With exception of Lake Angeline mine, which works three shifts per day, there is not a single mine in Ishpeming field working with a night crew.

VERONA MINING CO. (Iron River)—Company suspended all operations at Bengal and Baltic mines several days ago and it is unlikely that further work will be done until next summer. Properties were closed down for 10 days short time ago in order to make room for stocking ore, and it was not long after resumption that word came from Cleveland to suspend all operations. Fogarty, owned by same company, has reduced its force to one shift. Company has laid off single men who were employed at Caspian. There are not many mines in operation in Iron River district, only two working in Spring Valley, and they are employing small forces.

## MINNESOTA

### Cuyuna Range

RADIO-ACTIVITY OF CUYUNA ORE has been investigated by George B. Woodason, who has a local reputation as a divining-rod expert. Between two photographic plates were placed several keys and coins. All were then placed inside a book, which was wrapped in lightproof paper and other covering and encased between tightly screwed boards. The whole was then buried in 7 ft. of mud at chosen location. After several hours it was taken out, and plates, on development, were found to be radiographs. [A reproduction of photograph thus obtained accompanied correspondent's letter. —Editor.]

IRON MOUNTAIN (Iron Mountain)—Contract let with Ames Iron Works, New York, for two 150-hp. horizontal-tubular boilers and complete hoisting equipment.

THOMPSON (Crosby)—In stripping operations a large body of peat has been opened. Minnesota School of Mines is making experiments to determine its commercial value.

DULUTH-BRAINERD (Ironton)—Shaft down 44 ft., leaving but 12 ft. more till orebody will be encountered. Develoment work will be continued throughout winter, to permit of shipments next season.

ROWE (Riverton)—Due to unseasonably mild weather, hydraulic stripping still continues, although management had planned to discontinue work some time ago. One steam shovel is now stripping.

### Mesabi Range

A UNIQUE CARGO OF IRON ORE cleared from Superior, Wis., in Steamer "Verona," Nov 27. It contained five different grades of ore from as many different mines, and was loaded at three different docks, the Great Northern, Northern Pacific and Missabe. The "Verona" is last boat to load this season from Northern Pacific and Missabe docks.

COMMODORE (Virginia)—This openpit operated by Corrigan McKinney & Co., has suspended for season after shipping 500,000 tons.

MADRID (Virginia)—A. B. Coates, who has been operating this mine, an underground property within city limits of Virginia, for last two years, has served notice of cancellation of his lease, effective Dec. 31. During lease mine shipped 120,000 tons. Fee owners will operate property next year.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

BARNES & M'CONNELL (Hattenville, Okla.)—New 400-ton concentrator is running on Tar Creek.

OLIVER YOUSE (Miami, Okla.)—Good drill strikes have been made on Wilbur land and also on Toovey tract.

L. C. CHURCH (Miami, Okla.)—Two shafts are being sunk on Cooper & Goodwin land and plans are being made for two mills.

POMONA (Joplin, Mo.)—Increased productions are being made. Company is working stope 11 ft. high and 40 ft. wide, at 185-ft. level.

SUNFLOWER (Alba, Mo.)—Rich lead-ore strike has been made in drift extending from main shaft. E. L. Ralston and associates are operating property.

CONNOR LAND (Carterville, Mo.)—Walter Bryant soon will start new concentrator on old Minnie P. lease. Sheet ore is being worked at depth of 190 feet.

HOO HOO (Joplin, Mo.)—George H. Jocelyn has taken over mine and concentrator and will improve plant and open new ground. Good productions are being made.

UNDERWRITERS' LAND CO. (Joplin, Mo.)—Company has new concentrator at new mine in West Joplin camp. It is near Priscilla, operated by same company and is heavy producer.

GERONIMO (Joplin, Mo.)—Concentrator is to be moved to Ragland lease by J. M. Short & Co. Geronimo has produced $150,000 worth of zinc ore, but Short declares company has lost $38,000 on property.

ORES REALTY CO. (Carl Junction, Mo.)—This company, of New York men has begun drilling on Atherton land. Mineralized ground from 175 ft. to 200 ft. has been encountered. Tract lies between Carl Junction and Neck City, and operators believe strike is in ore trend between two camps. Several thousand feet of drilling will be done, company having leased 560 acres.

### St. Francois County, Mo.

ST. JOSEPH LEAD CO.—Stockholders at a recent meeting approved plan of consolidation with Doe Run Lead Co.

## MONTANA

### Broadwater County

KEATING (Radersburg)—A change was recently made in operating force and under new régime arrangements have been made to sink shaft from 800- to 1200-ft. level.

### Chouteau County

DRILLING FOR GAS AT HAVRE is about to be started. A derrick has been put up, and boilers and drilling machinery are installed capable of drilling to a depth of 2000 ft. There is much talk in Butte on possibilities of smelting Butte zinc ores in Montana if a plentiful supply of gas is found.

### Jefferson County

KING SOLOMON (Clancy)—Shaft is being sunk from 400 to 700, and a good body of ore has been cut.

BOSTON-CORBIN (Corbin)—Operations have been suspended for winter. Cold weather stopped work at concentrator.

### Lewis & Clark County

BUTTE & MINNESOTA (Wolf Creek)—Plans for a 50-ton mill, to be built next season, are being made.

## MONTANA

### Granite County

NORTHERN BELL—This company has reconstructed its hoisting plant and is now unwatering mine preparatory to sinking shaft to greater depth.

SWASTIKA (Philipsburg)—Copper ore of good grade has been opened at depth of 160 ft. in shaft, and a west drift has been started to determine extent of find. Ore is being placed on dump for shipment.

NORTH STAR (Maxville)—At this copper property of Royal Basin Mining Co., preparations are being made for construction of concentrator; and samples of ore have been sent to testing plants to determine flow sheet.

### Madison County

WATSEKA (Rochester)—It is rumored that operations may soon be started again and A. W. McCune, of Salt Lake, one of the owners, recently visited property. It is thought mine can be operated profitably by using electricity in place of steam, as formerly, the power to be conveyed over a line from Twin Bridges.

THIRD SPHYNX—The Rainbow Lode Development Co. is steadily pushing development on this claim in the Northeast part of Butte and the shaft is now down 900 ft. The crosscut on the 600-ft. level, which was driven 400 ft. and then stopped temporarily, is being extended again. It is undecided how deep the shaft will be sunk, as it will depend upon how soon ore is opened, and the prospects.

### Silverbow County

BUTTE MINERS TAKING FRIEDMAN TUBERCULOSIS CURE under auspices of Butte Miners' Union number about fifty.

NORTHERN PACIFIC R.R. CO. is to pay taxes on reserved mineral rights. By a decision of Supreme Court of Montana, handed down Nov. 26, Northern Pacific is compelled to pay taxes in Montana on mineral rights it reserved in its deeds of agricultural lands. A former application of company to district court for an injunction to restrain Park County authorities from levying taxes, was denied. From data collected by state commissioner, it appears that a total of $3,357,527 would accrue to state. It is probable that case will be taken to Supreme Court of United States.

ELM ORLU (Butte)—Framework is completed and everything is nearly ready for installing some of the machinery in new zinc concentrator. Water mains from artesian wells two miles away deliver water from a pumping station at wells. Outlook at present is that concentrator will be ready for operation about Feb. 1.

BULLWHACKER (Butte)—Company expects to have its enlarged leaching plant in operation about the first of year. Only a small amount of copper is being turned out at present, but extensive development work in the mine is being continued. By first of the year company will be in a position to treat 500 tons of ore per day.

BUTTE & DULUTH (Butte)—Recent developments have been so satsfactory that plans are under way for doubling present capacity of leaching plant which is treating nearly 500 tons of ore per day. Original capacity was greatly enhanced by introduction of agitating devices by which time of leaching was reduced from one or more days to a few hours.

BOSTON & MONTANA DEVELOPMENT CO. (Butte)—Surveys for Butte, Wisdom & Pacific Ry., to be built by this company, have been completed through Big Hole Valley to Jackson, and surveyors are running a line from Dewey up Wise River to Elkhorn mines of company. Camp has been moved from Elkhorn Mountains to Wise River level, from which place a tunnel has been started into mountain.

PILOT-BUTTE (Butte)—Engineers report opening of disputed vein on 1600. Theretofore vein had not been opened between 1300 and 1800, which fact gave rise to dispute with Anaconda company over ownership of orebody on 1800, where Pilot-Butte was mining. The 1600 crosscut was driven at suggestion of Anaconda company and Pilot men claim that discovery proves their contention and their ownership of vein in question

LA FRANCE COPPER CO. (Butte)—Assets Realization Co a Heinze company, has filed a claim for $1,800,000 against this company on bonds and unpaid coupons which had been guaranteed by United Copper Co Assets of latter are held by Assets Realization Co as collateral for a loan of $1,000,000 and a sale of these assets will be ordered by receiver of United Copper Co as soon as permission is granted for such sale by federal court Chief holding of La France is group of claims known as Lexington mine, which has been shut down for several years

ANACONDA (Butte)—Big sawmill of company, at Hamilton, started Nov 20, on a two years' run F G Cottrell device for electro-static precipitation of solid matter from furnace fumes is being tried out at new leaching plant at Washoe works In roasting process, preceding leaching, some copper contained in tailings being treated, is carried off with fumes To save this copper, electro-static precipitation has been suggested and an experimental plant was installed under direction of inventor Plant will be made permanent, provided the saving warrants additional expense Experiments with Cottrell device are also carried on in arsenic plant of Washoe works with a view of doing away with the more cumbersome appliances now being employed Cottrell recently delivered a highly interesting lecture on his invention to students of Montana State School of Mines at Butte.

## NEVADA

### Churchill County

LAMA (Camp Terrell)—This group has been leased and development will begin at once

NEVADA HILLS (Fairview)—Report for October shows 4456 tons milled gross value $49,358; loss in tailings $5980, net costs $30,013 net profit $13,365 Mill recovered 87.9%; 15.5% by concentration and 72.4% by cyanidation.

### Humboldt County

GOLDBANKS QUICKSILVER CO. (Goldbanks)—Buildings have been erected and furnace will be installed.

DESOTO—This property, 10 miles north of Rochester, is being operated by lessees. Crosscut will be run from tunnel, now in 900 ft., to cut Silver Reef vein.

CODD LEASE (Rochester)—A shoot of shipping-grade ore, 120 ft. long, has been opened on 150-ft. level below tunnel level. Electrical equipment will be installed.

SEVEN TROUGHS COALITION (Seven Troughs)—Winze sunk on recently discovered oreshoot below 1000-ft. level shows high-grade streak on hanging wall and 2 to 5 ft. of milling-grade ore.

### Lander County

PLACER MINING FIELD NEAR BATTLE MOUNTAIN is steadily increasing in extent. Work is now being done in Galena Cañon, Willow Creek, Bannock, Pedro Gulch and Copper Cañon. Gold has also been found in paying quantity in Buster Gulch and Iron Cañon.

### Lyon County

EMPIRE-NEVADA (Yerington)—Churn drilling has commenced.

COPPER BAND (Ludwig)—Shoot of high-grade copper ore has been struck in this mine, one mile northeast of Nevada-Douglas. Development work is being done on tunnel level.

MASON VALLEY MINES CO. (Thompson)—Ore receipts for week ended Nov. 27, 1913, were as follows: From Mason Valley mine, 1955 tons; from Nevada-Douglas, 908 tons; from other mines, 469 tons; total, 3332, or a daily average of 476 tons. During same week six cars of matte were shipped.

### Mineral County

SILVERADO (Mt. Patterson)—This mine, an early silver producer, has been leased and will be opened at once.

### Washoe County

GRANITE HILL (Reno)—Shipments of good-grade copper ore are being made. A 3-ft. shoot of ore has been opened on 180-ft. level upon which drifting is being done.

### White Pine County

GOLDFIELD CONSOLIDATED (Goldfield)—Total tonnage milled in November, 28,929, yielding $348,000; net realization, $168,000.

## NEW MEXICO

### Grant County

CLEVELAND GROUP (Silver City)—This zinc property, in the Pinos Altos district, owned by George H. Utter, was lately reported sold to Empire Zinc Co. It is stated that sale was made for cash, a check for full amount, between $200,000 and $300,000 having been drawn.

### Socorro County

MAUD MINING CO. (Mogollon)—Another contract has been let for advancing drift on 500-ft. level.

DEADWOOD (Mogollon)—Mine operation has been somewhat handicapped by water again, though about normal capacity is maintained in mill.

PACIFIC MINES CO. (Mogollon)—Installation of electric equipment is proceeding satisfactorily. Plant will likely be ready for service by Dec. 1. Burro pack trains were held up two days week before last on account of unusual storms.

LITTLE CHARLIE (Mogollon)—Shipments to custom mill have been stopped until installation of pipe line to Maud mill and connection with latter's compressor is made, when machines will be used in the stopes and development work. Pipe is on ground ready for laying, which will be started at once.

## NEW YORK

### St. Lawrence County

NORTHERN ORE CO. (Edwards)—This company, operating only zinc mine in New York State, is preparing to increase size of its concentrating mill in order to provide room for elaborate apparatus for separating pyrites from blende. Experiments have been in progress for over a year to attain a successful method of separating these two minerals of nearly same density Ore is mainly composed of pyrites and blende, and is high grade. Electric power will be furnished from hydro-electric plant of Watertown Light & Power Co., six miles distant, at South Edwards, on Oswegatchie River Development underground continues at 300- and 400-ft. depths, where drifting has blocked out a good-sized ore body.

## OREGON

### Baker County

COLUMBIA (Cracker)—Reduction plant is treating from 90 to 100 tons of ore per day Amalgamation, concentration and cyanidation machinery of latest type are used

### Crook County

MAYFLOWER (Howard Post Office)—This is only quartz property in county that has a milling plant. Treatment consists of amalgamation, concentration and cyanidation, and capacity is 20 tons

### Douglas County

MAYFLOWER (Bohemia)—Amalgamation, concentration and cyanidation plant will be kept running all winter

### Lane County

WEST COAST (Bohemia)—Incidentally, through controversy over changing mail routes so that after next May, Champion will not get mail during winter months except by private contract, fact has come out as to production of gold by these properties In protesting against action of government statement is made that during last two years production was $100,000 This is a greater amount of gold than it was generally believed was coming out of property

## SOUTH DAKOTA

### Fall River County

ARDMORE OIL CO. (Ardmore)—First oil well to be drilled in this part of South Dakota is now going down at 30 to 40 ft. daily. A trace of oil is coming up with bailings. Gas is noticeable. Some years ago railroad company drilled a well about 1500 ft. deep, all but 30 ft. of which was in Benton shales, so that it is not expected that a flowing well will be struck at less than 1500 ft. A good rig, with 72-ft. steel derrick, is installed, hole started with 12-in. casing which rests on shale at 60 ft. depth, above that being wash and clay, and company is prepared to go [illegible]000 ft. if necessary. Drilling is being done by Ingersoll Bros.

### Lawrence County

HOMESTAKE (Lead)—Announcement is made that an extra Christmas dividend of $1 per share will be paid, in addition to regular monthly disbursement of 65c. per share. This will make the total disbursement for December $420.414 and total for 1913, $2.167.620. Monthly dividends for next year will be at rate of 75c. per share. It is stated that net divisible earnings of company for current year will be $10 to $11 per share, and dividends will absorb $8.80, leaving a good balance to be carried to surplus. Numerous economies have been effected within last year or two, probably most important of which is operation of stamp mills by electric power generated at Spearfish hydroelectric plant, which has now been in full operation a little more than a year. Last July 20 stamps were added to equipment, and it is understood that 40 more will be placed in Amicus mill at an early date. Notwithstanding increased tonnage being handled, work of mining is being carried on with a smaller crew than ever before. A caving system, by which ore is drawn from surface to 500-ft. level, has resulted in a large economy of labor and dynamite.

### Pennington County

CHICAGO MICA CO. (Keystone)—Regular shipments of scrap and sheet mica are being made. Sheets are bringing top prices in Eastern markets, and outlook is good.

HILL CITY MINING & DEVELOPMENT CO. (Hill City)—State securities commission, which enforces new "blue-sky" law, gave company permission to sell stock. Machinery is being installed with which shaft will be sunk 200 ft. further, making it 300 ft. deep.

CONTINENTAL COPPER (Hill City)—Prospecting and development of surface showings is being done at a number of places. Machinery repairs are being made, and sinking will soon be under way. Shaft is 700 ft. deep and in copper ore for several hundred feet. It is now proposed thoroughly to explore property, after an idleness of several years.

## UTAH

### Beaver County

MAJESTIC (Milford)—Shaft which is being sunk on Hoosier Boy will be down 200 ft. in a short time, when drifting will be started to get under lead ore deposits.

LEONORA (Star District)—A force of men has been sent to this property, and the surface equipment is being put in order in preparation for winter work.

SHEEP ROCK (Beaver)—A cyanide plant is being installed to treat several hundred tons of tailings accumulated from 5-stamp mill. Some of the tailings run as high as $6.

### Juab County

IRON BLOSSOM (Silver City)—There is contention over taxes amounting to about $13,000 between officials of Utah and Juab Counties, property being near Utah-Juab line. State board of equalization has apportioned to Utah County for taxable purposes $409.325 of net proceeds of mine, taken from No. 3 shaft. Juab County claims that this sum should be apportioned to it, as all ore is mined within Juab County line, although shaft is in Utah County. A restraining order against Utah County has been issued, pending action of state board of equalization upon an application for reapportionment.

### Salt Lake County

SOUTH HECLA (Alta)—During year company marketed $24.539 worth of ore. An assessment of 6c. per share has been levied.

WASATCH MINES (Alta)—Company formed by merger of Columbus, Flagstaff, and Alta-Superior has levied assessment of 5c. per share on 300.000 shares of stock outstanding. There are 700.000 shares in treasury.

ALTA TUNNEL & TRANSPORTATION CO. (Alta)—Work has been started on the proposed 6000-ft. tunnel, which, when completed, will provide drainage, and transportation for mines of Alta. Winter work has been financed, and supplies laid in to last until spring. It is expected that water for power purposes will be developed. Tunnel is in 350 feet.

MICHIGAN-UTAH—A hoist has been installed in City Rocks tunnel at winze connecting with Cleaves tunnel. Some timbering has been done. Sinking is to be started from lower City Rocks tunnel, as well as development to west on 800- and 900-ft. levels. Teamsters have been scarce since completion of Salt Lake & Alta R.R., and it has been difficult to obtain teams for three-mile haul from terminus of tramway to railroad at Wasatch. On this account shipments have been held back.

### Summit County

PARK CITY SHIPMENTS for the week ended Nov. 15 amounted to 3.254.968 lb.; those for the week ended Nov. 22, to 3.809.880 pounds.

SNAKE CREEK TUNNEL—Some change will have to be made in floor of tunnel before work is resumed. This will be done, while electric equipment is being installed.

AMERICAN FLAG (Park City)—A 2500-ft. pipe-line is being laid from overflow tank of Daly-Judge mill. Connections between 1000- and 1100-ft. levels are nearly completed. There is a streak of ore running well in silver, lead and gold in top of raise

## WASHINGTON

### Chelan County

GRAND VIEW (Entiat)—A concentrator and cyanide plant are to be built and two additional stamps have just been added to present mill.

### Snohomish County

MONTE CRISTO (Everett)—Installation of a small refinery is being considered.

### Stevens County

ORIOLE (Metaline)—Excavation has been started for new concentrator of 50 tons capacity.

PHIL SHERIDAN (Republic)—W. R. Foley, Denver, has taken a lease on this claim, at a buying figure of $30,000.

## CANADA

### British Columbia

CONSOLIDATED MINING & SMELTING (Trail)—A force of structural-steel workers have been engaged to erect steel for a new lead-furnace building and for installation of two large electric cranes.

GRANBY CONSOLIDATED (Anyox)—A force of men is engaged erecting bunkers and wharves and building a wagon road at lime property purchased from Harkley & Moult, and which is 25 miles down Portland Canal from Stewart.

IKEDA (Moresby Island)—This mine examined recently by an engineer representing Granby company is reported to have been acquired by it. Other properties on Moresby Island are receiving attention from same company, which has in view increasing sources of supply of fluxing ores for new smelting works on Granby Bay.

SALLY—This mine, worked for a number of years by Boundary Creek Mining & Milling Co., during which time it shipped 2000 tons of ore 50 miles by wagon road to railway, has been acquired by a Victoria syndicate and will be operated by new owners under superintendency of Alexander Robinson. Group consists of 13 claims and fractions. Tunnels have been driven on four veins, total amount of work exceeding 3000 ft. Present management is driving a new tunnel to tap an important oreshoot. Meanwhile shipping ore is being taken from old workings.

OLD SPORT—Conrad Wolfle states that he and his associates have sold a portion of this group of copper claims, near north end of Vancouver Island, in Ella Mountain district Price is said to be $500.000. Ostensibly purchasers are W. M. Bacon and W. E. Cullen, but it is believed ownership passes to group in control of Stewart mine in Cœur d'Alenes. W. M. Bacon is manager of Stewart. W. E. Cullen, a Spokane lawyer, was a director of Stewart until August. New owners' plan to construct an electric railroad 18 miles in from coast. About $30.000 has been spent last four months in preliminary exploration.

### Yukon

CANADIAN KLONDYKE MINING CO.—For week ended Nov. 22, production was 2219 oz., normal production being 3000 oz. Decrease due to accident to dredges Nos. 3 and 4. Everything is running smoothly now.

YUKON GOLD CO (Dawson)—Operations for the season ended Nov. 1. Eight dredges had been in operation and 15 hydraulic mines. Total production from Dawson properties for year, $3.780.000 against $3.975.069 last year. Total production from Dawson and Iditarod, $4.580.000 this season against $4,379,000 last. Company is operating California and British Columbia properties for which season has not closed

## MEXICO

### Aguascalientes

AMERICAN SMELTING & REFINING CO. (Aguascalientes)—Smelter is operating at 50% capacity, only plant of company in Mexico now running. Officials deny that orders have been issued to close down all Mexican plants. Company will continue to operate wherever it can, and will follow policy of observing strictest impartiality in its dealings with all political parties.

### Baja California

WEST MEXICO MINES CO.—Addition of concentrators to present plant is of vital importance and at present operations are suspended until arrival of a separator and two concentrating tables. Principal mine of company, "San Lorenzo," is opening up in fine shape and a new and distinct strike has been made in this property of a large orebody carrying over 2 oz. of gold per ton and some silver.

BRAZILAR Y ANEXAS—During September a shipment oxidized ore was made from "Guasabe" mine, which is one of three properties owned by syndicate. Up to date over 3500 tons of ore worth $50 per ton has been treated and all of this came from "Guasabe" property. This mine also has a good grade lead-silver ore and a parcel has been shipped to Selby smelter.

### Jalisco

AMAJAC MINES CO. (Hostotipaquillo)—This Pennsylvania company has suspended operations, pending some assurance from authorities that its properties will be protected from bandits. Camp was raided by bandits in October, and again in November. Preliminary work on a 50-ton cyanide plant has been in progress for several months, and company is ready to take in machinery.

### Sonora

SAN SAVA (Cabullona)—Incorporation papers have been filed by M. S. Vinnie and others and claims are now owned by San Sava Mining Co. Property is six miles east of Cabullona and 15 miles south of Douglas.

## COLOMBIA

PATO MINES, LTD. (Zaragoza)—Pato dredge is even exceeding its remarkable record of last few months, production for week ended Nov. 11 being at rate of over $1.20 per cu. yd. Cleanup as cabled to London for that week amounted to $31,250 from 25,250 cu.yd. washed.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Dec. 10

The metal markets have continued rather dull and somewhat irregular in prices. There is a general opinion that consumption is decreasing.

Owing to an error in transmission, the price of silver in New York on Dec. 3 was given in our last issue as 57½c. per oz. The correct quotation is 57⅝c. for that date.

MONTHLY INDEX NUMBERS

| Month | 1912 | 1913 | Month | 1912 | 1913 | Month | 1912 | 1913 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 111 | 126 | May. | 118 | 126 | Sept | 127 | 118 |
| Feb. | 109 | 125 | June. | 117 | 117 | Oct | 133 | 114 |
| March | 111 | 125 | July | 114 | 110 | Nov | 129 | 110 |
| April | 115 | 124 | Aug. | 120 | 116 | Dec | 129 | . |

Average for year 1912, 119, year 1911, 112, year 1910, 115, year 1909, 115. Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum

## Copper, Tin, Lead and Zinc

**Copper**—During the last week the formal asking prices were abandoned, all producers becoming willing to entertain reasonable bids and respectively soliciting business. Right through the week electrolytic copper was offered at 14⅜c., delivered at home or in Europe on the usual terms, and buyers were met at below that price. Domestic consumers did not, however, become interested and sales to them were insignificant.

In the early part of the week some considerable tonnage was placed with the European consumers at 14¼c. delivered, equivalent to about 14.05c., New York, this business being for December and January shipments. On Dec. 9 some sales were made at 14.27½@14.30c., delivered, and on Dec. 10 sales were made at about the same prices in the early part of the day, but in the latter part some sales at 14⅜c., delivered, or slightly under, were reported.

The situation in Lake copper remains about as previously, in that the Calumet & Hecla is the only producer having any considerable supply to offer. In the early part of the week it was reported as naming a price of 14⅞@15c. for its special brands and making some sales thereat.

Casting copper continues to be a drug in the market, the accumulation of it increasing further during November. It is offered at concessions without finding buyers.

Regarding the market generally, it looks as if consumers in this country are waiting for copper delivered to them at 14c. On the other hand it looks as if European consumers had about exhausted their supplies, the fair amount of business lately done with them indicating this, and a considerable business with Europe is expected in the near future

At the close Lake copper is quoted nominally at 14¾@15c., and electrolytic in cakes, ingots and wirebars at 14.05@14.15c We quote casting copper nominally at 12¾@14c. as an average for the week

Standard copper in London has fluctuated within narrow limits, and spot is held around £65 10s., three months, £64 5s.; it closes at £65 8s 9d. for spot and £64 6s 3d. three months.

Base prices of copper sheets is now 20¼c per lb. for hot rolled and 21¼c for cold rolled Full extras are charged and higher prices for small quantities. Copper wire is 15¾@16¼c. per lb. carload lots at mill

**Tin**—The London market did not retain the firmer tendency, which was noted at the close of last week's report On the contrary, it again became very weak There was an evident desire on the part of the larger interests in this market to dispose of metal, and offers of both spot and future tin were freely made at concessions on the import price There was no demand for spot material but some transactions in futures took place The market closes steady at £171 for spot and £172 5s for three months, and around 37½c for December tin here.

**Lead**—The situation in lead is mysterious, the persistent weakness arising from causes that are not understood On Dec 9 the A S & R Co reduced its price to 4c., but independents had previously been selling as low as that, and there ensued some further cutting At the lower prices, however, there is decidedly more interest shown, it being generally recognized that the price of lead is getting down to a point at which some of the mines cannot produce at a profit.

The London market is firmer, Spanish lead being quoted £17 17s. 6d. and English lead £18 5s. per ton.

**Spelter**—A round tonnage was sold at 4.97½c., St. Louis, sales extending through the week. The principal consumer has remained out of the market. Smelters assume different attitudes. Several of them have large accumulations of stock. Some have wanted to sell, while others are quite content to lay low, especially in view of the sharp restriction of production. In conservative opinion this market is thought to be scraping bottom. We quote 4.95@5c., St. Louis and 5.10@5.15c., New York.

In London the market is also firmer, good ordinaries being quoted £21 5s. and specials £22 per ton.

The base price of sheet zinc in carload lots was reduced 25c. per 100 lb. on Dec. 4 and is now $7.25 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill. Extras and discounts unchanged.

DAILY PRICES OF METALS

NEW YORK

| Dec. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb | Tin: Cts. per lb. | Lead: New York, Cts. per lb | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 4.8540 | 57¾ | 14⅞<br>@15 | 14.05<br>@14.10 | 38⅛ | 4.05<br>@4.10 | 3.90<br>@3.95 | 5.10<br>@5.15 | 4.95<br>@5.00 |
| 5 | 4.8505 | 58⅜ | *14⅞<br>@15 | 14.05<br>@14.10 | 38¼ | 4.00<br>@4.10 | 3.85<br>@3.95 | 5.10<br>@5.15 | 4.95<br>@5.00 |
| 6 | 4.8525 | 58⅞ | 14⅞<br>@15 | 14.05<br>@14.10 | 38¼ | 4.00<br>@4.05 | 3.85<br>@3.90 | 5.10<br>@5.15 | 4.95<br>@5.00 |
| 8 | 4.8540 | 58½ | *14¾<br>@15 | 14.05<br>@14.10 | 37⅝ | 4.00<br>@4.05 | 3.85<br>@3.90 | 5.10<br>@5.15 | 4.95<br>@5.00 |
| 9 | 4.8530 | 58¼ | *14¾<br>@15 | 14.05<br>@14.10 | 37¾ | 4.00 | 3.85 | 5.10<br>@5.15 | 4.95<br>@5.00 |
| 10 | 4.8510 | 57⅞ | *14¾<br>@15 | 14.05<br>@14.15 | 37½ | 3.95<br>@4.00 | 3.80<br>@3.85 | 5.10<br>@5.15 | 4.95<br>@5.00 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and nondesilverized; the specially refined corroding lead commands a premium The quotations on spelter are for ordinary Western brands; special brands command a premium Silver quotations are in cents per troy ounce of fine silver.

LONDON

| Dec. | Silver | Copper: Spot, £ per Ton | Copper: Spot, Cts per Lb. | Copper: 3 Mos | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead: £ per Ton | Lead: Cts. per Lb. | Zinc: £ per Ton | Zinc: Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | [illegible] | 65¾ | 14.31 | 64¾ | 69[illegible] | 174¼ | 17[illegible] | [illegible] | 3.80 | 20¾ | 4.48 |
| 5 | 27 | 65½ | 14.23 | 64¼ | 70 | 174¼ | 175¼ | 17[illegible] | 3.83 | 20¾ | 4.54 |
| 6 | 27¼ | | | | | | | | | | |
| 8 | [illegible] | 65½ | 14.23 | 64[illegible] | 6[illegible] | 172 | 17[illegible] | 17[illegible] | 3.80 | 21 | 4.56 |
| 9 | 26$\frac{13}{16}$ | 65¼ | 14.18 | 64¼ | 68¾ | 170[illegible] | 172 | 17[illegible] | 3.83 | 21¼ | 4.59 |
| 10 | 26¾ | 65$\frac{3}{16}$ | 14.21 | 64$\frac{3}{16}$ | 68¾ | 171 | 17[illegible] | 17¼ | 3.8[illegible] | 21¼ | 4.62 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent discount For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅓c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c

## Other Metals

**Aluminum**—The market remains quiet and business is on a moderate scale. Prices are unchanged and we continue to quote 18¾@19¼c. per lb. for No. 1 ingots. The foreign market is quiet, but rather firm.

**Antimony**—Business has been quiet and prices inclined to be weak, though actual changes are small. Cookson's is 7⅜@7⅝c. per lb.; Hallett's, 7⅛@7⅜c. For Chinese, Hungarian and other outside brands, 6@6¼c. per lb. is paid.

**Quicksilver**—Demand continues fair and prices are steady New York quotation is $39@40 per flask of 75 lb. San Francisco, $39 for domestic orders and special terms for export. London price is £7 10s. per flask, with £7 5s. quoted from second hands.

**Magnesium**—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

## Gold, Silver and Platinum

**Gold**—The price of gold on the open market in London was unchanged at 77s. 9d. per oz. for bars. India is still taking some gold, but the demand for Egypt is about closed.

Gold in the United States Dec. 1 is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, $1,111,984,969; in Treasury current balance, $172,298,685; in banks and circulation, $633,214,789; total, $1,917,498,443, an increase of $11,596,927 during November.

Sales of gold bars from the New York Assay Office in November, were $2,852,818, being $625,062 less than in October, and $95,879 less than in November, 1912. For the 11 months ended Nov. 30, total sales were $28,523,381 in 1912, and $28,666,374 in 1913; an increase of $142,993 this year.

**Iridium**—Prices continue at $80@81 per oz., New York, with a fair demand.

**Platinum**—The market is quiet with no special change reported. The quotations remain $43@44 per oz. for refined platinum and $47@50 per oz. for hard metal.

Our Russian correspondent writes under date of Nov. 27, that the market is strong and there has been a slight advance in prices. Owing to mild weather and the absence of snow the offers of metal by the miners are considerable for the season, but they are readily taken up. Some of the large sellers are holding out of the market, anticipating higher prices. Current quotations for crude metals 83% platinum at Ekaterinburg are 9.55 rubles per zolotnik—$35.90 per oz.; at St. Petersburg, 36,700@36,800 rubles per pood—$36.02 per oz., average.

**Silver**—The failure of the India Specie Bank of Bombay, causing a sharp decline in bullion has been followed by the taking over in London of the silver contracts of this bank into strong hands and as a consequence silver has reacted from the lowest, closing today at 26¾d. in London.

Shipments of silver from London to the East, Jan. 1 to Nov. 27, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes | |
|---|---|---|---|---|
| India | £9,465,000 | £9,416,000 | D | £49,000 |
| China | 1,449,000 | 753,500 | D | 695,500 |
| Total | £10,914,000 | £10,169,500 | D. | £744,500 |

Coined silver in the United States on Dec. 1 is estimated by the Treasury Department as follows: Dollars, $565,669,263; subsidiary coin, $177,470,510; total, $743,139,773. Of the dollars, $491,524,000 are held in the Treasury against silver certificates outstanding.

## Zinc and Lead Ore Markets

### MONTANA ZINC ORES

Butte & Superior production in November was about 11,000 tons of zinc concentrates.

### PLATTEVILLE, WIS.—Dec. 6

The base price of 60% zinc ore declined to $37@40 per ton. The base price of 80% lead ore slumped to $48 per ton.

SHIPMENTS WEEK ENDED DEC. 6

| | Zinc ore, lb. | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 2,908,100 | 182,000 | 694,500 |
| Year to date | 139,263,410 | 5,305,080 | 186,275,110 |

Shipped during week to separating plants, 2,847,180 lb. zinc ore.

### JOPLIN, Mo.—Dec. 6

High-grade blende ore sold on a basis of $39 Thursday, strengthening to $40 at the week end, as many as 12 carloads selling on the latter base. The base per ton of 60% zinc ranged down to $38, that price being paid on what is termed a metal base for ore usually penalized for iron. Ore with 8% of iron, sold on the "metal base," is equivalent to a $44 base with deductions. Calamine dropped to $20@22 base at the week-end. The average price of all grades of zinc ore is $37.68. Lead averaged $50.70, but the week-end price dropped to $49 base of 80% metal contents. The highest price paid was $54 per ton.

SHIPMENTS WEEK ENDED DEC. 6

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week | 10,939,050 | 1,020,240 | 2,009,820 | $276,305 |
| Totals 49 weeks | 534,859,670 | 41,257,240 | 90,125,140 | $14,554,769 |

Blende value, the week, $212,770; 49 weeks, $12,538,915.

Calamine value, the week, $12,570; 49 weeks, $529,009.

Lead value, the week, $50,965; 49 weeks, $2,376,854.

## IRON TRADE REVIEW

### NEW YORK—Dec. 10

General conditions are practically unchanged. A few more orders for railroad equipment are noted, and a little more activity in structural steel. The general disposition among buyers is to hold back at least until the close of the year. Prices are not strong, though makers are less inclined to shade them in order to secure contracts than they were.

Pig iron is still quiet. Production is declining a little. Demand seems best for foundry, just now, but there is also some inquiry for basic in the West.

**Pig-Iron Production**—The reports of the blast furnaces, as collected and published by the "Iron Age," show that on Dec. 1, there were 227 coke and anthracite stacks in blast, having a total daily capacity of 71,700 tons; a decrease of 6850 tons from Nov. 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in the United States in November was 2,265,100 tons; for the 11 months ended Nov. 30, it was 29,057,000 tons. Of this total 20,390,800 tons, or 70.2%, were made by the furnaces owned or operated by the steel company.

**Alabama Pig-Iron Make** in November is reported at 160,057 long tons. For the 11 months ended Nov. 30, the total make was 1,863,976 tons, an increase of 200,283 tons over last year.

### PITTSBURGH—Dec. 9

Steel-mill operations have shown only a slight further decrease, being now 50 to 55% of capacity; but some mills are working much better than others. A feature of the restriction in output is that as a rule mills are running short time, down to two days a week in extreme cases, instead of closing some departments completely. Thus the employment is distributed fairly well among the men, instead of large numbers being laid off entirely. This involves a greater expense, but holds the men together, and seems to dispose of statements sometimes made by Washington newspaper correspondents, that manufacturers are trying to make hard times.

Evidences continue that the actual consumption of steel is in excess of the shipments which buyers are willing to take, and as stocks are already low the inference is strong that there will soon be an increase in demand, though possibly not a large one. In tubular goods, a branch of the finished-steel trade which seems to disclose quite accurately the actual activities among consumers, specifications received thus far this month exceed those of a similar period in any preceding month since August, though by only a narrow margin.

While there is no assurance that the declining tendency in steel prices is passed, it is a fact that in the past week the market has shown more resistance to declines than at any time since about Aug. 1. A decided disposition is manifested to stand firm on present prices, apparently in the belief that buyers are as likely to take hold at this level as at a lower level.

**Pig Iron**—The market has continued very dull as to actual transactions, but a little inquiry has appeared in the past two days, involving basic and forge. Bessemer is extremely quiet, while foundry is being sold only in small lots. The market appears to be scraping bottom. We quote: Bessemer, $15; basic, $13; malleable, $13.50; foundry, $13.50; forge, $13.25, at valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The English syndicate has reduced its price $3 a ton and the German makers are meeting the new price, but thus far have not cut under it. We quote English and German, prompt and forward, at $47, Baltimore, with $2.16 freight to Pittsburgh.

**Steel**—The market is easily quotable on the reduced basis mentioned last week, $20 for billets and $21 for sheet bars, at maker's mill, Pittsburgh or Youngstown. The mills seem to be quite firm at this level. Very little tonnage is going in the open market, the consumption being supplied on long-term contracts, chiefly with a monthly adjustment of the price.

**British Foreign Trade in Iron and Steel** and manufactures thereof is valued by the Board of Trade returns as below for the 10 months ended Oct. 31:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel.................. | £45,634,880 | £12,558,339 | Exp. £33,076,541 |
| Machinery, hardware, etc. ..... | 51,689,811 | 13,394,557 | Exp 38,295,254 |
| Total.. ............ | £97,324,691 | £25,952,896 | Exp. £71,371,795 |
| Total, 1912.... ... ....... | 83,191,491 | 22,923,598 | Exp. 60,267,893 |

Actual tonnage of iron and steel exported was 4,015,661 in 1912, and 4,150,081 in 1913; increase, 134,420 tons. Imports were 1,623,189 tons in 1912, and 1,816,107 in 1913; increase, 192,918 tons.

## IRON ORE

Shipments of iron ore from the Lake Superior region by water in November were 3,233,468 tons. The total shipments for the season to Dec. 1 were, in long tons:

| Ports | 1912 | 1913 | Changes |
|---|---|---|---|
| Escanaba ..................... | 5,231,655 | 5,399,465 | I. 164,810 |
| Marquette ..................... | 3,296,761 | 3,137,618 | D. 159,143 |
| Ashland ..................... | 4,797,101 | 4,338,230 | D. 458,871 |
| Two Harbors..................... | 9,370,969 | 10,075,718 | I. 704,749 |
| Superior. ..................... | 14,240,714 | 13,788,343 | D. 452,371 |
| Duluth ..................... | 10,495,577 | 12,331,126 | I. 1,835,549 |
| Total......................... | 47,435,777 | 49,070,500 | I. 1,634,723 |

To the total are to be added two or three belated cargoes shipped after Dec. and the rail shipments for the year, probably about 800,000 tons, making a total of 49,900,000 tons for the season.

**German Iron-Ore Imports**, 10 months ended Oct. 31, were 11,836,281 tons; exports, 2,168,607 tons. Imports of manganese ore were 573,293 tons; exports, 7219 tons.

## COKE

The Connellsville "Courier" reports the coke production in that region for last week at 344,108 tons, 133,170 tons being made by merchant ovens and 210,938 tons by ovens owned by steel companies. Shipments were 356,786 tons. This is a decrease from the previous week of 11,132 tons in production and 22,119 in shipments.

**Coke**—Consumers are showing very little disposition to take hold on contracts for first half, since prompt is available at $1.75, possibly less, and contract prices quoted are considerably higher, up to $2 held by a large number of operators.

**Anthracite Shipments** in November were 5,786,931 long tons, being 551,263 tons less than in October. For the 11 months ended Nov. 30, the total shipments were 57,666,076 tons in 1912, and 63,407,010 in 1913; an increase of 5,740,934 tons, or 10%, this year.

**Coal Production in Holland** in 1912 was 1,725,394 metric tons, an increase of 248,223 tons over 1911. The production is all from a single group of mines.

Fuel exports of Great Britain, 10 months ended Oct. 31, in long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal ..................... | 52,550,191 | 61,257,261 | I 8,707,070 |
| Coke ..................... | 803,011 | 989,010 | I 185,999 |
| Briquettes ..................... | 1,252,007 | 1,711,865 | I 459,858 |
| Steamer Coal..................... | 15,020,522 | 17,434,411 | I 2,413,889 |
| Total ... ... | 69,625,731 | 81,392,547 | I 11,766,816 |

Imports of coal were only 187,043 tons in 1912, and 16,450 tons this year.

# CHEMICALS

## NEW YORK—Dec. 10

The general market seems to be in fair condition, with sales on a moderate scale only.

**Arsenic**—The market continues dull, with abundant supplies. Dealers quote $3 per 100 lb., but this could be shaded on a good order.

**Copper Sulphate**—Only a moderate business is reported. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—Competition from the new agency continues, though some producers are holding entirely out of the market at present figures. This has made prices a shade firmer at 2.17½c. per lb. for spot, and 2.20c. for futures.

## PETROLEUM

The production of petroleum in California in October is reported at 8,162,889 bbl.; deliveries, 8,419,374 bbl.; stocks Oct. 31 were 47,421,983 bbl. There were 39 new wells completed in October and 329 wells drilling at the end of the month.

## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | July | August | September | October | November |
|---|---|---|---|---|---|
| Alaska shipments | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 | 3,391,300 |
| Anaconda ...... | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 | 25,250,000 |
| Arizona, Ltd... | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 | 2,800,000 |
| Copper Queen ... | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 | 7,115,991 |
| Calumet & Ariz... | 3,800,000 | 4,500,000 | 4,000,000 | 4,500,000 | .. |
| Chino ....... .. | 4,746,525 | 5,788,572 | 4,196,296 | 4,767,466 | . |
| Detroit ......... | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 | 1,922,352 |
| East Butte. .... | 1,060,257 | 1,162,007 | 1,233,018 | 1,040,997 | ..... |
| Giroux ........ | 584,546 | 524,953 | 198,178 | 156,084 | .... |
| Mason Valley.... | 908,892 | 867,060 | 918,000 | 1,052,000 | ..... |
| Mammoth....... | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 | 1,700,000 |
| Nevada Con. ... | 5,403,919 | 5,989,973 | 4,441,671 | 5,898,046 | ......... |
| Ohio .. ... | 601,700 | 689,000 | 685,900 | 698,691 | ...... |
| Old Dominion. .. | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 | .......... |
| Ray. ........ | 4,097,000 | 4,269,519 | 4,336,434 | 4,725,419 | ..... |
| Shannon...... .. | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 | 1,110,000 |
| South Utah...... | 140,000 | 223,498 | 241,843 | 232,269 | ... |
| Tennessee.. .... | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 | 1,688,000 |
| United Verde*... | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 | .... |
| Utah Copper Co.. | 9,849,043 | 10,302,251 | 11,463,905 | 9,929,478 | . . |
| Lake Superior* .. | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 | 6,600,000 |
| Non-rep. mines*. | 6,200,000 | 6,200,000 | 6,000,000 | 6,200,000 | ........ |
| Total prod..... | 101,669,653 | 96,427,264 | 91,835,075 | 88,102,302 | .......... |
| Imp., bars, etc... | 29,029,990 | 22,474,471 | 35,703,660 | ......... | .......... |
| Total blister. . | 130,699,643 | 118,901,735 | 127,538,735 | ......... | .......... |
| Imp. ore & matte. | 8,527,046 | 9,171,351 | 10,800,162 | ......... | .......... |
| Total Amer... | 139,226,689 | 128,073,086 | 138,338,897 | ......... | .......... |
| Miami† . .... | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 | 3,230,000 |
| Shattuck-Arizona | 1,019,388 | 1,001,634 | 1,163,237 | 993,224 | ........ |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop.. | 618,379 | 647,905 | 621,120 | ........ | ........ |
| Granby......... | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 | 1,944,145 |
| Mexican Cos.: | | | | | |
| Boleo†... ....... | 2,240,720 | 2,264,640 | 2,369,920 | 2,424,800 | .. |
| Cananea ....... | 3,328,000 | 3,186,000 | 3,148,000 | 3,682,000 | 3,800,000 |
| Moctezuma...... | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 | 3,517,800 |
| Other Foreign: | | | | | |
| Braden, Chile.... | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 | 1,592,000 |
| Cape Cop., S. Af. | . | . | 607,040 | 712,320 | ......... |
| Kyshtim, Russia. | 2,500,000 | 1,585,000 | 1,187,000 | . | .......... |
| Spassky, Russia.. | 660,800 | 1,048,320 | 1,025,920 | 983,360 | .......... |
| Exports from | | | | | |
| Chile . .. | 9,856,000 | 8,736,000 | 5,600,000 | 6,160,000 | .......... |
| Australia | 10,304,000 | 7,720,000 | 6,944,000 | 7,728,000 | .......... |
| Arrivals-Europe‡ | 11,728,640 | 14,624,960 | 9,661,120 | 18,040,960 | . . .. |

† Boleo copper does not come to American refiners Miami copper goes to Cananea for treatment, and reappears in imports of blister

‡ Does not include the arrivals from the United States, Australia or Chile

## STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U S Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| XI, '12 | 134,695,400 | 69,369,795 | 55,906,550 | 76,741,964 | 103,801,600 | 180,546,564 |
| XII.... | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ... | .. . | . |
| I, 1913 | 143,179,625 | 65,210,030 | 60,383,847 | 105,312,582 | 78,491,840 | 183,804,422 |
| II. ... | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III.. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV..... | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V..... | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI.. . | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,994,000 | 124,808,606 |
| VIII. | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,905 | 66,420,480 | 120,015,385 |
| IX. | 131,101,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X | 130,070,481 | 68,173,720 | 68,123,473 | 29,493,092 | 53,625,600 | 83,118,692 |
| XI | 134,087,708 | 48,656,858 | 70,067,803 | 32,566,382 | 48,787,200 | 81,353,582 |
| XII . | | | | 47,929,429 | 46,592,000 | 94,521,429 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat

## Mining Companies—United States

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt. |
| Acacia, g | Colo | 1,438,989 | $1 | $129,618 | Jan '11 | $0.01 |
| Adams, s.l.c | Colo | 80,000 | 10 | 778,000 | Dec. '09 | 0.04 |
| Ahmeek, c. | Mich. | 50,000 | 25 | 2,100,000 | Oct. '13 | 3.00 |
| Alaska Mexican, g. | Alas. | 180,000 | 5 | 3,277,381 | Nov. '13 | 0.20 |
| Alaska Treadwell, g. | Alas. | 200,000 | 25 | 13,585,000 | Nov. '13 | 1.00 |
| Alaska United, g. | Alas. | 180,200 | 5 | 1,487,250 | Nov. '13 | 0.50 |
| Am. Zinc, Lead & Sm. | U. S. | 165,360 | 25 | 985,820 | Apr. '13 | 0.50 |
| Anaconda, c. | Mont. | 4,332,500 | 25 | 81,418,125 | Oct. '13 | 0.75 |
| Argonaut, g. | Calif. | 200,000 | 5 | 1,200,000 | June '10 | 0.05 |
| Arizona Copper, pf. | Ariz. | 1,426,120 | 1.20 | 1,836,780 | Oct. '13 | ..... |
| Arizona Copper, com. | Ariz. | 1,519,896 | 1.20 | 16,037,317 | Nov. '13 | ..... |
| Bagdad-Chase, g., pf. | Calif. | 84,819 | 5 | 202,394 | Jan. '09 | 0.10 |
| Baltic, c. | Mich. | 100,000 | 25 | 7,750,000 | Dec. '12 | 7.00 |
| Bingham N. H., c. | Utah. | 228,690 | 5 | 339,957 | Nov. '13 | 0.10 |
| Bonanza Dev., g. | Colo. | 300,000 | 1 | 1,425,000 | Oct. '11 | 0.20 |
| Bunker Hill Con., g. | Calif. | 200,000 | 1 | 791,000 | Nov. '13 | 0.05 |
| Bunker Hill & Sul., l.s. | Ida. | 327,000 | 10 | 14,647,500 | Nov. '13 | 0.25 |
| Butte-Alex Scott, c. | Mont. | 74,000 | 10 | 148,000 | Oct. '13 | 0.50 |
| Butte & Ballaklava, c. | Mont. | 250,000 | 10 | 125,000 | Aug. '10 | 0.50 |
| Caledonia, l.s.c. | Ida. | 1,300,000 | 1 | 52,000 | June '10 | 0.01 |
| Calumet & Arizona, c. | Ariz. | 596,353 | 10 | 15,170,882 | Sept. '13 | 1.25 |
| Calumet & Hecla, c. | Mich. | 100,000 | 25 | 122,650,000 | Sept. '13 | 10.00 |
| Camp Bird, g.s. | Colo. | 1,100,051 | 5 | 9,650,812 | Aug. '13 | 0.24 |
| Centen'l-Eur., l.s.g.c. | Utah. | 100,000 | 5 | 3,750,000 | Apr. '13 | 1.50 |
| Center Creek, l.z. | Mo. | 100,000 | 10 | 425,000 | July '13 | 0.05 |
| Champion, c. | Mich. | 100,000 | 25 | 8,100,000 | Oct. '13 | 1.00 |
| Chief Consolidated, s.g.l. | Utah. | 876,453 | 1 | 175,290 | Sept. '13 | 0.10 |
| Cliff, g | Utah. | 300,000 | 1 | 120,000 | Jan. '13 | 0.10 |
| Cliff, g. | Alas. | 100,000 | 1 | 180,000 | Nov. '12 | 0.05 |
| Colo. Gold Dredging | Colo. | 100,000 | 10 | 325,000 | Oct. '13 | 0.25 |
| Colorado, l.s.g. | Utah. | 1,000,000 | 0.20 | 2,570,000 | Dec. '12 | 0.03 |
| Columbus Con., g.s. | Utah. | 285,540 | 5 | 226,832 | Oct. '07 | 0.20 |
| Commercial Gold | Ore. | 1,750,000 | 1 | 43,750 | Dec. '10 | 0.00½ |
| Con. Mercur, g. | Utah. | 1,000,000 | 1 | 3,415,313 | July '12 | 0.03 |
| Continental, z.l. | Mo. | 22,000 | 25 | 297,000 | July '13 | 0.50 |
| Copper Range Con., c. | Mich. | 393,445 | 100 | 13,935,021 | Oct. '13 | 0.75 |
| Daly Judge, s.l. | Utah. | 300,000 | 1 | 620,000 | Oct. '13 | 0.15 |
| Daly West, s.l. | Utah. | 180,000 | 20 | 6,606,000 | Jan. '13 | 0.15 |
| Doctor Jackpot, g. | Colo. | 3,000,000 | 0.10 | 45,000 | Mar. '11 | 0.00½ |
| Doe Run, l. | Mo. | 65,782 | 100 | 3,500,974 | Sept. '13 | 1.00 |
| Elkton Con., g | Colo. | 2,500,000 | 1 | 3,129,460 | Nov. '13 | 0.02 |
| El Paso, g. | Colo. | 490,000 | 5 | 1,658,545 | Mar. '13 | 0.12½ |
| Ernestine, g.s. | N.M. | 300,000 | 5 | 400,000 | Dec. '12 | 0.00½ |
| Fed. M. & S., com. | Idaho. | 60,000 | 100 | 2,708,750 | Jan. '09 | 1.50 |
| Fed. M. & S., pf. | Idaho. | 120,000 | 100 | 9,207,851 | Sept. '13 | 1.50 |
| Florence, g. | Nev. | 1,050,000 | 1 | 840,000 | Apr. '11 | 0.10 |
| Frances-Mohawk, g. | Nev. | 912,000 | 1 | 546,000 | Jan. '08 | 0.05 |
| Free Coinage, g. | Colo. | 10,000 | 100 | 180,000 | Dec. '09 | 1.00 |
| Fremont Con., g. | Calif. | 200,000 | 2.50 | 214,000 | Nov. '13 | 0.02 |
| Frontier, z. | Wis. | 1,250 | 100 | 146,202 | Nov. '13 | 2.00 |
| Gemini-Key'ne, l.g.s. | Utah. | 5,000 | 100 | 2,160,000 | Nov. '13 | 10.00 |
| Gold Chain, g. | Utah. | 1,000,000 | 1 | 130,000 | May '13 | 0.03 |
| Gold Coin of Victor | Colo. | 1,000,000 | 1 | 1,350,000 | Feb. '09 | 0.02 |
| Gold Dollar Con. | Colo. | 2,500,000 | 0.10 | 100,000 | Dec. '12 | 0.00½ |
| Gold King Con., g. | Colo. | 5,750,370 | 1 | 1,407,319 | Dec. '11 | 0.03 |
| Golden Cycle, g | Colo. | 1,500,000 | 5 | 2,621,000 | Nov. '13 | 0.03 |
| Golden Star, g. | Ariz. | 400,000 | 5 | 140,000 | Mar. '10 | 0.05 |
| Goldfield Con., g. | Nev. | 3,558,367 | 10 | 26,330,470 | Oct. '13 | 0.40 |
| Grand Central, g | Utah. | 500,000 | 1 | 1,545,750 | Sept. '13 | 0.05 |
| Granite, g. | Colo. | 1,650,000 | 1 | 269,500 | Nov. '12 | 0.01 |
| Hazel, g | Cal. | 900,000 | 1 | 873,000 | Nov. '12 | 0.01 |
| Hecla, l.s. | Idaho. | 1,000,000 | 0.25 | 2,930,000 | Oct. '13 | 0.02 |
| Hercules, l.s. | Idaho. | 1,000,000 | 1 | 3,650,000 | July '11 | 0.06 |
| Homestake, g | S. D. | 218,400 | 100 | 33,858,563 | Nov. '13 | 0.65 |
| Horn Silver, l.s.z. | Utah. | 400,000 | 25 | 5,662,000 | Sept. '07 | 0.05 |
| Iowa, g.s.l. | Colo. | 1,666,667 | 1 | 216,832 | July '13 | 0.00½ |
| Iowa-Tiger Leasing g.s. | Colo. | 12,655 | 1 | 13,921 | Jan. '12 | 0.10 |
| Iron Blossom, s.l.g. | Utah. | 1,000,000 | 0.10 | 1,770,000 | Oct. '13 | 0.10 |
| Iron Silver, s.l.g. | Colo. | 500,000 | 20 | 4,700,000 | Apr. '13 | 0.10 |
| Jamison, g. | Cal. | 390,000 | 10 | 378,300 | Jan. '11 | 0.02 |
| Jerry Johnson, g. | Colo. | 2,500,000 | 0.10 | 150,000 | Aug. '11 | 0.01 |
| Kendall, g. | Mont | 500,000 | 5 | 1,475,000 | Nov. '12 | 0.02 |
| Kennedy, g. | Cal. | 100,000 | 100 | 1,831,001 | Apr. '10 | 0.03 |
| King of Arizona, g. | Ariz. | 200,000 | 1 | 396,000 | Aug. '09 | 0.12 |
| Klar Piquette, z.l. | Wis. | 20,000 | 1 | 162,500 | Dec. '12 | 0.50 |
| Knob Hill, g. | Wash. | 1,000,000 | 1 | 45,000 | May '12 | 0.00½ |
| Liberty Bell, g. | Colo. | 130,551 | 5 | 522,093 | Oct. '10 | 1.00 |
| Little Bell, l.s. | Utah. | 300,000 | 1 | 75,000 | Mar. '11 | 0.05 |
| Little Florence, g. | Nev. | 1,000,000 | 1 | 430,000 | Jan. '08 | 0.03 |
| Mammoth, g.s.c. | Utah. | 400,000 | 25 | 2,300,000 | July '13 | 0.05 |
| Mary McKinney, g. | Colo. | 1,309,252 | 1 | 1,077,558 | Oct. '13 | 0.02 |
| May Day, g.s.l. | Utah. | 800,000 | 0.25 | 148,000 | Feb. '13 | 0.03 |
| Mexican, g.s. | Nev. | 201,600 | 2.50 | 20,160 | Aug. '11 | 0.10 |
| Miami, c. | Ariz. | 664,993 | 5 | 2,588,910 | Nov. '13 | 0.50 |
| Modoc, g.s. | Colo. | 500,000 | 1 | 275,000 | Dec. '11 | 0.01 |
| Mohawk, c | Mich. | 100,000 | 25 | 3,175,000 | Aug. '13 | 2.00 |
| Monarch-Mad'a, g.s.l. | Colo. | 1,000,000 | 1 | 40,000 | May '11 | 0.01 |
| Montana-Tonop., s.g. | Nev. | 921,865 | 1 | 530,000 | Dec. '12 | 0.10 |
| Mountain, c. | Cal. | 250,000 | 25 | 4,216,250 | May '08 | 0.44 |
| National, g. | Nev. | 750,000 | 1 | 570,000 | May '11 | 0.10 |
| Nevada Con., c. | Nev. | 1,999,394 | 5 | 12,987,776 | Sept. '13 | 0.37½ |
| New Century, z.l. | Mo. | 330,000 | 1 | 237,600 | Oct. '09 | 0.01 |
| New Idria, q. | Cal. | 100,000 | 5 | 1,720,000 | Sept. '13 | 0.10 |
| North Butte, c. | Mont. | 410,000 | 15 | 11,275,000 | Oct. '13 | 0.50 |
| North Star, g. | Cal. | 250,000 | 10 | 3,936,989 | Sept. '13 | 0.20 |
| Old Domin'n, M. & Sm. | Ariz. | 162,000 | 25 | 3,361,000 | Oct. '13 | 1.25 |
| Ophir, s.g. | Nev. | 201,600 | 3 | 2,068,360 | Jan. '12 | 0.10 |
| Opohongo, g.s.l. | Utah. | 898,978 | 0.25 | 80,907 | Jan. '13 | 0.02 |
| Oroville Dredging | Cal. | 700,000 | 5 | 1,383,036 | Dec. '09 | 0.12½ |
| Osceola, c. | Mich. | 96,150 | 25 | 11,891,225 | Oct. '13 | 2.00 |
| Parrot, c. | Mont. | 229,850 | 10 | 7,290,227 | Nov. '13 | 0.15 |
| Pearl Con., g. | Wash. | 1,909,711 | 0.05 | 181,422 | Dec. '10 | 0.02 |
| Pharmacist, g. | Colo. | 1,500,000 | 1 | 87,500 | Feb. '10 | 0.00½ |
| Pioneer, g. | Alas. | 5,000,000 | 1 | 4,041,526 | Oct. '11 | 0.03 |
| Pittsburgh-Idaho, l. | Iad. | 803,000 | 1 | 216,810 | Oct. '12 | 0.04 |
| Pittsburgh Silver Peak, g | Nev. | 2,790,000 | 1 | 723,400 | Nov. '13 | 0.02 |
| Portland, g. | Colo. | 3,000,000 | 1 | 9,337,080 | Aug. '13 | 0.02 |
| Quilp | Wash. | 1,500,000 | 1 | 67,500 | Feb. '13 | 0.01 |
| Quincy, c. | Mich. | 110,000 | 25 | 20,842,500 | Sept. '13 | 1.25 |
| Republic, g | Wash. | 1,000,000 | 1 | 85,000 | Dec. '10 | 0.01½ |
| Rochester, l.z. | Mo. | 4,900 | 100 | 188,396 | Dec. '10 | 0.50 |
| Round Mountain, g. | Nev. | 866,426 | 1 | 363,365 | Aug. '13 | 0.04 |

## Mining Companies—United States—(*Continued*)

| Name of Company and Situation | | Shares | | Dividends | | |
|---|---|---|---|---|---|---|
| | | Issued | Par | Total | Latest | Amt. |
| Seven Troughs Coal., g. | Nev. | 1,500,000 | $1 | $37,500 | July '12 | $0.02½ |
| St. Joseph, l. | Mo. | 1,000,000 | 10 | 8,960,357 | Sept. '13 | 0.10 |
| Shannon, c. | Ariz. | 300,000 | 10 | 750,000 | Jan. '13 | 0.50 |
| Shattuck-Arizona, c. | Ariz. | 350,000 | 10 | 1,575,000 | Oct. '13 | 0.50 |
| Silver King Coal, l.s. | Utah. | 1,250,000 | 5 | 2,159,885 | Apr. '13 | 0.15 |
| Sioux Con., s.l.g. | Utah. | 745,389 | 1 | 872,097 | July '11 | 0.04 |
| Skidoo, g. | Cal. | 1,000,000 | 5 | 275,000 | May '12 | 0.02½ |
| Smuggler, l.s.z. | Colo. | 1,000,000 | 1 | 2,235,000 | Nov. '06 | 0.03 |
| Snowstorm, c.g. | Ida. | 1,500,000 | 1 | 1,192,103 | Oct. '13 | 0.02 |
| South Eureka, g. | Calif. | 299,981 | 1 | 366,881 | Apr. '12 | 0.07 |
| Standard Con., g | Cal. | 178,394 | 10 | 5,274,767 | Nov. '13 | 0.25 |
| Stratton's Ind., g. | Colo. | 1,000,000 | 0.60 | 546,750 | Nov. '13 | 0.06 |
| Success, z. | Ida. | 1,500,000 | 1 | 925,000 | May '13 | 0.02 |
| Superior & Pitts., c | Ariz. | 1,499,793 | 10 | 5,369,262 | Sept. '13 | 0.38 |
| Tamarack, c. | Mich. | 60,000 | 25 | 9,420,000 | July '07 | 4.00 |
| Tennessee, c. | Tenn. | 200,000 | 25 | 3,631,520 | Sept. '13 | 0.75 |
| Tomboy, g.s. | Colo. | 300,000 | 4.85 | 3,069,090 | June '13 | 0.48 |
| Tom Reed, g. | Ariz. | 909,555 | 1 | 1,591,580 | Nov. '13 | 0.06 |
| Tonopah Belm't, s.g. | Nev. | 1,500,000 | 1 | 5,243,000 | Nov. '13 | 0.10 |
| Tonopah Ext., g.s. | Nev. | 943,433 | 1 | 424,529 | Oct. '13 | 0.05 |
| Tonopah of Nev., s.g. | Nev. | 1,000,000 | 1 | 11,100,000 | Sept. '13 | 0.25 |
| Tri-Mountain, c. | Mich. | 100,000 | 25 | 1,250,000 | Dec. '12 | 3.00 |
| Tuolumne, c | Mont. | 800,000 | 1 | 520,000 | May '13 | 0.10 |
| Uncle Sam, g.s.l. | Utah. | 500,000 | 1 | 495,000 | Sept. '11 | 0.05 |
| United Cop. Min., c. | Wash. | 1,000,000 | 1 | 120,000 | July '13 | 0.01 |
| United (Crip. Ck.) g. | Colo. | 4,000,100 | 1 | 440,435 | Jan. '10 | 0.04 |
| United Globe, c. | Ariz. | 23,000 | 10 | 1,530,000 | Oct. '13 | 7.50 |
| United Verde, c. | Ariz. | 300,000 | 10 | 32,797,000 | Dec. '13 | 0.75 |
| Utah, s.l. | Utah. | 100,000 | 10 | 325,000 | Dec. '10 | 0.02 |
| Utah, c. | Utah. | 1,562,599 | 10 | 19,803,111 | Sept. '13 | 0.75 |
| Utah Con., c. | Utah. | 300,000 | 5 | 8,100,000 | Nov. '13 | 0.50 |
| Valley View, g. | Colo. | 1,000,000 | 1 | 210,000 | Dec. '10 | 0.04 |
| Victoria, g.s.l. | Utah. | 250,000 | 1 | 297,500 | Mar. '10 | 0.04 |
| Vindicator Con., g. | Colo | 1,500,000 | 1 | 2,767,000 | Oct. '13 | 0.03 |
| Wasp No. 2, g. | S. D. | 500,000 | 1 | 441,965 | Nov. '13 | 0.01 |
| Wellington Mines, g. | Colo. | 10,000,000 | 1 | 260,000 | July '13 | 0.00½ |
| Wolverine, c. | Mich. | 60,000 | 25 | 7,940,000 | Apr. '13 | 5.00 |
| Work, g. | Colo. | 1,500,000 | 1 | 172,500 | July '08 | 0.00½ |
| Yak, s.l. | Colo. | 1,000,000 | 1 | 1,727,655 | July '13 | 0.02 |
| Yankee Con., g.s. | Utah. | 1,000,000 | 1 | 167,500 | Jan. '13 | 0.01 |
| Yellow Aster, g. | Cal. | 100,000 | 10 | 1,176,789 | Nov. '13 | 0.05 |
| Yellow Pine, l.z.s. | Nev. | 950,000 | 1 | 323,008 | Nov. '13 | 0.02 |
| Yukon Gold, g | Alas. | 3,500,000 | 5 | 5,250,000 | Sept. '13 | 0.07½ |

## Iron, Industrial and Holding Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Amalgamated, c. | Mont. | 1,538,879 | $100 | $81,276,429 | Nov. '13 | $1.50 |
| Am. Sm. & Ref., com | U. S. | 500,000 | 100 | 24,833,333 | Sept. '13 | 1.00 |
| Am. Sm. & Ref., pf. | U. S. | 500,000 | 100 | 45,481,333 | Sept. '13 | 1.75 |
| Am. Smelters, pf. A. | U. S. | 170,000 | 100 | 8,130,000 | Oct. '13 | 1.50 |
| Am. Smelters, pf. B. | U. S. | 300,000 | 100 | 12,357,000 | Oct. '13 | 1.25 |
| Cambria Steel. | Penn. | 900,000 | 50 | 18,460,000 | Nov. '13 | 0.62½ |
| Greene Cananea | U. S. | 2,471,314 | 25 | 2,426,877 | Mar. '13 | 0.25 |
| Guggenheim Expl. | U. S. | 831,732 | 25 | 17,897,500 | Oct. '13 | 0.62½ |
| Inter'l Nickel, com. | U. S. | 115,820 | 100 | 10,089,316 | Sept. '13 | 3.00 |
| Inter'l Nickel, pfd. | U. S. | 89,120 | 100 | 4,274,192 | Aug. '13 | 1.50 |
| Inter'l Sm. & Ref. | U. S. | 100,000 | 100 | 3,300,000 | Aug. '13 | 2.00 |
| National Lead, com. | N. Y. | 206,554 | 100 | 7,540,308 | Sept. '13 | 0.75 |
| National Lead, pf. | N. Y. | 243,676 | 100 | 27,560,940 | Sept. '13 | 1.75 |
| Old Dominion, c. | Ariz. | 293,245 | 25 | 4,682,700 | Oct. '13 | 1.25 |
| Phelps, Dodge & Co. | U. S. | 450,000 | 100 | 28,309,304 | Sept. '13 | 4.50 |
| U. S. Steel Corp., com. | U. S. | 5,083,025 | 100 | 194,403,851 | Sept. '13 | 1.25 |
| U. S. Steel Corp., pf. | U. S. | 3,602,811 | 100 | 345,073,658 | Nov. '13 | 1.75 |
| U. S. S., R. & M., com. | U.S.-Mex. | 486,320 | 50 | 5,572,183 | Oct. '13 | 0.75 |
| U. S. S., R. & M., pf. | U.S.-Mex. | 351,105 | 50 | 12,965,225 | Oct. '13 | 0.87½ |

## Canadian, Mexican and Central American Companies

| | | | | | | |
|---|---|---|---|---|---|---|
| Ajuchitlan, g.s. | Mex. | 50,000 | $5 | $200,000 | Oct. '12 | $0.25 |
| Amparo, g.s. | Mex. | 2,000,000 | 1 | 1,246,884 | Nov. '13 | 0.04 |
| B. C. Copper | B. C. | 591,709 | 5 | 615,398 | Jan. '13 | 0.15 |
| Beaver Con., s. | Ont. | 1,996,490 | 1 | 409,879 | Dec. '12 | 0.03 |
| Buffalo, s. | Ont. | 1,000,000 | 1 | 3,177,000 | Nov. '13 | 0.07 |
| Cobalt Townsite, s. | Ont. | 1,000,000 | 1 | 450,000 | Aug. '13 | 0.24 |
| Coniagas, s. | Ont. | 800,000 | 5 | 5,560,000 | Nov. '13 | 0.70 |
| Con. M. & S. Co. of Can. | B. C. | 58,052 | 100 | 1,226,269 | Oct. '13 | 2.00 |
| Crown Reserve, s. | Ont. | 1,768,814 | 1 | 5,412,572 | Nov. '13 | 0.02 |
| Crow's Nest Pass C. Co. | B. C. | 248,506 | 25 | 2,182,864 | Mar. '11 | 0.25 |
| Dominion Coal, com. | N. S. | 150,000 | 100 | 5,550,000 | Jan. '13 | 1.00 |
| Dominion Coal, pf. | N. S. | 50,000 | 100 | 4,915,000 | Aug. '12 | 3.50 |
| Dos Estrellas, g.s. | Mex. | 300,000 | 0.50 | 14,580,000 | Sept. '13 | 1.25 |
| El Oro, g.s. | Mex. | 1,147,500 | 4.85 | 8,947,261 | July '13 | 0.24 |
| Esperanza, s.g. | Mex. | 455,000 | 4.85 | 11,330,435 | July '13 | 0.36 |
| Granby, s.l.c. | B.C. | 148,496 | 100 | 5,364,794 | Sept. '13 | 1.50 |
| Greene Con., c. | Mex. | 1,000,000 | 10 | 8,544,400 | Nov. '13 | 0.50 |
| Guanajuato D., pf., s. | Mex. | 10,000 | 1000 | 274,356 | Jan. '11 | 3.00 |
| Hedley Gold | B. C. | 120,000 | 10 | 1,044,000 | Sept. '13 | 0.50 |
| Hollinger, g. | Ont. | 600,000 | 5 | 1,260,000 | Nov. '13 | 0.15 |
| Kerr Lake s. | Ont. | 600,000 | 5 | 4,770,000 | Sept. '13 | 0.25 |
| La Rose Con., s. | Ont. | 1,498,407 | 5 | 4,637,803 | Oct. '13 | 0.25 |
| Le Roi No. 2, g. | B. C. | 120,000 | 24.30 | 1,471,580 | Jan. '13 | 0.36 |
| Lucky Tiger Com., g. | Mex. | 715,337 | 10 | 2,011,552 | Nov. '13 | 0.06 |
| McK.-Dar. Sav. s. | Ont. | 2,247,692 | 1 | 3,798,026 | Oct. '13 | 0.10 |
| Mines Co. of Am. (new) | Mex. | 1,700,000 | 10 | *1,215,000 | July '13 | 0.12½ |
| N. Y. & Hond. Ros. | C. A. | 150,000 | 10 | 3,192,500 | Sept. '13 | 0.20 |
| Nipissing, s. | Ont. | 1,200,000 | 5 | 10,890,000 | Oct. '13 | 0.37½ |
| Peñoles, s.l.g. | Mex. | 80,000 | 25 | 6,551,688 | Sept. '13 | 1.25 |
| Peregrina M. & M., pf. | Mex. | 10,000 | 100 | 328,656 | Sept. '10 | 3.50 |
| Pinguico, pf., s. | Mex. | 20,000 | 100 | 600,000 | Oct. '11 | 3.00 |
| Right of Way Mns† s. | Ont. | 1,685,500 | 1 | 202,260 | Dec. '11 | 0.02 |
| Rio Plata, s. | Mex. | 373,437 | 5 | 345,714 | Feb. '13 | 0.05 |
| San Rafael, g.s. | Mex. | 2,400 | 25 | 1,441,180 | Oct. '13 | 0.50 |
| San Toy, g.s. | Mex. | 6,000,000 | 1 | 540,000 | July '13 | 0.01 |
| Sopresa, g.s. | Mex. | 19,200 | 20 | 1,517,438 | Jan. '11 | 34.00 |
| Stand'd Silver-Lead | B. C. | 2,000,000 | 1 | 975,000 | Nov. '13 | 0.02½ |
| Timiskaming, s. | Ont. | 2,500,000 | 1 | 1,534,155 | Apr. '13 | 0.06 |
| Tem. & Hud. Bay, s. | Ont. | 7,761 | 1 | 1,823,835 | Aug. '13 | 3.00 |
| Trethewey, s. | Ont. | 1,000,000 | 1 | 961,998 | Jan. '13 | 0.10 |
| Wettlaufer-Lorrain, s. | Ont. | 1,416,590 | 1 | 637,465 | Oct. '13 | 0.05 |

*Previous to reorganization, $5,258,881.

†Previous to January, 1910, $324,644.

### Assessments

| Company | Delinq | Sale | Amt |
|---|---|---|---|
| Arctic, Ida. | Dec. 1 | Dec 31 | 00025 |
| Benton, Ida | Nov 25 | Dec 23 | 0 005 |
| Big Cottonwood, Utah | Dec. 10 | Dec 29 | 0 01 |
| [illegible], Ida | Nov. 25 | Dec. 17 | 0 03 |
| Boston, Nev | Dec 12 | Dec 30 | 0 02 |
| Candelaria, Nev | Nov. 24 | Dec 18 | 0 05 |
| Carbonate Center, Ida | Nov. 5 | Dec 22 | 0 001 |
| Clear Grit, Ida., postp'd. | Nov. 18 | Jan. 2 | 0 0025 |
| Comet Placer, Nev | Dec. 6 | Dec. 22 | 0 03 |
| East Hercules, Ida | Nov. 15 | Dec. 15 | 0 0015 |
| Empire, Ida., postp'd | Oct. 30 | Jan. 2 | 0 005 |
| Gold Mountain Champion, Ida. | Dec. 9 | Dec. 30 | 0 0025 |
| Great Copper King, Ida | Nov. 29 | Dec. 29 | 0 001 |
| Great Eastern, Ida | Nov. 18 | Dec. 18 | 0.0015 |
| Laclede, Ida | Nov. 24 | Dec. 15 | 0 003 |
| Nabob, Ida., postp'd | Nov. 17 | Dec. 21 | 0.005 |
| Nevada Silver Reed, Ida | Nov. 17 | Dec 18 | 0.0017 |
| New Yerington, Nev | Dec. 10 | Dec 30 | 0 01 |
| North Franklin, Ida., postp'd | Oct. 16 | Jan. 29 | 0 005 |
| Overman, Nev. | Dec. 10 | Dec. 30 | 0 05 |
| Plaza, Utah | Dec. 13 | Dec 29 | 0 0025 |
| Raymond-Illinois, Utah | Nov. 28 | Dec. 15 | 0 005 |
| Rescue Eula, Nev | Nov. 25 | Dec. 29 | 0 01 |
| Scranton Ext., Utah | Nov. 17 | Dec. 17 | 00025 |
| Seg Belcher, Nev | Dec. 5 | Dec. 30 | 0.02 |
| Silver Star, Ida., postp'd | Nov. 22 | Jan. 10 | 0.002 |
| Wasatch, Utah | Dec. 22 | Jan. 8 | 0.05 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York 1911 | New York 1912 | New York 1913 | London 1911 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 53 795 | 56 260 | 62 938 | 24 865 | 25 887 | 28 983 |
| February | 52 222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March | 52 745 | 58 375 | 57 870 | 24 324 | 26 875 | 26 669 |
| April | 53 325 | 59 207 | 59 490 | 24.595 | 27 284 | 27 416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24.486 | 28 215 | 27 199 |
| July | 52 630 | 60 654 | 58 721 | 24 286 | 27 919 | 27 074 |
| August | 52 171 | 61 606 | 59 293 | 24.082 | 28 375 | 27.335 |
| September | 52 440 | 63 078 | 60 640 | 24 209 | 29 088 | 27 986 |
| October | 53 340 | 63 471 | 60 793 | 24 594 | 29 299 | 28 083 |
| November | 55 719 | 62 792 | 58 995 | 25 649 | 29 012 | 27.263 |
| December | 54 905 | 63 365 | | 25 349 | 29 320 | .... |
| Year | 53 304 | 60 835 | | 24 592 | 28 042 | ...... |

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York Electrolytic 1912 | New York Electrolytic 1913 | New York Lake 1912 | New York Lake 1913 | London Standard 1912 | London Standard 1913 |
|---|---|---|---|---|---|---|
| January | 14 094 | 16 488 | 14 337 | 16 767 | 62 760 | 71.741 |
| February | 14 084 | 14 971 | 14 329 | 15 253 | 62 893 | 65 519 |
| March | 14 698 | 14 713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15 741 | 15 291 | 15 930 | 15 565 | 70 294 | 68 111 |
| May | 16.031 | 15 436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17 234 | 14 672 | 17 443 | 14 871 | 78 259 | 67 140 |
| July | 17 190 | 14 190 | 17 353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | 16 328 | 17 698 | 16 799 | 78 762 | 73.125 |
| October | 17 314 | 16 337 | 17 661 | 16 913 | 76 389 | 73 383 |
| November | 17 326 | 15 182 | 17 617 | 16 022 | 76 890 | 68 275 |
| December | 17 376 | | 17 600 | | 75 516 | . |
| Year | 16 341 | | 16 560 | | 72 942 | . |

New York, cents per pound, London, pounds sterling per long ton of standard copper

### TIN

| Month | New York 1912 | New York 1913 | London 1912 | London 1913 |
|---|---|---|---|---|
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 410 | 223 762 | 193 074 |
| October | 50 077 | 40 462 | 228 353 | 184 837 |
| November | 49 891 | 39 810 | 227 619 | 180 869 |
| December | 49 815 | | 226 875 | |
| Av. year | 46 096 | | 209 322 | |

New York in cents per pound. London in pounds sterling per long ton

### LEAD

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 4 435 | 4 321 | 4.327 | 4.171 | 15.597 | 17.114 |
| February | 4 026 | 4 325 | 3 946 | 4 175 | 15 738 | 16 550 |
| March | 4 073 | 4 327 | 4 046 | 4.177 | 15 997 | 15 977 |
| April | 4 200 | 4 381 | 4 118 | 4 242 | 16.331 | 17.597 |
| May | 4 194 | 4 342 | 4 072 | 4.226 | 16 509 | 18 923 |
| June | 4 392 | 4 325 | 4 321 | 4 190 | 17 588 | 20 226 |
| July | 4 720 | 4 353 | 4 603 | 4 223 | 18 544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | 4 698 | 4 924 | 4 579 | 22.292 | 20 648 |
| October | 5 071 | 4 402 | 4 894 | 4 253 | 20 630 | 20 302 |
| November | 4 615 | 4.293 | 4 463 | 4 146 | 18 193 | 19 334 |
| December | 4 303 | ... | 4 152 | | 18 069 | ..... |
| Year | 4 471 | ... | 4 360 | | 17 929 | . |

New York and St. Louis cents per pound. London, pounds sterling per long ton

### SPELTER

| Month | New York 1912 | New York 1913 | St. Louis 1912 | St. Louis 1913 | London 1912 | London 1913 |
|---|---|---|---|---|---|---|
| January | 6 442 | 6 931 | 6 292 | 6 854 | 26 642 | 26 114 |
| February | 6 499 | 6 239 | 6 349 | 6 089 | 26 661 | 25.338 |
| March | 6 626 | 6 078 | 6 476 | 5 926 | 26 048 | 24 605 |
| April | 6 633 | 5 641 | 6 483 | 5 491 | 25 644 | 25.313 |
| May | 6 679 | 5 406 | 6 529 | 5 256 | 25 790 | 24.583 |
| June | 6 877 | 5 124 | 6 727 | 4 974 | 25 763 | 22 143 |
| July | 7 116 | 5 278 | 6 966 | 5 128 | 26 174 | 20 592 |
| August | 7 028 | 5 658 | 6 878 | 5 508 | 26 443 | 20 706 |
| September | 7 454 | 5 604 | 7 313 | 5 544 | 27 048 | 21.148 |
| October | 7 426 | 5 340 | 7 276 | 5 188 | 27 543 | 20 614 |
| November | 7 371 | 5 229 | 7 221 | 5 083 | 26 804 | 20 581 |
| December | 7 162 | | 7 081 | | 26 494 | ..... |
| Year | 6 943 | | 6 799 | | 26.421 | ...... |

New York and St Louis, cents per pound. London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer 1912 | Bessemer 1913 | Basic 1912 | Basic 1913 | No. 2 Foundry 1912 | No. 2 Foundry 1913 |
|---|---|---|---|---|---|---|
| January | $15 12 | $18 15 | $13 32 | $17 35 | $14.00 | $18.59 |
| February | 15 03 | 18 15 | 13 28 | 17 22 | 14.01 | 18.13 |
| March | 14 95 | 18.15 | 13 66 | 16 96 | 14 10 | 17.53 |
| April | 15 13 | 17 90 | 13 90 | 16 71 | 14.15 | 16.40 |
| May | 15 14 | 17.68 | 13.90 | 15 80 | 14.12 | 15.40 |
| June | 15 15 | 17.14 | 14 11 | 15 40 | 14 22 | 15.10 |
| July | 15 15 | 16 31 | 14 38 | 15 13 | 14 38 | 14.74 |
| August | 15 43 | 16 63 | 14 90 | 15 00 | 14 85 | 14.88 |
| September | 16 86 | 16 65 | 16 03 | 15 04 | 15 63 | 14.93 |
| October | 17 90 | 16 60 | 17 18 | 14 61 | 17 22 | 14.80 |
| November | 18 07 | 16 03 | 17 09 | 13 91 | 18 00 | 14.40 |
| December | 18 15 | | 17 45 | | 18 73 | . |
| Year | $16 01 | | $14 93 | | $15.28 | |

## STOCK QUOTATIONS

### COLO SPRINGS Dec 9

| Name of Comp | Bid |
|---|---|
| Acacia | 03 |
| Cripple Cr'k Con. | ‡ 01 |
| C K & N | 07 |
| Doctor Jack Pot. | 06½ |
| Elkton Con | 51 |
| El Paso | 2 75 |
| Findlay | 01½ |
| Gold Dollar | 07½ |
| Gold Sovereign | 02½ |
| Golden Cycle | 1 00 |
| Isabella | 11½ |
| Jack Pot | 04½ |
| Jennie Sample | 04½ |
| Jerry Johnson | 03½ |
| Lexington | .003 |
| Old Gold | ‡ 02 |
| Mary McKinney | 59½ |
| Pharmacist | 01 |
| Portland | 1 05 |
| Vindicator | 83½ |

### SALT LAKE Dec 9

| Name of Comp | Bid. |
|---|---|
| Beck Tunnel | .03½ |
| Black Jack | ‡ 05 |
| Cedar Talisman | .00½ |
| Colorado Mining | 10½ |
| Columbus Con. | ‡.01 |
| Crown Point | ‡ 00½ |
| Daly-Judge | 5.20 |
| Grand Central | .53 |
| Iron Blossom | 1.15 |
| Little Bell | ‡.15 |
| Lower Mammoth | 01½ |
| Mason Valley | 3.00 |
| May Day | 05 |
| Nevada Hills | .48 |
| New York | ‡.02½ |
| Prince Con. | 22 |
| Silver King Coal'n. | 3.35 |
| Sioux Con. | 01 |
| Uncle Sam | 04 |
| Yankee | ‡.06 |

### TORONTO Dec 9

| Name of Comp | Bid. | Name of Comp | Bid |
|---|---|---|---|
| Bailey | 05½ | Foley O'Brien | 17 |
| Coniagas | 7 00 | Hollinger | 17 25 |
| T & Hudson Bay | 65 00 | Imperial | ‡ 02 |
| Timiskaming | 14 | Jupiter | 06½ |
| Wettlaufer-Lor | 06 | Pearl Lake | 07½ |
| Apex | ‡ 01 | Porcu Gold | 14 |
| Big Dome | ‡12 00 | Preston E D | 01½ |
| Crown Chartered | 00½ | Rea | ‡ 10 |
| Dobie | ‡ 10 | Swastika | 02 |
| Dome Exten | 07 | West Dome | 08 |

### SAN FRANCISCO Dec. 9

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | 07 | Belmont | 7.50 |
| Belcher | 42 | Jim Butler | 66 |
| Best & Belcher | 06 | MacNamara | 07 |
| Caledonia | 1 87 | Midway | 33 |
| Challenge Con. | 08 | Mont.-Tonopah | 90 |
| Chollar | 03 | North Star | 38 |
| Confidence | 38 | West End Con. | 1 22½ |
| Con Virginia | 12 | Atlanta | 09 |
| Crown Point | 34 | Booth | 02 |
| Gould & Curry | 03 | C O.D. Con. | 03 |
| Hale & Norcross. | 09 | Comb. Frac | .06 |
| Mexican | 1 25 | Jumbo Extension | ‡.08 |
| Occidental | 70 | Pitts.-Silver Peak | .36 |
| Ophir | 21 | Round Mountain. | 33 |
| Overman | .36 | Sandstorm Kendall | 05 |
| Potosi | 04 | Silver Pick | 03 |
| Savage | 11 | Argonaut | ‡3 25 |
| Sierra Nevada | 07 | Bunker Hill | ‡2 00 |
| Union Con. | 14 | Central Eureka | ‡ 23 |
| Yellow Jacket | 35 | So. Eureka | ‡2 00 |

### N. Y. EXCH. Dec. 9

| Name of Comp. | Clg. |
|---|---|
| Amalgamated | 69½ |
| Am. Agri. Chem. | 43½ |
| Am.Sm.&Ref.,com | 62½ |
| Am. Sm. & Ref., pf | 97½ |
| Am. Sm. Sec., pf. B | 81½ |
| Anaconda. | 34¼ |
| Batopilas Min. | 1 |
| Bethlehem Steel,pf. | 69½ |
| Chino | 37½ |
| Federal M. & S., pf. | 31½ |
| GreatNor.,ore.,ctf. | 33½ |
| Guggen Exp. | 46 |
| Homestake. | 118 |
| Inspiration Con. | 14¼ |
| Miami Copper | 21½ |
| Nat'l Lead, com. | 44½ |
| National Lead, pf. | 104 |
| Nev. Consol. | 14½ |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf. | 88¾ |
| Quicksilver, pf. | 2¾ |
| Ray Con. | 17¾ |
| Republic I&S,com. | 19½ |
| Republic I&S, pf. | 80¾ |
| SlossSheffi'd,com. | 26 |
| Sloss Sheffield, pf. | 86 |
| Tennessee Copper. | 30 |
| Utah Copper | 48 |
| U. S Steel, com. | 56½ |
| U. S. Steel, pf | 105 |
| Va.Car.Chem.,pf. | 97 |

### N. Y. CURB Dec. 9

| Name of Comp. | Clg. |
|---|---|
| Ariz Belmont | ‡ 04½ |
| Barnes King | 1½ |
| Beaver Con | 30½ |
| Big Four. | .08 |
| Boston Montana | 5 |
| Braden Copper | 7¾ |
| B. C. Copper | 2½ |
| Buffalo Mines | 2 1/16 |
| Can. G. & S. | 12 |
| Caribou | 64 |
| Con Ariz Sm. | 3/16 |
| Coppermines Cons | 2 |
| Davis-Daly | 1¼ |
| Diam'field-Daisy | 03 |
| Ely Con | 01½ |
| Florence | 22 |
| Gold Hill Con. | 20 |
| Goldfield Con | 1½ |
| Greene Cananea | 29½ |
| Greenwater | 06 |
| Internat S & R | ‡115 |
| Kerr Lake | 4½ |
| La Rose | 1 11/16 |
| McKinley-Dar-Sa | 1½ |
| Min Co of A new | 2 1/16 |
| New Utah Bingham | 45 |
| Nipissing Mines | 8 |
| Ohio Copper | ½ |
| Puebla S & R | 2½ |
| South Utah M&S | ‡ 3/16 |
| Stand'd Oil of N J | 400 |
| Stewart. | 1½ |
| Tonopah | 5½ |
| Tonopah Ex. | 1 9/16 |
| Tonopah Merger | 56 |
| Tri-Bullion | ½ |
| Tularosa | 50 |
| Union Mines | ‡ 08 |
| United Cop., pfd | ‡3 |
| Yukon Gold | 2 |

### LONDON Dec 1

| Name of Comp | Clg |
|---|---|
| Camp Bird | £0 14s 0d |
| El Oro | 0 14 0 |
| Esperanza | 1 0 0 |
| Mexico Mines | 5 2 6 |
| Oroville | 0 11 6 |
| Santa Gert'dis | 0 17 6 |
| Stratton's | 0 0 9 |
| Tomboy | 1 6 10½ |

### BOSTON EXCH Dec. 9

| Name of Comp. | Clg. |
|---|---|
| Adventure | 1½ |
| Ahmeek | 250 |
| Alaska Gold M. | 20¾ |
| Algomah | 90 |
| Allouez | 30¾ |
| Am. Zinc | 16½ |
| Ariz. Com., ctfs. | 3¾ |
| Bonanza | .59 |
| Boston & Corbin | ‡ 50 |
| Butte & Balak | 4½ |
| Calumet & Ariz | 60½ |
| Calumet & Hecla | 395 |
| Centennial | 13 |
| Cliff. | ‡1 |
| Copper Range | 33 |
| Daly West | 2½ |
| East Butte | 9½ |
| Franklin | 2½ |
| Granby | 68¾ |
| Hancock | 13½ |
| Hedley Gold | 29¾ |
| Helvetia | .25 |
| Indiana | 3½ |
| Island Cr'k, com | 46 |
| Island Cr'k, pfd | 81½ |
| Isle Royale | 17 |
| Keweenaw | 2½ |
| Lake | 5 |
| LaSalle | 3½ |
| Mass. | 2 |
| Michigan | .60 |
| Mohawk | 38 |
| New Arcadian | 1¼ |
| New Idria Quick. | 2¼ |
| North Butte | 24 |
| North Lake | 1 |
| Ojibway | .75 |
| Old Dominion | 48 |
| Osceola | 68 |
| Quincy | 54 |
| Shannon | 6¼ |
| Shattuck-Ariz | 25½ |
| Superior | 22½ |
| Superior & Bost. | 2¼ |
| Tamarack | 28 |
| Trinity | 3½ |
| Tuolumne | .65 |
| U. S. Smelting | 36¾ |
| U. S. Smelt'g, pf. | 46¼ |
| Utah Apex | 1½ |
| Utah Con. | 8 |
| Victoria | 1 3/16 |
| Winona | 1¼ |
| Wolverine | 40 |
| Wyandot. | .50 |

### BOSTON CURB Dec. 9

| Name of Comp | Bid |
|---|---|
| Bingham Mines | 4¾ |
| Boston Ely. | 44 |
| Butte&Lon'nDev | .32 |
| Cactus | 01½ |
| Calaveras. | 1½ |
| Chief Cons | 1 1/16 |
| Corbin | 5 |
| Cortez | 21 |
| Crown Reserve | 1 1/16 |
| Eagle & Blue Bell | 93 |
| First Nat. Cop | 2¼ |
| Houghton Copper | 2½ |
| Majestic | 22 |
| Mexican Metals | 39 |
| Moneta Porc | ‡ 01 |
| Nevada-Douglas | 1¼ |
| New Baltic | 50 |
| Oneco | 80 |
| Raven Copper | 13 |
| Rhode Island Coal | .01 |
| Smokey Dev | 25 |
| So Lake | 3½ |
| S W Miami | ‡1¼ |
| Tonopah Victor | 25 |
| Trethewey | .30 |
| United Verde Ext | .40 |

‡Last Quotation.

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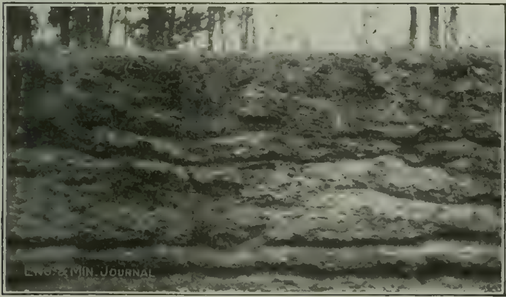
# Texas Iron Ore Deposits

By Robert Linton*

*SYNOPSIS—Iron ore in commercial deposits occurs in about 20 counties in Texas, but the number of mines, while distributed, is not large. The best are found in Cass County and those immediately adjoining. These deposits are described in character, method of working and geology. The grade and physical characteristics are noted in detail.*

⁂

Iron ore is found in about 20 counties of east Texas. The areas in which it is known to occur in sufficient thickness and concentration, and of suitable quality to be classed as commercial ore, are, however, comparatively limited. The total tonnage available has been variously estimated, but as no mining has ever been undertaken in Texas on a large scale, and little comprehensive development work done, the figures are based on insufficient data and can only be considered as indicating in a general way the state's iron-ore resources. Estimates made by Mr. Eckels of the iron-ore reserves of the United States, give 600,000,000 tons as the amount that Texas will probably produce. This includes the magnetite and hematite deposits in the central part of the state, but the bulk of the tonnage is made up of east Texas brown ores.



Face of Ore in Opencut

An Opencut in Cass Co.

### Situation of the Ore Deposits

The district that is best known and that appears to contain the best ore deposits, both as regards thickness and quality, is situated in Cass County and adjacent parts of Morris, Upshur and Marion counties. A great deal of active development work has been done in the past few years in this district, the favorable results of which have attracted considerable attention to them as a new source of ore supply for the furnaces along the Eastern Seaboard, where at present the supply is practically all imported, as well as a supply for local furnaces to produce foundry pig and certain finished products for the Southwestern market. Some years ago there were many small cold-blast charcoal furnaces operating in Texas, running on local ores and producing iron of superior quality. As timber became scarce and competition from the large iron-manufacturing centers became keener, these furnaces were gradually closed until the only one left is that at Rusk, owned by the state and operated with convict labor. This has been run only intermittently the past few years.

The surface of the region is rolling, made up of long ridges, generally narrow but widening occasionally into plateaus of considerable area. The intervening valleys are shallow and usually with gently sloping sides. The drainage is through various creeks and bayous into Caddo Lake, a part of the Red River system.

### Geological Character of the Ore

The iron ores lie in the Wilcox or Sabine formation, referred to the Eocene division of the Teritary, and the only member of the Tertiary occurring in east Texas. It consists of a series of siliceous and glauconitic sands, interstratified with clays, the total thickness of the series being 800 or 900 ft. This formation outcrops over all the district above mentioned and the soft sands and clays of which it is made up yield readily to erosion. The ore beds, being harder than these, form the resisting member of the formation and have constituated a most important factor in determining the topography of the region. They are ordinarily found capping the hills or following around the sides near the top.

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*Mining engineer, Trust and Savings Bldg., Los Angeles, Calif.

The ore horizon is sharply defined and adheres closely to a fixed level over large areas. The mean elevation is about 350 ft. above sea level and there appears to be little variation above or below this in the Cass County district. As a rule, although not invariably, the largest and best deposits of ore are found near the outcrops on the hillsides. Where the ridges broaden out into wide stretches of high ground, ore is usually continuous over them, but it frequently becomes so thin that it cannot be economically mined. Characteristically the workable ore follows around the flanks of the broader and higher ridges as a persistent belt of varying width, capping entirely the narrow spurs projecting from them when the tops of these lie within the limiting levels of the ore horizon.

Both brown and spathic ore occurs in the formation, the former usually lying in the sand member and the carbonate in the clay. The manner of occurrence of the ore suggests the conditions under which it was deposited. It was laid down on the bottom of bays and lagoons when the region was under water. The currents and eddies circulating in these bodies of water rendered certain localities favorable for deposition and prevented it in others, and the same conditions caused the sand to be washed out of the iron in the case of some deposits and to be allowed to settle and become intermingled with the iron in others. The wide variation in the thickness and silica contents of the east Texas deposits is thus readily accounted for.

### Ore Classification

The brown ores fall naturally into two classes: Nodular and ledge ores. The nodular ores are typically of geode structure, the shell being dense and compact with dark brown or black surface inside and frequently exhibiting a needle-like crystalline structure usually radiated. Both limonite and goethite occur in the nodular ores and occasionally ferrous oxide. The grade is uniformly high for brown ores. A sample cargo of 600 tons that was mined and shipped to Philadelphia in the spring of 1910 by the Texas Iron & Coal Co., had the following analysis:

Nodular Ore from Surface, Cass Co.

ANALYSIS OF BROWN IRON ORE

| | Per Cent |
|---|---|
| Metallic iron | 57.540 |
| Silica | 1.800 |
| Alumina | 0.942 |
| Manganese | 0.314 |
| Sulphur | 0.116 |
| Phosphorus | 0.118 |

Analyses of a number of samples taken from scattered tracts showed as follows:

AVERAGE GRADE OF IRON ORES

| Iron, Per Cent. | Insoluble, Per Cent. |
|---|---|
| 57.6 | 5.0 |
| 62.0 | 2.0 |
| 63.0 | 2.0 |
| 60.0 | 4.0 |
| 54.0 | 9.0 |
| 61.0 | 3.0 |
| 60.6 | 3.0 |
| 59.5 | 3.0 |
| Average 59.7 | 3.9 |

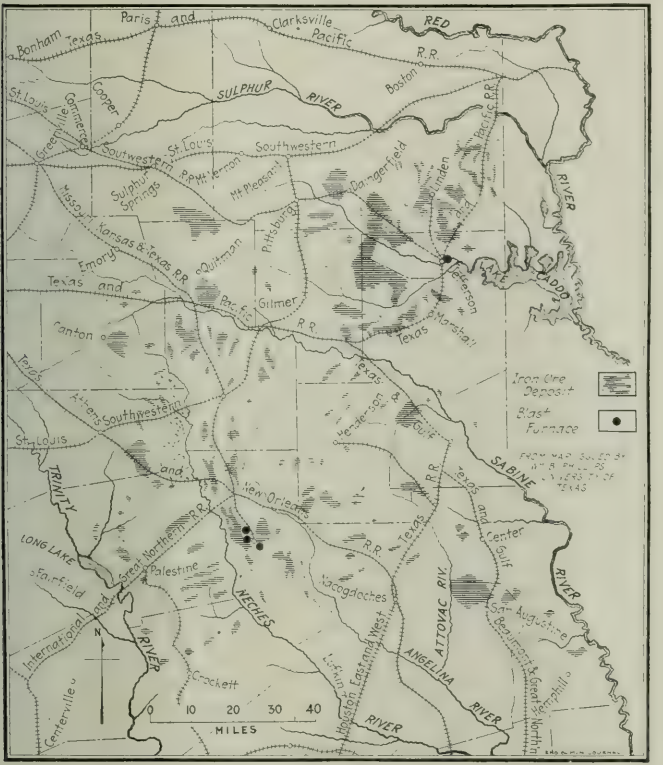
Calcining brings the average grade to above 65%. The ledge ores afford by far the greater part of the available tonnage. They lie in an irregularly bedded position, there being no continuous stratification, but rather a succession of numerous broad, thin sheets, parallel and overlapping, lying in sand beds with occasional admixture of clay. The workable ore usually lies within eight to 14 ft. of the surface. Considerable variation is noted in both structure and grade. The ore is most frequently laminated or cellular and the iron contents vary from a grade equal to the best nodular ore down through concentrating grade to a point too low to be considered workable. As the iron contents drop, the silica contents, which in the nodular ores rarely exceed 5%, rise in proportion. The proportion of silica in chemical combination is low, the high silica resulting from mechanical mixing of the sand with the iron hydrate. This may be in the form of dissemin

Lead Ore as Exposed in Opencut, Cass Co.

ated grains or as a separate layer termed locally a "sand shield." When in the latter form it peels off in crushing and is readily separated by jigging. In the disseminated form it cannot be separated by any known commercial process.

### Methods of Operation

Obviously, then, it is impossible to give any average grade for the ledge ores. The operating problem is to prospect the territory thoroughly in advance of operations so as to ascertain what portions of the same must be disregarded on account of the high silica and how that portion mined should be treated in order to bring its grade up. To illustrate this, the results of some tests on high-silica ores recently made may be of interest. The material from each pit was screened to separate the coarse lumps from the fines and the latter passed through washing boxes to approximate the action of a log washer and concentrated in a hand jig of plunger type. Calcining tests were run on a portion of the samples and the grade of calcined ore calculated for the other pits from these results. The material fed to the washer averaged about 1½ cu.yd. per ton of calcined ore. The results are shown in the table.



Texas Iron-Ore Districts

TESTS ON CALCINING BROWN ORES

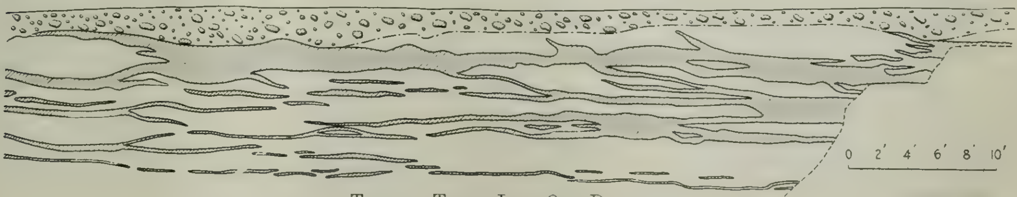
| | Analysis Raw | | Analysis Calcined | |
|---|---|---|---|---|
| | Iron | Insoluble | Iron | Insoluble |
| | 48.8 | 20.6 | 56.0 | 19.0 |
| | 48.2 | 20.0 | 56.5 | 18.0 |
| | 49.0 | 21.0 | 54.8 | 20.5 |
| | 47.4 | 20.0 | 55.2 | 20.0 |
| | 47.6 | 19.0 | 57.8 | 16.3 |
| Average | 48.2 | 20.1 | 56.0 | 18.8 |

It is interesting to note that the silica contents were lowered both by the concentration and the calcining, the latter due, no doubt, to snapping off of small particles of silica which were carried up the stack.

The carbonate ores usually lie at lower horizons. These carbonate ores are nearly pure siderite. The nodular ores and probably a portion of the ledge ores are derived from alteration of the same. When calcined, they afford a very high-grade product, as shown by the accompanying analyses.

The range in grade of what may be considered workable ores, is shown in the accompanying analyses of samples of ore concentrates taken over a considerable area in Cass and Marion counties.

As far as the manganese, sulphur and phosphorus contents are concerned, the quality of the ore is very satisfactory, although the phosphorus is, of course, above the bessemer limits. The variable elements are iron, silica and alumina, and the limiting factor in preparing and marketing the ore is the silica contents. Ferrous oxide, which occurs in some of the nodular ores, renders them more easily reducible than any ore which contains the iron wholly in the ferric state. The physical character of the ore, being largely of porous or cellular structure, is unusually favorable for furnace operations.



Type of Texas Iron-Ore Deposits

Operating conditions are such as involve no great difficulty, excepting that in some localities the water supply is limited. The fact that the ore deposits lie right on the surface on the high ridges and plateaus and follow an almost perfectly flat and level plane, makes steam-shovel work and transportation simple and cheap. The light character of the soil in which the ore is imbedded makes washing and concentration easy. The proximity of the Caddo oil district to the ore fields offers an abundant, convenient and cheap supply of fuel for calcining. Railroad rates to points on the seaboard and the lower Mississippi Valley and ocean freights to Philadelphia and other Eastern points are very low. ($2.30 per ton has been practically guaranteed to one of the companies.)

COMPARISON OF RAW AND CALCINED ORES

| Raw Ore | | | Calcined Ore | | |
|---|---|---|---|---|---|
| Iron Per Cent. | Insoluble Per Cent. | Loss in Ignition Per Cent. | Iron Per Cent. | Insoluble Per Cent. | Loss in Ignition Per Cent. |
| 45.2 | 7.0 | 29.0 | 63.8 | 9.0 | |
| 51.6 | 4.0 | 23.7 | 65.6 | 4.0 | 0.3 |
| 48.2 | 4.0 | 29.0 | 67.6 | 5.0 | |
| 47.4 | 5.0 | 28.0 | 69.0 | 6.0 | |
| 49.0 | 4.0 | 27.0 | 64.0 | 4.0 | |
| 49.0 | 4.5 | 24.5 | 66.2 | 5.0 | |
| 46.0 | 2.0 | 28.9 | 67.6 | 2.0 | 0.2 |
| 48.4 | 4.0 | 26.4 | 64.4 | 4.5 | 0.3 |
| 48.2 | 9.0 | 23.3 | 59.2 | 13.0 | 0.6 |

ANALYSIS OF ORE CONCENTRATES

| No. | Iron Per Cent. | Silica Per Cent. | Alumina Per Cent. | Manganese Per Cent. | Sulphur Per Cent. | Phosphorus Per Cent. |
|---|---|---|---|---|---|---|
| 1 | 44.6 | 19.2 | 7.6 | 0.23 | 0.165 | 0.104 |
| 2 | 53.0 | 10.0 | 4.2 | 0.20 | 0.055 | 0.126 |
| 3 | 49.0 | 16.0 | 4.6 | 0.18 | 0.068 | 0.069 |
| 4 | 55.8 | 7.0 | 2.5 | 0.20 | 0.063 | 0.072 |
| 5 | 55.2 | 8.0 | 2.9 | 0.28 | 0.051 | 0.063 |
| 6 | 51.4 | 8.5 | 3.4 | 0.26 | 0.061 | 0.079 |
| 7 | 48.0 | 16.0 | 6.7 | 0.17 | 0.068 | 0.083 |
| 8 | 61.0 | 2.0 | | 0.22 | 0.086 | 0.040 |
| 9 | 57.0 | 6.5 | 2.1 | 0.23 | 0.151 | 0.078 |
| 10 | 48.1 | 2.5 | 1.7 | 0.20 | 0.096 | 0.043 |

Note 1, 2, 7, concentrates. No. 10, carbonate ore, balance, clean ledge ores.

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# Cortez Associated Mines

The report of the Cortez Associated Mines, Jacala and Zimapan, Mexico, dated Oct. 1, 1913, and covering operations during 1912, states that the properties were closed down in April owing to conditions due to the Mexican Revolution. Before closing down the mines, Waldemar Lindgren was engaged to make a report on the properties, an abstract of which follows:

Zimapan is situated 85 miles north of Mexico City and Jacala lies 35 miles by road and trail N-NE of Zimapan. Development has shown that most of the Jacala orebodies are low grade as to copper and carry only one to three ounces silver. Four deposits are mentioned as likely to yield marketable ore. Several places are mentioned as containing low-grade fluxing ore, which would be valuable for smelting siliceous copper ores, such as exist at Zimapan. Under present conditions these ores cannot be mined profitably. Even were the railroad extended to Jacala, they would not justify the building of a smelter at that place. It is stated that some of the silver-lead ore could be sold for a few dollars per ton profit to a smelter in Zimapan if good railroad connections were established. At the Carmen mine, the production of which has probably exceeded $500,000, further development work has been recommended. The Encino Largo mine is stated to have some high-grade ore and some dump ore that could be shipped at a profit if transportation facilities were better. The report also contains a description of the geology of the Zimapan deposits.

Briefly, his conclusions about the Zimapan properties are: The silver-lead properties have little value under present unsatisfactory conditions of marketing ore; the visible resources from ore, dump and slags would probably not net more than $120,000, even if a modern smelter and fair communication were available; the lead-antimony deposit of La Sirena may prove to be the most valuable asset of the company. The final recommendations are that the company build a 500-ton smelter at Zimapan with lead and copper furnaces, and to acquire more property near Zimapan.

During 1912 the company spent $47,285 for exploration and development, $11,447 for local administration and $344 for hospital, aid and indemnity; total, $59,076, or about $7.40 per ft. for 7967 ft. of development work performed. In addition to this, 1287 ft. of core drilling was done at a cost of $1.307 per ft., or $1683, making total expenditure on mining operations, $60,759. A credit of $2726 for ore sold makes the net expenses $58,033 for operations. The company ended the year with $35,038 in cash, loans and accounts receivable; and accounts payable of $583.

⁂

# Fuel Oil in the Nitrate Industry

A factor of importance to the nitrate industry, the effect of which will be more apparent by the end of 1913 as far as the value of imports into Iquique is concerned, was the successful use of crude petroleum as fuel for the boilers in the oficinas, the use of oil effects a saving of about 40% and it is gradually being adopted by many oficinas, says consular report from Iquique.

Most of the fuel oil imported into the Province of Tarapaca is brought from Peru in its natural state and is delivered at Caleta Buena, a subport of Iquique, for the Agua Santa Nitrate Co. This company was the pioneer importer of oil into Iquique as fuel, the chief engineer insisting on trying it, much against the wishes of his directors, and ordering a consignment of American oil. The latter differs from the Peruvian oil in that the gasoline, naphtha, etc., have all been extracted before it is delivered, and it is so thick that the storage tanks must have a system of pipes through which steam or hot water is passed to heat the oil enough to make it flow. The tanks at Caleta Buena were not so built and the oil formed a solid mass inside and had to be dug out with spades before the tanks could be used again. As a result the importation of fuel oil for this company, which supplies several other oficinas, and now amounts to over 70,000 tons a year, was lost to the United States.

Although the West Coast Oil Fuel Co. sells California oil in this district, the storage tanks of its agents in Iquique were not completed until the fall of 1912, and only a small quantity (1220 tons) figures in the imports in 1912. The Nitrate Railways Co. lines were not properly equipped with tank cars for the transportation of oil to the pampas by the end of 1912. They may try the experiment themselves of burning oil in their engines. In any case, large quantities of American oil were expected to be imported into this district during 1913.

⁂

**Rich Gold Placers in Kamtchatka** are reported by Russian prospectors recently returned from Anadyr. Working is difficult, however, as the ground is frozen all the year round, and fuel is very scarce, there being but little timber in the country. Notwithstanding this there are some Russian and some American miners at work who are producing gold, which they sell to American merchants, who visit the country occasionally. It is proposed to send out a well equipped expedition from Vladivostok next season to explore the country and arrange for systematic working, if possible.

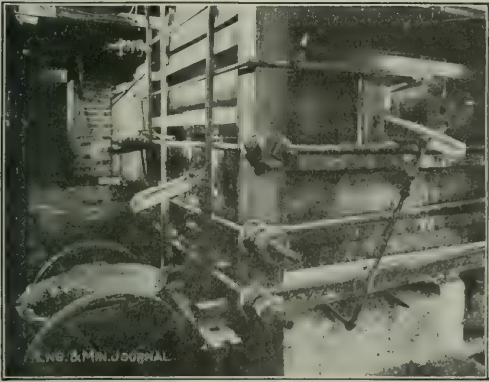
# Byproducts in Electric Zinc Smelting

By Woolsey McA. Johnson*

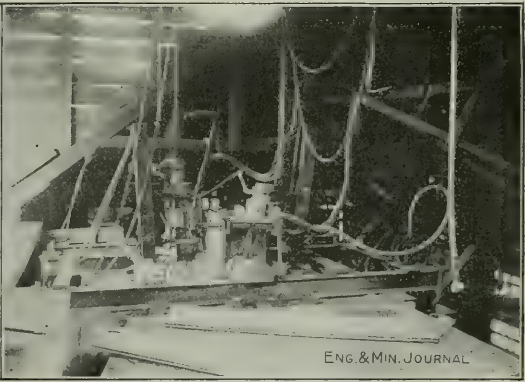
*SYNOPSIS—The field of electric zinc smelting apparently will lie in complex ores of zinc, lead, copper, silver and gold, where close saving of all the metals is needed, and in those ores which are self-fluxing or partially so.*

⁂

I started work on the electric smelting of zinc ores on July 2, 1903. I have had considerable practical experience in the smelting of zinc ores in the retort process. I have smelted 200 tons of zinc ore in the electric furnace. I believe that my opinion derived from this experience possesses special worth because of my especial experience. As far as this opinion goes, it is to the effect that the successful electric zinc-smelting process will only be successful if it utilizes to the fullest extent its own innate superiority and competes with the retort in those ways wherein electric smelting is strongest and wherein the retort is weakest.



Continuous Zinc Furnace



Electrode Arrangement

### Electric Zinc Smelting a Slagging Process

Now the retort cannot stand a slag-making charge and the electric furnace must have a slag-making charge. In making a slag under such reducing conditions that 800 lb. of zinc oxide is turned to metal, any lead compound is turned to lead bullion containing gold and silver, and all the copper and part of the iron combine with the sulphur and make a matte.

An analysis of cost sheets of different retort plants of the United States shows that the cost of working Joplin ores with losses included is less than the cost of working ores of a complex nature. My work in electric furnacing indicates that just the opposite will be the case in the process as practiced at Hartford.

Any successful metallurgical process is necessarily correct in three coördinated ways. First, it must be scientifically right. Second, it must be engineeringly right, for a furnace that will not stand up to its duty is useless. Third, it must be commercially right, for a process that does not make a return to capital as high or higher than the capitalist receives in the kind of a business under question, is commercially useless. In this article, regard will be first paid to the commercial side of electric smelting. The scientific and engineering factors will be considered only in so far as they contribute to the more important side.

Now as it is better to treat in the retort plant high-grade zinc ore, say zinc oxide going 72% Zn, or roasted Joplin ore going 68% Zn, than ores from Colorado going 35%, is it good business to try the hard thing instead of the easy thing? Commercially speaking, the smelting of complex zinc ores should be easier, though scientifically and practically harder.

To make its operation easy metallurgically speaking, the Johnson electric zinc furnace needs ore high in lime and iron to make a fusible slag. Such ore is rightfully penalized by the retort plant and, broadly speaking, is not commercially available. The same is true of zinc ore high in fluorspar. The advantage of having a market for such classes of ore should be considerable to the zinc-mining business.

Let us pass over such other points as that power cost for electrometallurgical purposes is higher in this country than in Norway and the fact that I impart one-half of necessary B.t.u.'s by the energy of burning coal and so at a maximum of commercial efficiency. Let us pass over the fact that liability to metallurgically dangerous "hot-spots" in electric furnaces is great when treating Joplin ores and slight when treating Western ores. (The term "Western" ore is used conveniently in the zinc business to denote anything that does not come from Joplin or Wisconsin.) Let us pass over such evident facts that flow of slag, matte, and lead keeps the bottom of the furnace clean.

Passing by all these points let us consider and review some other factors.

Experience in the metallurgy of zinc shows that a difficult part of the operation is the desulphurizing of the sulphide ores. This should be done to a "sweet" roast. About 75% of the troubles of roasting are due to trouble in getting the last 60 or 70 lb. of sulphur out of the ton of ore and making a dead-roasted product. My experience in retorting zinc ores has told me that roasting is the most important feature of the operation. At any rate, I was successful in increasing tonnage and recoveries by concentrating my attention on the roasting and mixing of the charge.

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*President, Continuous Zinc Furnace Co., Hartford, Conn.

Whereas the zinc retort requires ore with sulphur reduced to a metallurgical zero, the Johnson electric furnace requires ore containing sulphur enough to combine with the copper and part of the iron to make a fusible matte. In general, I mix the charge so as to have 4 to 6% of sulphur in it. Care must be taken not to make a matte so metallic as to be difficultly fusible. Pains are taken to avoid formation of "sows" or accretions. For this purpose I add special doses of raw pyrites heated to 800° C.

Provided my claim that in my electric furnace I can smelt ore roasted to 4 to 6% S be so, there are four points of commercial superiority over the retorting process, which I think follow:

(1) Cost of roasting is reduced by a large fraction.

(2) Capital cost of roasting plant is reduced.

(3) Less dust should be made because allowable limits of S as sulphides or sulphates are higher and fine concentrates can be roasted possibly easier in a muffle furnace.

(4) A rich gas high enough in $SO_2$ to increase capacity of sulphuric-acid plant by a good fraction is possible.

The production of slag is a *sine qua non* to the process tried at Hartford. If slagging is a necessity, the production of base-lead bullion containing gold and silver is also a necessity. The aim of the Continuous Zinc Furnace Co. is to turn these necessities into profitable luxuries. No copper or lead is lost by dusting or volatilization, for the apparatus that condenses zinc vapor to spelter catches these in form of dust. Any lead condensed with the spelter is not commercially lost.

The metals lost by slagging are insignificant. In fact, the copper, lead, gold and silver contents of the slag are so low as to excite incredulity. Ledoux & Co. reports on a careful sample of electric zinc-furnace slag, totaling 6000 lb., as follows: Zinc, 0.65%; copper, 0.12%; lead, 0.00%; silver, 0.15 oz. per ton; gold, 0.00. The metallurgical reasons for this are plain to me, but naturally not so apparent to the reader. The causes are several.

### REASONS FOR LOW SLAG LOSSES

First of all, our slags are superheated and well formed. Once a furnace broke out and slags ran 30 ft. through a 3-in. drain pipe on a 1 : 20 slope. Such liquid slags are a necessity in the Johnson electric zinc furnace.

Secondly, there is no blast going through the slag. Hence it is quiet. Also the oxidizing power of a blast does not exist. Accordingly it must be concluded that there is much less chemical pull on copper and lead on a slag free from oxygen than on one containing oxygen.

Thirdly, as E. N. Morrill, of our staff, pointed out, the furnace "hums" or pulsates 60 times a second, due to action of alternating current. This Mr. Morrill says produces an effect similar to that produced when the assayer taps the assay crucible to settle his button, but more intense.

Fourthly, the reduction effected by the iron sponge in the charge coming from the preheater is ideally powerful to clean the slag.[1] Silver alone does not seem to be phenomenally low. Can it be that the known affinity silver has for zinc plays any role? Certainly the slag is saturated with zinc vapor.

Unfortunately we have never had up to Nov. 1 a furnace in operation that was satisfactory from the standpoint of all the different parts of our process. Accordingly we could not run the furnace six or seven days, soak it up with zinc, lead and copper, then run 25 days with an initial and final "cutoff" so as to make a definite "cleanup." We cared little about actual recoveries; what we were after was not spelter, copper, matte and lead bullion, but a process that could produce these in commercial form when this process was practicalized and commercialized.

It does not seem unreasonable to assume that, as the furnace was kept open and as the slag was low in value, and as there was no loss by dusting, high recoveries can be obtained in a properly conducted campaign. But the new unit now being built will demonstrate this.

The wide range of slags possible in the electric zinc furnace gives it in one point commercial superiority. The driving off of zinc is important in its bearing. If we have an ore going 40% zinc and 10% oxygen combined with zinc or 50% zinc oxide, we are really doubling the values of copper, lead, silver and gold, because this zinc oxide is evolved and condensed as spelter. So if we have 2% Cu, 5% Pb, 10 oz. Ag and 0.5 oz. Au., we really are smelting an ore 4% Cu, 10% Pb, 20 oz. Ag, 1 oz. Au. This is a fact the bearing of which we ourselves did not see for some time.

A consideration of the smelting of the byproduct values as primary values will throw some light. Suppose we have after 50% zinc oxide has been reduced and zinc condensed to spelter, or 1000 lb. of stuff per ton of ore removed, 100 lb. lead bullion formed 200 lb. copper matte formed and 700 lb. of slag formed.

The materials forming these are charged into the electric furnace at 1000° C. and leave it at 1250° C. Call the latent heat of fusion as equal to heat evolved in formation of slag and matte. Such material has an average specific heat of less than 0.25. Then we have

$$\textit{Net heat needed per ton ore} = \frac{1000}{2.2} \times 250 \times 0.250 \textit{ cal.}$$

$$= 28.400 \textit{ cal.}$$

$$\frac{28.400}{860} = 33 \textit{ kw.h.}$$

for smelting 1000 lb. slag makers and byproduct per ton ore at a thermal efficiency of 100 per cent.

This figure is a surprisingly low one, but allowing for all losses in radiation a safe figure is 100 kw.h. for smelting slag and byproducts per ton of zinc ore or 200 kw.h. per ton of slag and byproducts. When the fact that this heat is imparted largely by the cheap heat units of soft coal as against the more expensive heat units of coke of blast furnace, the claims of the electric furnace as a rival to the lead-blast furnace do not seem to be absurd

A further advantage of the electric furnace is that its stronger reduction reduces lead in copper matte to 2% and sometimes to a trace. This is in accordance with theory. The lead bullion contains 1% zinc and 0.50% Cu due, of course, to more intense reducing conditions. A simple drossing removes these impurities, makes a rich scum and a partially cleaned bullion. How this fact will be employed commercially cannot be said.

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[1] See W. McA. Johnson's U. S. Patent 868,345, issued Oct. 15, 1907

We have made all sorts of copper mattes at Hartford. Probably the most remarkable was in June, 1913. Here we made out of a charge containing 0.43% Cu a 5.50% copper matte, only 75 lb. per day, to be sure, but regularly with slags analyzing less than 0.05% copper. We have run right along making at 9.5% matte out of 1.5% copper charge for 11 days with slag as analyzed by chemist of General Electric Co. at 0.01%. We have made a 19.8% copper matte out of a charge containing 1.6% copper while we were condensing zinc to spelter. Exactly what will be done commercially in case of slags is another question.

The Continuous Zinc Furnace Co. has made a considerable quantity of lead bullion containing 100 oz. silver and $25 gold, which was made while the furnace was giving off a zinc vapor that was condensed to spelter. It has made a considerable tonnage of copper matte. It has made and sold a considerable amount of commercial spelter.

The unit now in course of erection will make a long run on complex zinc ores, slagging off impurities in a fusible slag and making copper matte low in lead, and base-lead bullion. It will thus show its ability, I hope, to do on a large scale, something about which there is considerable natural skepticism.

The results of our work show what a powerful metallurgical agent is the electric current when its use is understood. Likewise, the commercial effects of the electric current when its use is understood, will be marked and gratifying. The results which we have given are astonishing.

We do not complain much about the general skepticism about our electric zinc smelting, for we ourselves have trouble in getting proper realization of our work. But the month of January, 1914, will show, to a certain extent, the actualities of our ideas.

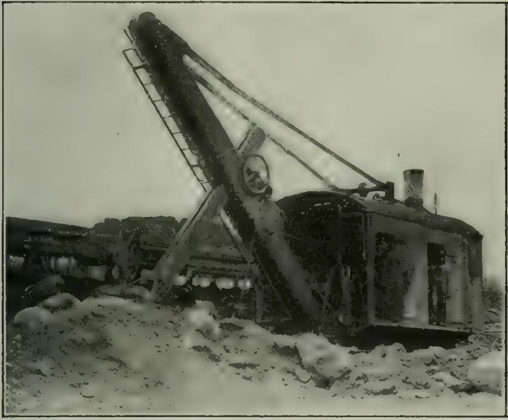
Fig. 1. Shovel in Position for Taking Load

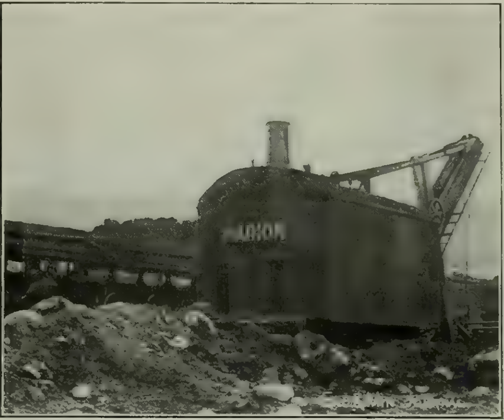

Fig. 2. Shovel Turned Completely Around to Get Out of Difficult Position

# New Steam Shovel for Cleaning Up

In stripping off the overburden from a Mesabi orebody which is to be mined as an openpit, it is necessary to do an extremely clean job. The mining company does not want any waste material left to bring down the grade of its ore and neither it nor the fee owner will allow ore to be wasted by removal mixed with the overburden. The last operation in stripping is cleaning up the overburden immediately on top of the ore, and on account of the irregularity of the ore surface, this is exceedingly expensive. The very last of the cleaning is performed with horses and scraper and by hand; but the bulk of the work is done with the steam shovel. It is customary in this work to use the old type of standard heavy shovel, which, however, is at a considerable disadvantage. Butler Bros., for some time, has employed a locomotive crane with a long boom and a clam-shell grab bucket for this work, and in 1913 introduced a further novelty in the turntable shovel of Marion manufacture. The type of shovel is not new, but it has not heretofore been applied to stripping. Its introduction in this case was at the instance of A. J. Conolly, in charge of stripping operations at the Longyear mine. The cleaning up here is especially difficult, both on account of the extreme irregularity of the ore surface and because of the drifts, crosscuts and rooms which are encountered, the property having been previously opened as an underground mine. The shovel has scored a remarkable success and promises to become standard for work of this nature.

It differs from the old-style machine, particularly in the fact that it revolves as a whole, boom, engine and boiler swinging at the same time, instead of merely having the boom and dipper revolve on the front of the frame. A wire rope is used instead of a chain for hoisting the dipper, the boiler is vertical, traction is obtained through gearing instead of chains and only one man on the engine is required, the craneman being unnecessary. The boom and dipper are counterbalanced by a weight attached to the back of the shovel. Rotation is effected by a series of spurs and pinions. The shovel weighs 36 tons, has a frame of rolled shapes and is equipped with a 1½ yd. dipper. It will dig 9 ft. below the track and load the large 20-yd. cars in use, thus having a lift equal to the old machines. It will climb a 10% grade, about twice what the big shovels are good for, and will dig satisfactorily on a steep incline.

For cleaning up, its advantages are manifold, being chiefly the result of its extreme flexibility. Suppose that the shovel is digging along the surface of the ore, when it is discovered that the contact of the ore and the overburden suddenly drops. This indicates a pothole or depression in the ore surface. The shovel can proceed on its course, digging down into the depression on a steep incline, but one probably not steep enough to uncover the ore. Finally, the dipper encounters the ore again, indicating that the other side of the depression has been reached. The shovel can then clean out the whole depression, working from the bottom and can turn 180° to get at that part of the overburden on which it has just made its descent. With the depression cleaned out, if the far side is too steep for the shovel to climb, it can dig a grade through the ore itself, swinging 180° and casting the ore behind it out of danger of mixture with waste material. A big shovel in such a case as this would have to be cribbed up to pass the depression, and if it became necessary to turn, would have to be run out on a Y.

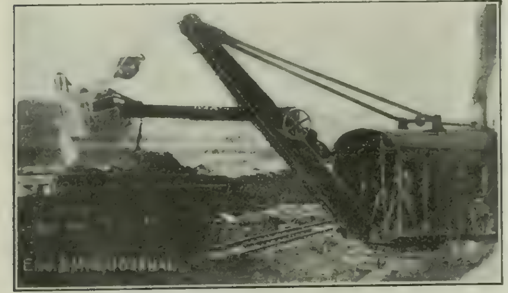

Fig. 3. Shovel Emptying Load Into a Flat Car

In some cases, it is advisable to take a double cut with the steam shovel, that is, the track for the loading train is maintained, while the shovel makes two cuts, one on each side of the track. The big shovel has to back out of the finished side to start the second side; the turntable shovel can run around the end. When it is needed to swing a scraper from the end of the boom, the turntable type can make a complete circle as against only 180° for the old type. These are some of the more noteworthy advantages of the new shovel; many others appear in practice. The photographs of Figs. 1 and 2, taken a few minutes apart from the same position, show the shovel swing completely around. In this case it happened to be working over an old drift and the settling of the ground made moving up difficult. The half-circle swing was part of a maneuver performed to enable the shovel to move up and well illustrates its flexibility.

Served by one train for a short haul, so that it worked about 65 to 70% of the time, the shovel has loaded 1150 cu.yd. in a shift. In 1914 it is planned to substitute a 50-ft. boom and use a clam-shell bucket for extracting material from the old workings, a further illustration of the adaptability of the machine. The elimination of one engineer, and the ability of the shovel to overcome difficult conditions results in a great saving and reduces the chances of loss in cleaning up, the great bugaboo of the stripping contractor. The shovel has come to stay.

## Santa Gertrudis Co.

The report of the manager for the Santa Gertrudis Co., Pachuca, Mex., for year ended June 30, 1913, states that development was carried ahead to a point where it is now possible and convenient to produce 25,000 tons of ore monthly. During the year 263,625 tons of ore, consisting of 111,498 tons of ore from old fills and 152,127 tons of new ore, were produced. The gross value of this ore was $3,430,721, or $13.02 per ton, of which 14.1% was in gold and 85.9% in silver. Exclusive of depreciation, it is stated that the cost of delivering this ore to the mill was $3.16 per ton. In addition to this amount $4.22 per ton was expended for new development and shafts. There still remains $111,829 of deferred development to be charged off.

At the Guadalupe mill 28.605 tons of quicksilver were recovered from the old patio, yielding $26,239.55, at a cost of $8903.94, making a net revenue of $17,355.61 from this source.

The new mill beginning with about 21,000 dry tons in July, 1912, reached a capacity of 27,500 dry tons in June, 1913. During the year there were milled and treated by cyanide 278,596 wet tons or 263,554 dry tons of ore having a gross value of $3,447,864 by assay. The total recover amounted to 89.41%, or $2,082,783, equal to about $11.70 per dry ton. The bullion contained 21,807 oz. of gold and 4,243,932 oz. of silver. The company declared $1,093,500 in dividends during the year.

## Gypsum as a Cement Retarder

Since it is the $SO_3$ that causes hindered setting of a cement, less of plaster paris is required than of raw gypsum, but as calcined plaster costs twice as much as the raw gypsum, the latter is more commonly used (Bull. 11, Oklahoma Geological Survey). It is generally added to the cement clinker before grinding, the amount ranging from 1.5 to 2%. This retards the initial set by 1 to 2 hr., and the final set by 4 to 6 hr.; in large proportions, the addition of gypsum accelerates the setting and reduces the strength of a cement. About 300,000 tons of gypsum per year are consumed in the cement industry of the United States.

## Argentina Mineral Exports in 1912

The following information regarding mineral exports from Argentina is taken from the *Bulletin of the Pan-American Union*, the items being arranged in order of descending value: Bar copper (exported to the United States), 217 metric tons; tungsten ore (to Germany), 637; copper ore, 304; borate of lime (to Germany), 557; plaster, 123; zinc, 72; mica, 3; onyx, 229; tin ore, 16; vanadium ore, 11; lead ore, 10; iron-tin ore, 16 tons; lime, 1213 hectoliters; silver ore, 2 metric tons; iron silver ore, 7 metric tons. The total value of exports was 285,272 pesos against 565,338 pesos in 1911.

# Slimes Agitation For Cyanidation

By Herbert A. Megraw

*SYNOPSIS—Agitation of slimes originated because of the impossibility of leaching the material which usually contained a higher per-ton value than sands, and often amounted to a large proportion of the total ore crushed. Methods have varied greatly, but early schemes are still considered best by some operators. The principal agitators, and their advantages, are discussed.*

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Treatment of the slimes involuntarily produced in crushing ores which were to be treated by the cyanide process was not a point of importance for a long time. As a matter of fact, during the early days of the process, slimes were considered an unmitigated nuisance, and little effort was made to treat them. The principal effort was to avoid formation, and the secondary effort was to clean from the sand that which had already been formed. A good many thousand tons of slimes were separated from sand destined to be leached, and lost, regardless of the fact that they contained considerable value.

### High Metal Content of Slimes

Some investigative souls took the trouble to assay the slimes, which were being discarded, over long periods of time, and to calculate the quantity also, discovering eventually that they were throwing away an appreciable percentage of the value of their original ore. In a great many ores, in fact it would be almost safe to say in most of them, the slimes carry a higher per-ton value than the coarser particles, or sand, due probably to the fact that the higher-grade minerals are extremely friable and pulverize very easily when put through the crushing machinery. This is particularly true with silver which occurs in various chemical compounds, such as argentite, proustite, stibnite, and many other well known combinations.

Gold does not often occur in such chemical combinations, but it does occur in an extremely finely divided state, and is often intimately mixed with iron pyrite, which is itself friable and is easily pulverized.

Refusing to continue this loss, operators began to search for some method for treating the slimes. It was early found that the material was unleachable, in fact, that was the reason it was discarded, but so strongly had the leaching process entrenched itself in the minds of the cyanide people that there was much waste of time and trouble searching for some way to leach slimes, or to put them in such condition that they might be leached like sand. Probably one of the most hope-raising efforts was the Sulman soap process, in which the slimes were agitated with a percentage of ordinary soap. This coagulated the slime particles, and when they settled, it was believed that the material could be leached. As a matter of fact, the process did not work out at all, although it is impossible at this time to say just exactly what the difficulty was. It is probable that the soft, coagulated colloids would pack about as tight as the original slime would, and successful leaching was found impossible.

### Beginnings of Agitation

After the failure of leaching, the only recourse was to agitation. The more conservative metallurgists hesitated a long time before undertaking any such process, as they believed it would be entirely too expensive to yield any ultimate profit. The first efforts were made by introducing compressed air into shallow, round or rectangular tanks containing the slime pulp, that is, the colloid material mixed with varying proportions of water. A small pipe connected by a hose to an air-main was introduced into the tank and an operator kept it moving from place to place continuously, thus keeping the material stirred up. The object was to maintain the solids in suspension, allowing the solution to act upon them. This process, while expensive, was a success because it gave a profit over its cost, and because it showed that there was no difficulty in dissolving the gold and silver from the slimes, the only trouble being the mechanical one of keeping the solids in suspension, and after the dissolving process was complete, in separating the solids from the solution. The percentage of extraction, that is, the percentage of metal dissolved by cyanide solution, was considerably higher than had ever been obtained through leaching the granulated portion, or sand.

At the mill of the El Oro Mining & Ry. Co., at El Oro, Mex., the early slime-agitation tanks were flat-bottomed, rectangular steel tanks with rounded corners. In these, slime pulp was kept in agitation by a ½-in. pipe, drawn to a point, connected by hose to an air-main. A Mexican was employed to keep this hose moving about from place to place and in this way succeeded in keeping the solids in suspension successfully and rather cheaply. A good many other plants followed this system and there are plenty of examples where round, flat-bottomed wooden tanks were used in the same way. An interesting feature of the use of the air pipe in steel or iron tanks was that where a little sand was mixed in with slimes and the air pipes allowed to remain in one place for a considerable length of time, the result was a neat, round hole drilled in the bottom of the tank.

A variation of the movable-pipe jet of compressed air was the installation of fixed pipes in the tank, the pipes having a number of holes drilled in them which discharged the compressed air at a number of different points throughout the tank. This worked very well the first time, but the pipes soon got plugged up and the result was that there was very little agitation taking place. These stationary pipes were used in a great many installations, but were not satisfactory in any. The entrance of slime stopped up the pipe so that the air came out at only a very few points, and these were likely to be in scattered sections of a tank, the result being that about four-fifths of the material was without agitation.

### Mechanical Stirring of Pulp

The next forward step was to institute agitation by mechanical means. This was done by using a round, flat-

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Note—This is the fifth of a new series of articles by Mr. Megraw. The series deals with comparative details of cyanide practice, discussing points of possible improvement. Preceding articles of this series appeared in the issues of Sept. 6, 1913, Oct. 4, 1913, Nov. 1, 1913, and Nov. 15, 1913. The next article will deal with "Chemicals Used in Cyanidation," and will appear in the issue of Jan. 24, 1914.

bottomed tank in which a central vertical shaft was installed, capped with a crown-wheel and moved by a pinion fixed to a horizontal shaft passing over a series of tanks. The vertical shaft was equipped, near the bottom of the tank, with arms reaching out nearly to the sides, and these arms, revolving at medium speed, kept the contents of the tank in agitation. A little later development of this same idea was that the arms were placed about half way of the depth of the tank, and depending from them were a number of swinging iron rods or pieces of wire rope weighted by chunks of iron at the bottom. The object of this improvement was to avoid the necessity of digging out a tank whenever a long stoppage occurred. In such cases, when the arms were near the bottom of the tank, they become immersed in the settled slime and held so solidly that it was impossible to move them in the regular way without breaking something. By having the arms about half way up the tank and having these swinging iron rods or pieces of wire rope reaching down into the slime, the arms were not so likely to be held firmly but could move freely when the power was applied. The iron rods or wire-rope pieces would pull out of the slime very easily and drag over the top of it, mixing it little by little as agitation progressed. By this method they would dig down into the slime and soon have it all in circulation.

Mechanical agitation in this form was usually assisted by centrifugal pumps, which changed the comparative location of the solid particles. It will be readily seen that a floating particle in cyanide solution making simply a number of revolutions in a tank would not come into contact with any other solution except that which immediately surrounded it. There would be no up or down motion to the particle to any great extent, nor would the comparative location of any particular particle and its surrounding solution be changed. By pumping from the bottom of the tank with a centrifugal pump and throwing the pulp back into the top, a total change of location was assured. By pumping from near the outside of the tank and returning the pulp near its center, a thorough change of location could be obtained.

Mechanical agitation did not continue popular because operators believed that its costs were too high compared to the work it did. It has been supplanted in most cases by a variety of simple and complex devices, all destined to remove the troubles that agitation is heir to. At the last report, however, we find that a recent cyanide plant, one of the most modern in the country, has built its new agitation tanks on the mechanical system. They have passed by the newer and more fashionable devices and returned to the round, flat-bottomed tank with agitating arms, and the whole assisted by centrifugal pumps. The designers of this mill claim that while mechanical agitation, as they use it, may not be absolutely perfect, neither is any other system perfect, and no one of them can show any substantially lower costs than are obtained by this system. While this statement may require modification, it probably is sufficiently true to give rise to serious thought on the part of modern cyanide-plant designers.

### Varied Forms of Mechanical Agitation

Mechanical agitation, during the time it has been used by American metallurgists, has taken a great many different forms. The simplest is that which has already been described—horizontal arms revolving within a flat-bottomed round tank. A form which has been largely used in Mexico, particularly in Guanajuato, where it was devised and first installed, is one in which the central vertical shaft and the horizontal arm are both hollow, compressed air being introduced at the head of the vertical shaft and conducted through the arm to various outlet points, so that while the mechanical agitation was taking place, the air would be forced out through the nozzles into the pulp in the tank. By this means it was attempted to obtain aëration in addition to mechanical agitation, the air assisting in the agitation as well as adding its oxygen to the charge.

Another system more or less well known is that devised by Hendryx in which the tank is usually provided with a cone bottom and in its center is a rather large tube extending from near the bottom to near the top of the tank. Within this tube is placed one or more turbines or propeller wheels, which are revolved upon a central shaft. The movement set up takes the material from the bottom of the tank, forces it up through the tube and discharges it at the top, thus obtaining a circulation from bottom to top throughout the tank. There is very little doubt that this gives good agitation, the principal objection which has been raised to it and one which has apparently been maintained is that its cost is more than is incurred by any one of several other systems. In fact, only recently a large installation has dispensed with its Hendryx agitators because of their high cost in competition with other machines. On a small scale, or in laboratory work, however, this agitator is particularly good as it gives an efficient direct agitation which is very sure to keep all the solids in suspension.

### The Air-Lift Agitators

Probably the most notable development in agitation devices is the Brown or Pachuca tank, which was introduced eight or nine years ago. It was invented and first used in New Zealand where it proved an economical success and was promptly transferred to Mexico, where its use has become widespread. The Pachuca agitator is nothing more or less than an extremely tall cylinder with a cone bottom fitted with an air lift in its center. The transferring of pulp from the bottom to the top is, in effect, very much like the operation of the Hendryx tank, but is accomplished by compressed air in place of mechanical movement. The tank is made tall and narrow and with a cone bottom in order that the influence of the air lift may extend to all parts of it, which would not obtain if its area were large in comparison to the size of the air lift, and also to prevent any settling upon the bottom. For this purpose, the cone bottom required is exceedingly steep as the tendency of slime, particularly of the light and flocculent variety, is to settle on any surface flat enough to hold it. Even with the steepest construction possible, however, there is very likely to be some settlement in the tank, and often there is a great deal of it.

The hold which the Pachuca tank took upon the metallurgical profession immediately after its introduction, was remarkable. It spread rapidly into plants, going to a large majority of the plants which were planned or under construction, and also into a large number of them which had already been built, displacing agitators of other types. Unfortunately, it seems that enough study had not been given to the matter to decide absolutely just what its advantages were. It is, moreover, quite probable that only by the practical experience following the continued use of this device could its disadvantages have been discovered. The principal drawback is that it takes more power by far than was originally claimed for it, which means that the cost runs higher than it should to procure satisfactory agitation. Another difficulty is that it is almost impossible to avoid settling of solids. If there is any sandy material in the pulp, it will settle on the bottom and build up on the cone sides no matter how steep they are, and leave only a small channel to one side through which the circulation takes place. This not only reduces the capacity of the tank, but misleads the operator as to agitation. At the top of the tank no notice of this reduced agitation can be obtained because the surface of the tank is usually covered with pulp and agitation is apparently going on as usual. If one, however, probed the tank with a long stick he would be likely to find a very solid deposit of sandy material in the tank which occupies a goodly portion of it.

### Additional Drawbacks of Air Agitation

Some operators have claimed that the carbon monoxide generated by the compressing of air through the lubricating oil used and heat developed, is deleterious to cyanide solutions, also that compressed air cooled the solution to a great extent. All of these objections may have some weight, but the two principal ones, its cost and the tendency toward settling, have been decisive in putting a rather sudden halt to the installation of Pachuca tanks. It is quite likely that fewer of them will be installed in the future.

Other machines have been installed to accomplish the same result, and the first success of the Pachuca encouraged many inventors to proceed with that device as a basis. Among the well known instances of this may be mentioned one of the hydraulic agitators which is a good deal like the Pachuca, in fact almost identical, except that the compressed air in the elevating central tube was replaced by a hydraulic jet. This tank has some advantages, but probably does not overcome either the item of cost or the propensity to settling. Some of these tanks are used but they are not extremely popular at the present time.

The Parral tank has had considerable application and may be regarded as one of the standard appliances. It is simply the installation of several air lifts in a flat-bottomed tank, the discharges being set tangentially so that a rotary flow of pulp is secured. The tank is well known among operators.

A machine which has been widely used and which was original in its idea, is the Trent agitator, about which much has been said for and against. Discussion about this machine has been particularly acrimonious, those in its favor becoming violent partisans, and those against it being with equal heat, opposed to its use under any circumstances.

### Combination Devices

The Trent agitator is essentially an arm agitator corresponding to the mechanical devices now in use, but the arms are hollow and the pulp is circulated through them. The great and essential difference of this machine is that the arms are not moved mechanically by any direct means, but are moved by the pulp itself, which is forced out of them by means of a centrifugal pump. The intake of the centrifugal pump is near the top of the same tank, where it can have practically clear solution, or at least solution which contains very little coarse, granular, or sandy pulp, while its discharge is through the bottom of the tank by the use of a special gland. The hollow arms, which are arranged to discharge the pulp all in one direction, act after the manner of a garden-lawn sprinkler, the reactive force of which causes the revolution of the arm. The pump is connected with a small air compressor for supplying oxygen to the solution, or a small valve is inserted in the suction through which it is allowed to take air from the atmosphere. The advantages claimed for the Trent agitator are, that it does not make expensive installations; that it gives satisfactory agitation at a low cost; and that it thoroughly aërates the pulp by adding air in minute particles to the whole pulp charge. It is also claimed that somewhat better extraction is obtained by the use of this machine. As far as these claims are concerned, that referring to the distribution of finely divided air to the charge is decidedly true. The Trent agitator in operation shows clearly that there is a very large volume of air mixed in with the charge. If one starts a tank which has not been under agitation with a Trent agitator, within a short time after it has been started, the volume of the pulp will be seen to have increased appreciably. This is due to the air which it gives to the charge in such finely divided particles that it is not rapidly liberated.

The latest applicant for honors in the field of slimes agitation is the Dorr machine. This device is an adaptation of the original Dorr thickener. It has a central shaft carrying two arms, which are set at an incline toward the center of the bottom of the tank, these two arms carrying rakes which move the settled material toward the center of the bottom of the tank. In the agitator, the arms are arranged identically, but the central shaft is inclosed by an air-lift tube, or the tube itself may constitute the shaft. The tube terminates just below the upper level of the tank and discharges into a launder, which again distributes the pulp over the surface of the tank area. The launder is, of course, optional and the device can be operated without it. When used, the launder has discharge openings at various points along its length so that the pulp will be dropped at different points in the tank. The air pipe for operating the lift is usually put in through the bottom of the tank, this being a simple operation, as there is no step bearing for the central shaft, its weight and that of the agitating mechanism being carried on a truss above the tank. In this machine there is mechanically no possibility of settling of solids on the bottom of the tank, and the agitation is positive. The slimes discharged at the top of the tank settle through the solution, to a large extent, and are scraped to the center of the tank again, and again elevated through the air-lift tube. The advantages of this tank are that the air-lift distance is low, the tank being of large area and low height, cheap to construct, and requiring little air at low pressure for the agitation. The arms are operated at low speed, and rake the slime gently toward a central tube. The arms probably do not take more than ¼ hp. in a large tank, while the air-lift works under practically ideal conditions, requiring little power, the amount depending upon the depth of the tank. These tanks have been installed in a number of mills, and reports of them up to the present time are favorable.

A recent patent shows the use of a principle somewhat similar to the Trent, or garden-sprinkler idea, the difference being that air alone is pumped through the arms, and escaping through the suitably-arranged arm openings, causes revolution. The whole mechanism is supported in a step bearing in the tank, the air entry being from above. The machine is known as the Hafer agitator.

### Objects of Agitation

It would serve no useful purpose at this time to enumerate the great number of agitating devices which have been tried from time to time, even those which may have been more or less successful, as those which have already been mentioned include the most important and are the ones which have received widest application among the operating plants of the world. It may, however, be of interest to discuss the principles of agitation from a general point of view.

Almost from the time of the inception of the cyanide process, oxygen has been believed to be indispensable in the reaction of dissolving gold and silver in cyanide solution. The truth of this having been demonstrated theoretically, and to a large extent, practically, operators went to extreme lengths to find means of furnishing this oxygen to their working solutions so that dissolution might be rapid and complete. Various chemicals have been used to supply oxygen, but these have all, or nearly all, been set aside as more expensive than the additional benefit derived through their use. Not having secured good results from chemicals, the next turn was to use air as a cheap source of oxygen. Air has been used for a number of years and great benefits have been claimed from it. However that may be, it is by no means certain that air is a good thing to use for oxidizing slime pulp under agitation. In many cases it can be said that the agitation itself is all that is necessary, and agitation is only necessary in order that the particles of ore in an extremely fine state may be free so that solution may act upon them at all times. When slime is settled, it forms an impervious mass through which solution cannot pass, and, therefore, solution is not at liberty to act upon the covered particles. The object of agitation is to keep these solids in suspension, so that the solution has an opportunity to act upon each particle continuously. Of course, if additional advantages could be obtained while this movement is going on and without additional expense, it would be undoubtedly advisable to make an effort to obtain them. For this reason, oxygen has been so widely used together with agitating processes.

Air is not a very unstable chemical compound, and it is somewhat unreasonable to suppose that by simply passing air into solution any great quantity of oxygen will be absorbed. It is true that some will be, but the extent of the change is not great, and no dependence can be placed upon it as a hastener of dissolution. Air under compression will give up its oxygen much quicker, as it has already been explained in an article in the JOURNAL.[1]

Recently, Morris Green[2] has shown that indiscriminate oxidation is not an advisable operation. However that may be, it is true that our ideas of oxidation will have to be somewhat revised, and in the meantime agitation had better be confined to the cheapest method of keeping fine particles of ore in suspension in solutions so that they can be acted upon with the greatest rapidity.

### Cost of Agitation

Agitation, like a good many other details of the cyanide process, defies reduction into concrete cost figures capable of reasonable comparison. Like crushing and grinding, agitation depends a good deal on the character of ore handled, and in addition, upon the specific gravity of the pulp handled, that is, the degree of dilution. It is clear that high cost at any one plant does not necessarily indicate poor work, but all data must be considered to make a fair conclusion.

At the Goldfield Consolidated mill, it is said that 75 cu.ft. of free air per minute is required to agitate a tank containing 85 dry tons. The installation consists of Pachuca tanks. The cost is stated to be 2c. per ton agitated for power and under 1c. for repairs and maintenance, a total of less than 3c. per ton, not including labor.

At the Liberty Bell mill, with Hendryx agitators, the cost was 5.4c., including the cost of settling in Dorr thickeners. At the Hollinger mill, cost is said to be 2.9c. per ton with Dorr agitators. Experiments at the Liberty Bell mill showed that the new Dorr tanks, holding 35 dry tons of ore, required 0.4 to 0.5 hp. for operating the arms and 40 cu.ft. free air, compressed to 8 or 10 lb., for the lift. At the West End mill, Tonopah, it is stated that a tank holding 88 dry tons of ore at a pulp sp.gr. of 1.25c., required 6.5 hp. to operate the pump, and about 1.5 hp. additional for air for aëration. The McNamara mill agitates 97 tons at 1.26 sp.gr., with an expenditure of 9.5 horsepower.

Costs are exceedingly elusive data with which to make comparisons, and cannot be depended upon unless all the factors leading to them are available for consideration. For comparing agitation systems, such items as cost of power, labor, and all other factors; specific gravity of the dry slimes, specific gravity of the pulp, percentage of sand in the slimes, etc., are required. Knowing all of these, a fair inference may be drawn.

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## Mineral Production of Italy in 1912

According to official reports, there were 656 producing mines in Italy in 1912, which were divided as follows: Sulphur, 358; lead and zinc, 94; coal and oil shale, 42; graphite, 31; salt, 31; iron, 27; asphalt, 15; pyrites, 11; mercury, 8; petroleum, gas, etc., 9; borax, 7; copper, 7; manganese, 5; all others, 11.

The output of principal minerals was as follows, the items being arranged in order of descending value: Sulphur, crude, 2,504,108 metric tons; zinc ore, 149,776; iron ore, 582,066; lead ore, 41,680; lignite, 660,491; iron pyrites, 248,612; mercury ore, 88,200; asphalt and bitumen, 181,397; copper ore, 86,001; petroleum, 7479; borax, 2309; salt, 18,775; rock salt, 39,954; copper pyrites, 28,973; graphite, 13,170; mineral waters, 36,750 metric tons; natural gas, 6,800,000 cu.m.; antimony ore, 1878 metric tons; tin ore, 350; manganese ore, 2641; silver ore, 27; gold ore, 2366; bituminous coal, 1911; bituminous schist, 1110 metric tons.

Quarry products were: Bauxite, 6702 metric tons; pumice, 17,386; talc, 16,240; barytes, 13,420; quartz and feldspar, 33,944; marble, 522,088 metric tons.

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[1] "Eng. and Min. Journ.," Oct. 2, 1909.

[2] "Journ." Chem., Min., Met. Soc., S. A., February, 1913; and "Eng. and Min. Journ.," June 21, 1913.

# Carnotite—I

By Thomas F. V. Curran*

*SYNOPSIS—Carnotite, the principal source of radioactive substances, is an ore of vanadium and uranium, named for a president of France. Its principal occurrence in the United States is in Colorado, where much ore is mined and milled. Some carnotite occurs also in Utah.*

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Carnotite is probably an alteration product of pitchblende, and is the mineral whence the major portion of our radium supply is derived. It was discovered by Charles Poulot, late in 1887 or early in 1888, in the Roc Creek (or possibly La Sal Creek) district of western Montrose County, Colo. In the beginning small lots were shipped to a little wooden shed near the east end of Champa St., Denver, where the ore was treated by Poulot and E. Cumenge, both chemists who were associated with M. Voilleque in the rare-metals business in Denver.

### First Operations on Small Scale

Poulot traveled extensively through Colorado and acquired a pitchblende deposit in Gilpin County, which he sold to the Roman Catholic Bishop Machboeuf, of Denver; the latter died in 1890 and bequeathed it to his successor, Bishop Matz, who sold it in 1912 to Yale College, for $10,000. Poulot was interested also in the tungsten deposits of Boulder County.

The uranium-vanadium mineral was named carnotite in 1888 by Mr. Poulot, at the suggestion of Mr. Cumenge, in honor of Marie Francois Sadi Carnot, president of France.

The ore was treated in such manner as to produce a crude form of combined oxides of uranium and vanadium, and shipped to France. There the vanadium was extracted and used in the South of France for coloring fine silks, while the uranium content was used in tinting porcelains, glass, etc. It is supposed that the Rothschilds, of St. Denis, France, were in some way connected with the business.

In the spring of 1899, Poulot built a small three-stage mill in the McIntyre mining district of San Miguel County, along the Dolores River, and operations were placed in charge of M. M. C. Freidel and E. Cumenge. The upper stage of the mill contained a large floor for storing ore, also the feeder of a 10-ton Krupp ball mill. The second stage held three low leaching tanks, each about 10 ft. in diameter, a Krupp ball mill, a 30-hp. upright boiler and a 10-hp. upright engine. The lowest stage contained one low and three high precipitation tanks and a small chemical laboratory. The total cost of the mill was about $8000. The ore milled aggregated about 355 tons; the output of uranium oxide, 15,000 lb. Work was abandoned in the summer of 1901. In the fall of 1902, experiments were conducted on several tons of low-grade ore, but discontinued a few months later, and not resumed.

In the spring of 1903, a concern known as Western Refining Co. used the Engle-Haynes extraction process and milled about 140 tons of ore, obtaining about 2500 lb. of uranium concentrates. The same process was employed in 1905 by the Dolores Refining Co., which erected a plant about a mile from the old mill. Its period of operations was brief. Recently this process, only slightly modified, has been patented in this country, but not by its originators.

Thereafter the carnotite industry was dormant until the fall of 1909, when the General Vanadium Co. of America, of Baltimore, purchased and began operating a number of prospects along the south side of the East Paradox Valley; among these were such well known producers as the Jodandy, Canary Bird, Blackburn, Rummer and Valley View lodes; initially, all were operated for the vanadium value of the ore. Early in 1910 I induced radium makers in England, France and Germany to experiment earnestly with carnotite, and a strong and steady demand soon was developed for it.

### Carnotite Principal Radium Mineral

Carnotite is a canary-yellow powder, or slightly cohering mass or yellow stain in rock crevices or in sandstone, and is composed principally of potassium-uranyl vanadate and small quantities of barium and calcium. Potassium has a specific radio activity, although it seems to emit only *beta* rays, of penetrating power about equal to those of uranium, but of electrical effect of only about 0.001 of the uranium *beta* rays. Sometimes the uranium values are in the form of finely pulverulent carnotite filling the interstices of soft gray sandstone; at others, it may be encountered as an impregnation permeating even the sand particles. The sandstone varies in texture and hardness, from extreme coarseness to the opposite; sometimes it is very hard, though usually it is soft and friable.

Here a word may be said as to uranium, the most important constituent of carnotite. Uranium is silver-white when fused, gray-black when powdered, somewhat malleable and nearly as hard as steel. It oxidizes in air, more vigorously upon heating and is soluble in dilute sulphuric acid and hydrochloric acid. Its principal oxide is $U_3O_8$, which is soluble in hydrochloric, sulphuric and nitric acids and contains 84.85% uranium, sp.gr. 7.193. Uranium compounds were first isolated by Klaproth in 1789 out of pitchblende and autunite. The metal was isolated in 1840 by Peligot. Radio activity in uranium was discovered in 1896 by Becquerel. Radium was isolated in 1908 by Professor and Mme. Curie.

### Best Carnotite Deposits in Colorado

The Dolores, or red beds, are the lowest formation visible in the cañons, which are followed by La Plata sandstones, above which occurs a series of thin bedded sandstones with shales, this strata being practically horizontal and contains the carnotite. Sometimes conglomerates are found in this strata, though rarely, and apparently they are foreign to the strata. The elevation above sea level of the highest determined mine is 6700 ft. It may be noted that the carnotite deposits along the Atkinson Creek, only about eight miles north from this mine, are only 5400 ft. above sea level, and there are mines in Utah as low as 4500 ft. above sea level.

So far as investigation has progressed, it is safe to say that the best carnotite deposits are in Colorado, and are found in western Montrose County, in Long Park, Bull

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*Curran & Hudson, Placerville, Colo.

Cañon, Jodandy Hill, Club Ranch, Hydraulic, Atkinson Creek, Tabequache Creek, Lion Creek, Roc Creek. Deposits occur also in Mesa County, near Gateway, in San Miguel County, in the McIntyre mining district near Cedar and also in Dolores, Routt and Rio Blanco Counties. In Utah, the ore is found in Grand, Emery and San Juan Counties. It occurs also at Radium Hill, near Olary, in the Flanders Range of South Australia and in Central Turkestan and is reported in Spain and near Guarda, Portugal.

The extent of the American carnotite field is very large, probably several thousand square miles. I have examined much of this large region, but generally have found the ore in small patches only, and of grade less than 1% $U_3O_8$, with the exception of a small section bounded on the north by La Sal Mountains, along La Sal Creek, and on the south by Big Cañon, which is about three miles north of "The Glades" ridge, in San Miguel County, which latter contains a very thick deposit of bituminous coal. The commercially important deposits in this small area, which is only about 50 miles long and not over 15 miles wide, are not numerous, and it is obvious that the practice of skimming off and shipping only ores running over 2% $U_3O_8$, cannot continue long.

### Paradox Valley a Producer of Carnotite

Paradox Valley, closely associated with the recent history and occurrence of carnotite, is a basin, which may have been the bed of a sunken lake, about three miles wide and 28 miles long, nestling at the bottom of the jagged, scarred and eroded mesa ranges reaching above the valley about 1700 ft. The entrance is made as the stage road turns over the western brow of Coke Ovens Hill, six miles west of Naturita. Two or three miles from this entrance point, the wagon road to Long Park debouches northwesterly, ascending the mesa's foothills five miles, thence Long Park stretches in a shallow basin six miles, merging into the series of corrugated ridges and cañons, beginning with Hieroglyphic Cañon and ending at Saucer Basin, that continue until the Dolores River is reached, seven miles west, at its juncture with the Rio San Miguel.

Bisecting the Paradox Valley, the sluggish Dolores River wends its serpentine way in a northerly direction, following the course of the high, snow-clad La Sal Mountains that form the western end of the valley. Since the valley proper runs easterly and westerly, or at right angles to the course of the river, the valley is called "Paradox." In passing, it may be observed that the general direction of Paradox Valley is practically the same as the San Miguel River, which empties into the Dolores near Hydraulic. Many theories are advanced as to the formation of this valley, one being that the mesa at one time extended from Long Park across what is now the valley to the top of Jodandy mine hill or the Monogram flat, that internal gases caused it to raise into a low ridge and upon the subsidence of these gases, the ridge became a valley with abrupt, sheared sides. The upward tilt of about 10°, to the sand-stone formation toward the valley, from both its north and its south side, is pointed out. Another theory is that tremendous erosion resulted in the valley, but the formation makes this improbable. In the McIntyre district there are evidences that the old bed of the Dolores was about 800 ft. above its present bed, and as a rule, 800 ft. is the mean elevation of carnotite beds above the existing river beds. No topographical map has been made of the carnotite ore belt, and without it, little progress will be made in the study of this formation.

### Ore Extraction Accomplished with Difficulty

The ore extracted from the carnotite deposits on the south side of the valley is packed on burros to the stage road, at a cost of about $2 per ton. Here are situated the Monogram claims, owned by a Pittsburgh concern. This group consists of possibly 30 claims; the ore is found under a cap rock, usually not more than 10 ft. thick, and this is below a few feet of surface soil. The quality of the ore is fairly good, and the quantity satisfactory. The ore must be hand picked carefully to yield an average shipping grade of 2% $U_3O_8$. However, this observation can be made truthfully of all other deposits, except for some solution-enriched pockets of ore that may be encountered here and there in the carnotite region. To the east is found the Jodandy group of about 10 claims, and the Thunderboldt group, all of which show the effect of the skimming and gophering mining policy that has been followed. Indubitably, under a wise trade policy, practically all the ore found on these mine dumps would have been shipped and yielded the shipper a fair profit.

As has been said before, the north side of the Paradox Valley is the flat basin known as Long Park, which latter is inclosed in saw-tooth hills that rise 300 ft. above the basin floor. The south border of this basin is the upper ridge of the northern wall of Paradox Valley. The northern boundary merges into the sloping south cañon walls of the San Miguel River, one of the swiftest streams in the West. Running stringer-like from the south rim of Long Park basin in a northeasterly direction, are the hogbacks that contain the carnotite. Practically all these have strata of the yellow ore, dipping toward the San Miguel River, about three miles northeasterly and 1000 ft. below. The prominent carnotite claims are the Maggie C., which is patented, the Swindler, Cripple Creek, Hope, Media, Jack Angle, Park, Nos. 1, 2 and 3, the Great Western, Honeymoon, Vanadate, Bryan, North Star, Sunday and Nucla; all are connected by wagon road to the Paradox Valley stage road. The trip may also be made by automobile.

The west border of Long Park is, as has been stated, Hieroglyphic Cañon, which ends at the San Miguel River near Club Ranch. Various claims are scattered along the Cañon walls, and upon the flat bench overlooking the south side of the San Miguel River, is situated the Yellow Jacket group, that shows apparently abundance of the yellow ore under a cap of rock and earth of usually not more than 4 ft. Again, the ore must be hand-sorted to yield an average of 2% $U_3O_8$. On the north side of the San Miguel River are several prospects that should be of the same character as the Yellow Jacket group, but very little work has been done.

About a mile further down the river and on the same or north side, is Atkinson Creek, and here considerable prospecting has been done. The Big Mitt, that lies for 1500 ft. along the bench above the west bank of the creek, has had the ore exposed in eight places. The Ruth Ellen shows in the location shaft several feet of ore averaging much higher than ordinary shipping grade. The Club No. 2 also shows excellent ore along the outcrop for several hundred feet. Further south and west, across the San Miguel River, is Saucer Basin, which is at the juncture of the Dolores and the San Miguel. Here is the Cliff claim, one of the best producers in the whole carnotite region, with apparently not another carnotite claim within several miles of it.

Across the Dolores River are a number of claims that are being developed and from which several carloads of ore have been shipped. On this side also is Roc Creek, along the top of which is Carpenter Flats, where the ore may be found at the very grass roots in the Park Belle claim. Along Lion Creek are the Confusion and others which have all been developed enough to show them as of importance. Along La Sal Creek is the Yellow Bird group, famous in the early Poulot days, and further south the Kent and Bonanza claims, the first named in honor of the great English vanadium authority, J. Kent Smith, and which shows a tunnel 70 ft. long cut the entire distance through a 3-ft. vein of carnotite.

Bull Cañon has about 40 claims. This region is much eroded, the sandstone is very hard, and the ore strata quite irregular and pockety, but with good bunches of ore showing occasionally. The Batchelor group and the Black Fox may be mentioned, as also the Wedding Bell and the Sunrise.

A few miles south of Bull Cañon are the Stephens mines, which are on flat benches akin to the Yellow Jacket bench along the San Miguel River. From one of these benches several carloads of carnotite of grade averaging more than 3½% $U_3O_8$, has been taken. The occurrence seems to be in the bed of an ancient creek bed, and in a pay-stratum about 1 ft. thick. Overlying this was a blackish-gray stained sandstone layer 3 ft. thick, and a continuation of the same layer, but not stained, of about 2 ft., this latter being at the surface. Three miles south is Big Cañon, along which are some 40 claims belonging to the American Rare Metals Co., and to a number of individual owners. The ore here seems much mixed with carbon from the immensely thick deposits of coal in the Glades, a portion of which would naturally drain into this region. In uranium content, this ore will average not quite 1 per cent.

### Some Utah Carnotite Deposits

Sixteen miles west and north of Monticello, San Juan Co., Utah, is the Dry Valley district, in which a number of claims have been located. This region is especially arid and conflicting tales are told by prospectors, the most glowing being that the region is about like Paradox in the quality and quantity of the ore, but that water is very scarce and the railroad 100 miles away, while in the Paradox the average distance from the railroad is about 60 miles. Little space need be taken in describing the Green River deposits, or those of Temple Rock, Utah, 45 miles south of Green River. Torn and disheveled as the Colorado carnotite fields undoubtedly are, they are regular and orderly compared with the tumbled masses of lava, mud, rock and alkali that compose the Utah deposits. Ten miles from Green River station one of these deposits is found, with the ore in a coarse, iron-specked sandstone, not in horizontal beds as in the Paradox, but in tiny stringers running from the surface to a depth of 6 or 10 ft., and ending abruptly. Very little systematic exploration work has been done. The Cisco deposits are even worse. Those below Thompson, Utah, should offer better promise of stratum uniformity, hence of finding profitable carnotite deposits.

(*To be concluded.*)

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# The Placer Situation at Fairbanks

Alaska Correspondence

Sluicing in the Fairbanks district, Alaska, ended in October when heavy snowstorms were followed by cold weather. The placer season of 1913 was not prosperous for miners, merchants or anyone else, although an auspicious start was made during the first part of May. An unprecedented period of dry weather from the latter part of May to the first of August handicapped operations on many creeks. Many operators were forced to cease work until more water was available, and many men thus temporarily thrown out of employment joined in the rush to new diggings on the Chisana. The stampede took much of the ready money of the camp. When the rains of August permitted a general resumption of activity, the operators found themselves short of laborers. This condition lasted for only two or three weeks, however, for the closing down of many mines because of the inability of the operators to make ends meet released more than enough men to supply the demand of those who could operate. A heavy fall of snow in the first week of September threatened to bring sluicing to an end, but warmer weather followed. By the middle of the month, however, only a few plants were working, and these closed down for the winter early in October.

While many factors combined to make the last season a failure, the underlying cause of the general financial failure was the poverty of the ground being exploited. Practically all of the better ground of the Fairbanks district has been worked out, and there remains only "side" pay and other ground that was passed up in the boom days as too poor to be worked at a profit. The events of the last season would indicate that, though working costs have decreased slightly, the gold tenor of the gravel has not increased while it has been lying idle.

The Fairbanks district occupies an unfortunate position among placer camps in that its comparatively large deposits of low-grade gravel are not so situated as to be amenable to treatment by mechanical means. Scrapers have been used with marked success on certain of the shallower creeks, notably Pedro, Gilmore and Fairbanks. On the deeper creeks, however, they have no commercial application. The same applies to dredging. There is, unquestionably a small amount of dredgable ground near the heads of the creeks, where the depth to bedrock is slight and the valueless material overlying the "pay" is not of great thickness. But there is too little of such ground available at any one place for dredging to be a profitable enterprise, though it is possible that a small dredge that could be dismantled and moved from place to place would prove successful. The largest quantities of gold-bearing gravels, however, lie buried beneath from 30 to 200 ft. of muck and barren gravel. Only the lower four or five feet of the gravel, on the average, and the upper foot of the bedrock carry gold in important quantities. To remove the worthless material, many times greater in quantity than the pay, would, of course, be much too expensive to render dredging or scraping feasible. Hydraulic methods, obviously, are even less applicable.

The only hope for the future lies in improving the present methods of drift mining. While there is undoubtedly much room for improvement, yet it is questionable if any sweeping reduction in working costs can be made; and only a sweeping reduction can render much of the remaining ground profitable.

In the large territory of which Fairbanks is the political and commercial center, including the Chena River and its tributaries, the Salchaket, the Kantishna, the Totatlanika, Wood River, and many other similar districts, there is probably considerable ground suitable for dredging, hydraulicking and scraping. In the opinion of many competent observers, these districts offer more promise for lode mining, also, than does the territory immediately adjacent to Fairbanks.

## Fires in Michigan Iron Mines

By P. B. McDonald*

Attention of iron-mining companies on the Western Menominee Range has lately been directed to the increase of burning rock in underground workings caused by oxidation of sulphur compounds associated with the ore. Serious fires are now burning in the Fogarty mine of the Verona Mining Co. in the Iron River district and in the Bristol mine of Oglebay, Norton & Co., at Crystal Falls. The sulphur compounds oxidize underground when exposed to friction and the air, and smoulder in the cracks of the rock, being practically impossible to put out. The sulphur occurs in the black slates of the walls and also in the ore; some of the commercial iron ores of this district contain as much as 3% sulphur. In the past, rock piles on surface have burned for years, but not much trouble was encountered underground although the Youngs mine and the old Sheridan mine had some trouble. The fires now burning are causing serious inconvenience and it is feared the tendency to fires will increase as greater depth is attained and more sulphur is struck; the fire in the Bristol mine is in the new workings and may cut off a valuable portion of the orebody. The method of fighting such fires is to bulkhead up all underground openings in the vicinity to shut off the air supply; in the case of the Youngs mine a small shaft over the affected portion was left open and a stack added at surface in order to let the fire burn itself out, which it is believed it did, although the workings have never been reopened.

## Nevada Wonder

The annual report of the Nevada Wonder Mining Co., Wonder, Churchill Co., Nev., for year ended Sept. 30, 1913, states that 39,118 dry tons of ore were mined and treated. The total gross value of this ore was $572,359, made up of 630,606 oz. of silver and 9248 oz. of gold. A total recovery of 93.1% of the metal contents, or $535,661 of the gross value was made. The mine was worked continuously during the year, although no ore was hoisted for 38 days in November and December, 1912, on account of construction work and for 32 days in January and February, 1913, on account of water shortage for milling. The main shaft was sunk three compartments wide from the 700-ft. level to a depth of 1030.5 ft. and enlarged to three compartments from the 700-ft. level to the surface. The 318.5 ft. of sinking was done at a cost of $31.26 per ft. This includes the cost of enlarging and fitting up the 700-ft. station for the electric sinking hoist, and cutting stations 12 ft. from the shaft on the 800- and 900-ft. levels, and 15 ft. from the shaft on the 1000-ft. lever. The shaft was timbered with 8x8-in. Oregon pine. General development work consisted of 6831.5 ft. of drifting, raising, and crosscutting. The entire surface equipment at the mine, both of buildings and machinery, was remodeled for the purpose of providing facilities for handling a greater amount of work in the mine.

Apparently the total cost of mining, milling, etc., was about $12.80 per ton milled; of this about 16% was for metal deductions. The milling costs averaged $3.092 per ton, made up of $3.249 for direct charges and $0.157 for indirect charges. On May 29, 1913, the company declared its first dividend, the rate being 10% on the capital stock.

## Mineral Production of Belgium in 1912

According to official reports, there were 13 zinc smelters and 10 zinc-rolling mills operated in Belgium in 1912. These employed a total of 9186 workmen. All of the zinc ore produced in Belgium (840 tons) was consumed by these works and 488,030 tons of foreign ore in addition; the coal used amounted to 997,740 tons. The production of spelter was 205,940 tons, as compared with 198,238 tons in 1911. (In this and following paragraphs where "ton" is used, the metric ton is meant.)

Five lead works were operated, which employed 1826 workers. These treated 73,605 tons of ore, coming almost exclusively from foreign countries, 123,370 tons of plumbiferous, argentiferous and auriferous byproducts, and 47,080 tons of work lead. The production of refined lead was 54,940 tons, exclusive of work lead from foreign countries, which was treated in Belgium. There were 279,960 kg. of gold and silver produced and 550 tons of copper matte as a byproduct.

In 1912 there were 17 works operating blast furnaces. Fifty furnaces were in blast, which employed 5282 workers. The consumption of coke was 2,451,320 tons, and of ore, 6,311,850 tons, of which 89,860 tons were domestic. Pig-iron production amounted to 2,301,290 tons, 2,137,730 tons of this amount being used for steel making.

Considering the stock on hand at the beginning and end of 1912, and also taking into account the imports and exports (780,365 and 14,062 tons, respectively), it appears that the domestic consumption of pig iron in Belgium was 3,067,593, as compared with 2,727,878 tons in the previous year.

## Osmiridium in Tasmania

The report of the Tasmanian Geologist, W. H. Twelvetrees, on the Bald Hills osmiridium field vouches for the existence of the precious metal *in situ* in the serpentine rock, samples of which he had crushed and assayed yielded up to 59 oz. to the ton. He says: "It must be understood that it is irregularly disseminated in the rock. It is rarely visible in the stone, and this is partly due because of its covering of oxide of iron, a dull black coating making the grains of metal indistinguishable from those of magnetite or chromite." The occurrence is one of extreme interest, for osmiridium in undisturbed rock has hitherto been recorded only from Russia.

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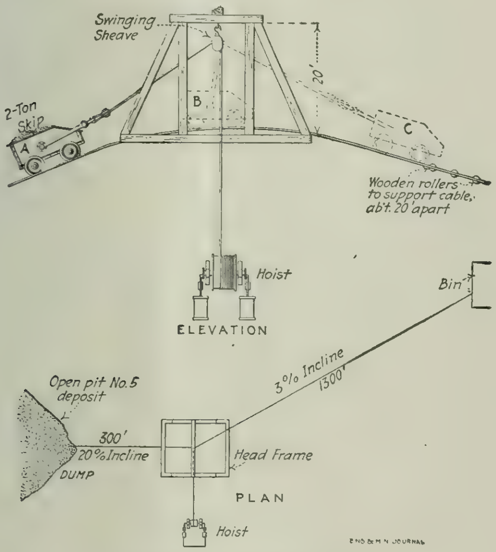
*Mining engineer, Gouverneur, N. Y.

# DETAILS OF PRACTICAL MINING

## A Gravity Haulage System

By Frank C. Rork*

The scheme here described was devised to hoist and transport ore from a deposit in the Moose Mountain mine to the mill bins, situated about 1500 ft. from the ore. A headframe about 20 ft. high was erected at the highest point between the ore and the bins. Instead of fastening the sheave in the usual way, it was suspended, so as to swing and turn according to the pull on the cable. The bail on the skip was constructed so that it would turn over as the car went by the headframe.



Details of Haulage System

In the position *A*, the skip is shown coming up the incline. At *B*, the momentum carries it by the highest point of the track, the bail turning over as it passes. The hoistman then releases the friction and allows the loaded skip to pull the cable out as it goes down the incline to the bins. It is necessary to support the cable on wooden rollers, otherwise the drag of the cable would stop the skip.

On the return trip, the momentum of the empty skip is sufficient to carry it past in the same manner. By speeding the hoist on the return trip the round trip can be made in about four minutes, which would limit the capacity to 300 tons per 10-hr. shift, but there is no reason why 4- or 6-ton skips could not be used.

The hoist is belt-driven from a motor. There are two drive pulleys on the motor which are connected by two belts to two pulleys on the hoist countershaft, one 60 in. and one 30 in. in diameter. By means of two friction clutches the 30-in. pulley drives the hoist on the return trip at double the regular hoisting speed.

This scheme has been in operation for about six months, and is proving satisfactory for the purpose for which it was designed.

⁂

## Drilling Mesabi Gopher Holes

Blasting in the Mesabi openpits is necessary in stripping if the overburden is somewhat consolidated, and rather generally in mining unless the ore is unusually soft. Two methods of drilling and blasting are in use. One consists of drilling deep down-holes at the top of the bench, using a jumper drill, often with several men, chambering the bottom with dynamite and blasting with black powder; the other is given the wholly indefinite name of "gopher-holing," a term which has a different signification in every mining region.

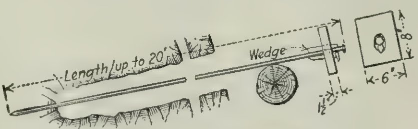


FIG. 1. LONG MOIL WITH PLATE AND WEDGE FOR DRIVING IT OUT OF HOLE

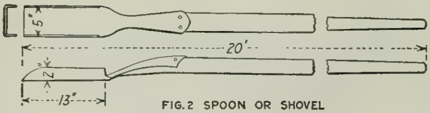


FIG. 2 SPOON OR SHOVEL

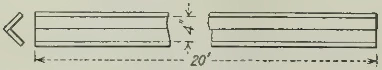


FIG. 3. LOADING TROUGH

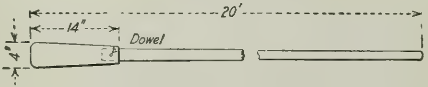


FIG. 4 TAMPING BAR

Eng. & Min. Journal

Typical Set of Gopher-Hole Tools

Gopher-holing here consists of working out an inclined hole about 16 to 20 ft. deep, beginning at the bottom corner of the bank and extending in at an angle of 10 to 20° below the horizontal. This is accomplished in various manners. In the cases observed, a set of tools similar to that illustrated, was employed. In addition to these, an ordinary hand auger was used to start the hole and take out the first few feet; this hole was blasted with a stick or two of dynamite, the effect being to leave a long bootleg of 8 to 14 in. in diameter. The auger being unwieldy in deep holes, a long moil-pointed bar usually of 1¼-in. steel was next brought into service, shown in Fig. 1. This was driven into the bottom of the bootleg for a foot or two, by two men with doublejacks. When progress became slow, a perforated plate about 1½x6x8 in. was slipped over the end of the moil and wedged to it, either with two small wedges or with one wedge and a track spike as illustrated. By hitting the head of the wedge with the two doublejacks, the moil was extracted. During this process, it was usually supported on a log as shown, to keep the plate off the ground.

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*Mine superintendent, Moose Mountain, Ltd., Sellwood, Ont.

The moil hole was then blasted by inserting a stick or two of powder and exploding with an electric cap. These alternating processes were continued until the desired depth of hole was obtained, the average diameter being perhaps 12 in. This intermediate blasting was done with a single dry cell. It was somewhat surprising at first to see the miner load his hole, step a foot or two to one side of the collar, connect his battery, and set it off. As a matter of fact, material was not even shot out of the mouth of the hole, the sole effect being to shatter the ground adjacent to the charge. To remove the broken material, the long-handled spoon shown in Fig. 2 was used. It is made of an ordinary No. 2 shovel by bending the sides up straight so as to give a depth of about 2 in. and opening the socket to take the large 2- or 3-in. end of a peeled sapling.

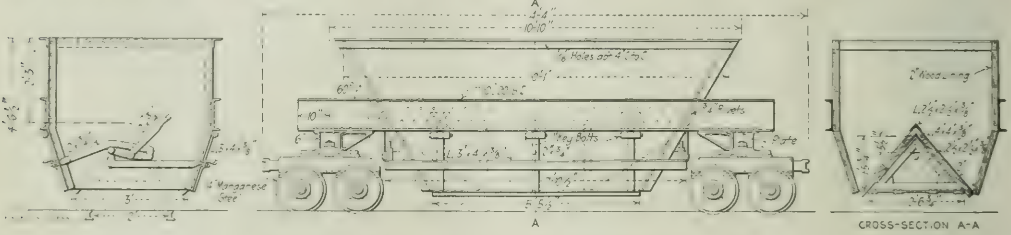
When the hole was sufficiently deep, a larger charge of dynamite, 10 to 15 sticks, was exploded in a bottom to give a good chamber. Black powder to the extent of about three kegs was charged into the chamber by shaking it down the launder shown in Fig. 3. A dynamite primer was inserted in the middle of the powder charge and the whole tamped tight with the tamping bar shown in Fig. 4. The remainder of the hole was then also tamped with lean ore.

The tamping bar consists of a round, tapered wooden head about 4 in. in diameter at its big end and 14 in. long, with the smaller end bored to permit the insertion of a 2-in. sapling which is fastened with a wooden dowel pin. No nails are used and in the construction of the trough, copper nails are considered advisable. It is an obvious rule of safety not to bring iron and rock into contact in the presence of black powder.

The holes were blasted in groups and for this purpose the battery was discarded and a push machine used. It is customary to move some distance off for this blasting but if well carried out, one might stand on top of the blast without injury, since there is rarely any discharge of material, the whole bank being lifted and allowed to drop, thus effectually shattering the material.

## Double Truck Gable-Bottom Car

The drawing illustrates a car recently designed for use on the stock-pile trestle of the Kennedy mine on the north Cuyuna range. The car will hold 100 cu.ft., about six tons of ore. The electric locomotive in use on the trestle will handle one car per trip. The body of the car is hopper-shaped with a gable through the center and two side doors swinging out and up. The ends of the hopper are pitched at 60° and the gable is about 50°, these steep pitches being necessary from the fact that the ore is sticky and hangs to a flat slope. It is possible also that in the coldest weather the ore may freeze slightly which would cause it to stick to the car. The inside of the body is protected with a 2-in. lining of wood. The two side gates give an extremely fast discharge, since they provide about a maximum opening for the passage of the ore. It is extremely important that the cars dump quickly, as it will tax the capacity of the system to handle the ore as fast as it is hoisted at best, the trestle being unusually long considering the size of the mine; it is considered unsafe to stock-pile near the shaft over the mine workings and only the outer half of the trestle can be used. The double trucks make it possible to swing the entire body in between and thus keep it lower and more stable. The company itself manufactures everything but the trucks.



RAPID-DUMPING 6-TON CAR FOR STOCK-PILE TRESTLE

⁂

## Safety of Shaft Hoisting Ropes for Great Depths

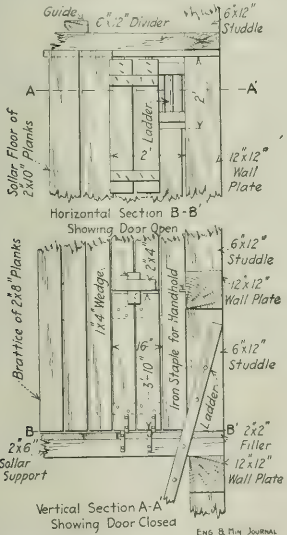
For a number of years it has been more and more painfully recognized as a great difficulty to modern mining that with growing depth and increasingly heavy hoisting loads the diameter of hoisting ropes must, under prevailing safety provisions, grow to such an extent that the ropes become too unwieldy for practical work, says the *Mining Journal*. The latest German contributions to the voluminous literature devoted to remedies for this state of affairs come from Doctor Speer and F. Baumann, and are published in *Kohle und Erz*, No. 35, and *Glückauf*, No. 40, respectively. The remedies proposed by both authors, in common with most of their predecessors, are either the use of wire ropes of increased tensile strength, or the reduction of the now prevailing safety coefficient, or the combination of both. As regards the first, it is pointed out that the tensile strength of 180 kg. per sq.mm., which may in present circumstances be regarded as about the maximum in practical work might, and probably will, within measurable time be raised by the use of improved wire in the manufacture of ropes to 210, or, according to Dr. Speer, even to 240 kg. per sq.mm. As regards the safety coefficient, both authors arrive, on the basis of most exhaustive and detailed calculations, at the conclusion that the figure at present imposed by the mining regulations might, without any danger, be considerably modified. In fact, Mr. Baumann sums up his computations by stating that with a rope whose tensile strength is equal to 210 kg. per sq.mm. the minimum safety coëfficient, applied to the combined weight of rope and loaded skip, ought to be fixed as follows:

Up to 10 tons hoisting load and to 1500 m. depth, coefficient = 6
Up to 20 tons hoisting load and to 1000 m. depth, coefficient = 6
Up to 20 tons hoisting more than 1000 m. depth, coefficient = 5
Up to 30 tons hoisting load and to 1000 m. depth, coefficient = 5
Up to 30 tons hoisting more than 1000 m. depth, coefficient = 4

⁂

## Manway and Skipway Door

The Bennett shaft near Keewatin on the Mesabi range is divided into a combination manway and pipeway and two skipways, arranged in a row. A vertical partition or brattice of 2-in. planks separates the manway from the adjacent skipway. The shaft sets are spaced 5 ft. and on every third set a sollar is built of 2-in. planks laid on 2x6-in. joists parallel to the end plates. Repair work on the pipes necessitates the lowering of material and tools, which ordinarily must be carried down by hand or slung from sollar to sollar. To enable such supplies to be lowered in the skip and taken into the manway, a door has been provided in the brattice at each sollar. The ladder opening in the sollar is 2 ft. square, situated in a corner next to the skipway. The door occupies the place of the second and third brattice boards and is hinged at the bottom so as to cover most of the ladder opening when it is swung down. It is 3 ft. 10 in. long and its top comes even with the center of the set above the sollar set. It is held closed against the divider of this set by a wedge made out of a 2x4-in. piece, slipping through a 1x4-in. slot in another 2x4-in. piece spiked horizontally to the brattice and divider. A 2x2-in. filler is nailed to the top of the 2x6-in. sollar-joist next to the skipway, in order to bring the bottom of the door flush with the sollar floor.



Corner of Manway Compartment

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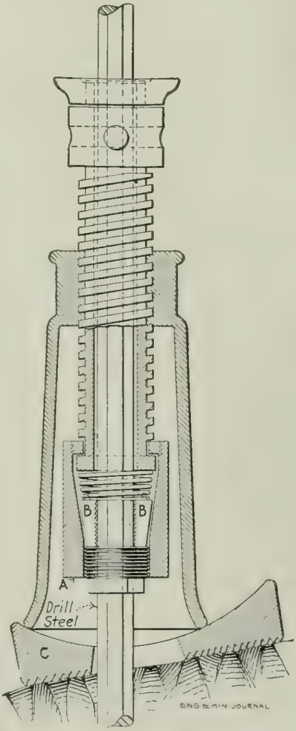
## Device for Pulling Stuck Drill Steel

To avoid delay and possible loss of a drill hole a special apparatus was devised and used on the Catskill Aqueduct. It consists of a hollow jackscrew with a collar on its lower end, to which is attached a cylindrical gripping chuck *A*, containing a set of toothed gripping jaws *B* in its conical interior, according to *Engineering & Contracting*. This jackscrew stands on a saucer-shaped base *C*, which, as the drawing indicates, permits the jack to follow the line of the drill regardless of its inclination to the rock. In operation, jack and base are slipped over the drill. When the screw is turned upward its operation, pulling on the sleeve, compresses the spring, forcing the wedges tighter and tighter against the drill to which the force of the pull is transmitted. The standard jack, 3 in. in diameter with 1/4-in. pitch, has a lift of 8 in. and if this does not loosen the drill sufficiently to permit of its removal by hand, a new grip is secured by simply turning the jackscrew backward, lifting again and repeating until the drill bar is free. Several sets of grip jaws are provided, so as to handle different sizes of drill rods.



Paul Mitchell Drill-Pulling Jack

This device is made in sizes to suit the work required to be done. For drills less than 1¼ in. in diameter a 3-in. jackscrew weighing 80 lb. with 30 tons lifting capacity is used; for drills up to 2 in. diameter of shank and 50 ft. long on heavy quarry drilling, a 3-in. jackscrew of 100 lb. weight and 50 tons lifting capacity is made. Paul & Mitchell Co., Millbrook, N. Y., market the device.

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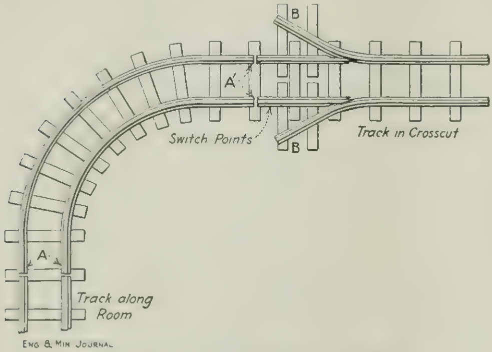
## Fitting Track Curves in Top-Slice Rooms

In the top-slicing method of ore extraction as practiced on the Mesabi, successive rooms are opened off the crosscut extending 10 ft. one way, and 40 ft. the other. The track from the crosscut is turned into the long side of the room only. For the first room mined from any crosscut, a curve is fitted into the track such as represented by the portions of the rails *A-A'*. When the room is mined and caved, the track is taken out and it is desirable to use the same curved portion for laying track into the next room. It is only rarely that the break in the crosscut rails is such that the curve will fit. The difficulty is overcome by Captain James Rosewall of the Harold mine by using two switch points, as shown. The curve rails are laid, the portions *B* of the crosscut rails are spread out and the switch points fitted in to make a tight and smooth joint. The switch points used, of course, are such as would be used for a split or fixed switch and not for a stub switch.



Track Curves in Top-Slice Rooms

The trick is one taken from openpit practice, where in changing tracks it is often difficult to get joints to match without recourse to this device.

⁂

## A Safety First Calendar

The greatest difficulty in work along safety lines is to impress on the employees the importance of such work and to obtain their coöperation. Most of the enlightened companies in mining as well as industrial lines now do their share or more than their share, and the carelessness, ignorance and recklessness of the workmen is usually responsible for such accidents as occur. Education of his employees is the main problem confronting the operator. Classes, bulletins, competitions, rules and disciplinary methods are employed to solve the problem. The National Tube Co. has lately added a new device to the list of those in use. A safety calendar has been designed for distribution to each of the 30,000 employees of the company. The calendar is exceedingly attractive; it carries a picture illustrating a safety precaution, and on each month of the calendar is printed a safety motto. It is hoped that such a daily reminder of the safety-first principle will aid appreciably in forcing on the workman a sense of his obligations.

Some of the mottoes read as follows:

> It is better to be careful a thousand times than to be injured once. Get the safety habit. If you see a man acting carelessly, tell him about it, and do not be afraid of hurting his feelings by doing so.
>
> Neglect of slight injuries often results in blood poisoning and serious trouble. The company has provided an emergency hospital, where employees injured in the mill can receive the best of attention. Do not neglect small injuries.
>
> Many employees used to think it was brave to do work in a reckless way, and cowardly to be looking out for one's safety. Fortunately such people have become scarce. They are now regarded as fools, and they are discharged when the management finds them out.
>
> Playing, wrestling, or fooling on the mill premises, as well as playing or fooling with machinery or tools, is dangerous. Such conduct should be strictly prohibited.
>
> Every danger sign posted in the mill means that the danger pointed out is real. Men must ascertain what is on these signs around places where they work and give heed to the warnings. The red ball on a sign means danger.
>
> The women and children of an employee's family can be of great help in the safety work by continually urging him to be careful and use safe practices. If he has a slight cut or injury, insist that it be dressed promptly at the mill emergency hospital.
>
> Your eyes are valuable to you. Wear goggles when working where chips or sparks may fly. They may be awkward at first, but you will soon get used to them and then you would not work without them.

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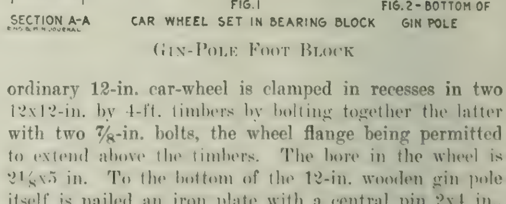
## Foot Block for Revolving Gin Pole

For many purposes in constructing with a gin pole, it is convenient to be able to revolve the pole. An ingeniously contrived bearing for this purpose used at the Gilbert mine on the Mesabi is herewith illustrated. An ordinary 12-in. car-wheel is clamped in recesses in two 12x12-in. by 4-ft. timbers by bolting together the latter with two ⅞-in. bolts, the wheel flange being permitted to extend above the timbers. The bore in the wheel is 2⅛x5 in. To the bottom of the 12-in. wooden gin pole itself is nailed an iron plate with a central pin 2x4 in., which fits in the bore of the wheel. The bottom of the pole is further provided with a collar of ½x3-in. iron, shrunk on.



SECTION A-A

FIG. 1 CAR WHEEL SET IN BEARING BLOCK

FIG. 2 - BOTTOM OF GIN POLE

Gin-Pole Foot Block

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**Patents Covering Cobalt in High-Speed Tool Steel** are owned by the Becker steel works of Willich near Crefeld, Rhenish Prussia, which claims that its efficiency is thereby greatly increased.

# DETAILS OF METALLURGICAL PRACTICE

## A Boiler Feed-Water Filter

In most tropical regions, at low elevations, the seepage water that is temporarily retained in the soil and not the rapidly drained flood waters must be relied upon for boiler feed. This water remaining in long contact with the decomposed rock of which the soil consists, dissolves certain salts, and becomes surcharged with organic matter from decaying vegetation. It also holds in suspension minute particles of rock material. For these reasons boiler-scale troubles are apt to be experienced whether or not there be limestone in the vicinity.

A case in point at a mine in Nicaragua is described by C. Carleton Semple in *Power*. Upon taking charge of the mine he found that a 30-hp. locomotive-type boiler which was supposed to be capable of generating enough steam to operate all the machinery in the 100-ton mill, could not supply steam enough to keep more than half the machinery going at full speed.

This boiler was found to be badly scaled. The scale was made up of alternate bands of red and white material. The red material was granular, the white compact and both hard. A test with hot and cold strong hydrochloric acid failed to show effervesence, indicating absence of carbonates. The glasses in which these tests were made were left standing over night, and the next morning the scale was found to have dissolved in the acid and to have formed a heavy gelatinous mass, from which it was surmised that the scale was made up chiefly of minerals held in suspension and not of salts in solution in the water. This simple test indicated that the preventive for the trouble consisted in removing the fine material from the feed-water supply.

Of course, attention was given immediately to the removal of the scale already formed. This scale was entirely too hard to be removed by any scraping or punching tools that could be operated through the handholes, and to have taken out the tubes would have delayed operation for six weeks, because no extra tubes were on hand and a new set would have had to be ordered from New Orleans.

Several commercial brands of boiler compounds had previously been tried with indifferent success. After ascertaining the source of the trouble the boiler was filled to within a few inches above the top row of tubes with water after about 1 gal. of kerozene had been poured in through one of the handholes. The boiler was then fired up and a pressure of only 30 lb. maintained, while no attempt was made to run the plant. The blowoff was opened for a short period every three hours and the water level reëstablished. After three days the fire was drawn and all the scale that had loosened was removed.

After a second treatment the boiler was placed in regular use and every morning one-half pint of kerosene was added to the feed water. For the first six weeks the fire was drawn every week and the loosened scale removed. A few weeks after this treatment had been started it was possible to run all of the machinery part of the time and half of it all the time at full speed. After two months all of the machinery could be kept running all the time at good speed. After seven months an 80-hp. return-tubular boiler was ready to be put in commission to operate an addition to the mill. The small boiler was then retubed, and it was found that practically all of the scale had been removed from between the tubes by the kerosene treatment, but little had been removed from the crownsheet.

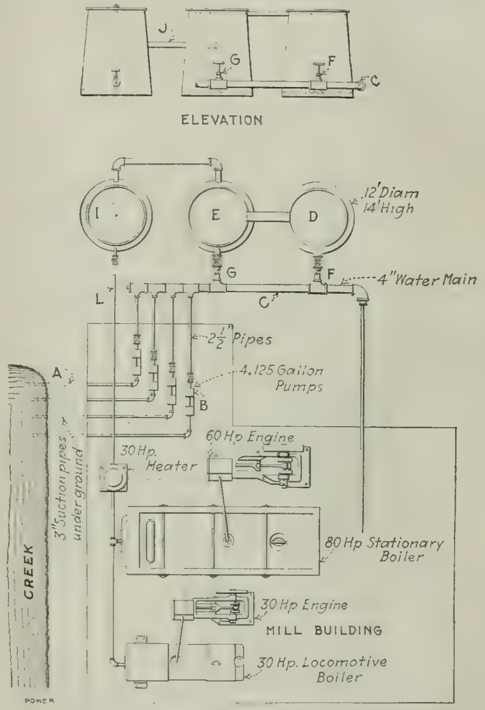

Fig. 1. Piping of the Filter Tanks

Before firing up the new boiler the outside surfaces of the tubes and the inner side of the boiler shell were rubbed over with flake graphite until a thin glossy coating covered the metal. This was done not so much with the idea of preventing corrosion, of which there was no evidence, as to prevent any scale from adhering.

Meanwhile a filtering plant was installed to remove the solids in suspension in the water taken from the creek for the boiler-feed supply. This plant was exceedingly simple and required only one 12x14-ft. wooden tank in addition to the two 14,000-gal. tanks that held the mill-water supply. These were arranged as shown in Fig. 1, in which *A* are 3-in. suction pipes from the creek to the four pumps; C the 4-in. water main that supplied the mill with water and which was connected at one side and near the bottoms with the mill-water tanks *D* and *E*, the connecting pipes being controlled by the valves *G* and *F*. The tanks *E* and *D* were connected at the tops by a trough, about 6 in. deep The filter tank *I* was connected with the tank *E* by the 4-in. pipe *J*, about midway between the top and bottom of the tanks, and which extended across the tank to the opposite side, the end of the pipe within the tank having been plugged and the pipe itself drilled with ½-in. holes. The valves on the mill-water main were normally wide open, so that the speed of the pumps had to be so adjusted that all three tanks remained full of water.

Normally the valve *G*, Fig. 1, was closed and the valve *F* left open, so that the water entered the tank *D* at the bottom, rose in it to near the top, thence passed over into the tank *E*, through the trough and rising in the tank *E* to the height of the pipe *J*, flowed into the tank *I*. In rising through the tanks *D* and *E* the coarser solids had ample opportunity to settle.

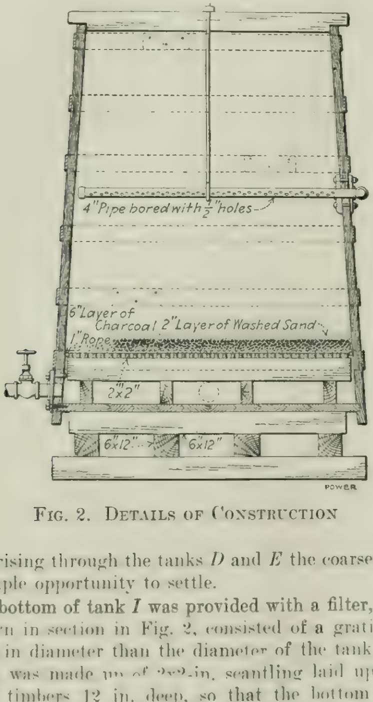

FIG. 2. DETAILS OF CONSTRUCTION

The bottom of tank *I* was provided with a filter, which, as shown in section in Fig. 2, consisted of a grating 1½ in. less in diameter than the diameter of the tank. This grating was made up of 2x2-in. scantling laid upon two sets of timbers 12 in. deep, so that the bottom of the filtering bed was 24 in. above the bottom of the tank. Upon the grating a double layer of thin, white cloth, which in all tropical countries is sold under the name of *manta*, was tacked in place and the grating calked by a piece of hemp rope driven down between the edge of the grating and the sides of the tank. On the cloth was spread a layer of screened charcoal 6 in. deep, the pieces of which were not less than ½ in., nor greater than 2 in. in diameter. Upon the charcoal was spread a layer of washed river-sand containing no particles that would pass a screen with 20 meshes per linear inch. This sand sank into the spaces between the lumps of charcoal, but was, on the average, 2 in. deep over the charcoal. The layer of charcoal was used only to prevent too tight packing of the sand upon the filter cloths.

After the filter had been in use for a week or 10 days its upper surface became coated with a thin gelatinous coating which allowed water to percolate through it, but entangled the finest sediment and prevented it from passing through the filter bed.

The water below the filter tank *I*, from which all sediment had been removed and which was clear, was drawn off through the pipe *L* to a 30-hp. feed-water heater, from which all the plates had been removed. All of the exhaust steam from one 60-hp., one 30-hp. engine and four service and four boiler-feed pumps was led into it, heating the feed water to 210° F., before flowing to the pumps. The bottom of the heater was about 2 ft. above the four pumps, not shown in the sketches, so that the water flowed to them by gravity. The feed water was fed to the boiler constantly; one or the other of each pair of pumps, there being two feed pumps for each boiler, was always in motion, the speed being so regulated that the feed equaled the evaporation.

After this system had been installed no further trouble was experienced from scale. It was the custom to stop operations the first and 15th day of each month, which were the mill cleanup days. Then the boilers were blown out and about half an ordinary water bucket of granular material would be found in the bottom. This was probably the salts held in solution in the water and which could, therefore, have passed the filter bed. No scale formed on the plates or tubes, and no corrosion was evident at the end of two years.

At these cleanup times the drain valves on the tanks would be opened to drain off the settled sand and sludge. The sand on the filter beds was removed and a new layer substituted every six months. The cloth was renewed after being in use 18 months. The heater served as a sand trap, inasmuch as it would have caught and held sand that might have been washed through a hole in the filter cloth and thus have prevented its entering the boiler had such a hole formed.

All the lubricating oil in the exhaust from the engines and pumps entered the feed-water heater, from which the plates and box for removing such oil had been taken out. Consequently much oil must have returned to the boiler and the quantity accumulated steadily for two weeks. A cheap mineral cylinder oil was used, but no trouble was experienced from its presence. On the contrary, the oil was regarded as beneficial rather than detrimental, as, together with the organic matter in the water, it probably caused salts that had been in solution in the water to settle as a granular sand rather than in a compact mass. The filtering capacity of one 12x14-ft. filter tank was just sufficient for the two boilers. The water percolated very slowly.

⁂

## Tin Reclaiming by Matte Smelting

The reclamation of tin from tin waste, slag or even from ore, by matte smelting, is urged by Jan Rueb, The Hague, Netherlands (Brit. pat. 27,148 of 1912). According to his ideas, the stanniferous material is smelted with enough pyrite or other sulphur-bearing material to matte all the tin. The matte is then leached for tin with alkaline sulphides. If copper is present, it may be desirable to roast the matte, and leach out the copper first.

# THE ASSAYER AND CHEMIST

## Assay Method for Palladium and Platinum

By H. D. Greenwood*

Palladium is a silver-white metal, much used for plating surgical and scientific instruments and in the dental trade as a substitute for gold and platinum. The dental trade uses over one-half the palladium produced. It is unaltered on exposure to hydrogen sulphide and, therefore, lends itself well to plating fine silver ware.

Palladium is now being recovered in small quantities by the copper refiners, and sold to the trade in the form of bar, powder and the oxide; the latter two find the greatest favor in the trade, as in these forms it can be crushed to about 80 mesh and accurately sampled. Owing to the small quantities of palladium for sale, it has been the custom to accept the weights and assays of the refiner, the returns merely showing a lump sum paid for a certain lot.

In comparing the methods of assay, it has been found that no two refineries use the same method and in nearly every case it is a recovery method rather than an analytical one. The following method which was tried out by two chemists, gave closely agreeing results. I believe it to be short and accurate, although there is nothing new or original about it. Criticism is cordially invited so that a start can be made toward establishing a standard method.

### Palladium

Weigh out eight portions of 0.500 gram each into 250-c.c. Jena beakers, dissolve in 10 c.c. concentrated $HNO_3$, 5 c.c. concentrated HCl and 5 c.c. $H_2O$, placing the beaker on the water bath; when action ceases transfer to hot plate, boil, dilute with $H_2O$ to 100 c.c., and filter. Should there be an insoluble residue, it probably contains palladium oxide. The insoluble residue should be filtered off and boiled with 3 c.c. formic acid and 5 c.c. $H_2O$, which will reduce oxides of palladium to metal, which can then be dissolved as above.

Expel all HCl by evaporating the filtrate with repeated additions of $HNO_3$, bringing the volume to about 100 c.c. Add 25 c.c. of a 10% solution of mercuric cyanide, boil slightly and allow to stand over night. Filter through an ashless paper, washing the precipitate well with a warm 1% solution of mercuric cyanide. Burn in a porcelain or silica crucible. The oxides formed on burning are reduced by boiling the burned residue with 50 c.c. of a 20% solution of formic acid, filtering on a tared gooch and weighing as palladium.

The oxides can be reduced in hydrogen gas, care being taken to remove the stream of hydrogen before taking away the flame so as to prevent the palladium from absorbing hydrogen.

One-quarter- and one-gram portions may be taken, but after a little experience, it will be found that ½ gram makes the best working portion.

### Platinum

Weigh out eight portions of 1 gram each into 250-c.c. Jena beakers, add 15 c.c. concentrated HCl, 10 c.c. concentrated $HNO_3$ and 5 c.c. $H_2O$; place on the water bath, after action has ceased, transfer to hot plate and expel all $HNO_3$ by repeated additions of HCl, evaporate to 40 c.c., dilute to 100 c.c. with water and filter off residue, if any. (See treatment of residue under "Palladium.") Evaporate the filtrate to 40 c.c., add 25 c.c. ethyl alcohol and 25 c.c. of a saturated solution of ammonia-chloride, stir well, bring to a boil and allow to stand over night in a cool place.

Filter the ammonium-platinic chloride through a weighed gooch, washing the precipitate with a 20% $NH_4Cl$ solution, dry, ignite and weigh as Pt. When the Pd contents is high (Pd 900 to Pt 5) the reprecipitation of the $(NH_4)_2PtCl_6$ is sometimes necessary, and where the percentage of Pt is low the various portions may be combined to make a workable and weighable quantity. The results should agree within two parts per thousand (0.20%) and splitting limits on the material should not be greater than 3 to 5 parts. Should copper be present it is separated from palladium by precipitating the latter as ammonium-palladic chloride, then dissolving and heating the precipitate as above. No copper salts are present in the palladium powder sold to the trade.

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## Suggestions on the Platinum-Palladium Assay

By A. M. Smoot*

Many of the errors in the platinum-palladium assay arise from the fact that the chlorides of these metals in aqueous solution are present at least partially as the hydrochlorplatinic and hydrochlorpalladic and -ous acids, that the ions are not entirely $Pt''''$, $Pd''''$ and $Cl'$, but $H'$ and $PtCl_6''$ and $PdCl_6''$. For instance, if the attempt be made to throw down the chlorine of these compounds with $AgNO_3$, the precipitate will carry a certain amount of the platinum metal, which is almost certainly not entrained, but present as $Ag_2PtCl_6$. The remembrance of this peculiarity of the platinum-group metals will often help greatly in their analysis.

Palladium can be separated from platinum by taking advantage of the easy reduction of the palladic compound. When the two metals are in *aqua regia* solution, evaporating to dryness several times with HCl, thus expelling all traces of nitrogen oxides, is sufficient to re-

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Note—The jewelry trade is also beginning to absorb large quanities of palladium in the manufacture of white gold (80% gold and 20% palladium). This alloy has the same color as platinum, but is harder, cheaper and wears better. The demand for palladium exceeds the supply.

*Chief chemist, U. S. Metals Refining Co., Chrome, N. J.

*Ledoux & Co., 99 John St., New York.

duce the palladic to the palladous form. The platinum can then be precipitated as ammonium platinic chloride, as $(NH_4)_2PdCl_4$ is soluble in excess of ammonium chloride. A little nitric acid then converts the Pd$''$ to Pd$''''$, and in this state it can be precipitated as $(NH_4)_2PdCl_6$.

When in the higher state of valence, it is obvious that both platinum and palladium can be separated from copper as the chlor-salts, and later separated from each other.

There are considerable precautions to be taken in igniting such compounds as $(NH_4)_2PtCl_6$. They decompose very rapidly when the decomposition temperature is reached, and the great volume of gas disengaged is likely to carry off the heavy metal mechanically. With platinum it is decidedly preferable to redissolve the $(NH_4)_2PtCl_6$ in water, add sulphuric acid, pass in $H_2S$, filter off, and ignite the sulphide, which is a slow-roasting process.

However, if the hydrochlor-salts are ignited, char the filter paper at the lowest possible temperature, and afterward raise the heat just as slowly as possible.

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# The Determination of Nickel with Dimethylglyoxime

The use of dimethylglyoxime as a means of separating nickel and cobalt was given in a paper written by O. Brunck in 1907, who gave credit to Tschugaeff for suggesting dimethylglyoxime as a means of detecting the presence of nickel. When this method was proposed it had one fault, the high cost of the dimethylglyoxime, but recent experiments have shown that the method is of great value, and with its application now almost universal, has come a reduction in the cost of the reagent that places the new method at the command of anyone who wishes to use it. The general outline of the dimethylglyoxime method appears in the Journal of Apr. 26, 1913, p. 857. An article upon some of the ramifications of this subject appeared in the *Metal Industry*, August, 1913, by Percy F. Brown, from which this abstract is taken.

Brunck calls attention to the fact that the nickel can be determined in either a dilute or strongly concentrated solution, and suggests the use of a 1% alchoholic solution of the dimethylglyoxime. A slight excess secures complete precipitation, but theoretically four parts of the reagent are required to precipitate one part of nickel. The nickel solution, which usually contains free acid, should be heated in a beaker nearly to boiling and the reagent added. Then ammonia is added drop by drop until the solution smells faintly of the ammonia. Filter through a gooch crucible, using suction.

For the separation of nickel from cobalt, according to Brunck's method, 0.5 gram of the sample is dissolved in HCl, or if a salt, it is dissolved in water, and the solution evaporated nearly to dryness. After diluting to 100 c.c., with water, add 0.2 gram of dimethylglyoxime, 2 grams of sodium acetate. Filter after allowing to stand one-half hour. Nickel and manganese may be separated by using sodium acetate to neutralize the acid instead of ammonia. For separating nickel and zinc, either ammonia or acetic acid may be used, but the latter is preferable. For separating nickel and iron, to the solution containing iron, in the ferric state, tartaric acid is added before precipitation, to prevent the subsequent formation of ferric hydroxide on adding ammonia. The method for separating nickel and aluminum is similar to that used for nickel and iron.

Tartaric acid is added to prevent the precipitation of chromium by the ammonia, but it is also necessary to have a sufficient amount of ammonium chloride present when the separation of nickel and chromium is attempted.

The use of a-benzildioxime was suggested by Frederick W. Apack in *Chem. Trades Journ.*, June 14, 1913, reprinted in the Journal, July 12, 1913. The reagent is said to be quite as delicate as the dimethylglyoxime, and has the additional advantage that coloration is produced, even with small traces of nickel, much more quickly than with the dimethylglyoxime. This reagent is said to give a much more insoluble precipitate than with the dimethylglyoxime.

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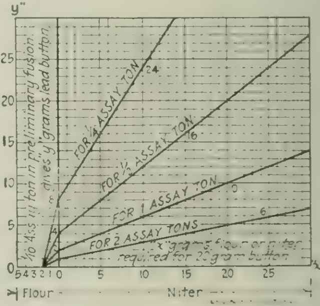
# Quick Calculation of Assay Charges

By R. E. Chase, Jr.[*]

After weighing the lead button from a preliminary fusion, an assayer will generally perform a mental calculation to arrive at the quantity of reducing or oxidizing agent required in the regular fusion. The busy assayer working on miscellaneous sulphide ores, making a number of preliminary fusions at a time, will find the accompanying diagram of considerable convenience. It should be posted in the balance case or on the wall nearby. He can then read off his flour or niter charges directly and check himself back and forth half a dozen times in less time than it would ordinarily take him to make one mental computation.



Handy Diagram for Assayers

The Y axis gives grams of lead button obtained when 1/10 assay ton of ore was used in the preliminary fusion. Grams of flour and niter required to produce a 20-gram button in the regular fusion are read off on the left and right of the zero point on the X axis.

Curves are drawn for regular fusions, using 1/4, 1/2, 1 and 2 assay tons of ore respectively. It is assumed that the flour has a reducing power of 10, and the niter an oxidizing power of four. For example, suppose that 1/10 a.t. of ore in the preliminary fusion reduces four grams of lead. Reading along on the fourth horizontal line from the bottom, we find that for a regular fusion of 1/4 a.t., one gram of flour will be required to reduce a 20-gram button. A 1/2-a.t. charge, however, would run "straight" (no flour or niter). Charges of 1 to 2 a.t. would require respectively 5 and 15 grams of niter.

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[*] 1309 N. Mullen St., Tacoma, Wash.

# Contract Systems in Michigan Copper Mines

Houghton Correspondence

*SYNOPSIS—Contract systems strictly are not binding, but they afford an incentive for increasing output per man by paying bonus for all work done over a stipulated amount, yet no man falling behind his contract fails to receive a living wage. Difficulties of making fair contracts to company and miner or tram-men are discussed. Scientific management applied as a measure of contract work.*

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Although the strike of the Michigan copper miners was undoubtedly agitated and called as part of the regular propaganda of organized labor, still the claim has been made that the reason for the apparent ease with which the Western Federation converted an entire and seemingly satisfied community to its ranks must be laid at the door of the cry for efficiency which for the last three years has been so loudly heard in the Copper Country. There is, of course, some justice in this claim: for leaving aside the undoubted benefits derived by the miners in the way of larger pay checks as the result of scientific innovations, the fact remains that the introduction of new contract, bonus and piece-work systems are always regarded with suspicion; that at first they benefit only the few; and that while these few probably see the advantages of such systems, still the rank and file is apt to be disgruntled; and this large number of somewhat disgruntled men, regarding their companies with suspicion, perhaps made fertile soil for the agitator from the union camps to cultivate. That the managers saw what effect such innovations would have on the men, there is every reason to believe, but they either misjudged the activity of the agitators, or discovered it too late, or else they decided that the changes must be made at all costs, come what may.

There are several distinct reasons why a definite, binding contract system cannot be applied to underground operations in the Copper Country. They are, first, one party in the contract, the laborer, is unable financially to enter into any arrangement as to pay, which would be binding, if he fell behind on the contract. In the Michigan copper country the large majority of laborers and miners have little money saved, a fact which the union agitators have emphasized strongly. To fall behind, therefore, on their contract, would mean hardship. That this state of affairs is recognized by the companies is evident from the fact that today nowhere in the Copper Country does a so called contract miner go home pay-day with less than a living wage, no matter if according to his contract, he has earned but half the amount.

Second, the nature of the underground operations is such as to render it impossible to fix a rigid contract price. In mining, the character of the ground is almost always variable. A given price per foot or fathom may be satisfactory for a few months, but the time comes when the miner is drilling in hard ground or coppery ground. Nobody knows how long this hard stretch of ground will last, and the miner must be assured of a living wage in the meantime. The company also must protect itself when the miner runs into soft ground. So there is need of some factor in the contract that can be juggled when the character of the ground varies. Contract tramming is still in the experimental stage in the Michigan copper mines. Although it has been tried on certain levels of a few of the mines, no one mine is as yet doing even half of its tramming on contract. The method of mining is such that the trammer does not always have a "good chance." Two Water-Leyner drills in a 9x6-ft. drift will break on an average about 11 tons per shift. This is about half a shift's work for a party of two trammers But the miners are in the habit of blasting, say nine cut-in holes, breaking perhaps six or seven tons, leaving a couple of the squaring holes for the next shift to fire when they have squared. The squaring holes break 15 or 16 tons. So the amount of ore in the drift usually varies, and one day the trammers have less than half a shift's work and the next perhaps more than half, but less than a full shift's work. When they are not tramming from the drift they will probably be sent to run ore from a chute. At this latter operation they should make from 15 to 35 tons per man per shift of 10 hours. So the "chance" which these trammers have varies from day to day, and is entirely beyond their control. Depending directly upon the number of holes drilled each shift by the miners, and on the "chance" to "run" a mill. The trammers who tram from chutes alone can make a consistent showing only when plenty of dirt is on hand to be taken from the chute every day. When such is the case a fair contract can be fixed. To equalize the "chance" and enable the captains to make a fixed tramming rate, certain Calumet & Hecla mines are making the experiment of shifting the trammers about from time to time, sending them first to one level and then another.

Third, the method of mining is often such that an incentive for the man to work fast and perhaps carelessly at some particular operation is detrimental to the effectiveness of the method as a whole. In a mine where stopes are worked on shrinkage, it is of importance that the broken copper rock be kept close up to the back to afford the miners a good chance to rig their machine and also, as in the case in some of the mines south of Portage Lake, to assure support for a bad hanging wall. A party of trammers on contract tramming from a chute under a stope in which miners are expected to work must not therefore "run" the chute, even if they have a good chance to make something on their contract by so doing. Similarly, a mine in which careful selecting of stoping ground and close picking of the broken rock are being done cannot very well put the stope miners or the pickers on contract. If this were done miners would want to bundle ahead with a big breast and would not try to avoid poor bars of ground. And the pickers would send up poor rock which should be discarded and left in the mine for fill.

## Contractors Never Receive Less Than a Living Wage

To overcome these various objections, every contract for sinking, drifting, stoping or tramming in the Copper Country mines has some factor in it which can be juggled. And the pay the contractor gets represents not what he has actually made according to the terms of his contract, but rather it represents a living wage plus an arbitrary bonus for the extra effort the contractor has put forth. But he never receives less than a living wage.

The tendency of late in some of the Calumet & Hecla mines has been to try to get down to a hard and fast contract system. In the early days supplies all had fictitious values; a box of powder for instance might cost as much as $30. Maps and records were not kept as accurately then as now, the mining captain and not the superintendent handled the contracts, and the variable factor in the contract was the elasticity of the captain's tape on measuring-up day. The late Captain Pollard of the Wolverine mine, where a so called contract system for stoping has been in vogue for many years, and successfully, invariably used his right forearm for all stope and drift measurements when he was afraid the miners had fallen behind on their contract or had made too much on it. In shaft sinking when the miners fell behind their contract for some reason beyond their control, they were usually given a bonus or extra for cutting plat or for helping the timbermen. Today, however, the tendency is to get away from these subterfuges and try to put things on a more definite basis.

### SCIENTIFIC MANAGEMENT TESTS

Several innovations in contract drifting were tried at the Superior mine some two years ago when it was necessary to do many thousand feet of development. This was at the time when the one-man machine was being introduced in the mines of Michigan. Accurate time records after the type described by F. W. Taylor in his books on scientific management were made on the drift miners. They were given a contract price with the understanding that it would not be cut. The form of contract was simple: it consisted merely in a given price per foot of small drift. The miners were not charged for any supplies. They were given all spare parts necessary, shovels, monkey-wrenches, oil, etc., the only limitation put upon them at all was in the matter of powder. Records of drifting when the miners had to pay an exorbitant price for a box of powder showed that good drifting could be done at that mine using only 8 lb. of 40% powder per foot of drift. So a penalty of 10c. per lb. was made which would be deducted from the contract price for every pound of powder over 10 that the miners used per foot of drift. That is, if the price according to contract was $1.80 per ft., if the miners used 11 lb. of powder per ft. in driving the drift, the contract price would be cut to $1.70 per ft. On the other hand no allowance was made to the miners for any great saving of powder. If they only used 6 lb. per ft. of drift the contract price remained the same. This proved a satisfactory system; but contract prices did finally have to be cut or boosted as the ground varied, and it was found necessary to raise the contract price and charge the miners cost for powder and for other supplies such as fuse, caps, wrenches and oil. Such a contract is what one finds generally in the Copper Country today. It is not, of course, any more binding than any of the contract schemes that have gone before it. At best it is merely a method of letting the miner understand that he will be paid for extra effort, and all the innovations made are schemes to measure that extra effort.

A contract system was worked out at one of the Calumet & Hecla subsidiary mines for stoping, which seems to have been successful. The miners work 24 shifts per month, or 48 shifts for the party, day and night. For the 48 shifts the company account rate is $3.25 per shift or the monthly wage is $78. For this pay they are supposed to break, using one Water-Leyner machine, 900 tons of rock per month. This is "company account" work. It amounts to 18¾ tons of rock broken per shift at a cost of 17⅓c. per ton. For every ton above 900 the miners get 10c. For instance, if the tramming record shows that the party has broken 1000 tons, or 100 tons more than company account standard, the miners get $10 extra pay or $5 per man. Thus these extra tons of rock cost the company 10c. each as against the company-account rate of 17⅓c. per ton. This is entirely fair, for the miners have the understanding that they will always receive at least $78. Supplies are not charged to the miners unless they exceed 7 or 8c. per ton. If the miner has used up 9c. worth of supplies per ton of rock broken he must pay the extra cent. If he has used up 10c. worth of supplies the captain has the right to pay him company account, $78, or possibly contract pay less 1c. per ton. Here again no allowance is made to the miner if his supply cost runs below 7c. per ton.

At the mines controlled by the Copper Range Consolidated Co., no attempt is made to set a definite contract price for the drifting. The vein varies greatly in width and as the miners must drift as wide as the copper goes there would be difficulty setting a rate either per foot or per ton. There is close supervision of all the operations in these mines whether the work is done on a company account or so called contract and from years of experience the drifters and other contract miners learned that extra effort on their part will mean extra pay, and, as in most of the mines in this district, the miner need never worry about going home with less than a living wage.

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## Major R. G. Leckie

### BY H. MORTIMER LAMB*

As briefly announced in a recent issue of the ENGINEERING AND MINING JOURNAL, Major Robert Gilmour Leckie, who may almost be described as the father of mining engineering in Canada, died at Sudbury, Ont., Nov. 5 last, in the 81st year of his age. Major Leckie was born in Renfrewshire, Scotland, Aug. 23, 1833. He came of fine old stock, being the representative of the ancient Stirlingshire family of Leckie of that Ilk. He was educated at the Glasgow High School and Glasgow Technical College. He went to Montreal at the age of 23, and for a time was associated there with a ship-building enterprise. Very shortly thereafter, however, he became interested in mining, first in the eastern townships of Quebec, and later in Nova Scotia. In the eastern townships he was associated with early copper-mining efforts, and also held an interest in nickel properties in the township of Orford, which were acquired subsequently by Boston capitalists, headed by W. E. C. Eustis, who organized a company first known as the Orford Nickel Co., then as the Orford Nickel & Copper Co., and finally as the Orford Copper Co., which again, after a lapse of time, was merged in the International Nickel Co. Major Leckie was for some time managing director of the Orford Nickel Co. In Nova Scotia he was associated with numerous coal and gold-mining enterprises, and about the year 1880, was responsible, in association with the late William Hedley, of Halifax, and Senator Senecal, of Montreal, for the consolidation of the coal companies operating in the neighborhood of Springhill, in Cumberland County, with the Springhill & Parrsborough Ry. Co., thus forming the Cumberland Ry. & Coal Co., of which he became managing director. Under his direction, this undertaking from modest beginnings presently grew to great importance, attaining an output of 500,000 tons of coal per annum. Again, during Major Leckie's régime at Springhill, the Provincial Workmen's Association—or coal miners' union—was organized in Nova Scotia, but, it is interesting to note, that although after his retirement there were at Springhill something like 23 strikes within a period of 21 years, no strike took place during his term of management, which was characterized by moderation combined with firmness. In 1890, Major Leckie became general manager of the Londonderry Iron Co., a post he held for three years. At this time he was also successful in consolidating the numerous smaller coal undertakings in Cumberland County, including the Joggins Mining Co. and the Milner, while the Joggins Ry. was also taken in, under the title of the Canada Coal & Ry. Co., now operating as the Maritime Coal, Power & Ry. Co. Before his departure from Nova Scotia in 1898, Major Leckie acquired the Torbrook iron mines, which he worked until they were purchased by the Messrs. Drummond, of Montreal. After leaving Torbrook, he acted in the capacity of examining engineer for Col. Robt. M. Thompson, of New York, and in this connection reported on nickel and other mines in New Caledonia, Norway, Sweden and Australia. He was also for many years consulting engineer at Sudbury for the Canadian Copper Co. Since his retirement from consulting practice his activities have been employed in acquiring and partially developing promising prospects in northern Ontario. Of these, at least one, a gold property at Long Lake, near Sudbury, has been placed on a productive basis, and having been acquired, is now being worked by the Canadian Exploration Co. with success.

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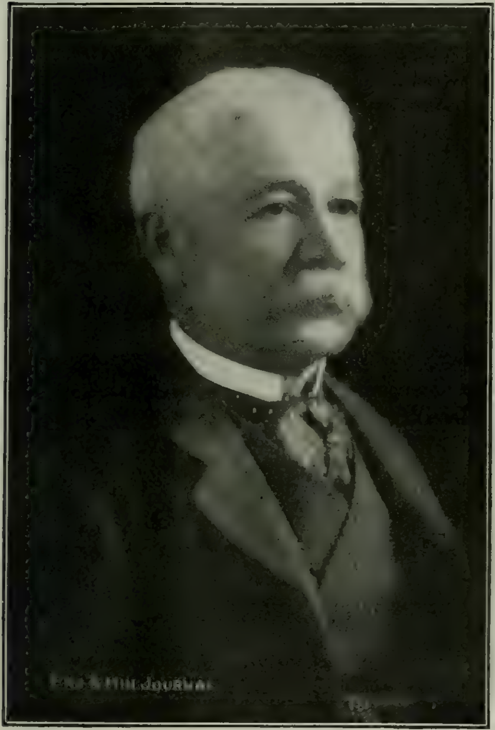
*Secretary Canadian Mining Institute



MAJOR J. G. LECKIE

This, then, is a brief outline of a long and honorable professional career. It merely suggests the energy and enterprise of him who is the subject of this sketch. But Major Leckie's activities and interests were not bounded by the limitations of his profession. He was public spirited to an eminent degree. He, in coöperation with Charles Fergie and John E. Hardman, was chiefly responsible for the organization of the Mining Society of Nova Scotia. He was the first president of the Federated Canadian Mining Institute, and a charter member of the Canadian Mining Institute, which was, as is well known, a reorganization of the former society. He joined the American Institute of Mining Engineers in 1879, and was a vice-president of that society in 1893-94. He took a great interest in military affairs, and during the Fenian Raid held a commission as lieutenant in a rifle company raised in the eastern townships at that time. In 1882 he was gazetted major in the 53d Battalion, with which regiment he remained for several years. He was an ardent Imperialist, a stalwart Conservative in politics, and a member of the Church of England. Last, but far from least, he was a sportsman to the core. Sport of every description, racing, hunting, fishing, cricket, curling, all held for him the greatest attraction, and he believed always "in playing the game." Only once in 20 years has he failed to be present at the annual meetings of the Canadian Mining Institute. Of these meetings, and more especially of "after-meetings," he was the life and soul, and despite his years, ever the youngest man there. He will be sorely missed, for as one of his oldest friends has just written to me: "Leckie's passing over to the majority leaves the world a less happy place for all his friends; but we are sure he will be waiting for us on the other side with a smile and a hearty handclasp."

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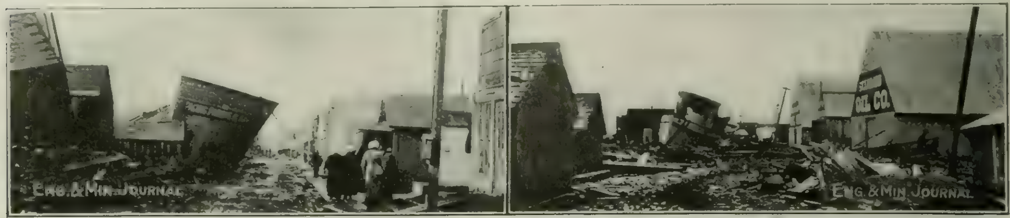
## Refining Copper with Cuprous Electrolytes

It has long been recognized that were it possible to use cuprous salts to make the baths in copper refineries, the power consumption would be reduced 50%. Such an electrolyte is claimed by George D. van Arsdale, of East Orange, N. J., to be composed of cuprous-ammonium sulphite (U. S. pat. 1,069,305).

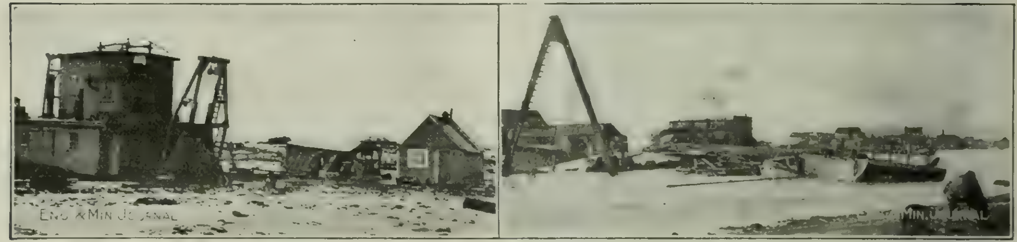
This cuprous-ammonium sulphite is made by making a copper-sulphate solution strongly ammonical, and then impregnating with sulphur dioxide, or by reducing with such reagents as phosphorous acid. This would apparently get around the insolubility of most cuprous salts, and by keeping an excess of $SO_2$ present, the reversion to cupric form could be prevented.

# PHOTOGRAPHS FROM THE FIELD



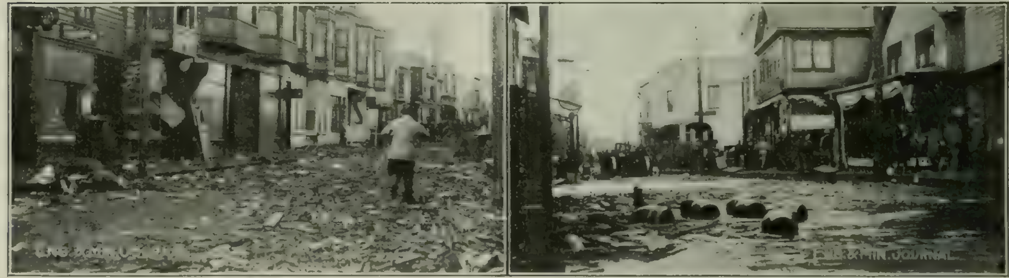
A Storm Practically Destroyed Nome, Alaska, Oct. 6, Wrecking 500 Buildings

The damage has been estimated at $1,500,000. The town of Soloman was destroyed by the same storm



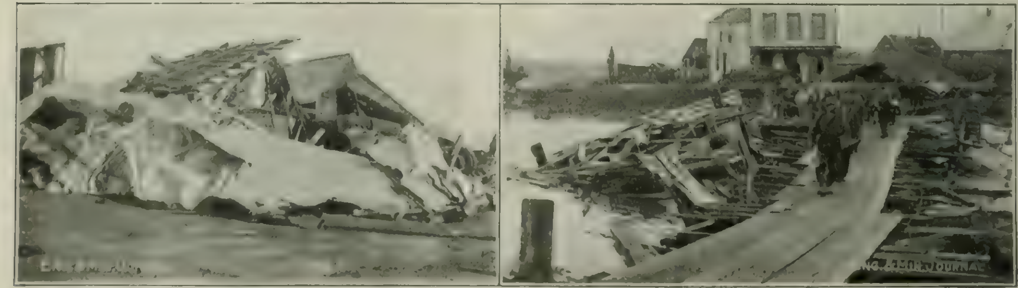
The Waterfront after the Storm, the Severest Ever Recorded at Nome

After a dry summer the storm was a climax to a discouraging season, production having been about half of normal.



The Main Streets of Nome after the Storm Had Passed

The Nome miners have petitioned Congress for a suspension of 1913 assessment work; many lost their homes and their mining outfits.



One of the Wrecked Buildings and Pontoon Bridge across Snake River at Nome

Four were killed in the storm. The steamers "Corwin" and "Victoria" managed to reach open sea and escaped damage

Plant at Anaconda, Where Charles S. Bradley Experimented in Leaching Copper Ores
A leaching process for copper ores is being sought by metallurgists in most of the principal copper-producing regions.

The Anaconda Company's Experimental Leaching Plant for Copper Ores
This plant is reckoned as being of 80 tons daily capacity.

Peck Experimental Centrifugal Concentrator for Copper Slimes, at Anaconda
Another Anaconda plant where a process for the recovery of fine copper minerals is being developed.

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MINING AND TREATMENT OF FELDSPAR AND KAOLIN IN THE SOUTHERN APPALACHIAN REGION. By A. S. Watts. Pp. 170, illus. Bull. 53, U. S. Bureau of Mines, Washington, D. C.

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PORTIONS OF ATLIN DISTRICT, BRITISH COLUMBIA: With Special Reference to Lode Mining. By D. D. Cairnes. Pp. 130, illus. Memoir 37, Canada Dept. of Mines, Geological Survey Branch, Ottawa.

SUMMARY REPORT OF THE MINES BRANCH OF THE DEPARTMENT OF MINES FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1912. Pp. 175, illus. Louis Coderre, Minister of Mines, Ottawa.

THE MINING AND QUARRY INDUSTRY OF NEW YORK STATE. Report of Operations and Production during 1912. By D. H. Newland, 5¾x9, pp. 114, paper. Bull. 166, N. Y. State Museum, Albany.

CYANIDATION IN THE MERCUR DISTRICT OF UTAH. By L. O. Howard. With introductory chapter by Don Maguire. 7x10¼, pp. 64, illus., paper; 50c. Reprinted from "Salt Lake Mining Review," October, 1913.

OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA FOR 1901-1912. No. 6, 1913. By G. H. Knibbs, Commonwealth Statistician, 6¼x9¾, pp. 1226, illus., board. Commonwealth Bureau of Census and Statistics, Melbourne, Australia.

THE GEOLOGY OF THE HUDSON RIVER AND ITS RELATION TO BRIDGES AND TUNNELS. By George F. Kunz, Reprinted from Appendix B of the Eighteenth Annual Report of the American Scenic and Historic Preservation Society, 1913. 5¾x9, pp. 454. J. B. Lyon Co., Albany, N. Y.

REPORT ON CONDITIONS OF EMPLOYMENT IN THE IRON AND STEEL INDUSTRY IN THE UNITED STATES. Vol. III: Working Conditions and the Relations of Employers and Employees: Vol. IV: Accidents and Accident Prevention. Pp. 594 plus 350, illus. Prepared under the direction of Charles P. Neill, Commissioner of Labor, Washington, D. C.

ANALYSES OF COALS IN THE UNITED STATES. With Descriptions of Mine and Field Samples Collected Between July 1, 1904, and June 30, 1910. By N. W. Lord, with chapters by J. A. Holmes, F. M. Stanton, A. C. Fieldner and Samuel Sanford. Part I—Analyses; Part II—Descriptions of Samples. Pp. 1199. Bull. 22, U. S. Bureau of Mines, Washington, D. C.

CYANIDE PRACTICE, 1910 TO 1913. Edited by M. W. von Bernewitz. 6x9, pp. 732, illus.; $3. Mining and Scientific Press, San Francisco, Calif.

A collection of articles on cyanide practice in general and in detail, which have been published in the "Mining and Scientific Press", between 1910 and 1913. It is the third book of its kind to be published.

CONVERSION TABLES OF FOREIGN WEIGHTS, MEASURES AND MONEYS. By John J. Macfarlane. 6x9, pp. 62, paper; 50c. Foreign Trade Bureau, Philadelphia Commercial Museum, Philadelphia.

This set of table is the best we have seen in its particular field. It gives the American equivalents of foreign weights, measures and moneys and vice versa.

AMERICAN RAILROAD ECONOMICS. By A. M. Sakolski. Pp. 295. $1.25. The Macmillan Co., New York.

A sound and concise presentation of a complicated subject, which ought to be studied by legislators who contemplate engaging in railway legislation Also a useful and interesting book for people in general.

THE GYPSUM AND SALT OF OKLAHOMA. By L. C. Snider 6x9¾, pp. 214, illus. Bull. 11, Oklahoma Geological Survey, Norman.

Contents General consideration of gypsum, the manufacture of gypsum products gypsum products and their uses, geology of the gypsum-bearing area of Oklahoma, nature occurrence and development of the gypsum of Oklahoma, and the salt resources of Oklahoma.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES. 7½x10, pp 1666, cloth $10 S E Hendricks Co., New York.

The twenty-second annual edition of this directory has been revised and enlarged and now contains about 437 pages of new matter. Its aim is to furnish complete classified lists of manufacturers in the various industries and trades, including mining, for the benefit of both buyers and sellers. A complete and simplified index adds to the value of the work as a reference book.

THE IRON ORES OF MISSOURI. By G. W. Crane, 6½x10, cloth; pp. 434, illus. H. A. Buehler, State Geologist, Rolla, Mo.

Contents: History, development and production of Missouri iron ores; the ores of iron, factors controlling their value; physiography of the iron-bearing region; geology; brown ores; the hematites of the filled sinks; specular hematite in porphyry; iron ores of the Carboniferous and Silurian; descriptions of known deposits of iron ore; table of analyses, indexes.

GOLD DREDGING. By T. C. Earl. 5½x9, pp. 208, illus.; 20s. E. & F. N. Spon, Ltd., London, Eng.

This is an interesting little book by a man who has evidently had some experience in the subject whereof he writes. It is not exhaustive and does not go deeply into the engineering features, but it is not in any way an undigested compilation of articles from the magazines and newspapers. Its illustrations comprise a very interesting collection of photographs from many out of the way places, and there are a lot of good statistical tables. It is a book that is worth the while of those who are interested in its subject.

OUTLINES OF MINERALOGY. By Grenville A. J. Cole. 5x7½, pp. 339, illus.; $1.60. Longmans, Green & Co., London, Eng.

This is the latest addition to the already long list of mineralogies. The author is professor of geology in the Royal College of Science for Ireland. His idea in this book was to treat minerals as constituents of the earth, and it is thus intended primarily for geologists. It is strong in its presentation of the physical properties of minerals and is sketchy on the purely descriptive side. We note with interest and approval that the author has relinquished the name "calamine" to the metallurgists to whom it belonged originally, and calls the carbonate of zinc "smithsonite" and the hydrous silicate "hemimorphite" as proposed by Ingalls 15 years ago. If all mineralogists had been so rational some costly litigation might have been avoided.

GEOLOGISCHE DIFFUSIONEN. By Raphael Ed. Liesegang. 6¼x9¼, pp. 180, illus., paper, 5 marks; cloth, 6 marks. Theodor Steinkopf, Dresden and Leipzig.

The special study of colloids has now developed to such a degree that the author finds not a few points in which its results are of importance in geology. Artificial colloids such as gelatin and albumen have furnished the materials for interesting and important experiments. Pigments, for example, such as silver salts when precipitated under the proper conditions afford a so called "rhythmic" pattern of concentric colored bands not unlike Newtons rings. They remind one strongly of agates, whose possible deviation from gelatinous silica will at once come to mind; of concentric patterns produced in weathering and to a small degree of bonded veins. The author attacks all these and a number of other geologic matters, and endeavors by his experiments with colloids to throw light upon them. The experiments are significant and well merit the attention of geologists who are interested in these and related phenomena.

GOLD, PRICES AND WAGES. By J. A. Hobson. Pp. 181 illus. $1.25 Methuen & Co., Ltd., London; George H. Doran Co., New York.

This book is largely an examination of the quantity theory of money, and we may say at once is a rejection of it, at least in the form commonly held and expounded, but of course not, as the author says, of the "sense in which the so called quantity theory is a simple, self-evident proposition," which admits no question, requires no exposition, and neither raises nor solves any problem. Mr. Hobson in a preface of six pages concisely summarizes his arguments, with the unique idea that "busy readers may make up their minds, before starting, whether it is worth while to follow his line of reasoning."

We can assure every one interested in the subject that it is worth while, Mr. Hobson's reasoning and arguments being clear and scholarly, and of a character that the exponents of the quantity theory will find it hard to controvert. In other words, Mr. Hobson does not attribute increasing prices for commodities to the increase in gold production, but assigns other reasons, which is the side of the question that we have taken since many years The British and French economists lean this way more than do the American Mr Hobson illuminates not only this but also some of the other great economic problems of the day that are closely associated with it. In many respects his ideas are ingenious and novel.

# CORRESPONDENCE AND DISCUSSION

## The Parral Agitator

In the Journal of Nov. 29, 1913, there appeared under the heading "Argo Mill, Idaho Springs, Colo.," an article by J. V. N. Dorr in which the flow-sheet of the mill is described. The following reference made in this article to the Parral tank I consider misleading:

> The underflow from Dorr A goes to the first agitator, which is a 20x12-ft. Dorr machine and not a Card table No. 1, as shown. The other agitator is a Parral which is causing a lot of trouble on account of the continual building up of the solids. The overflow from the Parral passes to Dorr No. 1 (thickener).

That the readers of the Journal may be informed about the above statement I will submit what the manager of the mill writes concerning the operation of the Parral tank in this mill. And, by way of preface, I wish to give certain facts that will explain the conditions.

The apparatus of the Parral tank in question was sold the Argo Reduction & Ore Purchasing Co. for its mill by the Denver Engineering Works. The apparatus was of the general design made for the agitation of the slime pulp of ordinary quartzose ores after concentration. I was, at that time, in a district in Mexico between which and the United States mail communication had been severed since last March, and in consequence I had been out of touch with the installation of the tank or its operation until my return to the United States early in the fall. On Sept. 28 last, I opened communication with Arthur A. Roller, manager of the mill, inquiring about the service of the tank. To my letter Mr. Roller very frankly replied under date of Oct. 21, as follows:

> Your favor of Sept. 28th at hand. One 12x20 Parral tank has been in operation now for about six months. It is working on a continuous-agitation basis, 20-lb. air pressure, tube-mill product showing a screen analysis as follows:

| | Per Cent. |
|---|---|
| On 100 mesh | 3.97 |
| On 150 mesh | 9.10 |
| On 200 mesh | 11.43 |
| Through 200 mesh | 75.14 |
| Total | 99.64 |

> We had no trouble in keeping the tank going and after shut downs of 8 to 12 hr. with the air off have started within a couple of hours. But the tank has been gradually filling up with packed slime at points between the four 8-in. air lifts. * * * * I forgot to state that we are treating a heavily mineralized ore, one which concentrates five tons into one, and although we concentrate out considerable of the mineral ahead of the agitators, the slime pulp still contains lots of mineral.

Though the tank had been treating heavily mineralized slime for six months and after various shutdowns from 8 to 12 hr. was "gradually filling up at points between the four 8-in. air pipes" is not so bad. Here is an extract of a letter which I happen to have at hand from James I. Long, manager of the Pamilla Mill, at Parral.

> We have had, as you know, a great deal of trouble with agitation in those tanks that used the rubber sleeves originally provided with them. The sleeves soon became slack and allowed the compressed-air pipe to fill with the fine sand which caused no end of trouble, and, as we had no trouble with your valves under trial we ordered a complete outfit of them to replace the rubber sleeves, and since that time all troubles with the agitation in the Parral tanks have been eliminated.

But had the tank and the Parral apparatus installed in it at the Argo mill been designed for the heavily mineralized pulp which the mill, as a custom plant, is called upon to treat, there would have been no filling up.

Bernard MacDonald.

South Pasadena, Calif., Dec. 5, 1913.

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## Economical Fine Grinding in Pans

In an article on this subject by M. G. F. Söhnlein, the author describes some recent experiments in fine grinding with pans as a substitute for tube mills. He states that while his 5-ft. pan working under the conditions required when used as an amalgamating device, had a grinding capacity of only 2½ tons per 24 hr. ground to +150 mesh, by providing it with a forced central-feeding arrangement he was enabled to increase the grinding capacity of the pan to 30 tons per 24 hr. ground to —200 mesh at a cost of about 30c. per ton. He proves, I infer, that so far as installation and operating costs are concerned, the grinding pan is much cheaper and better as a fine-comminuting machine than the tube mill, provided the iron wear of shoes and dies of pan does not interfere with subsequent treatment.

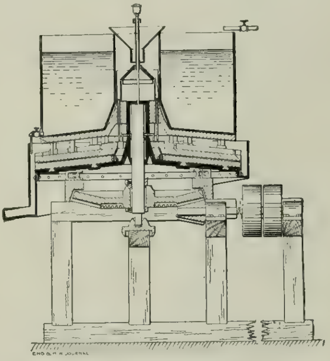
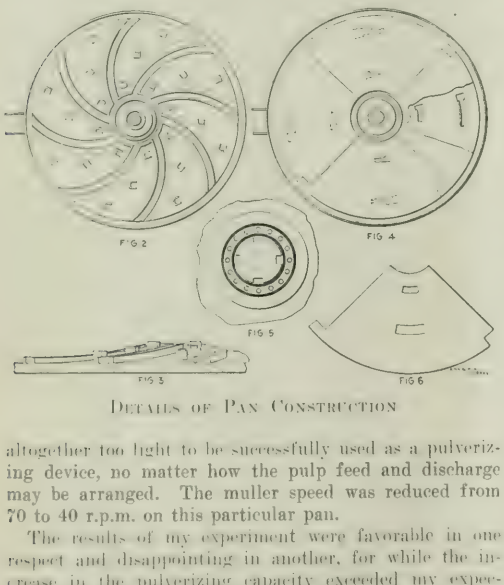


Fig. 1. Fine-Grinding Pan

Being, perhaps, as vitally interested in the subject of pan or muller-grinding devices as any one, I feel it incumbent on me, since reading Mr. Söhnlein's description and seeing the drawing of his forced central-feeding device to state that in the spring of 1880, while superintendent of the pan-amalgamating mill of the Silver Cliff Mining Co., at Silver Cliff, Colo., I experimented with a central-feed arrangement, almost identical with the one shown and described by Mr. Söhnlein, and succeeded in increasing the grinding capacity of a 4½-ft. cone-bottomed pan, grinding from 30-mesh screen, pulp to pass 100 mesh, from an estimated hourly capacity of ½ ton to approximately 10 tons per hr., or a capacity equal to that of the whole 20 pans in the mill under the old feed conditions.

The only respect in which my feed arrangement differed from that of Mr. Söhnlein was that I closed the outer ends of the channels between the shoes so that no particles of pulp could be thrown out by centrifugal force before being ground by shoe and die. My method of operating both feed and discharge was altogether different from that used by Mr. Söhnlein. I completely closed every space in the muller spider and shoe-ring so that all the pulp had to pass between the shoe and die to the periphery of the grinding surface, and discharge thence downward to the mercury channels in bottom of pan and out through the plug-hole into an idle settler. From this point it was shoveled, after being partially dewatered, into another pan for amalgamation. The sides of the pan were not used at all in the grinding operation, for the objects were not only a positive, direct feed but an equally positive, unobstructed discharge of ground material, the latter an impossibility where the overflow discharge idea is used. Furthermore, instead of grinding a pulp consisting of 48% solids, my pulp probably contained less than 15% solids, as I used all the water that would pass through between the shoe and die while grinding, in order to flush out all the ground pulp as rapidly as possible. I also loaded the muller with 1500 lb. weight of old shoes and dies because the ordinary pan muller is altogether too light to be successfully used as a pulverizing device, no matter how the pulp feed and discharge may be arranged. The muller speed was reduced from 70 to 40 r.p.m. on this particular pan.



Details of Pan Construction

The results of my experiment were favorable in one respect and disappointing in another, for while the increase in the pulverizing capacity exceeded my expectations many fold, we were no better off so far as our extraction was concerned, for we then discovered that 20% of the silver was held in a complex mineral, and the ore was too low in grade to bear the expense of a chloridizing roast to render the silver amalgamable.

To this day I have no very definite knowledge of the power expended in driving the muller with its extra weight during the experiment, having then had no further concern in that regard than to wonder if, after reducing the speed and more than doubling the weight of the muller, an 8-in. belt traveling about 600 ft. per min. and driving a gear train having a ratio of 1 : 4, would turn the muller when grinding the sands, but as the belt did the work without a slip, I am quite certain that it could not transmit more than 10 hp. under the conditions.

At that time the pulverization of ores to a greater degree of fineness than 40 mesh was confined to a few silver-amalgamating mills in this and foreign countries and half a dozen gold mills in Gilpin and Clear Creek Counties, Colo., consequently my muller grinding device was of no value to me except as a distant future possibility.

When fine grinding in mill practice had gained such headway, I applied for a U. S. patent completely covering the central pulp-feed and direct-discharge ideas as applied to muller grinding, and on Dec. 7, 1909, U. S. patent No. 942,424 was granted me. The accompanying illustrations will show that, while I have taken the pan muller as my basic idea for grinding, I have evolved from it a grinding mill which, except as to arrangement of driving gear, has not a feature in common with a pan of any description whatsoever, being both in design and in action as distinct a departure from any kind or style of grinding pan as is possible to conceive. The annular tank shown on top of the shoe-driving disk in Fig. 1 is removable and intended solely to receive dripping water to compensate for loss of shoe weight by wear—to keep the weight constant while the shoe is being worn away. The only thing that has prevented my placing this mill on the market even before receipt of patent is the excessive iron wear in a mill of its grinding capacity, justly deemed by cyanide authorities a serious objection to muller-grinding mills.

I am again inspired with the hope, however, of doing something with my regrinding mill, for in the Journal of Apr. 12, 1913, a magnetic device for the separation of fine iron from mill pulps was shown and described, which, if the claims of the inventor are verified, will render mills of the pan-type competitors to be reckoned with by tube-mill manufacturers.

In conclusion, I desire to suggest to Mr. Söhnlein, through the Journal, that he might use some of my ideas to his advantage in his mill. He is perfectly welcome to them for such use so far as I am concerned, for any benefit he may derive from them should help me indirectly.

E. E. Wann.

Los Angeles, Calif., Oct. 7, 1913.

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## Grinding Ores for Cyanidation—II

In the cost data on grinding, published in Table VII, page 921, the cost of breaking given for the Independence mill includes also sorting. Breaking alone amounted to 12c. per ton. The figure given for grinding, 52.17c., includes concentration in addition to roll and chilean-mill reduction. It is a department cost, taking in tube milling the middlings from concentration tables and pumping sands and slimes to the cyanide department. Corresponding data for the year ended June 30, 1913, is: Breaking and sorting, 17.35c., and crushing and concentrating, 42.46c. per ton. Sorting cost about $0.064, leaving the amount chargeable to breaking about $0.109 per ton milled. This shows a low cost for both sorting and breaking.

A. A. Nason.

New York, Dec. 9, 1913.

# EDITORIALS

## The Position in Silver

The price of silver, which was fairly steady during the early half of the year, and which in October ranged between 61 and 62c. in New York, began to fall after that time, and has since experienced a serious decline. The first recessions were apparently due to reports of insufficient rains and the consequent prospect of short crops in India, but a more potent cause was a certain uneasiness felt as to the general financial condition in that country.

That this uneasiness was well founded has been shown by the failure late in November of the Indian Specie Bank of Bombay, a large institution, mainly under the management of Indian capitalists. This bank had been the main stay of the great speculation which has dominated the silver market for over two years, and which for the most part of that time, appeared to be successful. The burden of carrying the large stocks of silver necessary to the success of that speculative movement proved too heavy in the end, however, and the whole affair broke down. The consequence was a break in prices, and on Dec. 1, the metal reached its lowest point at 56⅛c., in New York, although there was a subsequent rally of about 1½c. and the price now stands between 57 and 58c., with an apparent probability that it will continue around that level.

The failure of the Indian Specie Bank was followed almost immediately by the sudden death of its managing director, and in the proceedings following the closing of its doors, it was brought out that in addition to stocks in Bombay, the bank was carrying silver to the amount of over £3,000,000 in London, and a demand for more margin on this was one of the moving causes of the suspension.

The speculation seems to have failed, partly because the stocks became too heavy to be carried, but mainly because of the finesse of the financial agents of the Indian government, who succeeded last summer—as we noted at the time—in securing from other sources, and at a moderate price, the supplies of silver which were needed for coinage. It was this demand and the possibility of being able to exact high prices from the government, which had made the speculators so persistent. The situation was a serious one, and there was a prospect of a general break which might have carried the metal down to 55c. or even below. The news comes from London, however, that the silver stocks referred to, together with some of the contracts of the Indian speculators, have been taken over by a syndicate which is strong enough to carry them for the present and until a more settled condition of the market is reached.

Another point which affected the position has been the long delay in the settlement of affairs in China. It was expected that the new government of that country would be able to secure a substantial loan and to undertake the reorganization of the currency which has been proposed and planned for some time. This reorganization would have required the purchase of a large amount of silver, but it has been long delayed. Moreover, the position in China is such that it is quite uncertain when the work can be undertaken. Purchases of the metal from that country have been rather light, and in fact Chinese bankers have been selling more or less silver to India to meet the current demand, which, of course, has acted unfavorably on the London market. At the present time, it is a difficult matter to say when the Chinese demand will revive.

Upon the whole, it is probable that the silver market will be quiet and rather depressed for some time to come. Gold shipments to India for several months past have been lighter than they were a year ago, and this is to some extent an encouragement for sellers of silver, but the position, apparently, will not show much improvement for several months.

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## The Coming Gold Camp

Unless a long list of our most experienced engineers have committed an error of judgment, the Gastineau district of Alaska, including the mines of Treadwell Island on one side of the Gastineau channel, and those adjacent to the town of Juneau; on the opposite side of the channel is destined to become, during the next five years, the most important gold-mining district of America. The mines of Treadwell Island have been for many years producing about $3,500,000 in gold per annum, and without doubt will continue to do so for many years to come. Around Juneau there is now being developed a deposit of gold ore which, in point of tonnage, probably exceeds anything else that is known in the world, except perhaps the Rand. Several mines are now being developed, these including the Perseverance, Juneau and Ebner. For the Perseverance and Juneau stamp mills are already in course of erection. It is contemplated that the Alaska-Gastineau Mining Co. (Perseverance mine) will eventually mine and mill 20,000 tons of ore per day, the Alaska-Juneau about 12,000, the Ebner about 8000, a total of 40,000 tons per day, or say 12,000,000 tons per annum. It is expected that this ore will yield about $1.50 per ton. If this estimate be borne out, we shall have a new production of $18,000,000 per annum, or nearly 20% of the total gold production of the United States at the present time.

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## "Standard" Copper

A correspondent inquires of us, "What is 'standard' copper, which is quoted regularly in the newspapers, and appears to have something to do with the New York Metal Exchange?" He adds that he knows what standard copper is in the London market.

Standard copper, in American parlance, means about the same thing as in London, or is so intended to mean, but there is the difference that in London there is a big speculative trade in standard warrants, i.e., certificates, while in the New York Metal Exchange there is scarcely any worth mentioning.

It is a great many years since any important business, except in tin, has been done on the New York Metal Exchange. The organization owns a valuable piece of property which causes many of the metal houses to maintain their membership, but in late years it has been scarcely more than a statistical bureau. A few years ago an effort was made to revive the affairs of the Exchange by the inauguration of speculative trading in "standard" copper, after the fashion of the London market, but no attempt ever fell flatter. This was a disappointment to the brokers and dealers, who hoped to see some business developed in the exchange, but the important interests refused to be represented there, and such speculative business in "standard" copper as there is continues to be executed through the London market.

Some few small brokers and dealers frequent the New York Metal Exchange and go through the form of offering and bidding for some trifling quantities of something or other, which, in the case of "standard" copper, is apt to result in a quotation of something like 15½c. offered, 14½c. bid, no sales, and 15c. named as settling price, which is apparently what is telegraphed to the newspapers. In the American market, "standard" copper does not mean anything of consequence; nor do quotations of it.

## Notes on Mine Valuation

This subject, so frequently discussed, is no doubt one of the most important branches of the mining engineer's profession and particularly so to those who specialize along its lines. Obviously the value of a mine depends primarily upon the ore contained in it. The first step to arrive at a conclusion is, consequently, a careful sampling of all the ore exposed in the mine. Inasmuch as the value of the mine depends so largely upon this sampling and the interpretation of the results obtained, it surely ought to be done by a capable and reliable man. Of course, it is not necessary for him to perform the actual manual labor, which is largely mechanical and can be done by anyone strong enough to wield a pick or a hammer and maul. The general plan of sampling and the specific way of taking each separate sample, the notations of the appearance of the vein or deposit where each sample is taken and all observations, geological and otherwise, necessary to arrive at an intelligent conclusion, should be done, however, by a man of experience. The final interpretation of results thus obtained may then be successfully made by an engineer who has never seen the property but is familiar with the characteristics of the district.

It is quite often the case, that a property sampled in one way is shown to be of no value whatever, whereas, if sampled differently, a good margin of profit is exhibited. There are several reasons for this, which two examples will illustrate. In one case the cross-sections of the vein taken were too wide and in consequence, the average assays were too low to admit of mining and treating at a profit. The chief value was found to be in a small streak in the large vein and when this streak was mined and milled separately a good profit was obtained.

In another case, the ore was in a wide brecciated zone and the fines carried the "mineral," while the coarse material was barren. A general sampling of the whole indicated a grade of ore too low for successful treatment. Later on, by mining all of the material, screening out the coarse (which was returned for filling) and milling the fines, a dividend-paying mine was developed.

Now suppose that in either or both of these cases, the sampling had been done by a man of but little experience and the results given to an experienced engineer to pass upon, with no further data at hand, probably the properties would be turned down. However, in the present condition of the mining industry such instances are becoming rare. As a general rule examinations of mines are now made by engineers of experience. They may differ in their general conclusions, but 99 times out of 100, it will be for some other reason than a variation in sampling.

Undoubtedly, it is easier to determine the value of a developed mine than correctly to "size up" a partially developed mine or a "prospect," which is necessarily a matter of judgment and experience in the main. The old saying, that "one man cannot see any farther into the ground than another," in a practical sense is not true. The man who has spent a life time in working, developing and examining mines and prospects all over the world, can certainly surmise better what is under the surface, than can a carpenter, a lawyer or an aviator. Most of the big mines of the world had the "ear-marks" before they were prospected and it surely requires judgment and experience to recognize and correlate the "ear-marks." The engineer who can do that has a very valuable asset.

A knowledge of the district and the character of its mines and ores is essential and for this reason it is often advisable to obtain a local engineer of good reputation to make a report on a mine in his district, the conditions of which he knows. At the present time, however, this is not of so much importance. But few new districts have been opened in the recent years and the older districts have been so carefully examined and described, that they are familiar to most of the engineers of experience. Certain general characteristics are common to the several mines of the same district and do not apply to the mines of another district, so that results deduced from the assay and geological maps must be influenced more or less by these facts. A failure to recognize this condition often results in the turning down of properties that do not look favorable from an inspection of the maps and even after a complete examination. A number of valuable mines both in Tonopah and Goldfield were rejected by supposedly competent engineers, simply for the reason that they were not familiar with the characteristics of the orebodies in the Tertiary eruptives of the mineral zone east of the Sierras. There has never been a time in the history of the Goldfield Consolidated when a correct estimation of ore and ore reserves could be made from assay plans. An assay across a breast might run $2 today and $2000 tomorrow. The ore-shoots were irregular, both in size and assay, and were encountered where least expected and were not found where expected. An examination at any time by an engineer who did not take into account these characteristics would show a great underestimation of its value. It is experience that counts in mine valuation, and more especially in prospect valuation, rather than mechanical sampling of exposed ore faces.

## BY THE WAY

Brainerd, Minnesota, is undecided in its mind as to whether it most desires to be known as the metropolis of the Cuyuna iron range or as the home of "Bullet Joe" Bush and "Chief" Bender, erstwhile Giantkillers.

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This story is told of a "hill billy," in one of the southeastern Missouri lead-mining towns. A street orator was lecturing on the white-slave question. One night as the shift was coming off, they were talking about the lecture. The hill billy listened and finally asked, "What is all that air doin' at the corner?" Someone replied that the man was lecturing on "white slaves." The hill billy became very enthusiastic and said, "Well, it's about time somebody started somethin' to git more wages fer us fellers."

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A few months ago we heard in certain quarters much talk about the probable imports of pig iron from China in the event of a reduction of the tariff. American blast furnaces were to be swamped by the flood of iron made by Chinese cheap labor. The trade is now bracing itself to resist this flood, which in the eight months ended Aug. 31 reached the enormous total of 50 tons, or no less than 0.000002% of our domestic production. Nor does the flood seem likely to increase, for a recent consular report gives the price of Hanyang foundry iron at furnace at 33.50 Hankow taels, equal to $22.50 per ton—more than double the price Alabama furnaces are quoting.

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This may be a new one to some of our readers: Enter to the only drink dispensary in the dusty Southwestern town, an engineer on an examination trip. A small crowd surrounds a happy-looking prospector who is setting them up. One man informs our engineer, "Jim just struck the thin edge of an orebody on his Red Mountain prospect today, and he's feeling mighty good." Then follows an introduction to Jim, who declares with emphasis, "Yes, sir, I am within just three feet of a million dollars." A year later, happening into camp again, our engineer encounters Jim, sitting dejectedly on a bench in front of the same dispensary. After a drink, in reply to an inquiry about the great orebody, Jim states with sad emphasis, "Partner, I'm a million feet from three dollars."

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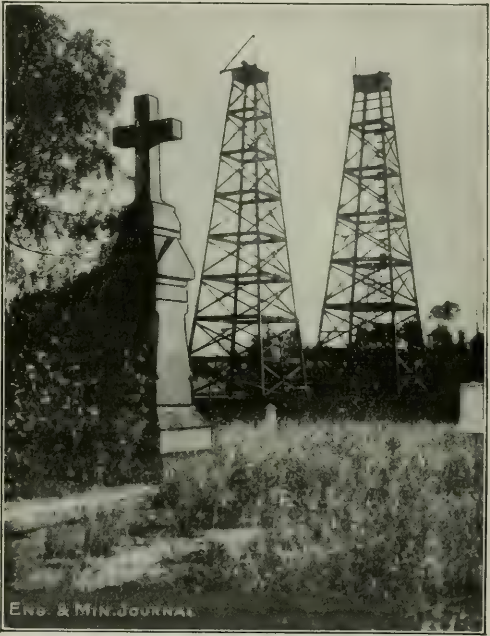
There are various methods of attacking the problem of decreasing underground accidents, and the attainment of relatively safe conditions depends largely upon the existence of a real desire and an earnest effort to that end. It would be hard, however, to find a more effective way than that adopted by E. P. Clonan, manager of the Port Henry Iron Ore Co., at Mineville, N. Y. Mr. Clonan follows the simple plan of being himself his own foreman. He makes it a practice to go underground with the men in the morning and stay under the entire shift. He personally inspects conditions of the working places and removes sources of possible danger. The inevitable result is that the mine has made a remarkable record for safety; it has been years since there was a death from accident underground, and this is in the face of the fact that conditions are inherently dangerous, the magnetite which forms the ore being mined out in great chambers with occasional pillars, leaving the backs far above the men and quite invisible. The technical and business details of mine management Mr. Clonan considers secondary to the welfare of his miners and delegates them to his subordinates. The only real obstacle we can see to the extensive application of this idea is that to make it effective, the manager must himself be a first-class and well trained miner.

⁂

Oil wells and tombstones are found side by side in the city of Los Angeles, where a rich oil deposit underlies the city of the dead. The derricks are built as close to the tombs as possible, though, of course, they are not permitted to encroach upon the sacred precincts. The wells have been producing steadily for years and the foundations of great fortunes were laid in this Los Angeles oil field.



Oil Wells By the Cemetery, Los Angeles

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The new Michigan compensation law for injured workmen provides that if an agreement cannot be reached between employer and employee as to the amount of compensation, the matter shall be settled by a board of arbitration, consisting of three members, one to be appointed by the state board of commissioners and one by each of the parties to the controversy. In a recent case at Iron River the Spring Valley Iron Co. appointed their attorney, the board of commissioners sent their chairman, and Charles Matson, the injured miner, who had lost an eye in the Zimmerman mine, selected a woman, Mrs. Lydia Kovala, to put up an argument in his favor.

## PERSONALS

Philip Argall, of Denver, Colo., has been visiting in New York.

Leo von Rosenberg, of New York, is in the Ray district in Arizona.

Edwin J. Collins has returned to Duluth, Minn., from a two weeks' trip to Montana and Utah.

Walter G. Perkins spent a few days in New York last week on his way from Chosen to London.

J. F. B. Erdletts, Jr., of 341 Salisbury House, London, is in Austria Hungary on professional business.

H. DeWitt Smith who has been examining placers in Santo Domingo has returned to New York.

Dr. William B. Phillips, head of the University Geological Survey of Texas, has been visiting New York.

Ott F. Heizer is now general manager of the Argo Reduction & Ore Purchasing Co., at Idaho Springs, Colorado.

Dwight E. Woodbridge, of Duluth, Minn., has been in the Monte Cristo district in Washington. He expects to spend part of the winter examining iron ore deposits in New York.

President E. P. Earle of the Nipissing mine, and David Fasken, a director, both of whom are also on the directorate of the Caribou-Cobalt, have returned from a visit of inspection to the Cobalt camp.

Francis G. Fabian and Harry E. Hall have formed a partnership under the firm name of Fabian & Hall, to engage in general mining and consulting engineering, with offices at 220 West 42nd Street, New York.

Mining Commissioner T. E. Godson, of Ontario, will go to Cobalt on Dec. 18 to make a personal inspection of Cobalt Lake before deciding to grant the application of the Cobalt Lake Mining Co. for permission to drain the lake.

Miss Eva Endurance Hurdler, a member of the Missouri Geological Survey and a graduated mining engineer is to wed Frank C. Greene, of New Albany, Ind., geologist for the Missouri Survey, on Dec. 18, and then quit her profession.

M. Stephan, operating manager of the Cie. des Forges & Acieries Electriques, Ugine, Savoie, France, who has been in this country for several weeks on business pertaining to the Girod electric furnace, sailed for Europe Nov. 13 on the "Olympic."

The S. W. Clawson collection of Bisbee copper ores was opened for public inspection by the Chamber of Mines & Oil at Los Angeles, Calif., Dec. 11. The fine specimens were bought for the mining exhibit by Thomas Thorkildsen and J. O. Royer and the cabinet containing them was secured by the generosity of J. Ross Clark and Seeley W. Mudd.

Sir Lionel Phillips, one of the best known mine owners in South Africa, was attacked at Johannesburg, Dec. 11, by a Dutch storekeeper named Nissun, and received three bullet wounds. His condition is said to be good and he is on the way to recovery. Sir Lionel was closely associated with Cecil Rhodes and Alfred Beit in the early days of the Transvaal, and has been, for a number of years, the Johannesburg partner of the house of Wernher, Beit & Co. In the troubles of 1896, he was sentenced to death at Pretoria, together with Colonel Frank Rhodes, George P. Farrar and John Hays Hammond, the sentences being later commuted to fines and banishment.

## SOCIETIES

**New Mexico School of Mines**—The faculty and senior class were entertained by C. T. Brown recently with a smoker at which Dr. F. L. Nason, chief geologist for the New Jersey Zinc Co., gave a talk on the zinc deposits of Mine Hill and Sterling Hill in New Jersey.

**American Museum of Safety**—The first International Exposition of Safety and Sanitation began in New York, Dec. 11, at the Grand Central Palace, Lexington Avenue and 46th Street. A number of large companies have exhibits there, including the United States Steel Corporation.

**Sheffield University, England**—The head of the Applied Science Department, Professor Arnold, recently indicated the policy to be adopted at the new non-ferrous department which has been built in St. George's Square at a cost of £45,-000. He said there would be two sections. One would be the basic metal section, where the melting work, analysis, and thermal testing of the various non-ferrous alloys would be done. The other section would be for plating. It was proposed to award science certificates which would carry a rank similar to that of the present associateship in ferrous metallurgy. A new departure was the formation of the University Metallurgical Club, which would be a metallurgical council of war for the Sheffield silver and steel trades.

**New York Academy of Sciences**—At the 96th annual meeting held in New York Dec. 15, the following officers were elected for the ensuing year: President, George F. Kunz; vice-presidents, Charles P. Berkey, Raymond C. Osburn, Charles Baskerville, and Clark Wissler; corresponding secretary, Henry E. Crampton; recording secretary, Edmund Otis Hovey; treasurer, Henry L. Doherty; librarian, Ralph W. Tower; editor, Edmund Otis Hovey; councilors (1914-1915), Wallace Goold Levison and Marshal A. Howe; members of finance committee, Emerson McMillin, Frederick S. Lee and John Tatlock. The meeting room of the Academy of Sciences is in the American Museum of Natural History, in the joint library of both institutions. To the honorary membership, limited to 100, two new members were elected: Dr. Charles Déperet, professor of geology at the University of Lyons, France, proposed by Prof. James F. Kemp of Columbia University and Sir David Prain, director of the Kew Botanical Gardens, England, proposed by Prof. Nathaniel Lord Britton, director of the New York Botanical Garden.

## OBITUARY

William F. Crane died at Montclair, N. J., Dec. 14, aged 57 years. He was controller of Phelps, Dodge & Co., and had been connected with that company for a number of years.

William Sydney Myton died in New York, Dec. 9, aged 70 years. He had been an operator in mining property for over 40 years, and owned interests in a number of mines in Colorado.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ROASTING—Process of Roasting Fine Ores. Wilhelm Buddëus, Wiesbaden, Germany, assignor to John Dern, Salt Lake City, Utah. (U. S. No. 1,079,897; Nov. 25, 1913.)

SINTERING—Improvements in Apparatus for Sintering Ores. J. E. Greenawalt, Denver, Colo. (Brit. No. 10,249 of 1913.)

PHOSPHATE—Method of Manufacturing Double Superphosphate. Thomas Leopold Willson and Maximilian Mattheus Haff, Ottawa, Ont.; said Haff assignor to said Willson. (U. S. No. 1,078,887; Nov. 18, 1913.)

COPPER—Improved Process and Apparatus for the Production of Copper by Electrolysis. M. Perreur-Lloyd, Boulogne-sur-Seine, France. (Brit. No. 6896 of 1913.)

HARDENING COPPER—Process of Hardening Copper. James A. McLarty, Toronto, Ontario, Canada. (U. S. No. 1,079,-786, Nov. 25, 1913.)

CYANIDING—Improvements in Apparatus for Agitating or Thickening Ore Pulp. A. James, London, Eng. (Brit. No. 8801 of 1913.)

FILTRATION—Vacuum and Water Connections. Clarence G. Patterson, Berkeley, Calif., assignor to Butters Patent Vacuum Filter Co., Inc. (U. S. No. 1,078,552, Nov. 11, 1913.)

OPENHEARTH FURNACES—An Improvement Relating to Regenerative Openhearth Furnaces. T. B. Rogerson, Glasgow, Scotland. (Brit. No. 10,853 of 1913.)

ALUMINA—Purifying Alumina. Howard F. Chappell, New York, N. Y. (U. S. No. 1,079,889 and 1,079,900; Nov. 25, 1913.)

ZINC—A Process of and Apparatus for Use in Manufacturing Zinc. C. V. Thierry, Paris, France. (Brit. No. 7953 of 1913.)

DRILL—Pneumatic Rock Drill. Eduard Altenhoff, Oberhausen, Germany. (U. S. No. 1,079,735; Nov. 25, 1913.)

HOIST—Mine-Hoist Recorder. Orie W. Ingels, Carlyle, Ill. (U. S. No. 1,079,493; Nov. 25, 1913.)

MAGNETIC SEPARATORS—Improvements in Magnetic Separators. H. J. H. Nathorst, Malmberget, Sweden. (Brit. No. 8485 of 1913.)

ORE CONCENTRATION—Improvements in or Relating to Apparatus for Ore Concentration. W. Broadbridge, A. C. Howard and Minerals Separation, Ltd., London, Eng. (Brit. No. 25,490 of 1912.)

ELECTRIC FURNACES—Improvements in Electric Furnaces. Comp. pour le Traitement des Metaux et des Minerais par l'Electricite Ampere a Puteaux (Seine), France. (Brit. No. 12,441 of 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Dec. 11

**The State Mining Bureau** has now sufficient men in the field to gather the data necessary for a complete review and record of the mining industry in California. State Mineralogist Hamilton, and Secretary Thayer, recently made a trip to the oil fields in preparation for the field work to be done by field assistant, McLaughlin. Mr. Hamilton has made general visits to other mining districts and is adopting a course in vogue several years ago of familiarizing the Bureau in a general way with the mining industry. There is at present a fine opportunity to extend the usefulness of the mining bureau for the reason that for the first time in many years there is a sufficient appropriation to carry out a broad line of work.

**General Petroleum, Ltd.,** is a new British organization capitalized at $75,000,000. On an exchange of securities it will take over the General Petroleum holdings in California, excepting the pipe line and 12 tank fields under construction. The new organization will be in nature a holding company, which will be authorized to issue $50,000,000 of 7% cumulative preference stock and $25,000,000 of ordinary stock. The syndicate handling the organization of the new company has advanced $1,000,000 to General Petroleum and will advance $2,000,000 more after Jan. 1, 1914. This money is to be used to meet obligations and against it $3,000,000 loan debentures will be floated by the new company. The closing of the deal is contingent upon the agreement of the General Petroleum underwriters to deliver half of the outstanding General Petroleum bonds for exchange. It is believed that enough of the bonds are now on hand to meet the obligation.

**The Western Fuel Co. Case** went to trial Dec. 9 before United States District Judge Dooling. The defendants in court were the president, vice-president, treasurer, other directors, the superintendent and two weighers who are charged with conspiring to defraud the Government of customs dues by the short weight of coal importations, and cheating the Government with short-weight deliverance in the army transport service and keeping engineers of steamship companies on a secret pay roll in compensation for their accepting short-weight fuel supplies. The delay in the trial last spring was one of the causes for the resignation of United States District Attorney McNab. The Western Fuel Co. is the largest importer of coal in California. A large amount of coal comes from Australia. The company has formerly been in the position of a monopoly and usually dictated the price of coal to the consumer. Since the general adoption of oil for fuel the coal business has fallen off and has not been so profitable.

### DENVER—Dec. 13

**The Cost of the Coal Strike** is estimated at $10,000,000 to date, conservative estimates placing the cost at $80 for every person in the state. The estimate is made up as follows: Loss in wages to 11,000 miners on strike, $2,607,000; loss in wages to 7000 railroad and other employees out of work as result of strike, $2,212,000; loss in traffic to railroads, $1,185,000; strike benefits collected from union miners at work to maintain strike, $632,000; loss to public through advanced cost of coal, $790,000; loss to operators through inability to fill orders, $1,580,000; cost of mine guards, loss of property and incidental expenses, $474,000; cost of maintaining militia, 46 days at $5000 per day, $230,000; loss in wages by militiamen, average $5 per day per man, $230,000; total, $9,940,000. Minor disturbances in the strike zone continue, and the military is busy most of the time. There is apparently no hope for a truce or for settlement; the miners are quiet and seem to have settled down for a long contest of endurance. They are receiving $38,000 per week for benefits. The suffering and loss to the people of the state has now been increased by the blizzard which has blocked the railways to the mining camps, closed the mines, filled the streets of the cities and towns, and rendered the haulage and delivery of coal to a large extent impracticable. Denver has given up the attempt to clear the highways, and is menaced by a coal famine, as the coal companies have practically ceased attempting deliveries in the residence districts, and will not guarantee any until Dec. 22. Strikebreakers continue to arrive in large numbers. The Victor-American Fuel Co. received a shipment of Alabama negroes Dec. 11, who were placed to work in local mines, and four or five other large consignments of experienced miners are said to be on the way. According to a statement issued at the Colorado Fuel & Iron Co.'s employment agency, all of the places of striking miners will be filled within two weeks if the present influx of workmen continues. The situation is so bad in Denver that the authorities have practically told the citizens of the resident districts that they must dig out their own streets so that coal deliveries can be made or else freeze. All the Cripple Creek mines have been closed down by fuel shortage owing to the snow blockade of the railway, and this is probably the case with every mine in the state that did not have its winter's supply of coal laid in before the storm. Street-car service in all the mining towns is closed indefinitely. On Dec. 11 coal-mine operators, dealers, tramway and railroad officials met in conference and decided to establish branch coal sales depots in all outlying districts of the city, when purchasers will pay about $1.50 per ton more than regular prices in the city and must haul it themselves. The price of 35c. per 100 lb. has been fixed.

### CALUMET—Dec. 13

**Another Injunction Has Been Granted** by Judge O'Brien, this one on the complaint of President Moyer, of the Western Federation of Labor, restraining the members of the Citizen's Alliance from interfering with the officers of the Federation, intimidating, or compelling them to leave the district against their will. The Michigan supreme court has handed down its decision in the injunction case granted on complaint of the mining companies against the Federation and insists that all acts meant to intimidate mine employees are forbidden, and calls for absolute prohibition of morning parades, which have been the cause of most of the disturbances. It also stated that Circuit Judge O'Brien misconstrued his official duty in procedure in the injunction case. A grand jury has been granted in Houghton County and will be in session within a few days. Special Prosecutor Nicholls has been put in charge of the grand jury, and he has also been appointed deputy attorney-general for Keweenaw County, taking the place of Prosecuting-Attorney Hamilton, of Keweenaw County. Judge O'Brien, accompanied by Sheriff Cruse and Attorney Nicholls, attended meetings of the Federation at Calumet, Ahmeek and Painesdale. He addressed the men stating that they must obey the law and live up to the injunction. He asked them to give up their guns to the sheriff, but the sheriff left the hall without securing any firearms. The action taken by the Citizen's Alliance has come only after a period of lawlessness and crime, in which murders were committed, houses dynamited, and working men subjected daily to threats, insults and beatings. The machinery of the law was completely broken down, and the action taken at the meetings Wednesday have the approval of every law-abiding citizen.

### ISHPEMING—Dec. 13

**The Curtailment of Mining Operations** seems more extensive than usual at the close of lake navigation, yet the contrast between the work now going on and the work of the shipping season exists largely because of the unprecedented production attained during the year. There are employed, it is believed, approximately as many men as at this time in 1912. Working forces had been greatly increased in the spring and there was exceptional activity while shipments were in progress. There have been retrenchments this autumn on all the old ranges, yet a survey of the situation indicates that only on the Mesabi is the volume of work materially less than was the case a year ago at this date, and this recession is largely offset by the increased activity in the new Cuyuna district, just as are the suspensions and curtailments at various mines in the other fields practically equalized by the development work at newer properties. To produce at the rate of 50,000,000 tons per annum requires a vast volume of preparatory work. Whether the demands of the iron trade will necessitate the continuance of that rate the coming year cannot be foreseen at this time. Nevertheless the Lake Superior region will be ready next spring to duplicate the output recorded this season. In the Iron River district of the Menominee range, little or no work is in progress at the Spring Valley company's Zimmerman mine, Pickands, Mather & Co.'s Baltic, Bengal and Fogarty properties, the Erie Ore Co.'s Youngs mine and Oglebay, Norton &

Co.'s Berkshire. However, while not as much ore will be produced as during the winter season a year ago, there is still considerable activity. Corrigan, McKinney & Co. are employing a large force at the Tully property, a mine which is in course of development. The same company is operating the Baker, adjoining the Tully. The Steel Corporation is employing practically the usual force at the Dober mine, as is Pickands, Mather & Co. at the Caspian, the Rogers-Brown Ore Co. at the Hiawatha, Rogers and Chicagon, the Mineral Mining Co. at the James and its other shafts, Oglebay, Norton & Co. at the Chatham, the Davidson Ore Co. at the Davidson, and the Jones & Laughlin Steel Co. at the Forbes. The last property is in the stage of development, with a second shaft sinking. Of the Wickwire Steel Co.'s group, the forces at the Virgil, Cortland and Wickwire have been scaled down 50% of the summer force, but there has been no curtailment at the Homer. The men at work in the Crystal Falls district of the Menominee constitute fully as large a force in the aggregate as a year ago. The only recent suspensions have been at the McDonald mine, a small property controlled by the Erie Ore interests and now closed, and in the operations of Pickands, Mather & Co. in the Amasa field. The Tobin mine of Corrigan, McKinney & Co. was put on the inactive list early in the year. Offsetting these retrenchments, M. A. Hanna & Co. are employing good-sized forces in the development of the Carpenter and Ravenna properties, two of the largest on the range, and the operations of the Longyear interests and Pickands, Mather & Co. in the Mastodon field are steadily expanding. The Mastodon field is well named, for it possesses one of the greatest iron deposits yet discovered in Michigan. The Longyear interests have started drifting at the 200-ft. level of their Judson inclined shaft, in Section 13, 42-33, and it is expected that the orebody, 150 ft. distant, will be reached early in January. Sinking to the second level is in progress. The Chicago & Northwestern R.R. has extended its line directly to the shaft. The autumn weather has been such that excellent headway has been made with the construction of the various mine buildings. The Mansfield mine, which the Steel Corporation is abandoning despite the fact that the lease has not expired, is filling with water, the pumps and the piping having been removed.

### JOPLIN—Dec. 12

**Striking Developments Have Lately Been Made** notwithstanding the slump in ore prices and the shutting down of properties all over the district. These developments have been made by the large operator and by the small one, the importance of each being about balanced. Those of the large operator are concerned principally with drilling large leases and of the small one of sinking shallow shafts into deposits of old-time richness. Of the first-class are the leases in the Miami-Hattonville region, extending from the Hattonville group of mines northward beyond the Oklahoma-Kansas state line. Those concerned in taking leases and preparing to drill them are, Lennon & McConnell, Chapman, Longacre & Short, Barnes & Co., and the Underwriters Land Co. All of these companies have taken up large acreages of virgin ground and are preparing to test them out by drilling during the next six or ten months. Each company has from 500 to 1000 acres under lease and the amount of drilling done during the period should be sufficient to test a large portion of the ground north of the new Oklahoma camp. The Underwriters Land Co. has just closed up its contracts for 800 acres. The land lies north of the Oklahoma-Kansas state line in the immediate vicinity of the Blue Mounds. All of it is in virgin territory although it lies immediately in the line of previous development in the older camp. Three drills will be put to work on the land as soon as they can be shipped from Joplin. On the other tracts there are already a number of drills at work. The area of this bona fide "wild cat" drilling will be the greatest undertaken in the Joplin district for many years. The district has grown by the drilling of small tracts adjoining a camp or in some instances in drilling isolated land outside of the original Miami camp drilling a number of years ago. But this is the largest acreage that has been tested. The Miami camp success brought about by the wild-cat development of the Miami Royalty Co. is responsible for this present trend of development. Perhaps another potent reason lies in the exodus of operators from the sheet-ground camps of the Webb City area to richer ore deposits during the present low-price period. The other trend of development in small leases by small operators is resulting in some rather astonishing things. Last month saw the discovery of what has been pronounced the richest shallow find for years. A group of prospectors, rather discouraged in their operations at a shaft, wandered down to a neighboring shaft and while going across a small branch they noted the glint of freshly broken galena in some outcropping flint boulders. They got a pick and shovel and started to investigate and in two hours had broken through the flint boulder into soft mud ground which ran 25% zinc blende and about 5% lead. They concluded to sink a shaft right on down and sunk 16 ft. in this ore. Being in the bed of the stream they then filled up the shaft and concreted it over and secured a lease upon four lots and began sinking a shaft a short distance from the bank of the stream. They struck the ore at 10 ft. and sank the shaft to 32 ft., taking out ore all the way. A drift was started and by the end of the second week the ore taken out after having been cleaned in a custom mill and the concentrate sold paid all the expenses of opening up, milling and a profit of $1700 besides. The second two weeks will see $5000 worth of ore mined and marketed in addition to the profit already earned. This discovery was made by Hill & Co. upon the Cave Springs Lead & Zinc Co. land, at Cave Springs. Naturally such a discovery has set a score of other prospectors to work in the same vicinity until practically the entire acreage surrounding this strike is now under lease and shafts have been started. This camp, which years ago was noted for its large production from rich mines, is now showing a marked increase after an idleness covering many years. One custom mill is now turning out from three to five cars of concentrates weekly and all of it is coming from just such shallow deposits, except in a few instances where a group of gougers are robbing the pillars of an old mine

### CASA GRANDE, ARIZ.—Dec. 10

**The Casa Grande Mining District** is about eight miles south of the town of Casa Grande, Ariz., and extends south to the Mexican border. Excepting the development being done by the Keystone Union Development Co., there has been but little activity in the district until recently, when the rumors of a proposed railroad to the Ajo mines, to be built by the Calumet & Arizona company revived work to a considerable extent. The Copperosity mine has been developing for the last four months and is capable of a production of 25 tons per day of 6% copper ore, for at least a year to come. The property is owned and operated by a Texas company. A Boston company has been developing a property known as The Reward. It is capable of a production of 100 tons per day, of 15% zinc ore. The same company has developed copper ores that are being shipped, the wagon haul being about 29 miles. The Lake Shore, a copper property 31 miles south of Casa Grande is owned and operated by the Keystone Union Development Co., of Pittsburgh, which is shipping a carload of 8% copper ore, weekly. The same company is developing the Orizaba, a silver-lead property, which experienced a period of prosperity, in the earlier history of the district, having a record of $60,000 to its credit. The ore was in quartzite and was found in irregular fissures. The company now operating sunk through the quartzite to an intrusive sheet of porphyry, where ore is found. Sinking to water-level has disclosed a continuous body of lead-silver ore carrying about 1% vanadium, 14% lead, 8 oz. silver and 0.14 oz. gold, per ton. Drifting along the line of contact, at a depth of 125 ft. has disclosed a continuous oreshoot, thus far. The Nugget property, 14 miles from Casa Grande, has been developed to a depth of 84 ft. and shows a shoot of ore having an average thickness of 7 ft., with the shoot extending the entire length of development, which is approximately 125 ft. The Turning Point mine is developed to a depth of 300 ft., disclosing lead-carbonate ore, carrying gold, silver and lead. A stamp mill with concentrating tables was installed, but losses were so large that its operation was temporarily discontinued, pending contemplated improvement. The Jack Rabbit property owned and operated by McKeesport, Penn., men, who have sunk a shaft to a depth of 400 ft., were obliged to discontinue operations, on account of a heavy flow of water encountered when the vein was cut, at that level. This property has made a production in silver ore, of approximately $80,000. In the last few months, some of the larger mining companies have had their field men visit the district.

### COBALT—Dec. 12

**Kirkland Lake Properties** including Tough-Oakes, Burnside, Wright and Robbins properties in the Kirkland Lake district, have been taken over by Englishmen. A company capitalized at £300,000 has been formed and 275,000 shares were issued at par, £1. This issue was over-subscribed and is now selling at a premium of 10s. per share on the English market. Final details regarding the purchase have not been made public, but it is understood that the Burnside property will be purchased outright, while the remaining three will be taken over for part cash and part shares. Of these four properties, the Tough-Oakes is generally considered the most promising. Good ore has also been found on the Burnside property. The Robbins and the Wright are mere prospects. Veins in this section are narrow, although high grade.

# THE MINING NEWS

## ALABAMA

### Jefferson County

LOUISVILLE & NASHVILLE AND SOUTHERN RAILROADS filed applications for a rehearing of Mobile pig-iron rate case and Selma coal-rate case. Commissioners some time ago ordered reduction of $1 per ton on pig iron from Birmingham to Mobile and of 20c. per ton on coal from Montgomery to Selma.

BESSEMER SOIL PIPE CO. (Birmingham)—Plant working on half time, affecting over 300 men. Repairs will be made and it is expected that plant will go into operation after Jan. 1.

GADSDEN PIPE CO. (Birmingham)—This plant and that of Campbell Manufacturing Co. are again in operation and it is said that Coosa Pipe & Foundry Co. will open after first of year.

ALABAMA & NEW ORLEANS TRANSPORTATION CO.—Barges are being operated on regular schedule between Tuscaloosa and Mobile. Barges carry 1000 tons and are self-propelling. This will furnish cheap transportation south for coal, iron and steel products from northern Alabama.

GULF STATES STEEL CORPORATION (Birmingham)—Deeds of Standard Steel Co. to Gulf States company were filed Dec. 5. Change does not alter operations but new company plans improvements and betterments. First cast iron was made week of Dec. 8; 25 extra men went to work.

## ALASKA

THREE SUITS AGAINST B. L. THANE have been filed, each to recover $31,250. F. L. Morris is plaintiff in one action, H. H. Patterson in another and Patterson and Morris join in third. It is claimed that Morris and Patterson owned individually and collectively a group of mines in Alaska and engaged Thane to dispose of them. Thane entered into an agreement with W. P. Hammon for purchase of group, understanding being that three plaintiffs in present action were each to receive one-fourth of profits. Mines were finally transferred to Alaska Gold Mines Co., Thane receiving 6250 shares of stock of corporation in payment. It is now alleged that instead of turning over to Patterson and Morris their share of proceeds, he has retained all of it for himself.

ALASKA UNITED (Douglas)—October milling, Ready Bullion mill, 20,132 tons yielding $42,329, or $2.12 per ton, $16,597 being profit; 700 mill, 18,774 tons yielding $32,160, or $1.73 per ton, $6438 being profit.

## ARIZONA

### Maricopa County

TUNGSTEN CLAIMS NEAR CAVE CREEK have been sold by Charles Philes to Eastern men. Ore carries copper in addition to tungsten. A contract will be let for driving a tunnel which will cut vein at a considerable depth.

A MATZATZAL CINNABAR PROPERTY will probably be equipped with a 50-ton Scott furnace. This property, near Phœnix, was recently purchased by Eastern men. There is at present considerable prospecting for cinnabar in that locality. Several groups of claims have recently been sold by locators.

### Mohave County

BI-METAL (Kingman)—Extensive examination was recently completed for Mines Co. of America. It is reported that results do not justify taking over property.

TOWNE (Chloride)—It is reported that this property, which has been a part of John Barry estate, has been sold to Cudahy company by Mrs. Barry, administratrix.

TOM REED (Oatman)—Bullion shipment for November was, with one exception, largest in history of property, amount being $110,000. Normal production for several months has been between $90,000 and $100,000.

### Pima County

VEKOL (Casa Grande)—A Texas company has purchased five-year lease held by W. J. Forbach and resumed work. An air compressor and gas engine are being installed. From 1880 to 1891 Vekol was one of the famous silver producers of Arizona, yielding several million dollars. Over 20 miles of shallow workings were opened at this time. Ore deposit is a replacement in limestone. At a depth of 300 ft. sulphides of lead and zinc were encountered with silver. No effort was ever made to develop and treat complex ores of lower levels. New owners will ship such ores as will pay freight and treatment costs and develop lower levels, carrying on experimental work looking toward design of a treatment plant.

### Pinal County

ARIZONA KING (Price)—Mine, seven miles above Price, in Box Cañon, has been sold by C. G. Werner to A. W. Scott, of New York. A new camp has been built and considerable equipment purchased. Two shafts will be sunk to a depth of 500 ft.

KELVIN-SULTANA (Kelvin)—No. 1 winze, which is being sunk from 300-ft. level, has at depth of 30 ft. opened up 5 ft. of 5% copper ore. A crosscut is being driven 50 ft. below main drift in No. 2 winze. New electric sinking hoist is installed in 300-ft. station.

CALUMET & ARIZONA (Superior)—Sinking of three-compartment shaft to 700-ft. level has been completed and work is already begun on station. It is probable that drifting will be done in two directions on this level. The crosscut on the fifth level, started some time ago, is well along and work on the extension of this drift will also be pushed. There are also five drifts from the tunnel under way. The C. & A. is now working 65 men in the mine and on assessment work.

### Yavapai County

HAYNES COPPER CO. (Jerome)—Shaft has been completed to 1200-ft. level. Extensive diamond drilling before beginning explorations is contemplated.

BAGDAD (Hillside)—A patent for 45 claims has been filed recently. During last year over $30,000 has been spent in drilling and other development work by General Development Co.

NELSON (Crown King)—Lower tunnel is being driven at rate of 100 ft. per month; 800 ft. having been driven, leaving 1000-ft. before shoot exposed in upper level will be cut. When under apex of vein face will be 900 ft. below surface.

Y. P. (Senator)—Equipment for remodeled plant is beginning to arrive. Two Huntington mills, a Monell slimer, six Monell tables, two Bunker Hill screens, a 20x24-ft. rag plant, engines and pumps have been received. When the remodeling of mill is completed it is expected that plant will treat about 80 tons daily. Several thousand tons of mill ore have been opened up in old Cash workings since they were unwatered.

HENRIETTA (Big Bug)—Electrical equipment is being installed. By time mill is ready to operate there will be upward of 1500 tons broken in stopes and ready for treatment. Copper-Gold Zone Mines Consolidated, an English company, which is developing the Henrietta is also planning to open up Nigger Brown mine in Black Cañon and is repairing wagon road from Turkey Creek to mine preparatory to hauling in supplies and necessary equipment.

### Yuma County

OLD PLACER DEPOSITS EAST OF EHRENBERG, on Colorado River, are to be operated by E. L. Burchamp, of San Juan field, Colorado. Cemented gravel is to be excavated by steam shovel and treated in specially designed apparatus

## CALIFORNIA

### Amador County

SOUTH EUREKA (Sutter Creek)—The 3c. dividend in November has been paid and another is expected in December. Starting of additional stamps in Oneida mill is contemplated.

ARGONAUT (Jackson)—It has been necessary to close down mill temporarily until repairs to hoisting gear are completed. New cable, purchased some time ago, will be installed. It is 4800 ft. long and weighs five tons.

ZEILA (Jackson)—Negotiations for sale of mine and mill to Nevada men are still pending. Large orebody disclosed in north end of ground, if developed, will make a new mine and require sinking of a new shaft. Old mine cannot be profitably worked below present lowest, or 1500-ft. level without additional expense which present owners seem disinclined to incur. If mine is not sold by end of year it will probably be closed down.

### Calaveras County

REINER MINING CO. (Stockton)—Company has been reorganized by election of E. H. Ehrler, of St. Louis, as president. Reorganization resulted from investigation of affairs of company under management of John C. Benson. Mine is at Altaville in Angels Camp district, and was being reopened after fire which destroyed surface improvements; but was closed down in July pending investigation. Mine will be reopened.

### Eldorado County

AJAX GOLD MINING CO. (Georgetown)—Mining properties of Everett F. Porter, between Georgetown and Georgia Slide, have been taken over by this company. Porter will be retained as superintendent. J. C. Tippett, of San Francisco, is president.

### Humboldt County

HORSE MOUNTAIN COPPER (Eureka)—Returns from first shipment of copper ore and concentrates to Tacoma smelter are reported to show that both are rich. This is said to be first shipment of copper ore for smelting ever made from Humboldt County.

### Inyo County

TECOPA CONSOLIDATED MINING CO. (Tecopa)—Shipment of 41 cars containing approximately 1700 tons of ore were shipped in November to Salt Lake smelters. Similar but smaller shipments were made during year. Mines are connected by standard-gage railroad with Tonopah & Tidewater R.R. at Tecopa in southeastern part of county.

### Nevada County

BRUNSWICK (Grass Valley)—Announcement of a dividend of 6c. per share is reported. Disbursement will amount to about $30,000. This is first dividend to be paid out of proceeds of production. Several years ago a dividend of 3c. per share was paid out of accumulated funds.

### Kern County

YELLOW ASTER (Randsburg)—Dividend of $5000 was declared Nov. 25, making total of $55,000 in 1913, and $1,176,789 since incorporation. Power lines which will supply pumping power are ready for electric motors. Lines to mills are completed, also concrete foundations for motors being built by Westinghouse company. Southern Sierras Power Co. has recently completed a concrete switch house at substation east of Randsburg and installed a large transformer.

### Shasta County

MIDAS (Harrison Gulch)—New cyanide plant is treating old tailing dumps.

MAD OX (Stella)—Mine, equipped with a 10-stamp mill, has been taken over by H. W. McEwen McEwen has also taken bonds on Desmond Bros Red Cross group south of Mad Ox. These mines have been producers

GLADSTONE (French Gulch)—The twelfth consecutive dividend has been declared, payable Jan. 5, 1914. This makes $108,000 dividends in 1913, and a total of $1,008,000. It is deepest gold mine in Shasta County. A new electric hoist is being installed

## COLORADO

### Clear Creek County

JOSEPHINE Mine on Kelso Mountain near Silver Plume has been developed during last six months. A substantial reserve of silver-lead ore has been opened. Lower adit has opened 30-in. vein of galena for 200 ft. Upper adit is driven at elevation 300 ft. above lower adit and has cut main oreshoot 200 ft. from portal. Experiments have recently been made on ore from old dumps. Trial shipments have been made to Scotia mill at Silver Plume with satisfactory results.

### Lake County

UNWATERING THE DOWNTOWN SECTION will probably soon be started as Jesse F. McDonald, Colorado's former Governor, has secured capital necessary and is securing leases on Penrose Sixth St. shaft, Alice and Coronado mines, and on Nile, Augusta, Grey Eagle, Pocahontas, Bon Air, and Welson properties. Pumping will be done through Penrose and Coronado shafts. It will take three months to complete unwatering.

YAK TUNNEL (Leadville)—Sutton, Steele & Steele dry-process concentrators may be installed next spring

LITTLE JONNY (Leadville)—Two men were killed Dec. 6 by cave-in while working on lease in fourth level of No. 2 shaft.

### San Juan Region

TIGER (Silverton)—A snow slide occurred at this mine in Silver Lake Basin afternoon of Dec. 5, the snow caving in boarding house. All the crew of Iowa mine which is working under lease were housed there, the men crossing Silver Lake to and from mine on a jig-back tramway, no one however was hurt Silver Lake mine boarding house will be occupied for rest of winter by Iowa and Tiger mine crews.

MAYFLOWER (Silverton)—An extensive deposit of sulphide ore was opened this autumn and to date 8 cars have been shipped netting from $300 to $1000 per car. A short Bleichert tramway has been constructed joining upper tunnel where ore was opened, with boarding house below. Lessees and owners of this group of claims, mainly members of Malehus family, pioneers in this district, are contemplating building a mill in early part of next season.

SUNNYSIDE (Silverton)—Fire which occurred morning of Dec. 2, destroyed tramway terminal in which it started, blacksmith shop, transformer house and large snow shed connecting them. As a result mine, employing 125 men is closed. Plans for rebuilding have already been made and it is estimated that it will require at least 60 days to repair damage. Leschen tramway was dropped for a distance of 4000 ft., four towers being thrown down. Two towers, it is understood, will be erected to replace these until spring. Big span over Eureka Creek was left intact.

### Summit County

WELLINGTON (Breckenridge)—A timberman was killed Dec 6 by a cave.

### Teller County

DIVIDENDS PAID IN NOVEMBER were: Golden Cycle, $45,000, and Elkton Consolidated, $50,000

COLORADO SPRINGS & CRIPPLE CREEK DISTRICT R R—On Nov 20 an extensive rock-slide occurred, near mile-post 19, which tied up this railway for 10 days. As this road hauls all shipments from district, most of mines were more or less hampered in November production.

EL PASO (Cripple Creek) A station has been cut on level of Roosevelt drainage tunnel

VINDICATOR (Goldfield)—Plans are being prepared for erection of a concentrating plant to be located near mine

GOLDEN CYCLE (Goldfield)—A serious cave occurred on afternoon of Dec 1, extending from third to tenth levels, and about 200 ft along La Bella vein Five men were caught, two of whom were rescued uninjured within a few hours Others have not been found yet, and no hope is held out for them They are Frank M Woods, Jr, son of F M Woods, of Woods Investment Co, former owner of Gold Coin, Townsite of Victor, and other properties of early days, and two miners, Sam Sorensen and Pat Keveney Except for rescue work, mine is shut down

## IDAHO

### Bonner County

IDAHO-CONTINENTAL (Porthill)—Property will be shipping concentrates soon after Jan 1, unless unforeseen delays occur in completing concentrator Mill of 200 tons daily capacity is nearing completion Hydro-electric power plant on Boundary Creek 11 miles from Porthill, is completed and ready for service, and transmission line to mine was finished a few days ago Crushing rolls in concentrator are now preparing concrete material for compressor plant, equipment for which is ready for installation, and as soon as drill power is ready operations in mine will begin Road from mine to Porthill nearest railway point, is in excellent condition. Sleighs will be used to haul ore during winter and either auto trucks or caterpillar engines during summer.

### Clearwater County

ORO GRANDE GOLD MINING CO. (Orogrande)—This company, capitalized at $1,500,000, was organized to take over Hogan mining property in central Idaho gold belt. Basis of operations is a dike that traverses property for two miles known to be 300 ft. wide from hanging-wall side, footwall never having been reached. Through glory-hole 100,000 tons of $3 to $4 ore have been taken out. Mining will begin this winter. Surface equipment, consisting of 20-stamp mill and cyanide plant of 500 tons daily capacity will be ready to go into commission early in spring. Mine and mill are electric lighted throughout by plant on property. A sawmill and a power plant are included in equipment. A few changes in mill are expected to reduce cost of mining and milling to $1 per ton in treating a large tonnage.

### Cœur d'Alene District

MOSCOW (Murray)—Good milling ore has been encountered in face of 300-ft. drift. Work will be continued as long as weather permits.

## MICHIGAN

### (Iron)

THE VALUATION OF STOCKPILES occupied the greater part of discussions when representatives of most of the iron-mining companies operating in Michigan met at Lansing, Dec. 16, to talk over mine taxation with members of state tax commission. Tax commission realizes that it has not been fair in way stockpiles have been assessed. Mine operators claim that taxing stockpiles is double taxation as ore is taxed in ground and again when it reaches surface. Commission uses Lake Erie ore prices to determine valuations, while operators maintain this method is unjust, claiming that ore that has been in stock for years and cannot be sold is not worth near value placed on it by commission. There is ore in stock in Marquette County, high in silica, which has been at mines for 10 years and cannot be disposed of. This ore has little or no value at present but is taxed every year and more has been paid in taxes than will ever be received in return if ore could be sold. Commission desired to get all information it could and so sent out notices for conference at state capitol. State geologist realizes that method of assessing stockpiles is wrong and it is now certain that a change will be brought about.

## MINNESOTA

### Mesabi Range

BUCKEYE—Work is being rushed at this new operation.

ANISTEO—But three shovels are in operation, working day and night.

PRAIRIE—Three or four drills have been placed in operation and preparations are being made for a railroad spur to property.

EUCLID (Chisholm)—This mine, within city limits of Chisholm, has in late years caused city much annoyance through caving. Mine was gutted by a serious fire several years ago, and is now flooded with water from Longyear Lake, due to a break in dam between mine and lake. A small stockpile was washed away. This is mine over which State of Minnesota started action several years ago to determine State's right to mine ore underlying state waters, suit being in name of White Iron Lake Co. As but a small amount of ore remains in mine, it probably will never be unwatered.

## MISSOURI-KANSAS-OKLAHOMA

### Joplin District

PRINCIPAL CALAMINE PRODUCER of Joplin district now is Granby, Mo., with 10,000 tons produced. Most all properties are small, but making profits. Many new mines opened recently.

REO (Sarcoxie, Mo.)—Good productions of zinc ore are being made weekly.

CAYWOOD & CO. (Joplin, Mo.)—Ore running 20% is being taken out at 90-ft. level on Grundy land.

COAHUILA (Duenweg, Mo.)—Monthly production of 50,000 pounds lead concentrates and heavy tonnage of blende reported.

J. P. HURST & CO. (Joplin, Mo.)—These Chicago operators have opened orebody on Gray land. High-grade ore found from 100 to 126 feet.

HARTLEY LAND (Cave Springs, Mo.)—Moon & Co. have encountered heavy run of lead ore at 27-ft. level. Five acres are under lease.

EDNA GROUP (Galena, Kan.)—Scott & Merrell are developing good ore run at 47 ft.; Wyandotte tract, adjoining, also scene of new strikes

RED LION (Joplin, Mo.)—Gerster & Raines, of Galena Kan, have made mine prolific producer of zinc ore, good weekly turn-ins being reported.

W. B. STONE MINING & MFG CO (Galena, Kan)—This company's Cooper Hollow tract has been reopened by Gillman & Co., with several lots subleased and prospecting begun. Several years ago it was one of the most productive of district.

UNITED-LEHIGH (Carl Junction Mo)—Concentrator may be moved to Peacock camp, short distance west, for reopening old Peacock property, which was closed down few years ago, when plant burned. Operators believe good orebodies are yet available.

### Washington County

SOUTHEAST MISSOURI LEAD CO (Potosi)—In sinking second drill hole on tract four miles south of Potosi 3 ft of disseminated lead ore has just been struck at depth of 807 ft and another occurrence fine ore at depth of 930 ft. First hole found a little ore above sand at depth of 96 ft.

## MONTANA

### Madison County

BLOWOUT (Rochester)—Retimbering of shaft at this Corbin Copper Co. property has been finished and preparations are being made to resume crosscutting to vein on 500-ft. level.

### Silverbow County

A NOTICE TO EMPLOYERS OF LABOR IN BUTTE was lately published in the Butte daily papers as follows: "You are hereby notified by Butte Workingmen's Union that, in accordance with resolutions adopted by this Union Nov. 21, and approved by Silver-Bow Trades & Labor Council, Nov. 23, 1913, that on and after Jan. 1, 1914, wages for all men under and subject to jurisdiction of this union shall be not less than $4 per day." High wages paid in Butte for all kinds of labor, attract more men in search of work than can possibly be employed. It is estimated that there are at present over 4000 idle men in Butte who flocked into city, from all parts of country, attracted by glowing reports of activity and high wages.

NORTH BUTTE (Butte)—Plans are under consideration by this company to expand its activity, involving issue of new stock to raise required funds. It is said that amount of new stock will not exceed 20,000 shares and that stockholders will approve plans of directors, in view of many advantages incident to increased activity. North Butte has produced 27,000,000 lb. of copper during year at an average cost of 9½c. This is equivalent to a net earning of $1,600,000 or about $4 per share. Dividends to the amount of $2 per share have been paid, leaving $800,000 in treasury out of year's earning.

ANACONDA COPPER MINING COMPANY (Butte)—A. E. Wheeler, for last 10 years superintendent of Boston & Montana reduction works at Great Falls, has resigned to become consulting engineer for Union Miniére du Haut Katanga, operating in the Belgian Congo, Africa. James O'Grady has been appointed local manager of the works, J. H. Klepinger superintendent and Mr. Krejci assistant superintendent, change to take effect Jan. 1. Butte payroll of company for November aggregated $1,126,000. It is said to be largest payroll in history of Butte district. Roll is made up on a basis of $3.75 for miners.

BUTTE & DULUTH (Butte)—With installation of an electric hoist a dispute has arisen among union men as to whether hoist should be operated by a member of electricians' or of engineers' union. A meeting has been called by Butte Miners' Union to decide this point which seems to be a vital one. This is due to fact that at a number of mines in Butte, electric hoists are being installed to take place of those driven by steam. An innovation in surface mining was introduced lately under personal direction of Captain Wolvin. Two 50-ft. holes were drilled. 30 ft. apart and 30 ft. back of face of opencut. Each hole was loaded with 20 sticks of dynamite, followed by a charge of seven kegs of powder. Explosion of two holes dislodged 500 tons of rock. Method will be followed in future and it is planned to introduce steam shovels for loading blasted ore into cars which take it to leaching plant.

## NEVADA

### Comstock Lode

TAILINGS IN CARSON RIVER are being treated. One small pump dredge is in operation.

CALEDONIA (Gold Hill)—Several days shutdown was necessitated by breaking of pinion on electric hoist at New York shaft.

COMSTOCK PUMPING ASSOCIATION (Virginia City)—Recently installed Starrett sinking pump in Consolidated Virginia winze on 2500-ft. level of C. & C. shaft has received initial test and been found to be satisfactory.

### Clark County

AZALEA (Goodsprings)—Company was recently incorporated in Los Angeles to develop this property.

BULLION (Goodsprings)—It is reported that a concentrating plant similar to that now at the Singer will be built.

QUARTETTE (Searchlight)—Property has been sold and company is in process of liquidation. Previous to sale there had been paid in dividends and refunding rights a total of about $420,000.

SOUTH NEVADA (Las Vegas)—It is expected that first test run of new cyanide plant under erection at this property will be under way within next 30 days. Mill is to have a capacity of 300 tons daily.

### Elko County

NEVADA-ANACONDA (Elko)—Lease and bond has been taken for $60,000, it is stated. A shaft is being sunk and surface equipment installed. Bunk houses have been built.

### Humboldt County

IMLAY MINING CO. (Imlay)—Development work will commence at once. An assessment of 1c. per share has been levied.

STALL BROS. (National)—Tunnel is being driven to crosscut contact which is believed to be source of rich float, large quantities of which have been shipped.

ROCHESTER MINES CO. (Rochester)—A mill will be built early in 1914, it is stated, in either Rochester or Weaver cañon. Initial capacity 100 tons per day. Process, amalgamation, concentration and cyanidation.

### Lander County

GOODWIN & PLUMAS (Copper Cañon)—An option has been secured and a company organized. A mill will be built, it is stated.

### Lyon County

NEVADA-DOUGLAS (Ludwig)—Estimated production for November, 1913, 4650 tons averaging 5% to 6% copper. All ore not assaying over 3½% has been reserved for treatment in the contemplated leaching plant.

### White Pine County

STEPTOE VALLEY WORKS (McGill)—Mr. Hoffman, representative of Kelley Filter Press Co., has been on ground lately negotiating for installation of a plant for treatment of 2000 tons of slimes daily. These slimes which are now settled in first of a series of ponds are said to carry 1½% copper and 80c. in gold per ton. Present method of handling consists in excavating with an orange-peel bucket and air drying, and is not satisfactory for several reasons. Proposed plant costing $200,000 will deliver a product holding only 3% of moisture.

CONSOLIDATED COPPERMINES CO. (Ely)—Mines and property have been inspected lately by W. B. Thompson and Thomas F. Cole, their inspection also included water rights and possible smelter site at Warm Springs. Local papers were unable to secure an interview, and nothing is known here of future plans. Giroux mines have been doing nothing except on Ora claim for two months. At original Coppermine shaft, just north of Star Pointer, the upraise for new shaft starting at 215-ft. level has been holed through to level of Minnesota tunnel at a height of 180 ft., which is about one-half distance to surface. Raise is being made on stulls to surface and should break through before Feb. 1, after which shaft will be timbered from top to bottom. Development work has been carried on east of shaft with satisfactory results. Crosscuts in a northerly direction have been started at 100-ft. intervals, results indicating a continuous orebody lying north of main drift, and extending several hundred feet easterly and westerly.

NEVADA CONSOLIDATED—Company is crowding steam-shovel work in both Eureka and Liberty pits. There are about 750 men working with nine steam shovels and same number of churn drills. Three shovels are on ore in Eureka pit and two in Liberty pit, including 100-ton shovel belonging to Coppermines company but operated by Nevada Consolidated. This shovel has been excavating new 5% ore into Liberty pit through Ora lode claim, and is mining 1000 tons per day, which is sent to Steptoe works and credited to Giroux company. Three of the four shovels working on overburden are near summit of Eureka Hill, where company has an immense task in removing barrier between two pits. Another three months should see top slice removed, after which work will be slower still on account of rapidly increasing area of horizontal section. Seven of the nine churn drills are spudding in holes ahead of shovels and two are engaged in prospecting Josie claim at mouth of Liberty pit. Results of drill work on Josie indicates to a certainty that Eureka-Liberty orebody extends westward into Coppermines formerly Giroux property. One hole after penetrating more than 200 ft. of lime struck commercial ore, and continued in ore for 560 ft. From Josie claim westward for nearly 5000 ft. to Brooks incline shaft of Giroux company, surface indications are favorable, and while it is not anticipated that ore is continuous, the possibility is now admitted. Property west of Josie claim is entirely within holdings of Coppermines company.

## NEW JERSEY

### Morris County

WHARTON STEEL CO. (Hibernia)—Company closed down operation Dec. 3, when it discharged 60 men. Pumps in mines were stopped and removed from shafts later. No ore has been mined in several months. All mines at Upper and Lower Hibernia, owned formerly by the Glendon, Andover, Hibernia, and Bethlehem Steel companies, are owned by the Wharton Steel Co. Until a few years ago from 800 to 1200 men were employed at Hibernia mines, and that place was then a thriving village of more than 2000 persons. After death of Joseph Wharton a few years ago, business began to dwindle. Until two years ago output of mines was 10,000 tons of ore a month. Company owns mines at Teabo and Allen, near Rockaway township. These mines are idle, and so are furnaces at Wharton.

## NEW MEXICO

### Grant County

PHELPS DODGE & CO.—Work trains are now running into camp of Tyrone over newly constructed railroad from Whitewater, and it is expected that by first of year a regular passenger and freight schedule will go into effect. Work in Tyrone is progressing slowly.

### Socorro County

JUANITA LEASE—Regular shipments are being made and regular force of men is employed.

N. I. T.—Unwatering will be commenced in this mine and active work started by first of year.

KELLY—This mine is to be operated again when repair work and general cleaning up is completed.

## NEW YORK

### St. Lawrence County

COMPANIES NOW PRODUCING TALC for use in paper trade, etc., are International Pulp Co., including Union Talc Co. (3 mills in operation), Ontario Talc Co. (1 mill), Uniform Fibrous Talc Co. (1 mill). All mills are operated by water power from Oswegatchie River, and production varies with supply of water due to season of year.

PILLING & CRANE (Benson)—Magnetite mines and concentrating plant were recently reopened by this Philadelphia company. About 100 men are employed. Ore is blasted in an opencut where large blasts are used. Material breaks in such large masses that considerable blockholing is necessary. Ore is crushed in giant rolls reducing to size of walnuts, is then conveyed on belt to mill proper where it is again crushed. Another belt conveys to steam driers from which it passes to storage bins ready for concentration. Ore runs about 30% iron and is concentrated by magnetic process similar to that used at Mineville, N. Y. Electricity is supplied from company's power plant on Oswegatchie River at Browns Falls, four miles from mill. Nodulizing plant is not now being operated. Shipment of concentrates is mostly to Pennsylvania furnaces.

## OREGON

### Coos County

SALMON MOUNTAIN (Myrtle Point)—This is only producing quartz property in county, although there are a number of placer mines. Equipment is a Little Giant mill, one Wilfley table and one crusher.

### Jackson County

NELLY WRIGHT (Gold Hill)—Operations with 10-stamp mill have just been started; capacity, 25 tons of ore per day. This mine was purchased a short time ago for $50,000, and promises to be a good producer.

## SOUTH DAKOTA

### Lawrence County

MOGUL (Terry)—Work of installing machinery in new mill is proceeding at a good rate, and it is hoped to have it all in place by end of month.

WASP NO. 2 (Flatiron)—Milling operations, which were recently suspended on account of a shortage of water, will soon be resumed, as a supply has been secured, and everything is in readiness for work.

TROJAN (Trojan)—The 250-ton cyanide mill is operating steadily, and everything has been gotten in shape for the winter's campaign. Snow sheds and other outside work has been completed, and construction practically suspended.

HEIDELBERG (Two Bit)—Shoot of vertical ore recently uncovered is showing up well with development. Sinking is now in progress, and a crosscut will be driven to ore. It is planned to begin shipments as soon as there is good sleighing.

### Pennington County

BLACK HILLS TUNGSTEN (Hill City)—Company will sink an additional 100 ft., and contracts for work have been invited, to be received up to Dec. 9. Property was this summer equipped with a small concentrator, in which a test run was made early in autumn.

KEYSTONE (Keystone)—Boland & Wamsley are shipping an average of one carload of scrap mica weekly. Several products are made from it, including ground mica, concrete and cement facing mica, flake mica, lubricant, decorating mica and tire powder. Hall & Everly are furnishing a large part of output.

## UTAH

### Juab County

TINTIC SHIPMENTS FOR NOVEMBER amounted to 751 cars, those for the week ended Dec. 5 to 154 cars.

GRUTLI (Eureka)—Ore running well in zinc has been opened on 180-ft. level. Vein material is from 4 to 6 ft. wide, with best streak ranging from 6 in. to 1 ft. in width.

TINTIC STANDARD (Eureka)—Silver-lead ore taken out in development work from 1000-ft. level, is being hauled from this property in eastern end of district. This is company's first shipment.

COLD CHAIN (Mammoth)—Western part of this mine is now being developed from 1500- and 1800-ft. levels of Lower Mammoth. Two fissures carrying bunches of ore have been opened. Work from Lower Mammoth gives much greater depth than can be attained through company's own workings.

VICTORIA (Eureka)—There have been important developments on 1100 and a large part of present output of mine is coming from this level November shipments were heaviest of any this year, and December is expected to show a larger output Connections will soon be completed between 1050- and 900-ft. levels

IRON BLOSSOM (Silver City)—At annual meeting held in Provo, Dec 6, old officers were reëlected. Report shows a cash surplus of $438,551, an increase of $105,741 over balance on hand at first of year. Ore shipments amounted to 38,452 dry tons, of which 22,543 tons came from No. 1 workings and 15,909 from No. 3 workings. Developments on 600 level on East vein are reported promising, and ground on 1900, which is being developed is considered good

YANKEE CONSOLIDATED (Eureka)—Prospecting is being done on 200 level to locate northern extension of Beck Tunnel-Colorado ore zone. Work done here thus far has been several hundred feet from surface, and new work will prospect territory higher up into which ore channel should naturally make from properties on south. Prospecting is being done on 2000 also Output consisting of lead and zinc ore amounts to about 50 tons per week. Last car of zinc ore sent out ran 37 per cent

### Salt Lake County

UTAH COPPER (Bingham)—A quarterly dividend of 75c. per share has been declared

### Summit County

PARK CITY SHIPMENTS FOR WEEK ENDED NOV. 23 were 4,034 960 lb In addition to regular shippers, Silver King Consolidated, American Flag and Thompson-Quincy contributed.

DALY-JUDGE (Park City)—A dividend of 15c. per share has been declared payable Dec. 20

AMERICAN FLAG (Park City) Air connections between the 1100- and 1000-ft levels have been completed

SILVER KING CONSOLIDATED (Park City)—A dividend of 25c per share has been declared, payable Dec. 22.

SILVER KING COALITION (Park City)—A dividend of 15c per share has been declared payable Dec 21 Preparations are being made to develop ore-bearing ground below Alliance tunnel and heavy equipment has been installed to sink a shaft 1000 ft below the tunnel level.

MINES OPERATING CO (Park City)—Operations were delayed a few days on account of breaking down of a dryer. This has been repaired, and average daily tonnage of approximately 150 tons is being handled This tonnage will be maintained, and probably increased

## CANADA

### British Columbia

HEDLEY GOLD MINING CO. (Hedley)—A crew of 40 men has been employed on dam under construction on Similkameen River. Dam is to be built diagonally across river and is to be 400 ft. long, with lower end about 200 ft. below mouth of Twenty Mile Creek. Excavation which has already been made has proved beneficial effect of slimes, which have been discharging into river from mouth of Twenty Mile Creek since stamp mill started to run nearly ten years ago, for it has rendered gravels and sands of river bottom impervious to water, thereby adding a most important element of strength to dam. Below this argillaceous covering formed by slime accumulations, it was found to be quite dry, although lower than bottom of channel in which water of river was flowing a few feet distant. After dam is completed slimes will be allowed to run into mill pond freely for a few months to supply an impervious mantle to gravel that has been disturbed by excavating in constructing dam.

GRANBY CONSOLIDATED (Grand Forks)—Results of operations at Grand Forks and Phoenix for four months ended Oct. 31, show a profit amounting to $253,808. Company has lately acquired properties of Snowshoe Gold & Copper Mines, Ltd., which will be operated through workings of Gold Drop mine, which they adjoin at Phoenix, and will be furnishing ore before Jan. 1. At Anyox, several additional properties tributary to smelter have been taken over, including a limestone property and one copper property carrying an excess of lime, insuring an ample supply of that material for flux. These properties have been held under option for periods sufficient to admit of prospecting and careful examination and some of them are expected to prove of considerable importance, materially increasing tonnage available for Anyox smelting plant. No single investment was large, but aggregate, including Snowshoe properties, amounts to $275,000, payments running over various periods. Work of completing new smelter has gone steadily forward without unforeseen difficulties. Matter of transportation, which is of great importance, has been receiving considerable attention and

### Ontario

CREIGHTON MINE (Creighton)—A serious cave-in occurred the night of Dec. 9. Two pillars above third level gave way at first and later one more went due to extra load, which it was obliged to assume. About 250,000 tons of material fell altogether, in two main falls. First fall took place at 6:40 p.m., and ground fell from between third level and surface of openpit down to fifth level, a distance of 300 ft. Material fell on muck over drywalls causing them to cave in. There were about 60 men working in and near that section and all but one got out safely.

## MEXICO

### Jalisco

AMPARO (Etzatlan)—Several carloads of concentrates have been shipped from camp in Etzatlan district to San Francisco, leaving country through Pacific port of Manzanillo. Present condition of smelting industry in Mexico made shipment to States necessary.

SAN RAFAEL Y ANEXAS (San Pedro Analco)—This Pachuca company now in control of San Pedro Analco properties in Hostotipaquillo district, is at work on a wagon road to Southern Pacific station of La Quemada. A cable line will be used in transporting supplies and product across Santiago River.

CINCO MINAS (Hostotipaquillo)—A full force is again at work on 250-ton reduction plant, and end of year is expected to see it completed and ready for operation. Since anti-foreign outbreak at camp in October, when two Americans, Thomas Barrett and William Kendall, were killed, mining force has been reorganized, and active development has been resumed.

EL FAVOR (Etzatlan)—Rebel activity in Hostotipaquillo district has not interfered with mine or mill operations, but shipments of high-grade ore have been curtailed, due to fact that some freighters have withdrawn their animals to places of comparative safety, fearing confiscation by rebels. El Favor bullion output is being increased. Company has paid its fourth quarterly dividend, making the total disbursement for year $140,000, United States currency.

### Sonora

EXPORTS FROM AGUA PRIETA, for November were as follows: Nacozari, 13,491 tons; El Tigre, 214; Swamp Angel, 8, La Sonora, 101; La Alemana, 48; San Carlos, 10; San Pablo, 18, Monte Cristo, 10, La Union, 25; Good Enough, 19; Cresteneito, 4; Santa Rosa, 41 Ventana, 42; El. Vaquero, 27; total, 14,058 tons. El Tigre shipped 63 bars of gold and silver bullion weighing 9748 lb Estimates of ore and bullion values are: Copper, $2,119,400; silver, $806,700, gold, $259,600; total, $3,185,700.

HOHMAN (Nacozari)—An examination of this mine is being made It was formerly known as Camp Colorado.

ORMUS (Cumpas)—Large boiler has been purchased and shaft will be unwatered

ORMUS (Cumpas)—Work has been temporarily suspended and Manager McGimsey has gone to California to attend a meeting of company in regard to future development

ROY (Esqueda)—Property is held under mortgage by First National Bank of Douglas A bond and lease has been given to C E Jones who is now at mine making examination and cleaning up preparatory to starting work

CINCO DE MAYO (Esqueda)—Property operated by "Constitutionalists" under management of Capt E Villareal is making a profit of 15 000 pesos per month Mill treats about 20 tons per day making a concentrate assaying about 400 oz. silver per ton. Concentrates and high-grade ores are smelted in adobe furnaces and bullion is sent to refineries in United States When mining first started ore was shipped to smelters but owing to state in which title is held smelting companies have refused to take ore necessitating smelting it at mine. About 200 men are employed in mine, mill and smelter.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Dec. 17

The metal markets continue quiet with a declining tendency, which is balanced by a stronger tone in some quarters.

### Copper, Tin, Lead and Zinc

**Copper**—The improvement that we reported at the end of last week went but little further, after which things flattened out. There is gossip about some large sales having been made to dealers. Some of the large producers raised their nominal asking price to 14½c., delivered at buyers' works, but were not able to realize it. The market has been very dull. Domestic manufacturers have been indifferent. No sales to them have been reported to us, although copper has been offered freely at 14⅜c., delivered. A few millions of pounds have been sold for export at 14.25@14.35c., delivered in Europe.

The situation in Lake copper remains about as previously reported, the prices of the principal producers being nominally 14⅞@15c., while an occasional carload is sold by some outside producer at 14¾c. The position of casting copper remains unchanged.

At the close we quote electrolytic copper in cakes, ingots and wirebars at 14.10@14.15c. Casting copper is quoted nominally at 13½@14c. as an average for the week.

The London standard market has fluctuated within narrow limits, holding around £65 for both spot and three months. The close is cabled at £65 2s. 6d. for spot and £65 for three months.

Base prices of copper sheets is now 20¼c. per lb. for hot rolled and 21¼c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 15¾@16c. per lb. carload lots at mill.

Exports of copper from New York for the week are reported at 8032 long tons. Our special correspondent gives the exports from Baltimore for the week at 2155 tons.

At a recent meeting of the Union Miniere du Haut Katanga in Brussels, the president reported the production of copper for 11 months of 1913 at 6420 metric tons, from 48,500 tons of ore treated. This was an increase of 4016 tons metal over the previous year.

**Visible Stocks of Copper in Europe** on Dec. 15 are reported as follows: Great Britain, 11,910; France, 2650; Rotterdam, 2500; Hamburg, 2260; Bremen, 880, other European ports, 1000; total, 21,200 long tons, or 47,488,000 lb.; an increase of 400 tons over Nov. 30. In addition to the stocks above 1720 tons are reported afloat from Chile and 4300 tons from Australia, making a total of 27,220 tons.

**The Price of Casting Copper** was given in our last issue at 12¾@14c. for the week. This was a misprint, 13¾@14c. being the correct figure.

**Tin**—The London market, while very dull during the latter part of last week, showed an improving tendency beginning with this week. There was a fair activity and the confidence of speculators in the future of the market was expressed in their liberal purchases of future tin, which has been selling at a premium of over £1 10s. over spot tin. This confidence, however, was not imparted to sellers on this side, who seem to be anxious for business and, in order to obtain the same, ready to undersell London quotations. There was a fair amount of buying on the part of tinplate manufacturers, who report a better demand and, in consequence, an improvement in the consumption of pig tin in this industry.

The market closes steady at £172 for spot and £173 10s. for three months, and about 37¾c. for January tin here.

Messrs. Robertson & Bense report the arrival of tin ore and concentrates at Hamburg, Germany, in October, at 1368 tons, of which 1366.5 tons were from Bolivia and 1.5 tons from South Africa.

H. A. Watson & Co. report the arrivals of Bolivian tin at Liverpool in October at 30 tons bars and 1298 tons concentrates; the whole equivalent to 809 tons fine tin.

Tin production of Federal Malay States 11 months ended Nov. 30 was, 44,028 long tons in 1912, and 44,738 in 1913; an increase of 710 tons this year.

**Lead**—The low level of prices interested consumers, and a fair tonnage was taken by them during the week. The recent buying is believed to have gone a good way toward cleaning up stocks, although a little perhaps yet remains to be absorbed.

The foreign market is also somewhat firmer, Spanish lead being quoted at £17 17s. 6d. and English 7s. 6d. higher.

**Spelter**—Sales have been made right through the week at 4.97½@5c., St. Louis, covering December and December-January shipments. There is inquiry for future deliveries, but producers are averse to committing themselves. A feeling prevails that if the demand improves materially, the price for spelter may advance sharply.

The London market is somewhat firmer, good ordinaries being quoted at £21 10s. and specials £22 5s. per ton.

The base price of sheet zinc in carload lots is now $7.25 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill.

It is estimated roughly that about one-third of the zinc smelting capacity of the United States is now idle.

### DAILY PRICES OF METALS

NEW YORK

| | | | Copper | | Tin | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|
| Dec. | Sterling Exchange | Silver | Lake, Cts. per lb. | Electrolytic, Cts. per lb. | Cts. per lb. | New York, Cts. per lb | St. Louis, Cts. per lb. | New York, Cts. per lb. | St. Louis, Cts. per lb. |
| 11 | 4.8510 | 57⅞ | *14¾ @15 | 14.05 @14.15 | 37⅝ | 3.97½ @4.00 | 3.80 @3.90 | 5.12½ @5.15 | 4.97½ @5.00 |
| 12 | 4.8520 | 58 | *14¾ @15 | 14.10 @14.20 | 37½ | 4.00 | 3.85 @3.90 | 5.12½ @5.15 | 4.97½ @5.00 |
| 13 | 4.8535 | 58 | *14¾ @15 | 14.10 @14.20 | 37½ | 4.00 | 3.85 @3.90 | 5.12½ @5.15 | 4.97½ @5.00 |
| 15 | 4.8535 | 57⅝ | *14¾ @15 | 14.05 @14.15 | 37¾ | 4.00 | 3.85 @3.90 | 5.12½ @5.15 | 4.97½ @5.00 |
| 16 | 4.8520 | 57⅝ | *14¾ @15 | 14.05 @14.15 | 38 | 4.00 | 3.85 @3.90 | 5.12½ @5.15 | 4.97½ @5.00 |
| 17 | 4.8510 | 57⅝ | *14¾ @15 | 14.10 @14.15 | 37¾ | 4.00 | 3.85 @3.90 | 5.12½ @5.15 | 4.97½ @5.00 |

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

| | | Copper | | | | Tin | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Spot | | | | | | | | | |
| Dec. | Silver | £ per Ton | Cts. per Lb. | 3 Mos. | Best Sel'td | Spot | 3 Mos. | £ per Ton | Cts. per Lb. | £ per Ton | Cts. per Lb. |
| 11 | 26¾ | 65⅞ | 14.31 | 65 | 70 | 171½ | 172¾ | 18 | 3.91 | 21¼ | 4.62 |
| 12 | 26 13/16 | 65⅜ | 14.20 | 65 | 70 | 171⅜ | 172⅝ | 17⅞ | 3.88 | 21¼ | 4.62 |
| 13 | 26 13/16 | | | | | | .. | | | | ... |
| 15 | 26⅝ | 65⅜ | 14.20 | 65⅛ | 69¾ | 172 | 173½ | 17⅞ | 3.88 | 21¼ | 4.62 |
| 16 | 26⅝ | 65 | 14.12 | 64⅞ | 69¾ | 173 | 174¼ | 18 | 3.91 | 21⅜ | 4.64 |
| 17 | 26 11/16 | 65⅛ | 14.15 | 65 | 69¾ | 172 | 173½ | 17⅞ | 3.88 | 21½ | 4.67 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17¾c.; £15 = 3.26c = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

## Other Metals

**Aluminum**—The market remains dull, with small sales, and no improvement is expected before the end of the year. Prices are not changed, but are rather nominal at 18¾@19¼c. per lb. for No. 1 ingots, New York. The foreign market is quiet but steady.

**Antimony**—Trade remains quiet; buyers seem to be taking only for pressing requirements. Prices show no material change. Cookson's is quoted at 7.40@7.60c. per lb.; Hallett's at 7⅛@7⅜c. For Chinese, Hungarian and other outside brands 6@6¼c. per lb. is asked.

**Quicksilver**—A fair business is reported and the market is steady, with no change in prices. The New York quotation is $39@40 per flask of 75 lb. for large lots. The jobbing price for small orders is 54@56c. per lb. San Francisco, $39 per flask, with special terms for export. London price is £7 10s. per flask, with £7 5s. quoted from second hands.

**Bismuth**—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

**Cadmium**—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

**Nickel**—Quotations for ordinary forms, shot-blocks, or plaquettes—are 40@45c. per lb., according to size or order and quality. Electrolytic nickel is 5c. per lb. higher.

**Selenium**—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders.

## Gold, Silver and Platinum

**Gold**—There was no change in prices on the open market in London, 77s. 9d. per oz. being quoted. With the exception of some taken for India, the supplies arriving went to the Bank of England.

Imports of gold for the week at New York were $250,183, the larger part from Mexico. Exports were $98,438, chiefly to the West Indies.

**Iridium**—Dealers still ask $81@82 per oz., New York, for pure metal.

**Platinum**—The market is quiet and rather easy, but prices are unchanged. Dealers ask $43@44 per oz. for refined platinum and $47@50 per oz. for hard metal. The sales to jewelers this year have been rather light. The market abroad seems to be firmer than it is here, though the prices do not advance.

**Silver**—The market continues steady at the decline. Now that the large speculative interests that have been manipulating the price of silver so long have come to grief the probabilities are that the fluctuations in silver are likely to move within narrow limits; at any rate for the present.

Shipments of silver from London to the East, Jan. 1 to Dec. 4, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India........................ | £10 229,000 | £9,606,000 | D. £623,000 |
| China.... | 1,674,500 | 755,000 | D. 919,500 |
| Total .......... ... | £11,903,500 | £10,361,000 | D. £1,542,500 |

Imports of silver at New York for the week were valued at $578,017, largely from Mexico and South America. Exports were $789,984, nearly all to London and Paris.

## Zinc and Lead Ore Markets

### PLATTEVILLE, WIS.—Dec. 13

The base price paid this week for 60% zinc ore was $38@39 per ton. The base price paid for 80% lead ore was $48 per ton.

SHIPMENTS WEEK ENDED DEC. 13

| | Zinc ore, lb | Lead ore, lb. | Sulphur ore, lb. |
|---|---|---|---|
| Week | 3,794,440 | 172,100 | 1,024,360 |
| Year | 143,057,850 | 5,477,180 | 54,753,770 |

Shipments during week to separating plants, 2,609,740 lb zinc ore.

### JOPLIN, MO.—Dec. 13

One company filled orders for high-grade blende on a base of $38.50 per ton of 60% zinc, but all other companies paid a base of $40, with the demand stronger than last week. Blende carrying over 1% of iron sold on a metal base of $37@38 per ton. Calamine remains steady at $20@22 per ton of 40% zinc. The average price of all grades of zinc ore is $37.06. Lead sold as high as $54 per ton, though it is claimed by buyers that buying is on a base of $49 per ton of ore assaying 80% metal contents. It is evident a high base is being paid or some ore was contracted for several weeks ahead before the decline of last week. The average price of all lead is $49.86 per ton.

SHIPMENTS WEEK ENDED DEC. 13

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Totals this week. | 8,781,540 | 1,067,890 | 1,955,160 | $231,280 |
| 50 weeks........ | 534,242,130 | 42,315,130 | 92,079,910 | $14,786,049 |

Blende value, the week, $170,200; 50 weeks, $12,709,115.
Calamine value, the week, $12,335; 50 weeks, $541,344.
Lead value, the week, $48,745; 50 weeks, $2,425,599.

# IRON TRADE REVIEW

### NEW YORK—Dec. 17

The iron and steel markets are generally quiet, with little change from recent weeks, but perhaps a better tone beginning to be apparent.

Statistics of iron and steel imports in October, the first month of the new tariff, show no material increase over those of the two preceding months, while they are much smaller than the average of the first six months of the year. The general trade showing is extremely favorable, since the merchandise trade balance for the month was $139,000,000, easily a new record. The record showing was accomplished by heavy exports and relatively light imports, the former influence being predominant.

Steel mill operations appear to have reached their minimum about the first of the month, as there has been no general decrease since then, production and shipments being at about 50% of capacity. With some extensive closings over the holidays the month's average will be less, and there is a prospect that January operations will show an increase. Predictions of an early increase in buying, perhaps by the middle of January, are becoming more common.

The pig-iron market this week makes a more cheerful showing than for some time. Several large orders have been placed, and there is more inquiry for iron. The business comes nearly all from large consumers, who seem to have made up their minds that bottom prices have been reached. Smaller buyers are still inclined to hold back.

**The United States Steel Corporation** reports unfilled orders on its books, Nov. 30, at 4,396,347 tons. This is a decrease of 117,420 tons from Oct. 31, and of 3,535,817 tons from Dec. 31, 1912. This is the lightest report made by the company since November, 1911; but the decrease during the past month was lighter than had been expected.

### PITTSBURGH—Dec. 16

The attitude of steel buyers is not believed to be unfavorable, except that naturally they are indisposed to buy on a falling market. Steel prices, however, have been much steadier in the past fortnight than formerly, declines being almost insignificant, while mills are decidedly opposed to selling for far forward delivery at the current level, and this attitude may tend to encourage buyers.

Bars, plates and shapes can be bought at 1.20c. on very attractive orders, for early shipment, but on ordinary lots a quotation of 1.25c. is common, particularly on shapes. Sheets are quotable at about 1.90c. and 2.90c. for black and galvanized respectively, these prices being frequently shaded for prompt shipments, while on contracts for first quarter advances of $1 a ton are asked.

**Pig Iron**—The American Steel Foundries is believed to have bought about 10,000 tons of basic for first-quarter delivery to Alliance and Sharon, but details are unobtainable. Foundry iron is very quiet. We quote: Bessemer, $15; basic, $12.75; malleable, $13.50; No. 2 foundry, $13.50; forge, $13.15, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is quite steady at the new price of $47, Baltimore, freight to Pittsburgh being $2.16. English and German are on the same basis, and the German can be had with a guarantee of phosphorus as low as the English.

**Steel**—The mills seem to have established a dead line at $20 for billets and $21 for sheet bars, maker's mill, Pittsburgh or Youngstown. They will not sell beyond first quarter at this level. Transactions are extremely light.

**Connellsville Coke**—The Producers' Coke Co. is holding its coke strictly at $2 for first quarter or first half, and it is reported that some coke has been sold at this level. There are a few sellers at $1.90 or $1.85. Contracting is very slow, as prompt remains easily available at $1.75. Foundry coke is $2.50@2.75 for either prompt or contract.

**Foreign Trade of the United States** in iron and steel and machinery, 10 months ended Oct. 31, is valued as below by the Bureau of Statistics of the Department of Commerce:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Exports | $238,971,131 | $251,672,076 | I. $12,700,945 |
| Imports | 23,885,776 | 28,291,355 | I. 4,405,579 |
| Excess, exports | $215,085,355 | $223,380,721 | I. $ 8,295,366 |

The increase in exports this year was 5.3%; the gain in imports was 18.4%. For the last two months imports have shown a decrease as compared with last year.

**Foreign Iron and Steel Trade of Germany,** 10 months ended Oct. 31, metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel | 5,396,512 | 520,663 | Exp. 4,875,849 |
| Machinery | 466,514 | 77,643 | Exp. 388,871 |
| Total | 5,863,026 | 598,306 | Exp. 5,264,720 |
| Total, 1912 | 5,354,361 | 625,989 | Exp. 4,728,372 |

### IRON ORE

Iron ore in the East is very quiet. This is reflected in the fact that a number of the iron mines in Cuba have closed down, or have suspended work for a time. The reason is that a number of furnaces are holding back from buying ore at present, and contract buyers have been hestitating about the prospects for next year's business.

**Imports and Exports of Iron Ore** in the United States, 10 months ended Oct. 31, long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Imports | 1,741,577 | 2,191,136 | I. 449,559 |
| Exports | 1,088,901 | 907,275 | D. 181,626 |

Imports are chiefly from Cuba, Newfoundland and Sweden; exports to Canada. Imports of manganese ore for the 10 months were 227,890 tons in 1912, and 288,588 in 1913 ; an increase of 60,698 tons.

### COKE

Coke production in the Connellsville region for the week declined a little, being close to 322,000 tons. Shipments were only a few tons less. Makers are holding out for $2 per ton for furnace coke on contracts for 1914, but furnaces are very slow to close at that figure.

Virginia coke is now quoted at $1.75@2 per ton at oven for furnace coke.

**Exports and imports of coal in the United States** 10 months ended Oct. 31, in long tons:

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Anthracite | 3,032,691 | 3,598,343 | 1,657 | 864 |
| Bituminous | 12,395,776 | 15,543,656 | 1,337,891 | 1,136,737 |
| Coke | 679,772 | 731,868 | 86,425 | 67,297 |
| Bunker coal | 6,151,280 | 6,483,020 | ..... | ..... |
| Total | 22,259,519 | 26,356,887 | 1,425,973 | 1,204,898 |

The bunker coal, or coal sent abroad for the use of steamships in foreign trade, is practically all bituminous. The trade is chiefly with Canada.

## CHEMICALS

### NEW YORK—Dec. 17

The general trade has been still further quieted down by the approach of the holidays and the close of the year.

**Imports and Exports of Chemicals** and raw materials in the United States, nine months ended Sept. 30, were as follows:

| | Imports | | Exports | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| Arsenic, lb. | 4,190,361 | 5,615,876 | ....... | 66,000 |
| Copper sulphate, lb. | ........ | ....... | 5,712,696 | 3,765,323 |
| Bleach, lb | 55,074,235 | 47,429,010 | 400 | 13,260 |
| Potash salts, lb. | 469,342,269 | 432,102,304 | 2,650,210 | 2,915,117 |
| Soda salts, lb. | 9,053,189 | 8,762,607 | 368,270 | 433,730 |
| Acetate of lime, lb. | ....... | ....... | 58,661,375 | 57,279,340 |
| Nitrate of soda, tons | 347,694 | 524,831 | 6,560 | 4,276 |
| Sulph. ammonia, tons | 28,230 | 33,492 | 160 | ....... |
| Phosphates, tons | ....... | ....... | 927,822 | 1,096,102 |
| Sulphur, tons | 22,056 | 10,868 | 42,127 | 71,680 |
| Pyrites, tons | 690,338 | 716,085 | ........ | ........ |
| Magnesite, tons | 71,486 | 123,661 | 861 | 1,648 |
| Chrome ore, tons | 36,646 | 50,779 | ........ | ........ |

Exports include reëxports of foreign material. Some phosphate is imported, but it is not given separately in the returns.

**Arsenic**—Business continues dull with sales light. The nominal quotation is $2.95@3 per 100 lb., but it is claimed that on a large order business could be done at lower prices.

**Copper Sulphate**—Business has been slow and prices nominally unchanged, the principal seller asking $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

**Nitrate of Soda**—Recent heavy dealing seems to have filled up buyers, and there is very little doing. Quotations are unchanged at 2.17½c. per lb. for spot, and 2.20c. for futures.

### NEW CALEDONIA ORES

Exports of ores from New Caledonia nine months ended Sept. 30, as reported by the "Bulletin du Commerce" of Noumea, were 69,458 metric tons of nickel ore and 33,060 tons chrome ore. Exports of metals were 5761 tons of nickel matte.

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### COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | July | August | September | October | November |
|---|---|---|---|---|---|
| Alaska shipments | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 | 3,391,300 |
| Anaconda | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 | 25,250,000 |
| Arizona, Ltd. | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 | 2,800,000 |
| Copper Queen | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 | 7,115,991 |
| Calumet & Ariz. | 3,800,000 | 4,500,000 | 4,000,000 | 4,500,000 | ..... |
| Chino | 4,746,525 | 5,788,572 | 4,196,296 | 4,767,466 | .. |
| Detroit | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 | 1,922,352 |
| East Butte | 1,060,257 | 1,162,007 | 1,233,018 | 1,040,997 | .. |
| Giroux | 584,546 | 524,953 | 198,178 | 156,084 | .. |
| Mason Valley | 908,892 | 867,060 | 918,000 | 1,052,000 | 1,174,000 |
| Mammoth | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 | 1,700,000 |
| Nevada Con. | 5,403,919 | 5,989,973 | 4,441,671 | 5,898,046 | ..... |
| Ohio | 601,700 | 689,000 | 685,900 | 698,691 | ..... |
| Old Dominion | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 | ..... |
| Ray | 4,097,000 | 4,269,519 | 4,336,434 | 4,725,419 | .. |
| Shannon | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 | 1,110,000 |
| South Utah | 140,000 | 223,498 | 241,843 | 232,269 | .. |
| Tennessee | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 | 1,688,000 |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 | ..... |
| Utah Copper Co. | 9,849,043 | 10,302,251 | 11,463,905 | 9,929,478 | .. |
| Lake Superior* | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 | 6,600,000 |
| Non-rep. mines* | 6,200,000 | 6,200,000 | 6,000,000 | 6,200,000 | ..... |
| Total prod. | 101,669,653 | 96,427,264 | 91,835,075 | 88,102,302 | ......... |
| Imp., bars, etc. | 29,029,990 | 22,474,471 | 35,703,660 | 21,935,023 | ......... |
| Total blister | 130,699,643 | 118,901,735 | 127,538,735 | 110,037,325 | ......... |
| Imp. ore & matte | 8,527,046 | 9,171,351 | 10,800,162 | 5,062,015 | ......... |
| Total Amer. | 139,226,689 | 128,073,086 | 138,338,897 | 115,099,340 | ..... |
| Miami† | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 | 3,230,000 |
| Shattuck-Arizona | 1,019,388 | 1,001,634 | 1,163,237 | 993,224 | ..... |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,379 | 647,905 | 621,120 | 688,581 | .... |
| Granby | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 | 1,944,145 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,240,720 | 2,264,640 | 2,369,920 | 2,424,800 | 2,315,040 |
| Cananea | 3,328,000 | 3,186,000 | 3,148,000 | 3,682,000 | 3,800,000 |
| Moctezuma | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 | 3,517,800 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 | 1,592,000 |
| Cape Cop., S. Af. | ....... | ........ | 607,040 | 712,320 | 649,600 |
| Kyshtim, Russia. | 2,500,000 | 1,585,000 | 1,187,000 | ....... | .... |
| Spassky, Russia. | 660,800 | 1,048,320 | 1,025,920 | 983,360 | .... |
| Exports from | | | | | |
| Chile | 9,856,000 | 8,736,000 | 5,600,000 | 6,160,000 | 7,616,000 |
| Australia | 10,304,000 | 7,720,000 | 6,944,000 | 7,728,000 | 11,200,000 |
| Arrivals–Europe‡ | 11,728,640 | 14,624,960 | 9,661,120 | 18,040,960 | 9,107,840 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

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### STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S.Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| XI, '12 | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | .......... | .......... | .......... |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X | 139,070,481 | 68,173,720 | 68,123,473 | 29,793,094 | 53,625,600 | 83,418,692 |
| XI | 134,087,708 | 48,656,858 | 70,067,803 | 32,566,382 | 48,787,200 | 81,353,582 |
| XII | ........... | ........... | ........... | 47,929,429 | 46,592,000 | 94,521,429 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

## Assessments

| Company | Delinq | | Sale | | Amt |
|---|---|---|---|---|---|
| Arctic, Ida | Dec | 1 | Dec | 31 | 00025 |
| Benton, Ida. | Nov | 25 | Dec | 23 | 0 005 |
| Big Cottonwood, Utah | Dec | 10 | Dec | 29 | 0 01 |
| Bullion, Nev | Dec | 12 | Dec | 30 | 0 02 |
| Carbonate Center, Ida | Nov | 5 | Dec | 22 | 0 001 |
| Clear Grit, Ida , postp'd | Nov | 18 | Jan | 2 | 0 0025 |
| Comet Placer, Nev | Dec | 6 | Dec | 22 | 0 03 |
| Ely Consolidated, Nev | | | Dec | 31 | 0 03 |
| Empire, Ida , postp'd | Oct | 30 | Jan | 2 | 0 005 |
| Gold Mountain Champion, Ida | Dec | 9 | Dec | 30 | 0 0025 |
| Great Copper King, Ida | Nov | 29 | Dec | 29 | 0 001 |
| Hypotheek, Ida | Dec | 5 | Jan | 5 | 0 006 |
| Independence, Utah | Dec | 12 | Jan | 2 | 0 006 |
| Leroy, Ida | Dec | 3 | Jan | 3 | 0 002 |
| Little North Fork, Ida | Dec | 1 | Jan | 2 | 0 001 |
| Nabob, Ida , postp'd | Nov | 17 | Dec | 21 | 0 005 |
| New Yerington, Nev | Dec | 10 | Dec | 30 | 0 01 |
| North Franklin, Ida , postp'd | Oct | 16 | Jan | 29 | 0 005 |
| Overman, Nev | Dec | 10 | Dec | 30 | 0 05 |
| Plaza, Utah | Dec | 13 | Dec | 29 | 0 0025 |
| Rescue Eula, Nev | Nov | 25 | Dec | 29 | 0 01 |
| Robbers Roost, Calif | Dec | 5 | Dec | 29 | 0 01 |
| Seg Belcher, Nev | Dec | 5 | Dec | 30 | 0 02 |
| Silver Star, Ida , postp'd | Nov | 22 | Jan | 10 | 0 002 |
| Tintic, Utah | Dec | 10 | Dec | 31 | 0 002 |
| Utah of Fish Springs | Dec | 15 | Jan | 5 | 0 05 |
| Wasatch, Utah | Dec | 22 | Jan | 8 | 0 05 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53 795 | 56 260 | 62 938 | 24 865 | 25 887 | 28 983 |
| February | 52 222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March | 52 745 | 58 375 | 57 870 | 24 324 | 26 875 | 26 669 |
| April | 53 325 | 59 207 | 59 490 | 24 595 | 27 284 | 27 416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24 486 | 28 215 | 27 199 |
| July | 52 630 | 60 654 | 58 721 | 24 286 | 27 919 | 27 074 |
| August | 52 171 | 61 606 | 59 293 | 24 082 | 28 375 | 27 335 |
| September | 52 440 | 63 078 | 60 640 | 24 209 | 29 088 | 27 986 |
| October | 53 340 | 63 471 | 60 793 | 24 594 | 29 299 | 28 083 |
| November | 55 719 | 62 792 | 58 995 | 25 649 | 29 012 | 27 263 |
| December | 54 905 | 63 365 | | 25 349 | 29 320 | |
| Year | 53 304 | 60 835 | | 24 592 | 28 042 | |

New York quotations cents per ounce troy, fine silver. London, pence per ounce sterling silver, 0.925 fine

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14 094 | 16 488 | 14 337 | 16 767 | 62 760 | 71 741 |
| February | 14 084 | 14 971 | 14 329 | 15 253 | 62 893 | 65 519 |
| March | 14 698 | 14 713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15 741 | 15 291 | 15 930 | 15 565 | 70 294 | 68 111 |
| May | 16 031 | 15 436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17 234 | 14 672 | 17 443 | 14 871 | 78 259 | 67 140 |
| July | 17 190 | 14 190 | 17 353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | 16 328 | 17 698 | 16 799 | 78 762 | 73 125 |
| October | 17 314 | 16 337 | 17 661 | 16 913 | 76 389 | 73 383 |
| November | 17 326 | 15 182 | 17 617 | 16 022 | 76 890 | 68 275 |
| December | 17 376 | | 17 600 | | 75 516 | |
| Year | 16 341 | .... | 16 560 | | 72 942 | |

New York, cents per pound London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44.519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 410 | 223 762 | 193 074 |
| October | 50 077 | 40 462 | 228 353 | 184 837 |
| November | 49 891 | 39 810 | 227 619 | 180 869 |
| December | 49 815 | .. | 226 875 | |
| Av. year | 46 096 | | 209 322 | |

New York in cents per pound London in pounds sterling per long ton

### LEAD

| Month | New York | | St Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4 435 | 4 321 | 4 327 | 4 171 | 15.597 | 17 114 |
| February | 4 026 | 4 325 | 3 946 | 4.175 | 15 738 | 16 550 |
| March | 4 073 | 4 327 | 4 046 | 4 177 | 15 997 | 15.977 |
| April | 4 200 | 4 381 | 4 118 | 4 242 | 16 331 | 17 597 |
| May | 4 194 | 4 342 | 4 072 | 4 226 | 16 509 | 18 923 |
| June | 4.392 | 4 325 | 4 321 | 4 190 | 17 588 | 20 226 |
| July | 4 720 | 4 353 | 4 603 | 4 223 | 18 544 | 20 038 |
| August | 4 569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | 4 698 | 4 924 | 4 579 | 22 292 | 20 648 |
| October | 5.071 | 4 402 | 4 894 | 4 253 | 20 630 | 20 302 |
| November | 4 615 | 4 293 | 4 463 | 4 146 | 18 193 | 19 334 |
| December | 4 303 | | 4 152 | | 18 069 | |
| Year | 4 471 | | 4 360 | | 17 929 | |

New York and St. Louis cents per pound London, pounds sterling per long ton

### SPELTER

| Month | New York | | St Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6 442 | 6 931 | 6 292 | 6 854 | 26 642 | 26 114 |
| February | 6 499 | 6 239 | 6 349 | 6 089 | 26.661 | 25 338 |
| March | 6 626 | 6 078 | 6 476 | 5 926 | 26 048 | 24 605 |
| April | 6 633 | 5 641 | 6 483 | 5.491 | 25 644 | 25 313 |
| May | 6 679 | 5 406 | 6.529 | 5 256 | 25 790 | 24 583 |
| June | 6 877 | 5 124 | 6.727 | 4 974 | 25 763 | 22 143 |
| July | 7.116 | 5 278 | 6 966 | 5.128 | 26 174 | 20 592 |
| August | 7 028 | 5 658 | 6 878 | 5 508 | 26 443 | 20 706 |
| September | 7 454 | 5 694 | 7.313 | 5 544 | 27.048 | 21.148 |
| October | 7 426 | 5 340 | 7 276 | 5 188 | 27 543 | 20 614 |
| November | 7 371 | 5 229 | 7 221 | 5 083 | 26 804 | 20 581 |
| December | 7 162 | | 7 081 | | 26 494 | |
| Year | 6 943 | | 6 799 | | 26 421 | |

New York and St Louis, cents per pound London, pounds sterling per long ton

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15 12 | $18 15 | $13.32 | $17.35 | $14 00 | $18 59 |
| February | 15 03 | 18.15 | 13.28 | 17.22 | 14.01 | 18 13 |
| March | 14 95 | 18 15 | 13 66 | 16.96 | 14.10 | 17 53 |
| April | 15.13 | 17 90 | 13.90 | 16 71 | 14.15 | 16 40 |
| May | 15 14 | 17.68 | 13.90 | 15 80 | 14.12 | 15 40 |
| June | 15 15 | 17 14 | 14.11 | 15 40 | 14 22 | 15 10 |
| July | 15.15 | 16.31 | 14.38 | 15 13 | 14.38 | 14 74 |
| August | 15 43 | 16 63 | 14.90 | 15 00 | 14 85 | 14 88 |
| September | 16.86 | 16 65 | 16.03 | 15 04 | 15 63 | 14 93 |
| October | 17.90 | 16 60 | 17.18 | 14 61 | 17 22 | 14 80 |
| November | 18 07 | 16 03 | 17.09 | 13 91 | 18 00 | 14 40 |
| December | 18 15 | | 17.45 | | 18 73 | |
| Year | $16 01 | | $14 93 | | $15 28 | |

# STOCK QUOTATIONS

| COLO SPRINGS Dec 16 | |
|---|---|
| Name of Comp | Bid |
| Acacia | ‡ 03 |
| Cripple Cr'k Con | ‡ 01 |
| C K. & N | ‡ 07 |
| Doctor Jack Pot | 06 |
| Elkton Con | 51 |
| El Paso | 2 50 |
| Findlay | 01½ |
| Gold Dollar | 06 |
| Gold Sovereign | ‡ 02½ |
| Golden Cycle | ‡1 00 |
| Isabella | 09 |
| Jack Pot | 05 |
| Jennie Sample | ‡ 04½ |
| Jerry Johnson | ‡ 03½ |
| Lexington | ‡ 003 |
| Old Gold | 01 |
| Mary McKinney | 57 |
| Pharmacist | ‡ 01 |
| Portland | 1 00 |
| Vindicator | 82 |

| SALT LAKE Dec 16 | |
|---|---|
| Name of Comp | Bid. |
| Beck Tunnel | 04½ |
| Black Jack | 06½ |
| Cedar Talisman | 00½ |
| Colorado Mining | 10 |
| Crown Point | 00 |
| Daly-Judge | 5 20 |
| Gold Chain | 17 |
| Grand Central | 56 |
| Iron Blossom | 1 15 |
| Little Bell | 10 |
| Lower Mammoth | 01½ |
| Mason Valley | 3 00 |
| May Day | 05 |
| Nevada Hills | ‡ 48 |
| New York | 00½ |
| Prince Con | 21 |
| Silver King Coal'n. | 3 00 |
| Sioux Con | 01 |
| Uncle Sam | 03½ |
| Yankee | .03 |

### TORONTO Dec 16

| Name of Comp | Bid | Name of Comp | Bid |
|---|---|---|---|
| Bailey | 05 | Foley O'Brien | 16 |
| Coniagas | 7 12½ | Hollinger | 7 00 |
| T. & Hudson Ba | 70 00 | Imperial | ‡ 02 |
| Timiskaming | 13½ | Jupiter | 07 |
| Wettlaufer Lor | 07 | Pearl Lake | 08½ |
| Apex | ‡ 01 | Porcu Gold | 11 |
| Big Dome | 14 75 | Preston E. D | 01½ |
| Crown Chartered | 00½ | Rea | 12½ |
| Dobie | ‡ 10 | Swastika | 02 |
| Dome Exten | 06½ | West Dome | 08 |

### SAN FRANCISCO Dec. 16

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | .06 | Belmont. | 7.15 |
| Belcher | .48 | Jim Butler | .64 |
| Best & Belcher | 05 | MacNamara.. | .07 |
| Caledonia | 1 65 | Midway | 33 |
| Challenge Con. | 13 | Mont -Tonopah | .91 |
| Chollar | 02 | North Star | .37 |
| Confidence | ‡ 38 | West End Con | 1.22½ |
| Con Virginia | 12 | Atlanta | .09 |
| Crown Point | 34 | Booth | .02 |
| Gould & Curry | 03 | C.O.D. Con | .02 |
| Hale & Norcross | 07 | Comb. Frac | 06 |
| Mexican | 1 15 | Jumbo Extension | .08 |
| Occidental | 70 | Pitts -Silver Peak... | .35 |
| Ophir | 18 | Round Mountain | 33 |
| Overman.. | 35 | Sandstorm Kendall | 04 |
| Potosi | 03 | Silver Pick. | 03 |
| Savage | 10 | Argonaut | 2 50 |
| Sierra Nevada. | 07 | Bunker Hill. | 1 50 |
| Union Con | 10 | Central Eureka. | 28 |
| Yellow Jacket | 31 | So Eureka | 2 00 |

| N. Y. EXCH. Dec 16 | |
|---|---|
| Name of Comp. | Clg |
| Amalgamated | 70½ |
| Am. Agri Chem | 44 |
| Am.Sm &Ref .com | 61½ |
| Am. Sm & Ref , pf | 97½ |
| Am Sm Sec , pf B | 81 |
| Anaconda | 34 |
| Batopilas Min | 1 |
| Bethlehem Steel,pf | 67½ |
| Chino | 37½ |
| Federal M. & S , pf | 31 |
| Great Nor.,ore ,ctf | 31 |
| Guggen Exp .. | 43 |
| Homestake... | 116 |
| Inspiration Con . | 14 |
| Miami Copper | 21 |
| Nat'l Lead, com | 42½ |
| National Lead, pf. | 102 |
| Nev Consol | 14 |
| Phelps Dodge | 188 |
| Pittsburg Coal, pf | 85 |
| Quicksilver, pf. | 2 |
| Ray Con. | 17 |
| Republic I&S,com | 19½ |
| Republic I&S, pf... | 78 |
| SlossSheff'd,com. | 25 |
| Sloss Sheffield, pf | 85 |
| Tennessee Copper | 29 |
| Utah Copper | 47 |
| U S Steel, com | 55½ |
| U S Steel, pf | 104½ |
| Va Car Chem ,pf | 95 |

| N Y CURB Dec 16 | |
|---|---|
| Name of Comp | Clg |
| Ariz Belmont | 03½ |
| Barnes King | 1½ |
| Beaver Con | 32 |
| Big Four | ‡ 08 |
| Boston Montana | 5 |
| Braden Copper | 7½ |
| B C Copper | 2 |
| Buffalo Mines | 2 |
| Can G & S | 12 |
| Caribou | 69 |
| Con Ariz Sm | 1/16 |
| Coppermines Cons | 2 1/16 |
| Davis-Daly | 1 |
| Diam'field-Daisy | ‡ 03 |
| Ely Con | 01 |
| Florence | 22 |
| Gold Hill Con | 18 |
| Goldfield Con | 1 |
| Greene Cananea | 29 |
| Greenwater | 05 |
| Internat S & R | ‡115 |
| Kerr Lake | 4 |
| La Rose | 1 11/16 |
| McKinley-Dar-Sa | 1 5/16 |
| Min Co of A new | 2 1/16 |
| New Utah Bingham | 45 |
| Nipissing Mines | 8 |
| Ohio Copper | ¼ |
| Puebla S & R | 2 |
| South Utah M&S | ‡ 3/16 |
| Stand'd Oil of N J | 396 |
| Stewart | 1 3/16 |
| Tonopah | 6 3/16 |
| Tonopah Ex | 1 7/16 |
| Tonopah Merger | 52 |
| Tri-Bullion | ¼ |
| Tularosa | 50 |
| Union Mines | ‡ 08 |
| United Cop., pfd | ‡3 |
| Yukon Gold | 2 |

| LONDON Dec 8 | | | |
|---|---|---|---|
| Name of Comp | Clg | | |
| Camp Bird | £0 | 14s | 0d |
| El Oro | 0 | 15 | 0 |
| Esperanza | 1 | 1 | 3 |
| Mexico Mines | 5 | 7 | 6 |
| Oroville | 0 | 11 | 3 |
| Santa Gert'dis | 0 | 17 | 6 |
| Stratton's | 0 | 0 | 7½ |
| Tomboy | 1 | 7 | 6 |

| BOSTON EXCH Dec 16 | |
|---|---|
| Name of Comp. | Clg. |
| Adventure | ‡1½ |
| Ahmeek | ‡250 |
| Alaska Gold M. | 20 |
| Algomah. | ‡ 90 |
| Allouez | ‡30½ |
| Am. Zinc | 16½ |
| Ariz. Com., ctfs | 3½ |
| Bonanza | ‡ 59 |
| Boston & Corbin | ‡ 50 |
| Butte & Balak | 3½ |
| Calumet & Ariz | 60½ |
| Calumet & Hecla | ‡395 |
| Centennial. | ‡13 |
| Cliff. | ‡1 |
| Copper Range. | 33 |
| Daly West | ‡2½ |
| East Butte | 10 |
| Franklin. | 2½ |
| Granby... | 68½ |
| Hancock. | ‡13½ |
| Hedley Gold | ‡29½ |
| Helvetia....... | ‡.25 |
| Indiana | ‡3½ |
| Island Cr'k, com | ‡46 |
| Island Cr'k, pfd | ‡81½ |
| Isle Royale | 17½ |
| Keweenaw..... | ‡2½ |
| Lake | 5½ |
| La Salle. | ‡3½ |
| Mass. | ‡2 |
| Michigan...... | ‡ 60 |
| Mohawk. | 39 |
| New Arcadian | ‡1½ |
| New Idria Quick | ‡2½ |
| North Butte | 26½ |
| North Lake | ‡1 |
| Ojibway | ‡ 75 |
| Old Dominion | ‡48 |
| Osceola | 67½ |
| Quincy | 55 |
| Shannon | 5½ |
| Shattuck-Ariz | 25½ |
| Superior | ‡22½ |
| Superior & Bost | 2 5/16 |
| Tamarack | 28 |
| Trinity | ‡3½ |
| Tuolumne. | 65 |
| U S Smelting. | 36½ |
| U S Smelt'g, pf | 47 |
| Utah Apex | ‡1½ |
| Utah Con | 8½ |
| Victoria | ‡1 3/16 |
| Winona | ‡1½ |
| Wolverine | 40½ |
| Wyandot | ‡ 50 |

| BOSTON CURB Dec 16 | |
|---|---|
| Name of Comp | Bid |
| Bingham Mines | 4½ |
| Boston Ely | .40 |
| Butte&Lon'nDev | 30 |
| Cactus | 01½ |
| Calaveras | 1½ |
| Chief Cons | 1 3/16 |
| Corbin | 1½ |
| Cortez | 20 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | 97 |
| First Nat Cop | 2½ |
| Houghton Copper | 2½ |
| Majestic | 23 |
| Mexican Metals | 37 |
| Moneta Porc | ‡ 01 |
| Nevada-Douglas | 1 11/16 |
| New Baltic | 50 |
| Oneco | .80 |
| Raven Copper | 11 |
| Rhode Island Coal | 01 |
| Smokey Dev | 60 |
| So Lake | 3 |
| S W Miami | 1 |
| Tonopah Victor | 25 |
| Trethewey | 30 |
| United Verde Ext | .45 |

‡Last Quotation

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# Notes on the Cuyuna Range—I

By L. O. Kellogg*

*SYNOPSIS—Description of present conditions and practice on the Cuyuna iron range in Minnesota. Location, geology and discovery noted. Methods of exploration and drilling. Descriptions of the operating companies. Mining methods and typical equipments considered. Water, concentration and transportation problems discussed.*

⁂

The Cuyuna, the newest of the Minnesota iron ranges, lies in the central part of the state, south and west of the Mesabi, covering an area perhaps 50 miles long and of varying width. The fact that the ore occurs in highly inclined lenses relatively small but extremely numerous, that for the most part it is commercially a hard ore, that the country is flat and overlain by an unusually heavy mantle of drift so that ore never outcrops and rock only rarely, that some of the ore is high in manganese, that water is a serious problem, these characteristics serve to differentiate the Cuyuna from the other Lake Superior ranges and together with its recent development and still unproved extent make it of great present interest.

Armour No. 2 Headframe and Trestle

## Subdivisions

The district is usually considered as made up of two parts, the north range and the south range. The general strike of the formation, as well as of the individual lenses, is about N. 50° E. Two strong lines of magnetic attraction extending the whole length of the district indicate the orebodies that constitute the south range. On the northwest side of these lines, at the northeast end, several shorter parallel lines of attraction outline the north range. The north range was the first developed and is the principal producer still. It is claimed that the ore goes deeper there than on the south range. The most important place and the geographical center of the whole range, as outlined by the lines of attraction, is the city of Brainerd. Crosby, a recent settlement, is the principal town on the north range. Deerwood, Ironton, Cuyuna, Riverton, are other towns of some importance, usually closely connected with individual mines or groups. The principal producing mine is the Kennedy on the north range. The Barrows is the only producer as yet on the south range.

## Geology

It is not within the scope of this article to give in detail the history and geology of the district. The ore occurs as lenses, having their greatest dimension along the strike, the next greatest down the dip and the least dimension at right angles to these. The dip will vary from 45° to almost 90°. The country rock is either igneous or metamorphic, the walls being prevailingly a slate. An increasing importance is now being attributed to the igneous rocks. The country seems to have been much folded, which accounts for the repeated occurrence of the ore formation over a considerable distance at right angles to the strike. The ore has been derived from iron carbonates and silicates by natural concentrating processes. In some cases the original iron minerals have been metamorphosed to magnetite by the igneous intrusions and have suffered no further concentration. The areas where this has taken place show strong attraction but no ore.

In fact, the orebodies themselves show little attraction and the lines of attraction are the result of associated magnetic rocks. A strong attraction is a good sign of ore, but is not invariable nor is its absence always proof of the absence of ore. An account of the geology of the range can be found in Monograph LII of the U. S. Geological Survey, by Leith, Van Hise and associates. While

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*Of editorial staff, "Engineering and Mining Journal."

Eng. & Min. Journal

not strictly uptodate, there have been no radical changes in the conception of the geology since its publication.

The economic mineral is principally hematite. In some ores large amounts of manganese occur. The following are typical complete analyses, the averaged results of a number of samples on three north range properties:

TYPICAL ANALYSES OF CUYUNA ORES

| | Mine No. 1 | Mine No. 2<br>Foot-Wall Side | Mine No. 2<br>Hanging-Wall Side | Mine No. 3 |
|---|---|---|---|---|
| Fe | 56.80 | 61.31 | 58.78 | 61.88 |
| P | 0.275 | 0.295 | 0.22 | 0.066 |
| SiO | 8.80 | 4.49 | 6.41 | 8.09 |
| Mn | 0.30 | 0.44 | 0.35 | 0.37 |
| Al | 1.73 | 2.52 | 2.70 | 2.28 |
| Ca | 0.17 | 0.11 | 0.13 | 0.04 |
| Mg | 0.12 | 0.06 | 0.10 | 0.03 |
| Ignition loss | 4.65 | 6.64 | 7.47 | 1.19 |
| Moisture | 11.25 | | | |

### Discovery and Development

Mention of variation in the direction of the compass needle is found in the notes of the government land surveyors who worked through the country in the '70s. Grave suspicions were raised as to the presence of iron ore by the behavior of the compasses when the Northern Pacific ran the surveys for its present road. Cuyler Adams developed a belief in the possibilities of the district as a source of iron and began a period of investigation and surveying which extended over five years. At the end of that time he started to pick up land at prices that now look absurd. He paid $4 per acre for the land now constituting the Kennedy mine and all his extensive purchases stand him in only about $10 per acre. It is difficult to state the value of these lands today.

Mr. Adams can walk from Deerwood to Brainerd on his own property, most of it ore-bearing. This is one refreshing case where the reward for a new discovery has gone to the man most deserving it. Mr. Adams' success in bringing in the range as a producer was obtained only in the face of many difficulties. His ideas were scoffed at, his holdings were repeatedly drilled and turned down, but he had sufficient persistence and faith to win out.

### Exploration and Drilling

Preliminary exploration of a tract of land is performed with a dip needle. By this means the lines of strong magnetic attraction are discovered and plotted. The next operation in exploration is drilling. At first, Mesabi practice was followed, a given 40 being drilled over its entire area with holes regularly spaced at intervals of a few hundred feet. The attempts to use this method were largely responsible for the early discouraging reports on the range. It was extremely easy to miss the ore altogether. When the nature of the occurrence of the orebodies became better understood, a more suitable method was evolved. The line of attraction across a 40 being determined, four or five equally spaced points are established along its length and along a line at right angles through each point a series of holes is put down. This operation is called "cross-sectioning." The spacing of these holes is variable, but will average 40 to 50 ft. The holes may be vertical or inclined; the latter offer the advantage of intersecting the oppositely dipping formation more squarely and thus giving the same amount of information with less drilling; an incidental advantage is that they are less likely to be deflected by failing to enter a hard stratum at a sharp angle; they are, however, somewhat more expensive and difficult to drill. The choice between vertical and angle holes seems to be to a certain extent a question of locality. The north range formation is flatter, averaging about 60°, a condition more favorable to the vertical hole, and at present, so far as could be discovered, only vertical holes are there being put down. On the south range the dip is about 75°, so that an angle hole shows an increased advantage, and there are several now being drilled.

Drilling through the surface drift is done with a churn drill, of the Lake Superior pattern. In the softer rocks, the churn drill is also available, but for hard formation the diamond drill is more efficient. Accurate logs are kept of the drilling and sampling is carefully done when in ore. The work is for the most part carried on by contractors, there being one large company, the Longyear, and many smaller concerns in the field. Any drill runner is a potential drilling contractor, depending on his ability to get hold of a rig. The holes in the overburden of drift are cased with a 3-in. pipe and in the rock with a 2-in.

### Extent of District and Mining Operations

At present, while much drilling has been done, the limits of the district both in lateral extent and in depth are still undetermined. The deepest ore has been found on the north range. At a point about a mile east of Riverton the Carlson Exploration Co. put down a hole for 1017 ft. and bottomed it in material running 35% in iron. At slightly higher points a better grade was penetrated. In the Armour No. 1 ore has been found at 700 ft. and in the Pennington at 750 ft. On the other hand, some of the mines have been bottomed at from 300 to 400 ft. The chances of eventually finding a good deal of ore in depth would to an outsider seem to be excellent.

There are at present three points of activity on the south range, the Barrows mine, which recently began shipping, the Brainerd-Cuyuna shaft, being put down in Brainerd itself, and the Adams mine, of the Orelanis Mining Co., which is cutting its pump station and preparing for extensive mining. The Barrows mine, in a way, marks the southwest end of the range, although drilling has been carried on beyond it and the lines of attraction extend far beyond it. It is operated by the Virginia Ore Mining Co., a subsidiary of the M. A. Hanna Co. The mine is now hoisting about 200 tons with a single skip, but a new five-compartment shaft has been started. Considerable water has to be handled, about 200 gal. per min. at present.

### Brainerd-Cuyuna Mine

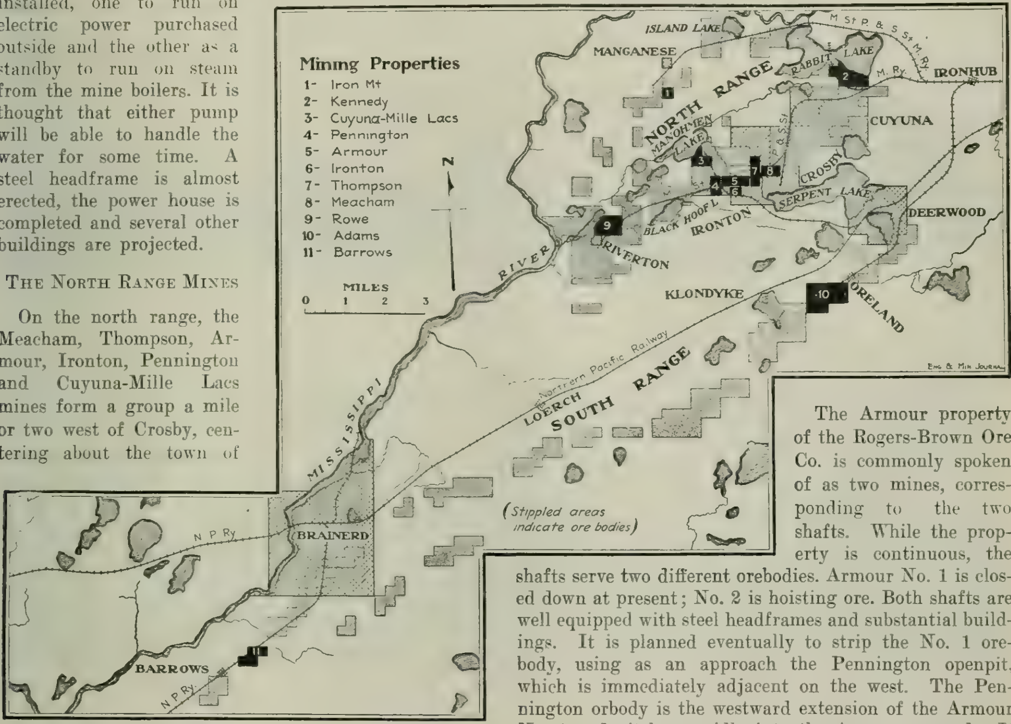
The Brainerd-Cuyuna shaft in the south end of the city of Brainerd is being sunk to mine a fair-sized body of ore. Part of a churn-drilling outfit is used for the preliminary sinking and seems to be rather a good rig for the purpose. The engine, tripod and a hemp rope are employed. The drilling engine has an oscillating cylinder and no crosshead; the hoisting rope is given several wraps around the projecting capstan head and the operator keeps pulling off the loose end as the rope is wound on and the bucket hoisted. The contents of the bucket are dumped into a wheelbarrow and wheeled away. At the time of visiting, the shaft was down about 40 ft., was timbered with 12x12-in. sets and was making little water. It is to be hoped that the last favorable condition continues.

### ADAMS MINE

The Adams mine, while on the south range, is geographically more closely connected with the north range mines, being only three or four miles south of Crosby. Cuyler Adams himself is directing operations here, and takes great pride and interest in the work. He has had put down a 137-ft. concrete drop shaft at considerable expense to him and more to the shaft contractor; he is installing his plant with great care and foresight and intends to make the shaft a central point for mining operations covering two or three miles along the strike. The pump station is being cut in hard, dry diabase and is also being supported with steel sets. Two pumps will be installed, one to run on electric power purchased outside and the other as a standby to run on steam from the mine boilers. It is thought that either pump will be able to handle the water for some time. A steel headframe is almost erected, the power house is completed and several other buildings are projected.

### THE NORTH RANGE MINES

On the north range, the Meacham, Thompson, Armour, Ironton, Pennington and Cuyuna-Mille Lacs mines form a group a mile or two west of Crosby, centering about the town of Ironton. To the northeast is the Kennedy, to the northwest the Iron Mountain and to the west, the Rowe, the Kennedy, Armour, Pennington, Ironton and Cuyuna-Mille Lacs are producing; the Meacham is closed down; the Thompson and Rowe are stripping and the Iron Mountain is developing.



MAP OF THE CUYUNA IRON RANGE

### THE THOMPSON MINE

The Thompson, of the Inland Steel Co., was first opened up as an underground mine in the face of a heavy flow of water. The flow at one time was 3500 gal. per min. and the country was drained for a long area around. The water is now choked back with dams and bulkheads and some of the neighboring properties allowed to fill again. Underground development comprises about a mile of workings, the lowest level being the 250-ft. At present all underground work is suspended and the property is being stripped. The orebody is about 1400 ft. long and the crest of the pit will be about 350 ft. across. The average depth of overburden is 70 ft. The company expects to steam shovel about 70 ft. of the ore after stripping and then to mill about 80 ft. The milling and subsequent underground mining will bring into use again the concrete shaft and its steel headframe, the shaft being used practically for pumping only while steam-shovel work is being carried on. The Thompson has another orebody of probably lower grade on which less work has been lone.

The Armour property of the Rogers-Brown Ore Co. is commonly spoken of as two mines, corresponding to the two shafts. While the property is continuous, the shafts serve two different orebodies. Armour No. 1 is closed down at present; No. 2 is hoisting ore. Both shafts are well equipped with steel headframes and substantial buildings. It is planned eventually to strip the No. 1 orebody, using as an approach the Pennington openpit, which is immediately adjacent on the west. The Pennington orbody is the westward extension of the Armour No. 1 and pitches rapidly into the Armour ground. It will be possible after stripping to mine a fair amount of the orebody with the steam shovel and the deeper portion to the east can then be taken out by continuing an inclined adit from the openpit. The Armour No. 1 has developed the 300-ft. level rather thoroughly.

### THE PENNINGTON OPENPIT

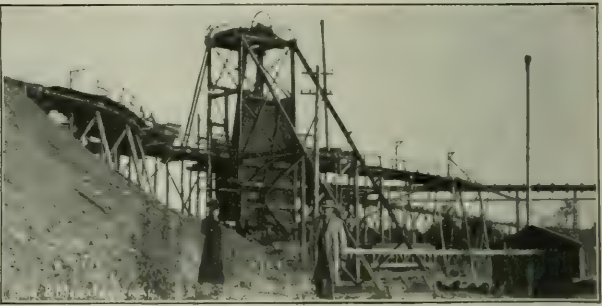
The Pennington mine is in many ways the most interesting in the district, chiefly as being the first property to be stripped and mined with a steam shovel. The Pennington Mining Co. is controlled by the Tod-Stambaugh interests. Working under conditions, some of which were favorable and others unfavorable, the property was stripped at a remakably low cost per cubic yard. The figure commonly given is 9c.; it is not certain, however, just what items are included in this cost.

The most favorable condition governing the work is the character of the overburden, which is a glacial drift, chiefly sand, uncompacted, dry and free of large boulders. It is almost ideal material for a shovel to handle; no blasting is required. Unfavorable conditions are the facts that the deposit is long and narrow, that the grades both for stripping and for mining are extremely steep and that the curves are sharp. Furthermore, it was necessary to make a supplementary cut at right angles to the pit in order to get a grade that was at all feasible. This, of course, added to the quantity of overburden removed. The distance from the pit to the end of the dump is 4000 ft., of which 1000 ft. is on a 6% grade and 3000 ft. on a 3%, giving a total difference in elevation to be overcome of 150 ft. The maximum grade is 7% and this, furthermore, occurs on a 23° curve. The overburden removed amounted to 1,250,000 cu.yd., the average depth being 70 ft. It is expected to mine 60 ft. of the ore with the steam shovel and to mill 50 ft. Milling and the final underground work will, of course, necessitate a shaft, which the company does not possess at present. The ore is in a series of parallel lenses so close together that the poor material separating them is not in sufficient quantity to lower the grade of the ore below merchantable limits.

Looking East in Partly Stripped Thompson Pit

Headframe and Shaft House of the Kennedy Mine

Adams Power House, Concrete Stack, Steam and Air Lines to Shaft



Barrows Headframe with Stock Pile on Left and Trestle and Launders on Right

### THE LOCKER-DONAHUE PROPERTIES

The Ironton mine of the Cuyuna-Duluth has been opened to get out a small portion of the Armour No. 2 orebody, which extends through one corner of the 10 held by the company. The mine is equipped with a wooden headframe and hoists with one skip. About 5000 tons has been mined this year, but the property must necessarily be a small one. The working level is the 200-ft.

The Cuyuna-Mille Lacs mine, to the northwest about a mile, is controlled by the same interests as the Cuyuna-Duluth, the Locker-Donahue. It is chiefly noteworthy for the high manganese content of its ore. About 30,000 tons have been shipped this year to various concerns, including the Bethlehem Steel Co., the Pittsburgh Steel Co., the Standard Iron Co., the Lake Superior Iron & Chemical Co., etc. This has been largely low-manganese material. Ore running 8 to 15% in manganese is used for making a basic pig, that running from 15% to 30% is suitable for spiegel and that above 30% for ferromanganese. The analyses of a recent shipment of ten cars ran from 41% to 50% in iron, from 0.025% to 0.033% in phosphorus and from 11.15% to 17.21% in manganese. Underground work is now being carried on, the 200-ft. being the working level, but it is intended eventually to strip the orebody. The company claims reserves of 10,000,000 tons and of this 1,500,000 is said to be well blocked out. One 140-ft. and several 350-ft. holes were stopped in ore. Ore has been found by drilling over a width of 600 ft. The overburden is from 50 to 70 ft. deep.

### THE ROWE MINE

The Rowe mine of the Pittsburgh Steel Ore Co. lies about six miles from Crosby to the west, adjoining the town of Riverton. It is particularly interesting for the hydraulic stripping which is being done. The overburden has been partly sluiced off and partly broken down with a hydraulic giant and pumped off. A steam shovel has also recently been added, to expedite matters. The ore which is being stripped is said to lie in two bodies, that to the north of higher grade than the other. A considerable tonnage is known to exist, but the grade is variable and it is commonly believed that most or all of it will have to be concentrated. The results of experiments along this line are said to have been favorable.

The Iron Mountain is a small outlying property that has just got a shaft into the ledge after having had considerable difficulty in sinking attempts.

### The Kennedy

The best mine of the district at present is the Kennedy, of the Rogers-Brown company. It will probably produce about a quarter of a million tons this year. Underground mining only is practiced and operations have had time to become somewhat systematized. The mine has the distinction of having been emphatically turned down by one large company after a thorough drilling. It happened that the holes were all put down at an inclination parallel to the orebodies and never got out of the foot wall.

Great difficulty was had in getting a shaft down to the rock when the Rogers-Brown company took hold and attempted to sink. Several shafts have been sunk, only the last one being used for hoisting and pumping. The mine is opened up on two levels, but the upper of these is called a sublevel and no ore is hoisted from it. The ore is mined by a top-slice method; rooms about 30x40 ft. are cut out and timbered temporarily; then the timbers are blasted out to permit the overburden to cave down. A mat of timbers is formed to keep the overburden from the ore. In some cases a slice is taken out so as to leave 10 ft. of ore between the top of the room and the overburden and then this is caved.

The general method is similar to that followed on the Mesabi, but the timbering is somewhat different, the posts of the sets being battered and the sets themselves placed somewhat irregularly. The mine is opened up on four ore lenses, the South, the Intermediate, the Midway and the North, which converge toward the northeast and are thought to come together under Rabbit Lake. Of these the Intermediate is the richest and the most productive. The Midway has been little developed. The North and South have been opened up to a considerable extent but are of lower grade than the Intermediate. Some apprehension is felt as to the possibility of Rabbit Lake's coming in on the mine. An impervious band of clay protects the mine from seepage, but lines have been established parallel to the lake shore beyond which mining is not permitted. The mine is 262 ft. deep, this being the lowest level, but has not been bottomed as all the drill holes were shallow.

### Operations and Equipment

The ore is shot down crib chutes to the bottom level, trammed to the shaft and hoisted. An electric tramming system is being installed. A new stock-pile trestle, 1100 ft. long, is under construction on the surface to take care of the winter's production. This is of unusual length but only the outer half can be used, as it is not considered wise to stock the ore over the underground workings. The mine makes a large quantity of water which is handled with a cross-compound, condensing Prescott, corliss steam pump, Mesabi pattern. As a standby there is a centrifugal pump direct connected to a condensing steam turbine. The headframe is of steel and the numerous other buildings are substantially constructed.

## Wallaroo & Moonta

The Wallaroo & Moonta Mining & Smelting Co., South Australia, for half-year ended June 30, 1913, shows a production of 3610 tons of refined copper from 35,456 tons of ore, matte and precipitates smelted. The following table shows the tonnage of ore produced and men employed:

| | Tons | Men Employed | Tons per Man (6 Mo.) |
|---|---|---|---|
| Wallaroo mines | 29,324 | 1071 | 27.40 |
| Moonta mines | 3,080 | 278 | 11.1 |
| Smelting works | 35,456 | 307 | 114 |

The ore from the Wallaroo mines averaged 8.24% copper and in addition to the ore 9 tons of precipitate were produced averaging 72.22% copper. The ore from the Moonta mines averaged 10.94% of copper and in addition to the ore 507 tons of precipitates were produced which averaged 74.29% copper. The production from purchased ores amounted to 291 tons of fine copper. The balance of liquid assets was $721,723 over current liabilities.

It is stated that the great success of ore-dressing through the use of the flotation process at the Wallaroo mines has led to the adoption of the process at the Moonta property. So far as this treatment has progressed there is every evidence that it will materially assist in working low-grade ores at a profit that otherwise would be rejected. The installation of the flotation plant at the Wallaroo mines has called for the exercise of considerable care and skill and has also involved a good deal of expenditure. The plant consists of tube mills and other recrushing machinery, elevating and settling appliances and the flotation machinery.

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## The Government's Attitude Toward the American Smelting & Refining Co.

### Washington Correspondence

Attorney-General McReynolds is still carrying on investigations into the organization of the American Smelting & Refining Co., with a view to making a definite report as to whether the concern is or is not a "trust," and as such needs to be prosecuted under the law as now framed. By inquiry at the Department, it is learned that the Attorney-General will not make any definite report either to Congress or to the President for some little time to come with reference to this subject. He has, however, completed the so called "field work," and whatever remains to be done is in the nature of office investigation, consultation with the company and decision on the line of policy to be followed. It is intimated at the department that the ultimate outcome will depend a good deal upon the attitude taken by the company itself in conferences which are now understood to be in progress between representatives of the department and of the concern itself. Included in the subject matter of the discussion, it is understood, is some consideration of the labor situation in the plants of the corporation, a phase of the concern's work which has recently been brought under the general consideration of former Commissioner of Labor Charles P. Neill, who has been transferred to the New York office of the company. If the corporation should be inclined to follow the suggestions of the Government, it is believed that it will be treated as was the New Haven, that is to say, nothing will be done to interfere with it through court proceedings. Government officials refuse to go into detail as to the points that are now at issue, but it is understood that they have been informed that any change in the form of organization of the company would be exceedingly difficult, inasmuch as the separation of the ownership of the various plants would hardly be feasible. The process of smelting is carried on successfully and profitably because of the coöperation of the different plants in dealing with the different grades of ore and in adjusting their production to the requirements of the different qualities of ore purchased in the various parts of the country. It is claimed that there is no "trust" in the ordinary sense of the word, inasmuch as the concern is subject to competition of a sharp kind from many sources.

Apparently the hostility to the Smelting & Refining Co. in Congress which was very acute about a year and a half ago, at the time when Attorney-General Wickersham announced that there was no trust in the business, has fallen off somewhat, partly on account of the fact that the Department of Justice is continuing its inquiries, under the new management of Mr. McReynolds, partly because some of the foremost opponents of the concern have left Congress.

The Department is working on the affairs of the so called quicksilver pool and authorized representatives state that as in the case of the smelting question, the field work has been done, but that no report in this matter will be formally made for some time to come. Quiet investigations are being made into the copper situation and particularly in the labor conditions in the copper industry, but no action as to these is in prospect for the immediate future.

Well informed persons assert that the administration has no wish in the present condition of the markets to introduce additional difficulties or to attempt proceedings that would unnecessarily harass any concern. In fact, such statements have been made of late in a semi-official way. The opinion is further expressed that nothing definite is likely to be done until the administration's anti-trust program has taken form and that when it has thus taken shape, the existing concerns will be asked to conform to it as nearly as they reasonably can. This plan, if followed, will defer matters for some time.

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## Bureau of Mines Appropriations

The estimates of appropriations for the United States Bureau of Mines, for the fiscal year ended June 30, 1915, as approved by the Secretary of the Interior, have just been forwarded to Congress. The estimates are as follows:

For general expenses of the Bureau of Mines, $70,000; investigating mine accidents, $347,000; equipment of mine rescue cars and stations, $30,000; equipment of testing plant at Pittsburgh, Penn., $10,000; testing fuels, $135,000; mineral-mining investigations, $120,000.

For inquiries and investigations of petroleum and natural gas, $30,000; inspection of mines in Alaska, $7000; books and publications, $2000; lands, leases, etc., for mine rescue cars, $1000. The total for the Bureau of Mines is $752,000. The item of $30,000 for the equipment of rescue cars and stations is for the first time placed separately in the estimates and represents an increase.

The $10,000 asked for the equipment of the testing plant is needed for the purchase of steam and electric equipment. The estimates set forth that the present power and electric service plant at the experiment station is on the eve of breakdown. For the mineral-mining investigations, an increase of $20,000 is asked, from $100,000 to $120,000. For the inspection of mines in Alaska, an increase of $500 over the previous year is asked. The same increase is asked for books and publications. The item for lands, leases, etc., for mine rescue cars is decreased $1000.

The item of $30,000 for inquiries and investigations of petroleum and natural gas is for the first time placed separately in the estimates and represents an increase.

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## Coal and Iron in Manchuria

A report from Consul General F. D. Fisher, at Mukden, Manchuria, says that the capitalization of the Pen Hsi Hu Colliery & Mining Co. has been increased to 5,000,000 yen (about $2,500,000), of which 2,000,000 yen is to be applied to the working of the colliery and 3,000,000 yen to the exploitation of the iron-ore deposits. Of the latter sum, 500,000 yen is now being expended in the installation of a blast furnace to have a capacity of 100 tons of pig iron per day, which will be followed later by the construction of three other blast furnaces of equal capacity, together with a complete steel plant.

The ore beds are in strata lying parallel with the slope of the mountain, and while development work has not been completed, an estimate places the amount of ore practically in sight at 80,000,000 tons, with a probability that the amount is larger. The ore is magnetite, portions of which run as high as 70% iron, and may be easily worked. The lower grades, however, will probably require magnetic separation.

From the development work in only a portion of the coal fields it is estimated that 120,000,000 tons are in sight. The coal is semi-anthracite, containing little sulphur, and is of excellent coking quality. It is reported that, owing to the favorable position of the ore beds, the ore can be mined and brought to the station of Nan Fen, six miles distant, where the smelters are to be located, for about $1.20 per ton.

While conservative engineers may consider that the superficial development work actually done does not fully warrant the assumption that the estimated amount of ore is actually there, such assumption may be based upon fair probability, and, if further work proves it to be correct, this undertaking will no doubt develop into extensive proportions. It is now looked upon as solving the present problem confronting the different steel works in Japan, that of getting pig iron.

As Okura & Co., which represents the Japanese interests in this concern and has the practical management of it, represents various German machinery houses, it is probable that German machinery will almost wholly be used in the works. Two German boilers of 12,000 hp. have already been received.

# A Geological Drainage Problem

By R. R. Heap*

*SYNOPSIS—It was long held impossible to lower the water level in the Miami district sufficiently to permit mining the lower Boone chert ore-runs. Previous pumping more or less unsuccessful. The Lennan Zinc & Lead Co. took advantage of the impervious Cherokee shale alongside steeply dipping ore to get a dry shaft to considerable depth. Drill holes and centrifugal pumps used to drain lower ore run. A stimulus to mining in the district. Coöperation on the part of other operators.*

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The Miami district, as it is commonly known, is one of the groups of mines that, linked together, form the Southwestern zinc and lead field. It is located in Ottawa County, Okla., four miles north of Miami, the county seat, from which it derives its name and about four miles south of the Kansas line. Its position with reference to the field at large, is on the extreme southwestern edge (Fig. 1.) The nearest district of importance is that of Galena, Kan., 20 miles northeast of Joplin, the commercial center of the district, being distant eight miles to the east of Galena.

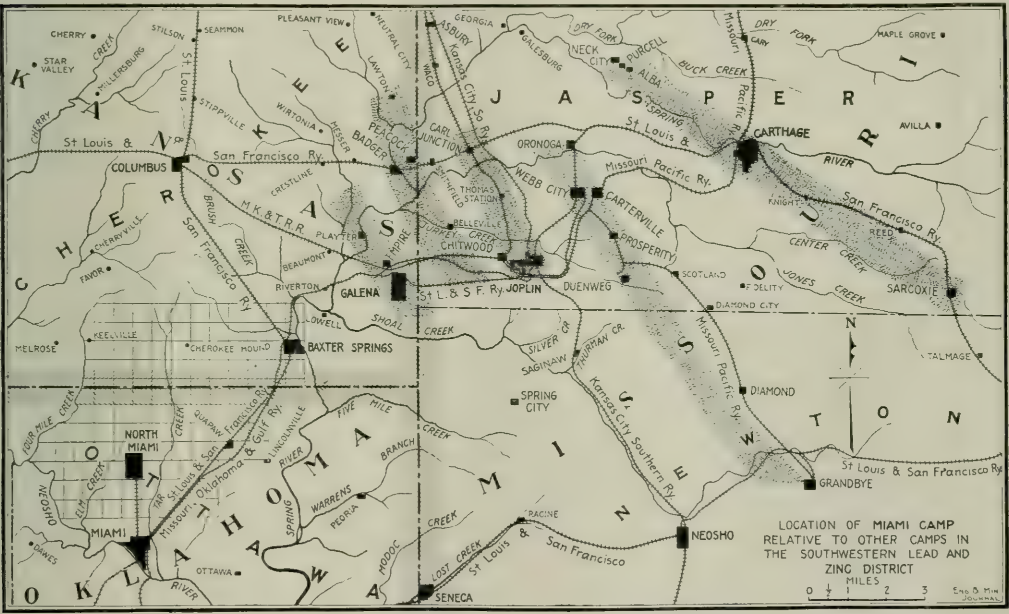

Fig. 1. The Southwestern Lead and Zinc District

### History of Early Pumping and Ore Development

The initial development work in this district was carried on during the fall of 1907 in the southern part, on the shallower upper levels of the New State mine, operated at that time by the Standefer brothers, the pioneer miners of the district. The water, which at that time was considered to be an artesian flow, stood at a level of 34 ft. from the surface and it required two 14-in. cornish pumps running continuously day and night for a period of 84 days to lower the water table to the 102-ft. level, where mining operations were commenced.

It was at this early stage of mining that conjectures were made regarding the pumping problem as shown by the following paragraph from one of the government geologists' report:

> A circumstance which has delayed the development of the district is that each undertaking requires the raising of 500 to 750 gal. of water per min. This, of course, has been the case in most of the new camps in the Joplin region. With the lowering of the underground water level to the level of mining, the amount of pumping ordinarly becomes inconsiderable. In the Miami district, however, the situation is somewhat exceptional. The surface of the ground is low, not more than 25 ft. above Tar Creek, the drainage level for the region, and the water-bearing ore stratum is capped by the unbroken Cherokee shale. The mine water is different from the surface water in other camps, being highly charged with $H_2S$, like the deeper artesian waters, and the height to which it rises may represent artesian head rather than the underground water table. If this be so, there may be no great diminution of the amount of water with time, but on the contrary a possible increase with the development of the underground workings.

Later, in 1908, C. W. Reed, of the Queen City-Joplin, lowered the underground water level to 126 ft., and with no financial assistance from the other operators, assumed the entire burden of pumping for about a year; this permitted of dry mining to approximately that level in all of the area developed at the time, the flow of water at the new level approximating 500 gal. per minute.

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*Superintendent, Lennan Zinc & Lead Co. and Miami Zinc & Lead Co., Miami, Okla.

Development work was gradually being carried on to the north, and when C. W. Reed shut down in 1909 the Standefer brothers, who were then mining on the S E 40 of the Emma Gordon 200-acre tract, again assumed the greater pumping burden, and with some assistance from the operators were able to sink their north shaft, at that time the most northerly of any operating shaft, to the 163-ft. level. It required a 6-in. steam pump running at full capacity to hold the water at that level, which, with the small amount of pumping done by others, would probably have shown a flow of about 750 gal. per min. at that level of mining.

### Geology of District

Up to this time no serious attention had been given by any of the operators to the general geology, especially to the unbroken, dry and impervious Cherokee shale, which caps the upper runs in the Chester sandstone. It was an established fact, however, as shown by actual development and drill exploration, that there was a pitch to the ore runs in a general northerly direction, from which it was concluded that any operations carried on north of the S E Gordon 40 would necessitate deeper mining and pumping operations of greater magnitude. Victor Rakowsky, of Duluth, in a careful and extensive examination, has given us a more comprehensive insight into the general geology as applied to mining than any engineer of note who has yet visited the district and to him I am indebted for most of the following geological data.

The orebodies occur in regular and well defined deposits of brecciated sandstone and flint, cemented usually with jasperoid, sphalerite and galena, and carrying sphalerite, galena and iron sulphide. The Chester sandstone contains the upper, and the Boone chert, the lower, orebodies. Referring to Fig. 2, it will be noted that there are two definite subzones of mineralization which diverge at an angle of 56° striking N 22° W and N 34° E. The former zone is developed more extensively than the latter, and is made up of a system of parallel runs, while but a single run has been developed with the northeast strike. Outside drilling, however, points to other parallel runs in this direction. Two layers of ore are mined on each of the runs shown, the upper in the sandstone and the lower in the chert.

As in the general Joplin area, the rocks in the Miami district seem to comprise the Boone, Chester and Cherokee formations in ascending order, these formations being unconformable. There is apparently a solution unconformity existing between the Boone and the Chester at points where there is a steep dip in the upper sandstone and consequently in the orebodies therein, this steep portion extending some distance along the strike. The only point where these steeply inclined orebodies have been developed by mining operations is on the properties of Lennan & Co., where the central pumping plant is located. The Cherokee shale here lying unconformably on the sandstone fills the erosion valley to a maximum depth of 310 ft. as proved by drill holes. The occurrence of the shale at this depth permitted lowering the water to the mining level by a single method.

### The Orebodies

The ore occurs in zonal breccias and takes the form of regular, elongated bodies. The usual dislocation, slickensiding and moderate faulting is apparently due to minor displacement and underground solution. Distinct and defined runs in the Joplin district are rare, on account of the general displacement of the orebearing area. In the Miami district, however, the mineralization occurs along absolutely defined lines in simple uniform runs, the complicated and compound Joplin runs being entirely absent or not yet found. The linear extent of the runs is great, the *A* run, Fig. 2, being developed and defined for a distance of 9000 feet.

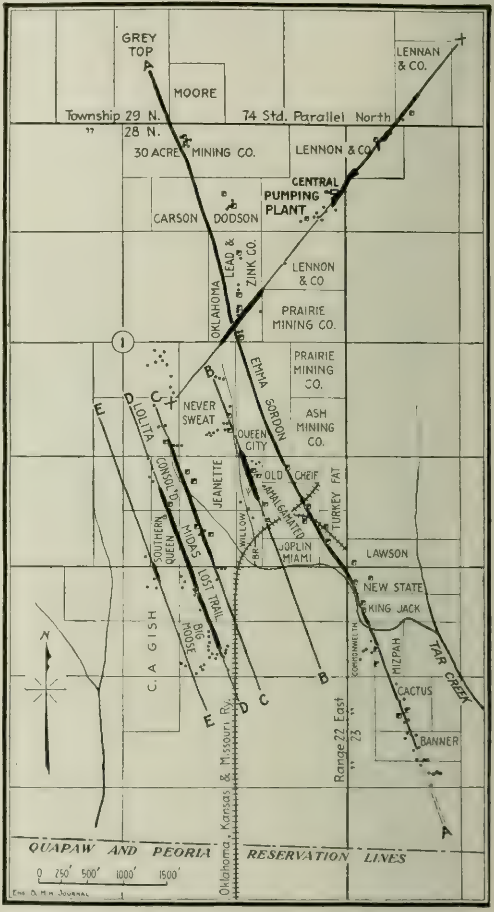

Fig. 2. Zones of Mineralization, Southwestern Lead-Zinc District

Mineralization occurs in the zonal breccia contiguous to the fractures. These fractures, cutting all the formations, probably occurred at the time of mineralization or prior thereto and may have resulted from a warping of the beds. There is often a sheeted flint developed with the fractures and this flint usually is not mineralized. Apparently the mineralization and the galena content are greater in the less broken ground contiguous to the fractures.

Referring to Fig. 4, it is assumed that the development of the erosion valley was prior to the mineralization, and that the subsequent fracturing and mineralization occurred at the edge of the erosion valley at this point. On all of the runs below the point of intersection of the *X* run and the *A* run, Fig. 2, the formations are approximately flat lying. Along the *A* run northwest of the point of intersection with the *X* run, the dip of the ore is in a northeasterly direction. These orebodies would then lie on the westerly limb of the syncline. Fig. 4 shows the ore in the sandstone with a steep dip to the northwest, the relation existing between this upper ore and the lower ore in the flint and the position of the Cherokee shale. It is believed that the lower flint orebody will be found to lie approximately flat, the mineralization extending, of course, only as far as the brecciation.

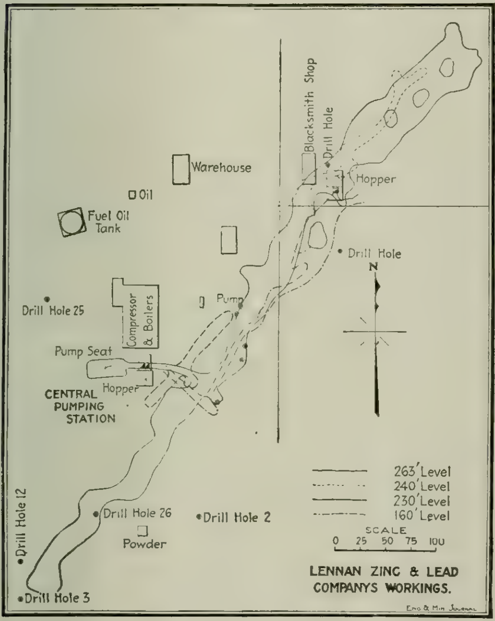

FIG. 3. MAP OF THE LENNAN WORKINGS

### FIRST HEAVY PUMPING OPERATIONS

Knowing that a heavier flow of water would be encountered at a deeper level of mining, L. C. Church, of the Church-Mabon properties, which are situated on an adjoining 40 northwest of the SE Gordon 40, Fig. 2, after a considerable amount of drilling, commenced early in 1910 the sinking of two shafts with the view of lowering the water table to at least the 220-ft. level; this would permit extensive mining of his properties on the *A* run in the Chester sandstone formation. He was the first operator to give any serious consideration to the Cherokee shale as an important factor in the pumping problem, and he sank his north shaft through this dry and impervious shale to what at that time he considered its greatest depth, 240 ft. A pump compartment was cut at the 230-ft. point and a drift cut through the shale to tap the water and the ore. The first installation consisted of two 7-in. compound steam pumps, which, unfortunately, proved inadequate for continuous service.

The other shaft located almost 1000 ft. south, encountered the rock and water at 196 ft. In this shaft was installed a double, 6-in. discharge, vertical-shaft drive, six-stage centrifugal pump, the shafting being held in place between the two 6-in. discharge columns by adjustable boxes clamped to the columns; it was belt driven by a gas engine on the surface. This pump had a rated capacity of 1250 gal. per min. against a 250-ft. head. Later, to uncover the submerged steam pipes, a similar installation was made in the north shaft.

Considerable trouble was experienced in these pumping operations, which did not permit an uninterrupted lowering of the water level. In sinking the south shaft, the blasting necessitated disconnecting and raising the pump, with ensuing delays. The long, small-diameter, driving shaft was also a source of trouble, and the volume pumped in the north shaft was not in sufficient excess of the normal inflow to rapidly lower the water level. Pumping operations were commenced Nov. 4, 1910. The south shaft was sunk to a depth of 236 ft., and the water was under sufficient control to permit of mining at the 230-ft. level in the north shaft and at the 220-ft. level in the south shaft in September, 1911. By weir measurement, the flow of water was 1000 gal. per minute.

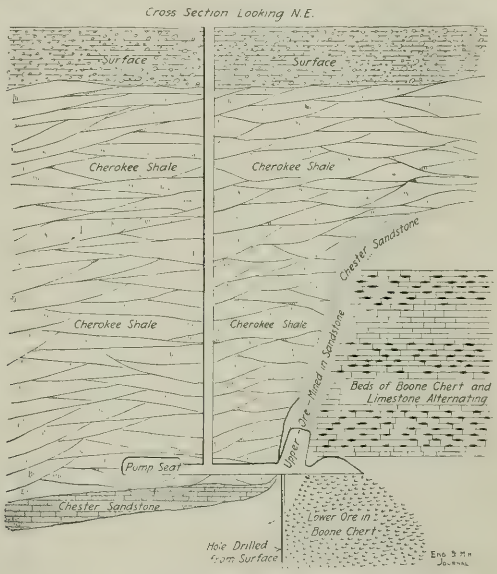

FIG. 4. STRATIFICATION IN MIAMI DISTRICT

### PUMPING METHOD BASED ON GEOLOGICAL CONSIDERATIONS

Meanwhile, much drilling had been done farther north on the northeast 40 of the Gordon tract and on the adjoining north 10 acres east, one mile due north from the New State mine. It was on these properties that the northeast or *X* run was discovered, showing ore at the deepest level of mining contemplated in the Southwestern Field. The drill explorations, of interest from both a geological and mining standpoint, showed the deepest deposition of shale and occurrence of ore and a dissimilarity between this northeast run and the northwest runs; of the latter, the *A* run is the best defined, showing a distinctly steeper inclination of the shale contiguous to the ore of the Chester sandstone and a decidedly marked dip of the run to the northwest. At a distance of 400 ft. northwest of the *X* run the shale was found deposited to a depth of 310 ft. Drilling showed the occurrence of ore almost without variation to a depth of 320 ft., the thickness being dependent on the location of the hole with respect to the inclination of the formation; the farther southeast, within the boundaries of the run, the shallower the upper ore and the greater the thickness of the lower ore, as can readily be seen from Fig. 4. The depth of the shale was variable, depending on the distance of the hole from the contact.

In planning the operations, a prime consideration was the situation of the pump shaft, to determine which the following factors were considered: The depth of the shale, its depth as related to ore levels, its inclination, the proximity of the ore run, the tramming distance, the necessity of both a pumping and a hoisting compartment and the method of timbering. The greatest depth to which the shale reached, 310 ft., was at a point some distance from the ore, and it also would not admit of sinking a dry shaft to the bottom of the ore; hence it was evident that to reach this bottom, two stages of pumping operations would be necessary. The first stage could be accomplished by sinking a dry shaft in the shale at the point which would give the greatest gain in depth and the least loss in its distance from the ore. The steep inclination of the contact continued to a depth of 270 ft., and below that depth showed a decided flattening, so that any further gain in shaft depth would be at a decided sacrifice in distance from the ore, in the ratio of 15:100. It was, therefore, decided to sink the shaft at a point 60 ft. from the ore.

### The Shaft and Pump Station

Experience in this district has shown that for hoisting with cans, from 28 in. to 30 in. in diameter, a shaft 5 ft. or 5½ ft. square is large enough, and it was, therefore, decided to make the size of the shaft 5½x11½ ft. in the clear, allowing 6 in. for a solid center brace of 4x6-in. pine. The common district method of shaft cribbing with 2x6-in. lumber was used; this will stand without distortion for a number of years. The shaft encountered the rock and water at 273 ft. Two feet below the bottom of the sump the holes which tapped the water were carefully plugged and the cutting of the pump compartment was started at the 263-ft. level. It was known that the flow of water at the 220-ft. level was 1000 gal. per min., and that the water in the tram shaft 250 ft. northeast of the pump shaft was standing at the 210-ft. level, showing a drainage head of over 50 ft. It was reasonable to expect an increase in the inflow with an increase in depth; this led to an estimate of a normal inflow of 1500 gal. per min. at 263 ft. Any rapid lowering of the water level would require the raising of a considerable amount in excess of this estimated inflow, taking into consideration the drainage head and the extent of the drainage area. It was, therefore, decided to install a pump rated at 3000 gal. per min. against a head of at least 300 ft., and the pump chosen was a duplex, triple-expansion, 16x24-in. corliss type, condensing Prescott, with a 16-in. suction and 14-in. discharge, rated to deliver 3000 gal. per min. to a height of 350 feet.

The pump compartment was cut on the west side of the shaft, of a size to give ample room, being 50 ft. in length by 16 ft. in width and 14 ft. in height. Steel sets were used, placed 6 ft. apart, the sides tightly lagged with 2-in. planks, well filled in behind, and the caps with 6x6-in. caps tightly floored with 2-in. planks. The water drift, which was subsequently to be the tram drift, was cut from the east side of the shaft, being made 10 ft. high at the shaft and lowered to 7 ft. two sets back; it was 7 ft. wide, the sets of square 8x8-in. posts and caps being placed 4 ft. apart and tightly lagged side and top with 2x12-in. planks.

### Methods of Water-Flow Control

At a distance of 22 ft. from the shaft, a heavy steel hinged door and frame were installed, and a tight concrete joint to the timber was made. The door was held tightly closed against the frame with a 1⅛-in. turnbuckle rod. In the door were three valves, and at the bottom, a slide gate. By means of these valves and the gate, the volume of water flowing to the pump could be accurately regulated during the preliminary drainage period. Beyond the door, a small sump was cut in the shale to settle as much sand as possible before reaching the shaft sump.

As soon as the pump installation was completed the drift was cut to the rock and the water tapped with a roof hole of the first round in the rock. Due to the 50 ft. head of water, only a few holes shot in the face were necessary at first to give the pump 2000 gal. of water per min. After shooting, the door was closed and a volume of 2000 gal. per min. allowed to flow the pump. A few weeks of pumping showed a rapid lowering of the water table and demonstrated the success of the method. The valves were then closed and the pump shut down, the small leakage around the door being easily handled with a 3-in. pump. The entire coöperation of the operators in the district was secured and the pumping contracts signed, after which the valves were opened and pumping commenced in earnest in September, 1912.

### Drifting and Mining

With any diminution in the flow of water, more holes were drilled in the face, and a hole at a time was shot. The pump worked almost steadily on a volume of 2000 gal. per min. for a period of 50 days, when the water level had been lowered sufficiently to permit of crosscutting the run. This progressed slowly because of the necessity of closing the door after each round of shots and then waiting for the water to drain below the top valve before opening the lower slide gate which would let the water drain down sufficiently to swing the door back into the drift safely. The water pouring in from all sides let the $H_2S$ escape, which made it necessary at first to work a double crew half an hour on and off, without even then obtaining good results. These difficulties made the development work progress slowly, and almost two months were required for drifting sufficiently to permit mining a reasonable tonnage.

The first diminution in the inflow was noticeable when the water table receded below the top of the drift door, from which the time the decrease continued at the rate of about 100 gal. per week until no seepage through the breccia cementations in the face was noticeable. Since this time, with the face of the drift down dry to the floor, the inflow has remained seemingly constant, being between 1200 and 1250 gal. per min. The total amount of time consumed in the lowering of the water table from the 210-ft. level to the 263-ft., was five months.

Mining operations in the drift were commenced in February, 1913, the heading-and-stope method so common in this district being used. The best results in the heading were obtained with a five-hole round composed of one lead-breast, one front cut, one roof, one back cut and one lifter, the lifter being drilled directly below the roof between the two cuts; the holes were shot in the order named. Because of the proximity of the confining wall of shale and the formation of the roof, 12-ft. holes in the stope were the longest it was safe to drill and shoot.

### SECOND STAGE IN DRAINING

Knowing that most of the ore lay below the 163-ft. level on all of these properties, steps were at once taken to formulate the best method for lowering the water down to 320 ft. The porosity of the formation and the drainage connection of the system of runs was well established by evident facts. At a distance of 3½ miles northeast along the strike line of the *X* run, a 3-in. pump handled the water at the 200-ft. level. One mile south on the *A* run at a point 20 ft. lower, the water level was at 212 ft., at which level the lower run in the Boone chert formation was being worked. The brecciation of the flint was strongly marked within the limits of this ore run.

To attempt to sink the pump shaft itself was inadvisable, since by tapping the water in the shaft, the door protection in the drift would be destroyed and the northeast tram shaft, which was connected to the pump shaft by a drift the full width of the upper run, was necessary for the current mining operations. To sink in either of the two unconnected shafts meant raising the water to the surface, which eliminated their use. These facts showed that any sinking must be done at some point or points in the drift in the ore run behind the door.

### DRILL-HOLE PUMPING

The drainage of a shaft by means of a drill hole was known to be possible where the volume of water to be raised was not considerable. The question was whether this method of drainage could be put into successful application where the amount of water was large. If so, a drill hole of sufficiently large diameter for a 9-in. or 10-in. suction pipe could be put down below the 263-ft. level and by the installation of a centrifugal pump the water level lowered an amount equal to the maximum suction lift of the pump. The only objection to this method was the question whether the size of the hole would permit an overflow of water sufficiently in excess of the normal inflow to afford rapid drainage.

The formation, due to the sandstone and flint breccia, was such that by a sufficient amount of shooting a chamber of considerable size could be made at any desired depth in the hole, large enough, we believe, to furnish a volume of 2000 gal. per min. to the pump suction. In this event, the porosity of the formation would allow the water table to be easily lowered. A place in the drift was, therefore, selected as most suitable for the hole from all points of view, and the point was also located on the surface with a transit. A 6¼-in. hole was put down from the surface, passing through the drift at 239 ft. Below the drift it was in rich ore from the 262-ft. point to the 320-ft., the bottom of the run. The drilling below the drift was watched carefully; between 20 ft. and 25 ft. the hole was in decidedly open ground from which no cuttings were raised; at 33 ft. it passed through the sandstone into the chert in which it continued in good ore for 26 ft. The sand pump seldom raised the full amount of cuttings to be properly expected, which further established the porosity of the formation.

The hole was then reamed out for the entire distance below the floor of the drift with a 15-in. bit, which, due to its weight of 1400 lb., must have made a 16-in. to 18-in. hole. At the bottom of the hole, 60 ft. below the floor of the drift, two charges of 40% dynamite were shot, using 35 and 57 sticks, respectively, for the first and second shooting. The big bit was then lowered into the hole, which had been thoroughly cleaned out before the shooting, and the rock chopped up, after which the hole was again cleaned out, the amount of cuttings raised showing that a chamber of considerable size had been made. Two similar chambers were made at points between 40 and 45 ft., and between 20 and 25 ft. below the drift. It took six days to mash up and pump out the rock broken by the shooting of these three different places in the hole. Data from the American Well Works gave a suction lift of 25 ft. for their pumps. Hence we chambered the hole in 20-ft. stages in order that a 25-ft. suction, deducting 2 ft. for the distance between the top of the suction and the floor of the drift, would put the bottom of the suction in about the largest part of the chamber in the hole, as shown in Fig. 5.

### CENTRIFUGAL PUMP INSTALLED

The first test was made with a 6-in., common type, centrifugal pump with an 8-in. suction. The pump and a 16-hp. steam engine, we happened to have on hand, were bolted to a solidly built frame of 8x8-in. timbers which was set level on the hard rock floor and filled with a 1:3 mixture of cement and tailing in all its open spaces. The length of the frame was 20 ft., and the distance between pump and engine centers 16 ft. As a precaution, the top 12 ft. of the hole was cased with 12-in. pipe perforated with 1-in. holes. No foot valve was used, but an 8-in. check valve was screwed to the top of the 23-ft. length of suction pipe in the hole, the bottom of the valve resting on the 12-in. casing. A short nipple was screwed into the valve, then a T and into this a 3-ft. horizontal nipple for connecting the pump suction to the bowl. The T permitted the use of a 4-ft. standpipe closed with an 8-in. cap. To eliminate all possible discharge head, the bowl was turned one-quarter around the horizontal axis, placing the discharge flange in a vertical position. A launder 12 in. wide by 10 in. high was built to carry the water from the pump as far as the sump in the shale behind the door, whence it would flow to the Prescott. The drill hole to the surface was cased off with 5⅝-in. casing for the depth of the shale, 170 ft.

The steam was carried down this hole with a 3-in. line reduced to 2 in. in the drift near the engine, the 3-in. line being used in order to have ample capacity for a second pump and hoist later on.

When the pump started, the water stood at the top of the hole, occasionally welling over. The pump was gradually speeded up to 730 r.p.m., which was the maximum attainable with the 16-hp. engine. At this speed, it discharged a volume of 1500 gal. per min. The water was lowered quickly in the hole to a depth of 17 ft.; under this increased lift, the engine was capable of maintaining a pump speed of only 620 r.p.m., and a 12x14-in. engine was, therefore, installed. The pump was given a speed of 900 r.p.m., discharging at first over 1600 gal. of water per min. The volume decreased as the suction lift increased, and at present with a lift of over 20 ft., the pump is discharging 1350 gal. per minute.

The level of the water table was quickly lowered in a small area near the hole, but required four days of pumping to be noticeable at any appreciable distance, when at a distance of 250 ft. south of the pump hole the water was found to be lowered in an open drill hole to a point 4 ft. below the floor of the drift. Since then the water is being lowered in this hole at the rate of about 3 in. in 24 hr., the level of the water after 14 days of pumping being 7 ft. 6 in. below the floor of the drift. In the northwest mill shaft, 700 ft. distant from the pump hole, one 3-in. pump is now easily handling the water at the 260-ft. level, which required the use of two 3-in. pumps running to capacity two weeks ago.

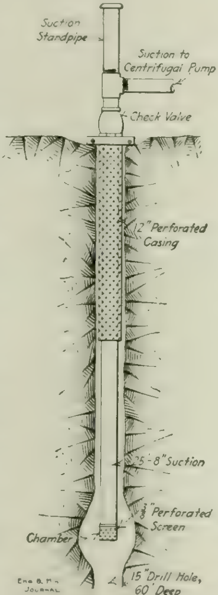

FIG. 5. PUMP-SUCTION SETTING

### SECOND HOLE UNDER WAY

A second pump hole in a similar place in the drift, but 25 ft. north of the adjacent northeast tram shaft and 180 ft. northeast of the first hole will be completed in a short time. The installation in this hole will consist of an 8-in. common type centrifugal pump rated at from 1800 to 2200 gal. per min., and instead of a check valve a specially designed 9-in. foot valve will be used, measuring 12 in. in extreme diameter with a 9-in. saucer valve working on a vertical stem, so as to give a 2-in. clearance lift between the valve and seat. A launder will be run from this pump to discharge into the launder of the 6-in. pump.

Upon the completion of the installation of this 8-in. pump, both pumps will be run at a moderate speed, sufficient to discharge a total volume of over 2000 gal. per min. to the Prescott. It may be deemed advisable to install another 8-in. pump in the place of the 6-in. to insure a discharge volume of 2000 gal., with only one pump in operation.

Continuous pumping of 2000 gal. per min. will soon lower the level of the water table, at least locally, to the depth of the suction lift, between 20 ft. and 22 ft. below the present level. This will be the first of the three levels necessary for lowering the water to the 320-ft. mining level.

### PROBABLE FUTURE OPERATIONS

On starting the second pump, a winze at the nearest safe distance from each hole will be sunk to a depth of 20 ft. and a small drift cut to each pump hole. The method of procedure then is not definite, but will be more easily worked out at that time.

A third pump, connected by gears or flexible-shaft drive to a vertical engine on the same stand, may be installed at the entry of the winze with the suction in the winze sump; this sump could easily be shot and cleaned out to a depth of 3 ft. below the water level. The discharge could be run up the winze into the launder above. By virtue of the heavy shooting in chambering the hole the ground would be shattered enough to be able to pick into the pump hole, and after raising the suction the drill hole could be plugged and the hole enlarged. Then by means of falls above and clamps below the suction could be lowered to the requisite depth below this 280-ft. level, the pump and engine lowered and installed with the discharge pipe in the hole and a similar procedure worked out at the south hole after the north pump in its new position had been run long enough to keep the south hole drained below the 280-ft. level. Then with both pumps on the 280-ft. level, the water level could be soon lowered to the 300-ft. level, to be followed by a repetition of the procedure and final lowering of the water to the 320-ft. level, at which level a pump will be installed at the northeast tram shaft of sufficient capacity to raise the volume of water directly to the surface. It would not be unreasonable to estimate a lowering of the water level at the rate of 1 ft. per day. The cost of drilling and completing the two holes, of one 6-in. and two 8-in. pumps, of two 12x14-in. engines, of all of the pipes and fittings, inclusive of those for the suctions and of the labor of installation will not quite reach $2100. No fair estimate can be made at this time of the total cost of reaching the 320-ft. level, but it is safe to say it will be far below that entailed by attempting to sink a shaft in the water either by staging with pump seats or by means of a sinking pump of large capacity.

### NECESSITY OF COÖPERATION

It will be seen from the foregoing paragraphs that the mining conditions in this direction are unique, being dissimilar, with respect to mine drainage, from any of the other districts in the Southwestern field. These peculiar drainage conditions put upon the particular company mining at the lowest level the entire burden of pumping for the district, the water in the entire system of runs falling to a surprisingly close level according to the distance from the pumping shaft.

This would seem highly unfair to the company doing the pumping, were it not for the fact that this water is an absolute necessity for the milling of the ore. For this purpose and also in recognition of the benefits derived in the complete drainage of the different mines, each operating company pays a weekly rental for the use of water in its mill, and each development company, after striking the ore run, pays a one-half rental during its development period up to the starting of its mill. The relationship between the company operating the central pumping plant and all of the other operators has resulted in the development of a weekly pumping charge agreeable to all concerned and has brought out a community interest in this district, which does not exist elsewhere in the Southwestern zinc and lead field.

### Future of the District

The method of installation, the size of the pump, and the ease with which the water has been handled, give the district the assurance of a continuous maintenance of the water level at a depth sufficient to permit uninterrupted dry mining in the lower Boone chert ore-runs. The water problem in this district was the most serious obstacle in mining the lower runs. These have proved to be extremely profitable. Therefore, the rapid drainage of the entire system of ore runs has resulted in a steadily increasing production on the part of the operating companies and has indirectly increased the amount of exploration work. A small increase in production, now assured by the development of numerous new properties, will soon give this district third place in the entire Southwestern field, in value of product.

The two different methods of solving the pumping problem, first, in lowering the water table to the 263-ft. level, and second, in lowering it to the 320-ft. level are extremely simple solutions of rather difficult problems, which are, however, not of unusual occurrence in this field at least. The first method of procedure shows the importance of using the shale deposit capping the ore as providing a means of dry sinking, of installing pumps of more than adequate capacity and of using steel-door protection and valve regulation. The second method shows the importance of the porosity of the formation as a means of drainage by drill holes of large diameter.

Drainage by drill holes has the following distinct advantages: The pumping of absolutely clear water, the rapid depression of the water level below the present one, dry and inexpensive sinking and cheapness of installation.

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## Aluminum Production in Norway

The production of aluminum appears to be making rapid headway in Norway, says the *Mining Journal*, Nov. 1, 1913. The Anglo-Norwegian Aluminum Co. has already successfully established its works at Vennesla, near Christianssand, with an annual capacity of about 2000 tons of 99 to 99½% aluminum. The company manufactures its own electrodes on the premises. The works of the Hardanger Electrical Iron & Steel Co. has been taken over by a syndicate or company, mainly French, for the manufacture of aluminum cables. The new company will adapt and add to the present buildings for the installment of its machinery, taking its power from the Tysse falls.

The Norske Nitridaktieselskap (capitalized at 10,000,000 kroner) has now almost completed its large works at Eydehavn, near Arendal. The quays are finished, the workmen's dwellings roofed, and the main factories are well forward. Swiftly as the work has been pushed, it has not kept pace with developments in the manufacture of the product. The new method for the fixation of atmospheric nitrite (which it was the original intention to operate on a large scale) has reached a new phase. A new furnace type has been constructed, which has considerable advantages over the former one, and this again has encouraged the company to improve still further the French method before it proceeds to extensive manufacture.

In order, therefore, to fill up the necessary waiting period, the company has decided to adapt its present works for the production of aluminum. The choice has been induced by the fact that some aluminum patent rights are held by the financial interests connected with the Norske Nitridaktieselskap. The bauxite will be imported from France. The excellent harbor conditions and the easy means of getting electric power from the regulated Arendal catchment should render the Eydehavn works well adapted for the production of aluminum. It is expected that manufacturing will have begun early next year. When in full working 25,000 hp. will be available, and about 400 hands employed.

⁂

## Italian Iron and Steel Production

The completed statistics of the production of iron and steel in Italy, and also those of coal, for 1912, have been made public. Italy is a small producer of coal and iron ore, and much of its metallurgical industry depends on imported raw materials.

### Iron Ore

The production of iron ore in 1912, was 582,066 tons, which compares with 373,786 tons in 1911 and 551,259 tons in 1910. Imports of iron ore in 1912 were 18,551 tons and exports were 12,313 tons. The production of manganese ore was 2641 tons. There was also produced 248,612 tons of iron pyrites, of which only 2144 tons were exported, while 70,762 tons were imported.

### Pig Iron and Steel

The make of pig iron and direct castings in 1912 was 418,675 metric tons, which compares with 342,586 tons in 1911. The make of steel ingots, largely from imported pig and scrap, was 922,000 tons, a gain of 186,000 tons over 1911.

The make of wrought iron from pig was only 1500 tons, but there was a large quantity made from scrap, some of it imported material.

### Finished Materials

The total production of finished material was as follows, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Wrought iron............. | 303,223 | 179,516 | D. 123,707 |
| Steel ....................... | 697,958 | 801,907 | I. 103,949 |
| Total ................. | 1,001,181 | 981,423 | D. 20,242 |

The principal items of finished steel in 1912 were 392,263 tons of bars and shapes, 130,067 tons rails and 89,905 tons of plates and sheets. The output of tin plates was 28,916 tons.

In 1912, there were in operation in Italy, 64 open-hearth furnaces, two bessemer converters, two Robert converters, five electric furnaces and two crucible furnaces.

The production of coal in Italy in 1912 was 663,812 metric tons, of which 660,491 tons are classed as lignite. Imports were 10,057,228 tons; exports 26,288 tons. The coke made—largely from imported coal—was 1,223,902 tons; briquettes, 874,365 tons.

# Depreciation to Be Deducted from Mining Company Profits

Washington Correspondence

After ten days' delay since the official announcement of the opinion, Justice Pitney has completed his revision of the text of the decision in the case involving the application of the corporation tax to mining properties, brought by Stratton's Independence, Ltd. The decision says:

The peculiar character of mining property is sufficiently obvious. Prior to development it may present to the naked eye a mere tract of land with barren surface, and of no practical value except for what may be found beneath. Then follow excavation, discovery, development, extraction of ores, resulting eventually, if the process be thorough, in the complete exhaustion of the mineral contents so far as they are worth removing. Theoretically, and according to the argument, the entire value of the mine, as ultimately developed, existed from the beginning. Practically, however, and from the commercial standpoint, the value, that is, the exchangeable or market value, depends upon different considerations. Beginning from little, when the existence, character and extent of the ore deposits are problematical, it may increase steadily or rapidly so long as discovery and development outrun depletion, and the wiping out of the value by the practical exhaustion of the mine may be deferred for a long term of years. While not ignoring the importance of such considerations, we do not think they afford the sole test for determining the legislative intent.

As has been repeatedly remarked, the Corporation Tax Act of 1909 was not intended to be and is not in any proper sense an income-tax law. This court had decided in the Pollock case that the income-tax law of 1894 amounted in effect to a direct tax upon property, and was invalid because not apportioned according to population as prescribed by the Constitution. The Act of 1909 avoided this difficulty by imposing not an income tax, but an excise tax upon the conduct of business in a corporate capacity, measuring, however, the amount of tax by the income of the corporation, with certain qualifications prescribed by the act itself.

For this and other obvious reasons we are little aided by a discussion of theoretical distinctions between capital and income. Such refinements can hardly be deemed to have entered into the legislative purpose. Of course, if it were demonstrable that to read the Act according to its letter would render it unconstitutional, or glaringly unequal, or palpably unjust, a reasonable ground would exist for construing it according to its spirit rather than its letter. But in our opinion the Act is not fairly open to this criticism. It is not correct, from either the theoretical or the practical standpoint, to say that a mining corporation is not engaged in business, but is merely occupied in converting its capital assets from one form into another. The sale outright of a mining property might be fairly described as a mere conversion of the capital from land into money. But when a company is digging pits, sinking shafts, tunneling, drifting, stoping, drilling, blasting and hoisting ores, it is employing capital and labor in transmuting a part of the realty into personalty, and putting it into marketable form. The very process of mining is, in a sense, equivalent in its results to a manufacturing process. And, however the operation shall be described, the transaction is indubitably "business" within the fair meaning of the Act of 1909, and the gains derived from it are properly and strictly the income from that business, for "income" may be defined as the gain derived from capital, from labor, or from both combined, and here we have combined operations of capital and labor. As to the alleged inequality of operation between mining corporations and others, it is, of course, true that the revenues derived from the working of mines result to some extent in the exhaustion of the capital. But the same is true of the earnings of the human brain and hand when unaided by capital, yet such earnings are commonly dealt with in legislation as income.

So it may be said of many manufacturing corporations that are clearly subject to the act of 1909, especially of those that have to do with the production of patented articles, although it may be foretold from the beginning that the manufacture will be profitable only for a limited time, at the end of which the capital value of the plant must be subject to material depletion, the annual gains of such corporations are certainly to be taken as income for the purpose of measuring the amount of the tax.

In dealing with the question whether many corporations are subject to tax, the decision says:

It seems to us that the first two questions certified must be answered in the affirmative principally for two reasons. First, because mining corporations are within the general description of Sec. 38, which comprises "every corporation, joint stock company, or association organized for profit, and having a capital stock represented by shares. . . . and engaged in business in any state or territory of the United States"; and, secondly, because the Act specifies those classes of corporations that are to be exempt from its operation, and mining corporations are not among them. Those exempted are labor, agricultural or horticultural organizations, fraternal beneficiary societies, orders or associations operating under the lodge system, domestic building and loan associations, corporations and associations organized and operated for religious, charitable or educational purposes, etc. Moreover, the section imposes "a special excise tax with respect to the carrying on or doing business by such corporation," etc. That mining companies are doing business, within the fair intent and meaning of this clause, seems to us entirely plain, for reasons already given. The conduct of such business results in profit, for it cannot be seriously contended that the ores are not worth more at the mine mouth than they were worth in the ground, plus the cost of mining. Corporations enaged in such business share in the benefits of the Federal Government, and ought as reasonably to contribute to the support of that Government as corporations that conduct other kinds of profitable business.

The third important issue raised by the case—whether depreciation should be given a special status in mining assessments is dealt with in part as follows:

It is at the same time obvious that any method of stating the account that excludes all element of gain from the process of mining must, through one process or another, exempt mining companies from liabilities to tax under the act of 1909 with respect to their mining operations. And so, an affirmative answer to the third question as propounded would be the same in effect as an affirmative answer to the first or the second. For it is a matter of little or no moment whether it is to be said (a) that mining corporations are not "engaged in business" at all, or (b) that they are engaged in business, but the proceeds of ore mined are not income, or (c) that such proceeds are income, but that there must be allowed as depreciation all that part of the proceeds which remains after paying the bare outlays of the business. In either case mining corporations would be exempt from the tax.

In our opinion, there are at least two insuperable obstacles in the way of returning an affirmative answer to the third question as certified.

In the first place, it is fallacious to say that, whatever may have been the original cost of a mining property or the cost of developing it, if in fact it afterward yield ores aggregating many times its original cost or market value, this result merely proves and at the same time measures the intrinsic value that existed from the beginning. We are here seeking the correct interpretation and construction of an act of legislation that was, at least, designed to furnish a practicable mode of raising revenue for the support of the Government, and to do this in part by imposing annual taxes upon corporations organized for profit and by measuring the amount of the contribution to be required from each corporation according to its annual income. The Act deals with corporations engaged in actual business transactions and presumably conducted according to ordinary business principles. It was, of course, contemplated that the income might be derived from the employment of property in business, and that this property might become more or less exhausted in the process, and because of this, a reasonable allowance was to be made for depreciation of it, if any. But plainly, we think, the valuation of the property and the amount of the depreciation were to be determined not upon the basis of latent and occult intrinsic values, but upon considerations that affect market value and have their influence upon men of affairs charged with the management of the business and accounting of corporations that are organized for profit and are engaged in business for purposes of profit.

And, secondly, assuming the depletion of the mineral stock is an element to be considered in determining the reasonable depreciation that is to be treated as a loss in the ascertainment of the net income of a mining company under the Act, we deem it quite inadmissible to estimate such depletion as if it had been done by a trespasser, to whom all profit is denied.

With respect to the proper measure of damages where ore has been unlawfully mined by one person upon the land of another, there is much conflict of authority. Different modes of determining the damages have been resorted to, dependent sometimes upon the form of the action, whether trespass or trover; sometimes upon whether the case arose at law or in equity; and often upon whether the trespass was willful or inadvertent.

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# Magnetite in Mattes and Slags

By J. W. Bennie*

Undoubtedly magnetite is formed from the oxidation of ferrous silicate in blast furnaces—as noted by E. W. Walter in the Engineering & Mining Journal of Jan. 25, 1913, and also in converters. The oxidation is only local, and does not account for the large amount of magnetite formed when smelting sulphide ores, especially under certain conditions.

About 16 years ago, while employed at a smelting plant on the Pacific Coast, I came across what I consider ideal conditions for observing the excessive formation of magnetite in the blast furnace. The ore being treated was a cuprous iron pyrite containing 7 to 8% copper and 45 to 48% sulphur. After a futile attempt at pyritic smelting, the management decided to stall roast the ore prior to smelting; this method of roasting answered fairly well most of the time, but occasionally instead of the ore being calcined, it was simply fused into a solid mass, consisting principally of a low-grade matte in which but little of the iron was oxidized. This material, after being broken up into proper size (by blasting) was sent direct to the smelting works. It contained but little more sulphur than what was known as "calcined ore" (the amount of sulphur varied from 20% to 23%), and was smelted as a calcined ore, using about 10% to 12% of a high-ash coke to the total burden.

As the material being treated was practically a low-grade matte, and very fusible, it was not long before troubles began. I do not remember the exact height of column of charge above tuyeres being carried at that time, but I suppose it was not above seven feet; to have carried it any higher, with the amount of blast then available, would simply have hastened the usual outcome of any prolonged efforts to smelt this material in this way; viz.: a frozen-up furnace. The freezing of these furnaces was materially hastened by the fact that the furnace jackets were made of cast iron, and, therefore, continuously leaking. (If my memory serves me aright, there were 52 jackets to each furnace, and it was not an uncommon occurrence to run one of these furnaces with one-half the jackets leaking; it varied the monotony of life around that smeltery.) The usual symptoms of a "sick furnace" were: (1) An excessive flow of low-grade matte; (2) rapid diminishment of slag flow; and (3) a thickening and sudden increase in grade of the matte. Samples of this matte showed as much as 20% $Fe_3O_4$. The opening of the furnaces showed excrescences—consisting of unfused quartz and lime surrounded by magnetite—from the tuyeres to a height of 3 ft. or 4 ft. above. It was quite evident that magnetite was produced from the oxidation of iron sulphide at too low a temperature to form slag.

The reaction $3\ FeS + O_{10} = Fe_3O_4 + 3\ SO_2$ occurs in all pyritic, or semi-pyritic smelting, and the formation of magnetite is the cause of the usual disasters attending pyritic smelting where there is insufficient heat being produced to cause the de-oxidation of the magnetite to ferrous oxide, or where the oxidation of the sulphides is not attended by sufficient heat to form ferrous silicate.

Conditions much like I described, existed some years ago at Mount Lyell, where in their "secondary pyritic process" of oxidizing and concentration of low-grade matte in the blast furnace, large quantities of magnetite was formed shortly after the blowing in of the furnace; there was a rapid accumulation of magnetite and unfused quartz, and this accumulation continued until smelting entirely stopped; the period elapsing between blowing in of the furnaces and their shutdown varied from four to six days. The management properly considered that in spite of the muscular metallurgy entailed the cost was materially less than that of any ordinary process for concentration of matte.

The reaction $FeS + 10\ Fe_2O_3 = 7\ Fe_3O_4 + SO_2$ occurs in the roasting of sulphide ores in MacDougall, or similar furnaces, if the temperature of the mixture of oxides and sulphides is suddenly raised. This reaction probably also occurs in blast and reverberatory furnaces.

A contributor, writing in the Journal of Nov. 1, 1913, on the subject of "Reduction of Ferric Oxide by Ferrous Sulphide," states that there is no such reaction as

$$FeS + 3\ Fe_2O_3 = 7\ FeO + SO_2$$

If such be the case, it will certainly surprise Peters and other metallurgists who use this reaction as the basis for determining the grade of the matte, or the amount of iron that will form slag, from any given mixture, in a reverberatory furnace.

It is true that Roberts-Austen shows this reaction as exo-thermic instead of highly endo-thermic (probably a printer's error) but it occurs nevertheless in reverberatory smelting. That $Fe_2O_3$ and $Fe_3O_4$ can be, and are, de-oxidized by means of FeS must surely be admitted; it is simply a matter of temperature.

The mere raising of the height of column of charge in the blast furnace does not necessarily mean the elimination, or non-formation, of magnetite. At the Shannon works, where we treat a mixture of minerals containing copper, varying from garnets to porphyries and where the saving of sulphur was at one time a matter of great moment—we carry a column of charge 12 ft. above the tuyeres, but this does not prevent formation of magnetite, more especially when we are forced by circumstances to make a high-fusion-point slag. The slightest cooling of the furnace at the tuyere zone, and the formation of excrescences immediately above tuyeres, is always accompanied by the formation of magnetite.

As Mr. Flynn is aware, sulphide ores are successfully smelted in this district in furnaces with a column of not more than 5 ft. above tuyeres, with no abnormal formation of magnetite.

The formation of magnetite in a blast furnace is dependent, therefore, on factors other than height of the smelting column. The chief factor is, I consider, the oxidation of the iron sulphides under conditions (such as insufficient temperature) which are not favorable for the formation of ferrous silicate. Where magnetite is used as part of the blast-furnace charge, its reduction would, therefore, depend on heat and carbon, or heat and sulphides. Both reactions would cause de-oxidation.

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*Manager, Shannon Copper Co., Clifton, Ariz.

## Nitrogen Fixation in Scandinavian

The carbide works at Odda, Norway, when operations were started, comprised 10 furnaces, each with a capacity of 7 to 8 tons of carbide per 24 hours (*Times Eng. Suppl.*, Oct. 15, 1913). Ten more furnaces, of 16 to 18 tons capacity each, have recently been added. The temperature is maintained at 5720° F., the electrodes of the older furnaces taking 1400 kw. and those of the newer ones, 3500 kw. It is stated that the radiation of heat from the new furnaces is less than from a steam boiler. The hot gases from the furnaces are used in the lime-kilns instead of producer-gas. The annual output, 32,000 tons up till recently, is now 80,000 tons of carbide.

Most of this carbide passes direct to the calcium cyanamide works of an associated company, which at the present time has an annual output of 80,000 tons, the number of furnaces having been increased nearly sevenfold since the opening of the works four years ago. The nitrogen used is prepared by the Linde process, 100 tons of air being liquefied daily. The furnaces have a capacity of 1 ton each; the nitrogen is supplied through valves in the side, and a current at 60 to 75 volts through an electrode in the center. After about 24 hours at 1650° F., the carbide is converted into cyanamide, the resulting product containing 20% of nitrogen. In addition to these developments, a company formed to acquire the rights of the Ostwald process (except in Westphalia and Rhineland), is erecting new works for the manufacture of carbide and cyanamide (and nitric acid) at Aura, Norway, with an estimated output of 200,000 tons of calcium cyanamide, and has acquired waterfalls at other places in Norway and also in Iceland, capable of furnishing power for an annual output of nearly 2 million tons of calcium cyanamide.

Works are to be erected at Dagenham on the Thames, at Trafford Park, Manchester, in Scotland, and in Ireland for producing from calcium cyanamide, 12,000, 12,000, 9000 and 3000 tons of nitric acid respectively. In the event of the supply of calcium cyanamide being curtailed or stopped, it will be possible to use the ammoniacal liquors from coke-ovens, blast-furnaces, residual recovery plant, and gasworks as sources of ammonia.

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## Messina Development Co.

According to the annual report of the Messina Development Co., Transvaal, South Africa, for year ended June 30, 1913, the total production of the company to date is as shown in the following table:

| Year | Tons of Ore Milled | Tons Concentrates Produced | Average Assay % Copper |
|---|---|---|---|
| 1906 | 476 | 280.0 | 66.0 |
| 1906-1907 | 2,967 | 768.5 | 60.6 |
| 1907-1908 | 5,183 | 1148.8 | 58.3 |
| 1908-1909 | 15,011 | 2240.2 | 52.3 |
| 1909-1910 | 23,578 | 2758.3 | 50.0 |
| 1910-1911 | 18,573 | 2503.4 | 50.8 |
| 1911-1912 | 10,317 | 1162.1 | 49.8 |
| 1912-1913 | 22,601 | 3602.1 | 45.8 |
| Total | 98,736 | 14,163.4 | 50.9 |

The ore reserves at the end of the year were estimated to contain 230,000 tons of ore averaging 10% copper. The grand total of development work, including shafts, amounts to 33,620 ft. With the total production, 98,736 tons, and ore reserves, 230,000 tons, total, 328,736 tons, it has evidently required 1 ft. of development work and shafts for every 9.77 tons of ore developed to date. The production for the year consisted of 3602.11 tons of copper concentrates averaging 45.8% cu. and 2591 tons of middlings averaging 11.6% cu.; total, contents 1953.16 tons of copper. The cost of producing and delivering the 3602 tons of concentrates to Swansea is summarized as follows:

| | Per Ton of Concentrates |
|---|---|
| Mining, milling, sorting, bagging and development redemption | $49.77 |
| Salaries, fees, insurance and general charges | 5.61 |
| Wagon and rail freights, ocean freights, insurance, agency, etc. | 22.59 |
| Total given in table as shown in report | $77.97 |
| To this must be added London office expenses, directors' fees, taxes, etc. | 15.10 |
| Total as indicated by profit and loss statement | $93.07 |

Development work consisted of 3186 ft. of drifts; 1378 ft. of crosscuts; 761 ft. of winzes; 920 ft. of raises and 400 ft. of stations; total, 6647 ft. This work was done at an average cost of $15.94 per ft. Development was charged off at the rate of $2.43 per ton of ore milled.

The main No. 5 shaft was sunk to a depth of 678 ft. from the surface, or 659 ft. for the year. The cost of this shaft, including masonry and concrete work above the first level, has averaged about $58.50 per ft. It is to be equipped with a 72-ft. steel headframe, two 3-ton skips, safety hooks, storage bins, etc., and a 22x48-in. duplex direct-acting Corliss winding engine with 8-ft. drums. The hoist will have a capacity of seven tons working to 2000 ft. in depth.

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## Rhodesian Mining Notes

### Special Correspondence

No important discoveries have recently been made by prospectors and this fact is disquieting as far as the future is concerned. Two of the largest producers in the past show signs of exhaustion. The ore reserve of the Eldorado mine is reduced to 36,000 tons valued at 22 dwt. The main shoot of ore having contracted in length from 600 ft. to 710 ft. in the lower level. The Giant mine is simply milling developed ore, exploration work having failed to disclose any extension of the orebody. This company will probably take up and develop claims from the Cam & Motor Company.

There are several new producers coming forward to maintain the output. The Shamva mines have now 2,325,000 tons developed, valued at about 20s. recovery value, and they are erecting a large plant.

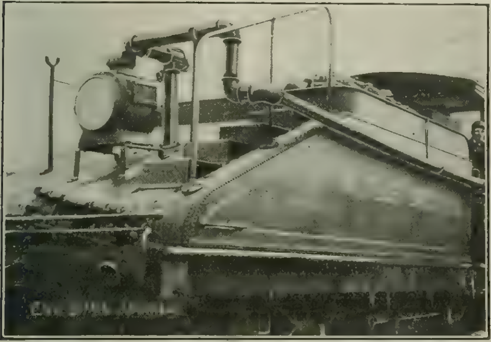
The Bell Reef has 42,000 tons valued at 48s. per ton fully developed and is erecting a plant to heat 4000 tons per month. The Golden Kopje, Connemara, Antelope, Enterprise and Eileen Alannah mines will shortly be producing, but the finest mine in Rhodesia will probably be the Cam & Motor mine, which has 1,000,000 tons of ore valued at 46s. fully developed and on which the erecting of a milling plant on West Australian lines to treat 15,000 tons of ore a month, is nearly completed.

The Falcon mines have 800,000 tons of gold-copper ore valued at about 60s. per ton, but I anticipate high working costs and poor recoveries from this deposit. The tin deposits have proved unpayable. The Lonely Reef Gold Mining Co. has 180,000 tons valued at 80s., developed and crushed in three months 11,600 tons for a recovery of 17.3 dwt. Working costs were 27s. 6d. per ton with 3s. 8d. government royalty.

# DETAILS OF PRACTICAL MINING

## Method of Supplying Steam-Shovel Water

The steam shovels in the Mesabi openpits obtain their water from the tenders of the locomotives handling the loading trains. The ordinary method of transferring the water is to use an injector on the shovel to create a suction in a rubber hose from the tender tank. The hose is expensive, costing about $100, and is subject to rough usage, which soon creates leaks and renders it unavailable for suction purposes. Butler Bros., stripping contractors, have developed a more satisfactory method. The tender carries a 4-in. pipe arranged to swing over the shovel and make connection readily, the water being forced over by an injector on the tender, using locomotive steam. The illustration shows the manner of arrangement. A 1-in. steam pipe supplies the injector. The water pipe has several ells to give it flexibility in every direction. The connection to the shovel pipe is made with an ordinary screw union. Several rests on the tender support the pipe when not in use.



PIPE FOR SUPPLYING WATER TO STEAM SHOVEL

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## Relative Merits of Storage Battery Types

Writing in *Power* Nov. 18, 1913, Eugene Oster discusses the lead-sulphuric and Edison types of storage battery, and derives the following conclusions as to their relative advantages:

(1) The principal advantage of the lead cell lies in its high efficiency and low first cost.

(2) Among the innate disadvantages of the sulphuric-acid battery can be mentioned: Excessive weight; structural weakness of parts; corrosive nature of electrolyte and fumes; loss of capacity; shedding of active material; exacting and incessant care required for successful operation; fracture and buckling of plates; sulphation; internal discharge; high installation and maintenance costs.

(3) The advantages of the Edison cell are: Increase of capacity with use; simplicity of the care required; ease of interconnecting the cells; steel-preserving electrolyte and lack of corrosive fumes; durability and sturdiness of cell structure; low weight per unit of capacity; ability to withstand short-circuits; absence of sulphation, buckling and sediment; immunity from injurious effects of overcharge; low maintenance cost.

(4) The disadvantages of the Edison cell may be summed up as high initial cost and comparatively low efficiency, due to low cell voltage.

It is thus evident that each type of battery has its special field, and, hence, a satisfactory selection can be made only after an exhaustive investigation of all the factors entering into an installation.

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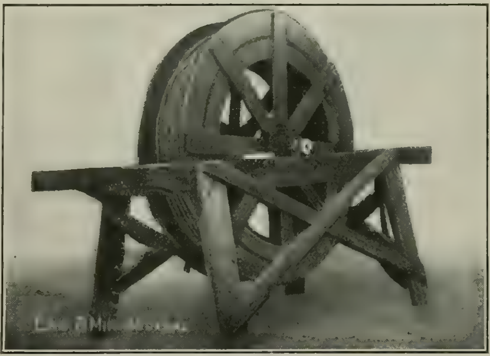
## Reel for Stockpile Trolley Wire

The system of stockpiling followed on the Mesabi and Vermilion ranges involves the extension of the pile in several faces, served by a series of tracks branching off the main track from the headframe. The ore is trammed out in end-dump cars by electric-trolley locomotives. The trolley wire must thus be continually extended. It is usual to keep the coil of extra wire hung on a support at the end of the track. For the Oliver mines at Ely portable reels are provided and are kept on the stockpile floor some way out from the toe of the advancing dump. The wire, as it leaves the top of the dump, is carried out on a horizontal boom so that it clears the dump face by from 10 to 20 ft. at all points and is out of danger of the falling material. The reel itself is built of 1-in. lumber and is 4 ft. in diameter and 10½ in. across the face where the wire winds, the flanges being 5 in. deep. The frame carrying the reel is of 2-in. lumber for the most part and is provided with barrow handles at the end to facilitate moving it about. The reel has an iron axle mounted in split porcelain insulators as bearings, to obviate any danger of short-circuiting.



WOODEN REEL FOR CARRYING EXTRA TROLLEY WIRE IN STOCKPILING

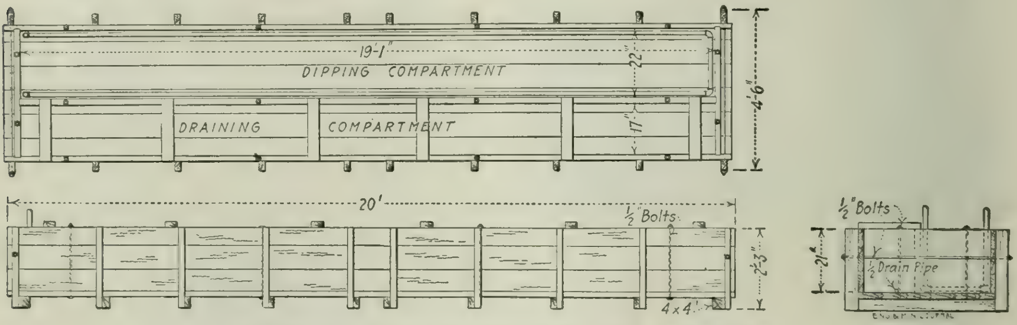
# Dipping Tank for Mine Timber

By L. O. Kellogg

At the Bennett mine, on the Mesabi, Carbolineum is rather extensively used for treating timber for both underground and surface construction. The material for such surface structures as the coal trestle and the casing on the vertical water-tank pipe and for the shaft sets and station timbering underground is dipped in the preservative before it is put in place.

The tank used for the purpose is simple enough, but has proved convenient and is so readily constructed as to merit description. It is built of 2-in. lumber throughout, except that the two end sills are 4x4 in. Its length is such as to accommodate the wall plates of the shaft sets, the longest pieces which require treatment. The boards in the box itself are tongue-and-grooved and are bolted together to get tight joints. A longitudinal, vertical partition divides the tank into two compartments, one for dipping, the other for draining, the former somewhat the larger.

The box is bound with sets of 2x4-in. material, consisting of a sill and two posts each, spaced about 2 ft. apart. The dipping compartment is lined bottom and sides to a height of about 18 in. with galvanized iron nailed to the wood and soldered at the joints. A steam coil on the bottom along the sides and one end keeps the Carbolineum slightly warm, to obtain a more rapid penetration. The timber is allowed to soak for a few minutes and then lifted out to drain on several 2x4-in. cross-pieces above the drain compartment.



Wooden Tank for Treating Timber with Preservative

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# Rock Drill Inspection

At the Village Main Reef on the Rand, every rock drill is brought up from underground at regular intervals and thoroughly overhauled ("Journ. So. African Inst. of Eng.," November, 1913). This includes reaming the cylinders and grinding the pistons to a standard fit. A record is kept of each machine and it is not allowed to stay underground more than three months. This greatly reduces the consumption of air, a point of particular importance here as in many Rand mines, since air is bought by the unit, and its cost varies directly as the quantity consumed. Where a mine generates its own air, this correspondence does not exist, the utilization of the total compressor capacity involving only a slightly greater cost than a partial utilization

# Handling Telephone Cables in the Mine*

The following kinds of conductors are in general use for wiring mine-telephone systems: (1) Cable; (2) braided rubber-covered, copper-steel or hard-drawn copper wire; (3) bare No. 10 B.B. double-galvanized iron telephone wire. When properly designed and manufactured, cable is perhaps the best type of conductor that can be employed for mine-telephone circuits.

Lead-covered cable, used to some extent, has in many cases given trouble. The metal covering is subject to attack from dilute acids, both organic and inorganic; it is extremely difficult to prevent electrolytic action, especially if metal supports are used; the lead sheath is mechanically weak, necessitating support at frequent intervals, while the constant jarring of the car or cage is often sufficient to cause crystallization and consequent parting of the cable.

Another type of cable now manufactured by the Western Electric Co., is especially adapted for use underground. This is known as circular-loom cable, and is composed of braided rubber-covered twisted pair wires with jute filler, over which is woven a circular loom of heavy cotton impregnated with a waterproof compound. The circular-loom covering differs from that ordinarily employed, in that the strands are laid longitudinally and transversely, instead of being braided diagonally. This makes a much stronger fabric, as the pull on the cable is resisted by the heavy longitudinal strands. The standard type of cable contains a special rubber insulating compound, well adapted to withstand mine conditions. If desired, however, wires insulated with a high-percentage rubber compound can be supplied. The cable can be furnished with any size conductors desired, but the No. 14 B. & S. hard-drawn copper or No. 16 B. & S. copper-clad are recommended.

Cable is superior to other forms of conductors for carrying the telephone circuit down shafts. On account of its construction it will maintain its insulation better than single wires, and being a single strand it is easier to protect and install than are two or more wires. Armoring, composed of spirally wound galvanized steel wires, is often employed to protect shaft cable from falling material.

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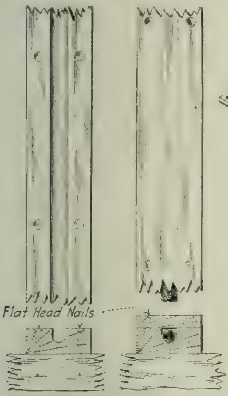
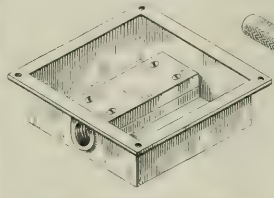
*An abstract of an article by Gregory Brown, of the Western Electric Co., "Coal Age," Dec. 6, 1913

Fig. 1 shows a method of supporting the cable as well as protecting it, and consists of a wooden casing covering the entire length of the conductor, the back being grooved to fit the cable approximately and the cover fastened down in such a manner as to exert a clamping pressure. Another effective method of protecting cable is to run it through conduit or piping.

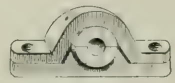
When the shaft is of considerable depth, it is necessary to support the cable by means of suitable clamps placed in iron boxes provided with covers to exclude the moisture. These boxes are either tapped for the pipe, or locknuts and rubber washers are employed. A box and clamp are shown in Fig. 2. When the shaft is not too deep, one such clamp at the top is generally sufficient. When a cable fastener is being attached to its support in the shaft, it should be so placed that there is a trifle of slack between it and the next preceding clamp. By proceeding thus, it will be assured that each support is carrying only its proper length of cable.



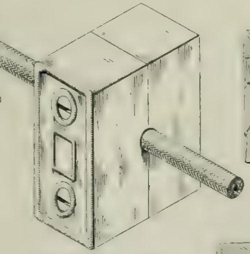
METHOD OF SUPPORTING CABLE WITH WOODEN CASING
FIG. 1



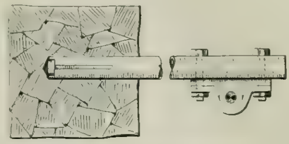
IRON CABLE BOX AND CLAMP
FIG. 2



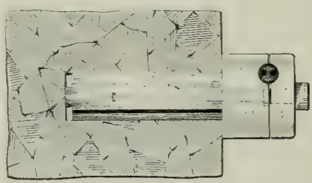
IRON CABLE CLAMP
FIG. 3



PORCELAIN CABLE CLEAT
FIG. 4



CABLE CLAMP MOUNTED ON PIPE
FIG. 5



SPLIT KNOB AND WOODEN PLUG
FIG. 6

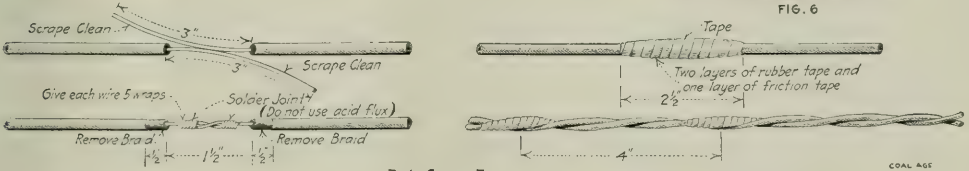


FIG. 7

Means of Protecting, Supporting and Splicing Telephone Cable

There are several methods employed for running cables in roads and entries. Where the road is timbered, it is good practice to fasten the cable to the sets by means of insulated iron clamps or porcelain cleats. The insulated iron clamp is shown in Fig. 3. It is fastened to the timber by means of wood screws. The porcelain cleat of Fig. 4 is more easily broken. The clamp and cleat of the size shown are suitable for two-conductor circular-loom cable, but can be furnished with various-sized openings adapting them for cable larger than the two-conductor.

In order to avoid injury, it is advisable to run the cable in an upper corner of the drift. Cable back of the timbers is poor practice, as it is difficult to get at in case of trouble. Where there is no timbering, it is satisfactory to suspend the cable from the back. A good method of doing this is shown in Fig. 5. A piece of 1¼-in. pipe, 8½ in. long, is split with a hacksaw for a distance of about 3 in. from one end. In this end of the pipe is inserted a metal or wooden cone, the largest diameter of which is slightly smaller than the outside diameter of the pipe. At the other end of the pipe there should be drilled in a transverse direction two holes, suitable for bolts to hold the cleats. A hole is drilled in the back for a distance of about 5½ in. The pipe plug is driven home in this hole. Where the back or sides are of such material as to make it difficult to provide a fastening, the pipe is made much longer, and the hole deeper.

Another somewhat less expensive method of support is shown in Fig. 6. A special creosoted wooden expansion plug is used which has a hole through its center, and is also slit halfway through. At the rear is a conical opening, into which fits a wooden cone; this expands the plug when the latter is driven home. A split knob, as illustrated, is then screwed into position.

This method is not quite so strong, but in cases where the rock is good it has been used with success, care being taken to support the cable at frequent intervals. Where the pipe is used, a distance of 20 ft. between supports has been found satisfactory. Where the back is uneven it is often necessary to increase this distance. The cable should at no point touch the roof.

Cable is sometimes run in a conduit and in some cases this has been fastened to the ties. This serves as a good protection for the conductors, except in case of wrecks. There have been cases also where armored cable has been employed on roadways. This possesses great strength and ability to resist crushing, a feature important as making it possible to communicate with men behind a fall of ground. A good way to install armored cable is to place it in a shallow trench upon a layer of sand. Rough boards are then laid over the cable, and the trench filled in, the office of the boards being to eliminate danger from picks or crowbars.

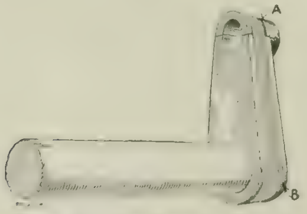
In making repairs or in joining one length of cable to another, the splicing operation should be performed as follows: The cable insulation is removed for a distance of about 8 in. from the end of each piece, leaving the braided, rubber-covered wire exposed. Over one end is slipped a piece of circular loom of sufficient length to cover the whole joint when completed. One of the projecting wires in each cable is then cut off so that it extends a distance of about 4 in. The rubber insulation is removed from each end of the four wires for a distance of 3 in., care being taken to see that the wire is not nicked. The short wire of one cable is then twisted around the long wire of the other, as shown in Fig. 7. Each joint is soldered, using rosin core solder for the purpose. Ordinary soldering salts should on no account be used, as it is impossible to get rid of all the acid, and its presence will cause corrosion. After soldering, the braid on each wire is removed for a distance of ½ in. and each joint is covered with two layers of pure rubber tape, starting the tapping operation on the rubber insulation from which the braid has been removed, and terminating it upon the insulation on the other side of the joint. Okonite tape is highly suitable for this purpose. One layer of adhesive tape is applied on this and starting from the cable sheath, two layers of adhesive tape are wound around the two wires together. After this the circular loom is slipped back over the joint and taped in position.

⁂

## Broken Crank Repaired with Wire

A small crank on a pump broke through the crankpin bore, according to G. A. Robertson, *Power*, Dec. 16, 1913, and the upper half of the crank fell entirely off. Circumstances were such that it was necessary to make a quick repair on the spot.

Slots *A* and *B* were filed in the small and large ends of the crank. The pin was placed in position, the broken part placed over it and fine steel wire was then wound around the crank until the slots were filled. Over this one round of large copper wire was placed to hold the fine wire, which would break when attempting to tighten by twisting it. The pump operated satisfactorily for several days, the wire remaining in position.



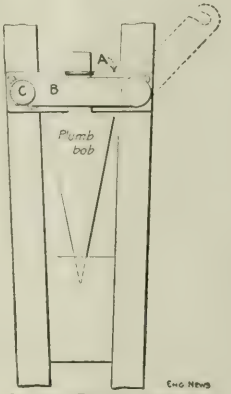
Wire Holding Broken Crank

⁂

**Congress Recently Granted the U. S. Geological Survey $50,000** to cover part of the damage done by the fire of last May which occurred in one of the rented buildings occupied by that bureau, consuming or ruining a large amount of property and publications.

## A Plumb-Bob Holder

An ingenious device for carrying a transit plumb-bob is described in a recent issue of *Engineering News*: The cut shows the device applied. The point of the plumb-bob rests in a ¼-in. hole bored ½ in. deep in the spacing block of the leg, while its neck fits between two strips of brass. The inner strip *A* is secured by two screws. The outer strip *B* is hinged at one end, while the other end is notched to hook over a pin *C*. This pin is fitted as a clamp screw, so that by a slight turn of the milled head the plate is held firmly in place. Both plates are slightly bent at the middle so as to allow for the neck of the plumb-bob and the string which is wound around it.

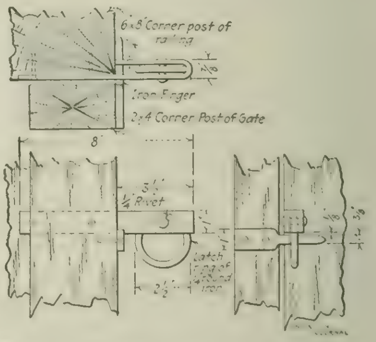


Plumb-Bob Carrier on a Tripod

⁂

## A Handy Gate Latch

The gate latch herewith illustrated is one used at the Bennett mine, Keewatin, Minn. While in this particular instance it was applied to the gate into the manway, through the fence around the shaft collar, it is suitable for any gate and is extremely neat, reliable and convenient. It consists of a horizontal finger attached to the gate and a ring held loose in a double-strap hanger fastened to a corner post of the fence. The 2½-in. ring rests on a ¼-in. rivet between the two straps. In closing the gate the finger strikes the ring, which is so positioned as to move freely inward and upward and allow the finger to pass. The gate cannot open by itself, as the finger strikes above the center of the ring so that the latter cannot lift; nor can it swing outward, since it strikes the closed end of the double strap; the latch is released by lifting the ring with the hand.



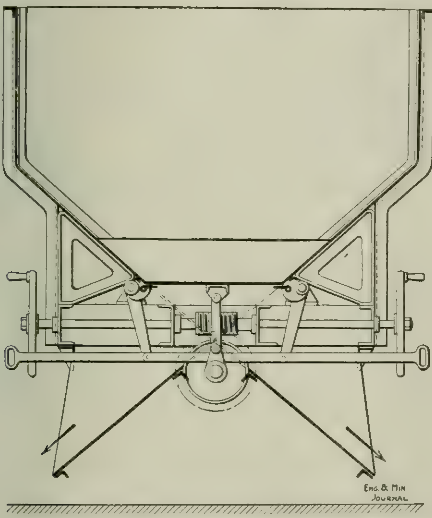
Ring and Finger Latch on Shaft Gate

# DETAILS OF METALLURGICAL PRACTICE

## The Kluseman Ore Car

At the Simmer Deep mine, on the Rand, a broad-gage railway is in use for the joint reduction plant of the Simmer Deep and the Jupiter Gold Mining Co. The ore is supplied by four shafts, all provided with sorting and breaking plants, and the broken ore is hauled to the mill, the maximum distance being 9000 ft. and the average distance, 7000 ft.

Steam traction is used, the locomotive weighing 48 tons, and it has four axles, all of which are driving axles. The ore cars in use are the ordinary bottom discharge hopper cars originally used for hauling coal on the South African Ry., carrying 40 tons, and special ore cars of the Klusemann type, with side-discharge doors and carrying 35 tons of ore. The design of the Klusemann car is shown in the accompanying illustration. The weight of the Klusemann car is 13 tons and of the other car 22 tons. The train usually carries from 160 to 200 tons of ore. The steepest gradient is 3%, and this prevails on the approach to the mill. The sharpest curve has a radius of 400 ft. In the Simmer Deep and Jupiter mills, the train runs over the mill-ore bin, which has been designed to carry the extra load.

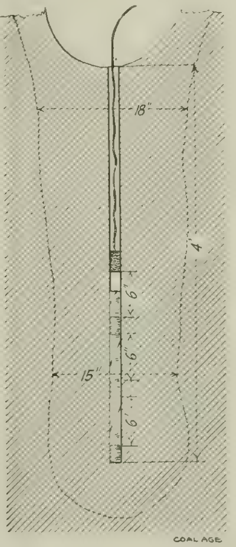


An Ore Car Used at Transvaal Mines

At the Simmer & Jack mines, the average cost for three months, during which time 204,500 tons of ore were moved, was per ton of ore hauled, 2.108c., and per ton-mile, 1.72c.; the number of trains hauled having been 1583; the number of trucks hauled, 7916; the ore hauled per train, 129 tons; the ore hauled per truck, 28.8 tons; the weight of locomotives, 46 tons; the bare weight of one truck, 11.5 tons.

## Blasting Pole Holes

The holes made for telephone, trolley and other poles can be blasted by electricity, according to *Dupont Magazine.* The holes should be 4 ft. deep for a 20-ft. pole to 7 ft. for a 50-ft. The average hole is 4½ to 5 ft. deep. Poles are set for telephone service 150 to 175 ft. apart with an average of 35 to the mile. The holes have a diameter varying from 14 to 18 in. The cost of digging holes for 25-ft. poles by post-hole diggers is about 58c. each.



Arrangement of Cartridges for Blasting Pole Holes

When blasting the holes by dynamite, the explosive should be distributed in the hole, as a charge at the bottom only, does not open the hole at the surface. A 4-ft. punch bar can be used for making the cartridge hole. It can be driven into place with a sledge and if knocked sidewise when driving can be removed without difficulty.

As the dynamite must be distributed, much time can be saved by making up cartridges of paper, 4 ft. 6 in. long, by rolling stiff wrapping paper round a stick of proper diameter and fastening four quarter sticks of 40% dynamite about 6 in. apart beginning at the bottom, as shown in the figure.

These small cartridges can be kept in place by the use of ordinary pins, stuck through the walls of the paper tube. This spaces the dynamite plugs properly and leaves a free space between them, thereby insuring the firing of the lower pieces, the cap always being placed in the top piece. Without the paper tube, there is some danger of the lower pieces not exploding, especially if much loose dirt intervenes. Water does not affect the proper exploding of the lower pieces, but loose soil does. A convenient way of placing the pieces of dynamite is to have a stick with marks 1, 2, 3, 4, etc., on it, and push the pieces into the tube one at a time and pin them in place.

The fuse need project only 2 or 3 in. above the surface, and should be bent to one side. The operator is safe in staying within a few feet of the hole, when the dynamite is exploded, as there is no general upheaval of earth. An ordinary post-hole digger is desirable for removing the loose earth. No digging bars are necessary, the earth being well broken. The average time for cleaning is from

5 to 10 min. The explosion hardens the sides of the hole and makes tamping around the pole, when set, less laborious. About 30 to 50 holes a day can be made by five men.

⁂

## Calcining of Gypsum

The principal commercial value of gypsum arises from the fact that at the moderate temperature of 130° C., three-fourths of its water of crystalliztaion is expelled, yielding plaster of paris. Water begins to come off below 100° C., but very slowly up to 130°. At 163° C. more water is expelled, and if a temperature of 221° is not exceeded, the resulting plaster is still serviceable, but if calcined above that temperature, the plaster becomes increasingly slow to set with the addition of water. At 343° C. gypsum is completely dehydrated, and the "dead burned" plaster loses all hydraulic properties, becoming $CaSO_4$, or anhydrite.[1]

In practice, two dissimilar methods are employed for calcining gypsum. The older method uses kettles holding up to 25 tons. The gypsum is first pulverized by passing successively through jaw crushers, gyratory crushers, and buhr mills, and is then charged slowly into the kettles, which are heated from outside and are provided with interior stirring devices. In about 1 hr. after filling, the mass reaches a temperature of 230° F. and begins to "boil" by rapid expulsion of water. When it reaches 350° F., the plaster is discharged into a cooling pit, and is afterward screened, the coarser grains being reground.

The more modern Cummer continuous process utilizes a rotary kiln through which furnace gases and hot air are drawn by fan. In this method, the gypsum is crushed only to nut size before being fed automatically and continuously into the kiln. It passes through the kiln in about 10 min. and is discharged at a temperature of nearly 500° F., which, however, is not sufficient to "dead burn" the gypsum owing to the presence of moisture which is not fully expelled during the short stay in the kiln. The hot gypsum is then stored in brick bins, where the mass acquires a uniform temperature just sufficient to produce plaster paris of the right quality. The calcined lumps are then pulverized and sifted. The advantages of the latter method are (1) that less than half so much fuel is required per ton of output, owing to the continuity of the heating, and (2) less power is required to pulverize calcined than raw gypsum.

⁂

## Concentration of Sliming Minerals

A rather neat idea for the treatment of ores in which the valuable material is one which slimes readily, is given by Orr Johnson Adams, of Grand Junction, Colo. (U. S. pat. 1,070,313). Such are certain vanadium and uranium ores. These he crushes, breaking the quartz grains as little as possible, then classifies wet.

The slime is usually comparatively high in valuable material, the coarse is low. The coarse material is then leached with some acid which is a solvent for the materials desired. This is a cheap process, as the coarse material is quickly leached, and there is usually only a small percentage of acid-consuming impurities in it.

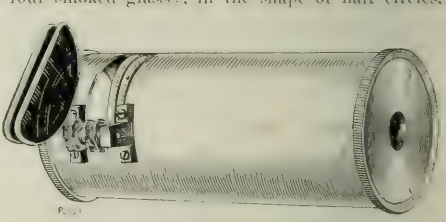
The solution, after being sufficiently neutralized by successive applications to the coarse ore, is then mixed with the previously separated slime. The impurities in this material will precipitate the valuable materials (such as vanadium, uranium, etc.), giving all of the original valuable material in a slime concentrate of small bulk. This concentrate, then, can afford comparatively high freight and treatment charges.

⁂

## Standard Umbrascope Smoke Tester

This instrument has been designed for use in cities and towns where the smoke ordinances for the regulation of the density of smoke are in force. The method employed in determining the density of smoke is by comparison with smoked glass of certain light-absorbing power, says *Power*, Dec. 2, 1913.

The tester, or umbrascope, which is manufactured by Williams, Brown & Earle, Inc., 918 Chestnut St., Philadelphia, Penn., consists of a nickel-plated tube, 1½ in. in diameter and 4 in. long. Near one end of this tube are four smoked glasses, in the shape of half circles, so hinged that one or all of them may be swung into the tube at once, which clouds the view through one-half of the tube. The clear sky is viewed through the other half of the tube and through as many glasses of specified density as the law requires. A comparison between the glass and the smoke decides which is the darker.



SMOKE TESTER

⁂

## Sprague's Method for Lead Arsenate

The customary method of manufacturing lead arsenate is to precipitate the compound from solution. According to C. B. Sprague, of the United States Smelting Co., this substance may be formed by roasting compounds containing lead oxide and arsenious acid together (U. S. pat. 1,064,023). These ingredients need not be in molecular proportion, if an excess of arsenious oxide is present it is more or less completely expelled, while an excess of lead simply remains as some one of the oxides, in the fused material, and finally in the leached residue. In practice speiss and litharge are used, about 4.4 lb. of litharge per pound of arsenic in the speiss producing about six pounds of lead arsenate.

These are roasted with access of air, and the roast conveyed to leaching kettles and extracted with 25 to 30% caustic-soda solution, about 1.5 lb. of caustic per pound of lead arsenate. After leaching, the solution is filtered from the insoluble residue, and the alkali neutralized with acetic or nitric acid, precipitating the lead arsenate. "The acid may then be regenerated by an appropriate method."

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[1] Extract from Bulletin 11 of the Oklahoma Geological Survey by L. C. Snider.

# THE COST OF DOING THINGS

## Summary of Machine-Drill Data

The following data were compiled from articles which have already appeared in the "Cost of Doing Things." For more details of operating conditions reference may be made to articles under the name of the operating company.

Alaska Treadwell mines, Douglas Island, Alaska: Average tonnage secured in stopes per machine drill shift, 34.7 tons; drilling rate, 28 ft.; length of shift, 10 hr. In drifts, 3¼ Ingersoll-Rand drills are used, it requires 40 min. to set up machine and the drilling rate is 33 ft. per shift. Records for 1911 at the Alaska Treadwell, United and Mexican mines show that the rate of drilling per machine shift in stoping ranged from 28.58 ft. to 32.71 ft.; in development, 33 to 41 ft. On the Ready Bullion claim 57.7 tons were secured in stopes per drill shift.

British Columbia Copper Co., Motherlode group, Greenwood, B. C., using a Sullivan 3¼-in. U F-2 drill, an average of 31 ft. of holes are drilled per 8-hr. shift. About 118 tons are secured per drill shift in stopes.

North Star Mines, Grass Valley, Calif., operates on an average of eight piston and 45 hammer drills daily. In drifts it requires 1.75 hr. to set up machines on vertical bars, including time required to clean out face. To rig a machine on horizontal bar takes 35 min. About 43 ft. of holes are drilled per 8-hr. shift with No. 8 water Leyner drills. In stopes 12-A Waughs usually drill 25 ft. of holes in 5⅔ hr. actual drilling time. 5.64 tons are secured per drill shift.

Mammoth Copper Co., Mammoth, Calif. At this mine about 38 tons of ore are broken in stopes and 1.6 ft. of advance made in development per drill shift. Operating 34 piston and five hammer drills requires 902,300 cu.ft. of air per day. It requires about an hour to set up drills in drifts, making two set-ups the average drilling rate is 60 ft. of holes per 8-hr. shift. In stopes, Ingersoll Sergeant D-24 drills average 45 ft. of holes per shift.

Erie Consolidated mine, Gaston, Calif., operating two piston and three hammer drills consumes 360,000 cu.ft. of air per day. In drifting 1½ hr. is required to muck back and ½ hr. to set up a machine, with two set-ups 55 ft. of holes are drilled in an 8-hr. shift. In stopes 8-C Waughs drill from 36 to 54 ft. per shift.

Pittsburg Silver Peak, Blair, Nev., water Leyner and Ingersoll-Rand piston drills are used in development, about 35 ft. of holes are drilled in an 8-hr. shift and 3.5 ft. of advance made. In stopes, 45.5 tons of ore are secured or 45 ft. of holes are drilled per drill shift with air hammer drills.

Cananea Consolidated Copper Co., Cananea, Mex. In drifts the drilling rate is approximately 40 ft. per 9-hr. shift, allowing 40 min. for set-up. In stopes the rate is 90 ft. with Ingersoll B C-21 stoper drills.

Ohio Copper Co., Bingham Cañon, Utah. This mine secures about 44.6 tons per drill shift worked in the mine including development. In drifts an average of 24.5 ft. are drilled in 8-hr. shifts allowing for two set-ups of one-half hour each. In stopes, the average for Waughs is six 6.5 ft. holes or 39 ft.; and for 3½-in. Sullivans, five 10-ft. holes or 50 ft. of holes.

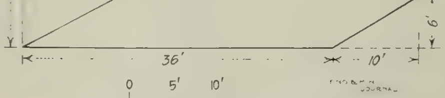
Liberty Bell mine, Telluride, Colo. In stopes, 37 tons are secured per 8-hr. drill shift and from 75 to 80 ft. of holes are drilled with Ingersoll B C-21 stopers. In drifting Ingersoll C-110 2¾ drills, making two set-ups and including time required for picking down, drill about 45 ft. of holes per shift.

Dome Mines, Porcupine, Ont. During a three-month period ended Mar. 31, 1913, Ingersoll-Rand No. 43 piston drills in drifts averaged 36 ft. of holes per 9-hr. shift and broke 1.68 linear ft. of drifts. In raises Rand B C No. 26 Butterfly hand hammer drills averaged 16.5 ft. of holes and broke 0.62 ft. of raise per shift. In stopes, 43.7 tons of ore were secured per shift and the drilling rate averaged from 30 ft. of holes for piston drills to 38.7 ft. for air hand hammer drills.

⁂

## Steam-Shovel Work

The following is an extract from a "Hand-Book of Steam Shovel Work," p. 236, issued by the Bucyrus Co., and is a record of shovel No. 1083 of the Oliver Iron Mining Co., Seller's Pit, Hibbing, Minn. This shovel was working in the soft ore typical of the Mesabi range. There was some taconite mixed with it and some "paint rock." These materials did not occur in the form of regular intrusions, but were scattered through the ore in lumps of 6 in. in diameter and upwards. Sometimes pieces too large for one man to handle were encountered. The paint rock was in smaller chunks and so soft that it was broken by the dipper when it penetrated it. Great care was exercised in excluding foreign matter from cars, and for this reason it was often necessary to stop the shovel completely. The delays in getting rock out of the way generally followed a process called "clawing down." The ore was blasted and doubtless the natural solidity of the ore was affected by the blasting, but not to such an extent that the material would crumble and



Blasting for Steam-Shovel Work

fall down itself. To handle rock and foreign material, four 7-yd. cars were spotted at the shovel after each train was loaded. The next train coupled on these cars and they were handled as a part of the train as long as it was loading. The shovel and loading tracks were standard gage, laid with standard ties and 50- or 60-lb. rails. The shovel was moved forward on 6-ft. sections, but after it was moved 50 ft. a standard track was laid behind the shovel and connected with the loading track. This track became the loading track for the next cut. When the following study was made the mine was working apparently at full capacity. For blasting, holes were churned 16 to 20 ft. back from the edge of the bank. These were sprung with two to four 7/8-in. sticks of 60% dynamite and then loaded with about two kegs of black powder to each hole. No attempt was made to blow the bank down, the desire being to give the material a slight shaking. A typical cross-section is given herewith followed by observations given in the report:

Material, iron ore; type of shovel, 95 B; distance of move, 6 ft.; kind of teeth, rock; lift, 9 ft.; size of ties, 6x6 in. and 6x8 in. by 8 ft.; size of bucket, 2½ yd.; age of shovel, second season; shift, 10 hr., two shifts per day.

Coal was brought up in dump cars; plank laid from car to coal bunker, and coal carried across in boxes, each holding about a cubic foot. Water was taken from locomotive tender. Repairs were made on Sundays and as needed; complete overhauling in shop each season if needed. This shovel had never been in shop even for minor repairs.

Coal used, 2¾ to 3¼ tons per shift; oil used, 1½ gal. valve per shift, 1¼ gal. black and ½ lb. of grease; water used, 4000 to 6000 gal. per shift.

Kind of track, etc., 60-lb. standard rail; kind and size of cars used, steel ore cars of 100,000 lb. capacity, wood ore cars of 70,000 lb. capacity.

Train was braked by air; hand signals were used by man on ground; 60-ton standard locomotives used. Length of haul to mouth of pit, ½ mile.

Two trains, two locomotives. Locomotives alternated with trains to be loaded. Locomotive took full train in and brought back six empties; then stood on siding and waited until other train was out of way.

Weather, fair, warm and sunny.

Started work 1:20 and stopped work 6:30, making the total time covered 5 hr. 10 sec.

| | Minutes | Seconds | Per Cent |
|---|---|---|---|
| Actual working | 173 | 30 | 57.9 |
| Waiting for cars | 71 | 5* | 23.6 |
| Moving shovel | 9 | 40 | 3.2 |
| Miscellaneous delays: | | | |
| Taking rock from car | 4 | 40 | 1.6 |
| Breaking rock | 5 | 15 | 1.8 |
| Breaking rock | 18 | 50 | 6.2 |
| Clawing down. | 1 | 10 | 0.4 |
| Clawing down | 2 | 45 | 0.9 |
| Breaking rock | 2 | 40 | 0.9 |
| Picking rock from car | 9 | 35 | 3.2 |
| Clawing down | 1 | 0 | 0.3 |
| Total time under observation | 300 | 10 | 100.0 |

* While waiting for the cars the shovel was idle 23 min. 5 sec. out of the 71 min. 5 sec., but spent the remaining 48 min. as follows:

| | |
|---|---|
| Loading rock | 25 min., 5 sec. |
| Clawing down | 5 min., 40 sec. |
| Casting ahead | 17 min., 15 sec. |

The cost of direct labor per day on standard basis was: Runner, $5; craneman, $3.60; fireman, $2.40; four pit men, $6; eight rockmen, $12; total, $29. During the observation there were 23½ cars of 50 tons and five of 35 tons loaded, a total of 1350 tons. Counting two tons per cu.yd., the total yardage was 675 cu.yd., this gives a cost for direct labor of 2.15c. per cu.yd. By a process of analysis this was distributed as follows: Charge to waiting for blasters, 0.225c.; to actual loading and delays moving up, 1.314c.; and charge to transportation 0.611c. The actual ratio of coal to water consumption was 6 to 7.7.

⁂

## Camp Bird Mine

The following data were taken from figures given in the annual report of the Camp Bird, Ltd., Ouray, Colo. The cost figures were taken from the profit and loss statement for year ended June 30, 1913:

OPERATING RESULTS FOR YEAR ENDED JUNE 30, 1913

| Receipts: | Per Ton Milled |
|---|---|
| By sale of bullion | $12.51 |
| By sale of concentrates | 9.84 |
| From cyanide slags and matte | 0.06 |
| Miscellaneous receipts | 0.05 |
| Interest on bank balances | 0.03 |
| Total receipts from operating Camp Bird mine | $22.49 |
| **Expenditures:** | **Per Ton Milled** |
| Mining: Blocking out ore | $0.69 |
| Ore breaking | 0.83 |
| Timbering | 0.45 |
| Loading and tramming | 0.72 |
| Hoisting | 0.24 |
| Electric lighting | 0.03 |
| Pumping | 0.12 |
| Engineering, geology, etc | 0.03 |
| Mine sampling and assaying | 0.04 |
| Foreman and shift bosses | 0.29 |
| Power expense | 0.57 |
| Maintenance | 0.52 |
| Other mine expense | 0.10 |
| Total mining | $4.63 |
| Tramway | $0.16 |
| Stamp mill; labor, crushing, etc | 0.87 |
| Supplies and fuel | 0.31 |
| Assaying and retorting | 0.05 |
| Foreman | 0.08 |
| Maintenance | 0.31 |
| Total stamp mill | $1.62 |
| Cyanide mill; Labor | 0.18 |
| Supplies and lights | 0.49 |
| Assaying | 0.04 |
| Foreman | 0.12 |
| Maintenance | 0.04 |
| Other cyanide expense | 0.12 |
| Total cyanide mill expense | $0.99 |
| Shipping and selling expense | $2.78 |
| General expenses including taxes | 3.43 |
| Depreciation on plant charged off | 1.00 |
| Total cost of production | $14.61 |
| 30,012 dry tons milled | |

During the year operations were reduced to a scale where ore could be furnished to but 25 stamps in the 60-stamp mill. Ore reserves were summed up as follows: Positive and partly developed ore, 23,000 dry tons that should yield a profit of $239,000; probable ore, 8000 dry tons that should yield a profit of $87,000. This estimate does not include any ore that may be developed below the 6th level.

Of the gold value in the crude ore there was a saving of 93.79%. Of the total value extracted there was obtained by amalgamation, 49.28%; concentration, 43.91%; cyanidation, 6.81%. Of the total contents extracted gold constituted 85.74%; silver, 9.92%; lead, 2.33%; copper, 2.01%. Gold content continued to decline.

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## Refining Cost of Silver in Copper Bullion

It costs about 0.6c. per oz. to refine the silver obtained from copper bullion. As a consequence copper bullion carrying 150 oz. Ag per ton will cost 60c. per ton more to refine than a 50-oz. Ag per ton bullion, without considering any metal losses on the higher grade of bullion. This often explains a difference in refining tolls which otherwise seems inexplicable.

# Carnotite—II.

By Thomas F. V. Curran*

*SYNOPSIS—Carnotite mining is expensive, as the mineral is widely disseminated, no highly concentrated deposits being known. It is concentrated on the ground, and compounds finally made in Eastern or European laboratories. Special units are used to measure its radio activity.*

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Taken as a whole, it should be reiterated that the carnotite-ore resources are important commercially, but that they are extremely limited if measured by their capacity to produce say 150 tons per month of ore, averaging not less than 2% uranium oxide. At present four tons of what should be shipping ore is thrown on the dump for every ton of ore that is shipped. The average cost of mining and sacking 2000 lb. of carnotite ore is $32, and this does not take account of mine depreciation, as it certainly should be made to do. The sacks cost $3.50 and $4.50 per ton of ore, the wagon hauling, $20 per ton, the packing from many of the mines to wagon road costs $7.50 per ton, and the freight to Galveston from Placerville costs $9.50 per ton. If the ore is sampled in Denver, $1 additional should be added to freight charge, and $3.50 per ton for sampling charge. The freight to European ports is from $3.60 to $5 per ton. The usual price paid for this ore has been about $2 per pound $U_3O_8$, but when the presence of mesothorium seemed to frighten the radium makers in the early part of 1913, and the price of radium bromide dropped from $71 to $69 per mg., they began immediately to slash the price paid to the producers of carnotite, notwithstanding that they only then receive from the ore buyer about 8% of its contained value in radium, vanadium and uranium. Since then, the price of radium bromide has advanced tremendously, some quotations being $150 per mg., but, strange to say, the radium-makers seem to think there is now very little relation between the selling price of radium bromide and the price they wish to pay for carnotite. Nevertheless, they are dependent upon carnotite for their radium output.

The carnotite shipped from Paradox in 1911, aggregated 1515 tons containing 26 tons of uranium. In 1912, the output was 1092 tons containing 22 tons of uranium. The decrease was due partly to inactivity of two corporate operators during part of 1912, and also partly because many of the rich surface pockets of carnotite had been worked out and much exploration work was necessary. The output for 1913 will be about 1200 tons, containing about 25 tons uranium. If the mining is pushed energetically in 1914, the output should be about 2000 tons, containing 40 tons uranium, but the 1915 output would show a material falling off. In order to produce carnotite steadily and regularly, exploration and development work must be kept in advance of actual mining operations, and must be regarded as of prime importance. This must necessarily affect the price of the ore.

Vanadium has a multitude of uses, the chief one being as an alloy of iron, steel, copper and bronze, wherefore it is much in demand. Its effect in well deoxidized metal is: (1) About one-fifth of the alloy that is added to the metal, automatically scavenges the molten mass of nitride and oxide gases, which gases are "poisonous" and cause the minute holes from which rupture arises: (2) one-half of the remainder of the alloy unites with the carbonless portion of the metal called ferrite, and toughens it still more; and (3) the balance of the alloy acts upon the carbides, strengthens them, and distributes them evenly. Hence, vanadium-treated metals are uniform, close grained, tough and strong, and attain the maximum in economy, safety and endurance. The cost of reducing ordinary vanadium oxide to ferrovanadium is about 68c. per lb. of vanadium content. The market price of ferrovanadium is $2.50 per lb. of vanadium content.

In the form of sodium uranate, uranium is used for tinting glass, porcelain and ceramics. In rich coloring, the uranate addition is sometimes as much as 25% of the weight of the glass. Naturally, such glass is highly radioactive. The price of sodium uranate is from $2.70 to $3.50 per lb., according to its purity, or freedom from vanadium. Its reduction cost is about 90c. per pound.

E. de Haen, of Hanover, Germany, advertises ferrouranium at about $50 per lb., indicating limited use. A Sheffield steel maker, a few years ago, used a complex Portuguese ore containing uranium, in making steel for the British Admiralty. The static and dynamic properties were claimed to be so wonderful that the concern spent $60,000 in trying to produce another heat of uranium steel, but in vain.

### Other Minerals Are Radio-Active

Carnotite and pitchblende are not the only minerals containing radium. Under the caption, "Uranium Ores in Portugal," the *Mining Journal*, London, says: "It has now, however, been proved that autunites (uranium ores from Guarda, Portugal), can successfully compete with pitchblende; that the known deposits of pitchblende are not sufficient to cope with the world's present demand for radium, even were all available ores placed on the market at once; that the most suitable ores for the extraction of radium are autunites; that the only known exploited deposits of autunites are in Portugal, and whatever the output, the increasing demand throughout the world for this mineral can never be supplied; that the average value of a 1% autunite ore is £30, or at $4.85, $145.50 per ton, and that there is practically a free market." Commenting, it may be observed that representative samples of this ore gave uranium values varying from 0.18 to 2.5%, with an average of 0.5%, and even this low average has been attacked by an autunite mine shareholder as too high.

### Uranium Minerals Occur in Australia

The Australian carnotite is little more than an incrustation and powder on the faces, joints and crevices of a lode formation, which consists of magnetic titaniferous iron, magnetite, etc., and quartz in association with black mica (biotite). Practically all the secondary uranium minerals are encountered, such as:

Torbenite (copper-uranium phosphate)
Autunite (Calcium-uranium phosphate)
Uranophane (hydrous uranium-calcium silicate)
Carnotite (potassium-uranium vanadate)
Fergussonite (niobates of rare earths, uranium, etc.)
Gummite (hydrous oxide of uranium)
Uranium ochre, monazite, etc.

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*Curran & Hudson, Placerville, Colo.

In the treatment of these ores, a preliminary leach of sodium-carbonate solution is recommended by Dr. Douglas Mawson, of the Australian Ministry of Mines, who is of the opinion that primary uranium minerals will be found in depth. The prominence given to the vugs lined with crystallized quartz, often amethystine or smoky, as the feature of the Mount Gee portion of the lode, recalls the characteristic feature of the Old Mexico group of claims in Bull Cañon, also the Sundown, Uranium Bell, and Bachelor group. Vugs filled with high-grade carnotite are frequently encountered in Long Park, but the lining is soft, almost decomposed and they are probably only old water courses. Little is known of the Turkestan carnotite; it is said to be low grade, not over 0.5% uranium-oxide content.

Rutherford and Soddy early suggested that radium is a disintegration product of one of the radio-active substances present in pitchblende, and from the fact that radium and uranium are always found together, that probably uranium is the primary source of radium. If so, the amount of radium in a mineral always should be in a constant ratio to the amount of uranium. This question was attacked experimentally by Boltwood, McCoy and Strutt, and the results obtained afford a direct and satisfactory proof that the amount of radium is directly proportional to the amount of uranium. The amount of radium per gram of uranium was found to be $3.4 \times 10^{-7}$ gram. Consequently, one gram of radium element is present in a mineral containing 3000 kg. of uranium.

## Electrical and Photographic-Plate Method of Determining Radiation

Two methods may be employed for examination of radiation of carnotite ore: (1) Photographic plate, and (2) ionizing action of the rays on surrounding gas, i.e., electroscope. The photographic method has been displaced by the electrical method, because it usually takes a day's exposure to darken the film appreciably and this darkening may be produced by rays not proceeding from the uranium constituent of the ore. Again, the thickness and rapidity of the films used affects the photographic effect of the different types of radiation. However, this method is valuable in investigating curvature of the path of the rays when deflected by a magnetic field.

The electrical method is a rapid and accurate means of quantitatively examining the radiation over wide range from extremely small intensity to very high intensity.

The extremely fine state of division of carnotite precludes successful ore dressing. Magnetic experiments have been unsuccessful. A method of sliming and subsequent attrition whereby the values, in the form of slimes, might be filter pressed or settled, lost one-third of the contained values. Crushing the ore and subsequent screening dry, gave negative results on works scale, although preliminary laboratory experiments gave promise of success. An elaboration of this method is to crush the ore coarsely and feed it through a revolving cylindrical-shaped copper brush, which removes the carnotite incrustation from the sand grains, without breaking the latter, then screening through a seve having mesh too fine to permit the sand grains going through, thus separating the sand grains from the carnotite.

## Alkaline Leach for Extraction

Leaching without agitation is impossible. Carbonate of sodium, rendering insoluble the lime present in the ore as sulphate, is advantageous. Nevertheless, freely formed calcium sulphate is a great hindrance to clarification of liquors and the free washing of the pulp. The action of the acid on the clay-like substances present, produces colloids, with disagreeable results. The clay present and the gases formed from the limestone form channels which are characterized by the colors left by the secondary precipitation along their course. No method depending upon difference in specific gravities may be employed. However, a Denver company is experimenting with low-grade carnotite ores trying to concentrate them by means of supposed difference in specific gravity of sand and carnotite, the separation to be effected by an air blast through a linen sheet covering an apparatus resembling a Wilfley concentrating table.

It is difficult to conceive of an ore more susceptible of chemical treatment than carnotite. In a solution of five parts water and one part c.p. sulphuric acid, 85% of the vanadium and uranium are in solution in 15 min., and the entire contents are in solution in 30 minutes.

The following is a method of alkaline leach. The ore is ground through a 14-mesh screen and boiled under agitation with a 10% solution of sodium carbonate until the values are in solution, as shown by the appearance of the pulp. This solution is yellow and contains the uranium as the soluble double carbonate and the vanadium as sodium vanadate (should there be a lower state of oxidation of either metal, as there probably will be, a preliminary oxidation would be necessary). From this solution, which is drained or filtered off, the uranium is precipitated with a solution of hydraulic acid as sodium uranate, which settles quickly and is filtered and dried. To the filtrate containing the vanadium, milk of lime is added, which precipitates the vanadium as calcium vanadate, and renders the sodium carbonate caustic, an equivalent of calcium carbonate being precipitated at the same time. The caustic solution, after filtration of the calcium vanadate, is recarbonated by the carbon dioxide from the preparation of the caustic lime and used over. This method has the advantage of using a reagent, which is indifferent to the action of carbonates of lime and iron and has also the advantage of producing a high-grade uranium concentrate.

## Many Methods of Recovering Elements

In 1890, O. P. Fritchele, of Denver, produced 500 lb. of a compound of vanadium and uranium, by an electrolytic-chlorine method. Samples of this compound will be examined to ascertain if the radium values remain therein.

The Ohly process treats the carnotite with sulphuric acid and sodium carbonate in excess to precipitate iron and aluminum hydrates. The uranium and vanadium remain in solution in the excess of sodium carbonate. Ammonia is added to precipitate the hydrated oxide of uranium which is subsequently ignited to uranium oxide or sodium hydrate is added to produce sodium uranate This method does not commend itself.

The general plan of concentration and marketing of carnotite, recommended by Prof. A. W. Forstall, S. J., Denver, in the 12th biennial report of the Bureau of Mines of Colorado, commends itself, namely, the preparation of sulphates consisting of the sulphates of barium, calcium, lead, with radium sulphates, or uranium and vanadium oxides with numerous impurities.

The U. S. Bureau of Mines, Denver, under direction of Dr. R. B. Moore and K. L. Kithil, has undertaken the problem of prevention of waste and of increased efficiency in carnotite mining; they are attacking the problem in a spirit of enthusiastic earnestness.

Carnotite residues, after acid treatment, may contain radium values in the form of insoluble sulphates. These are boiled with sodium carbonate solution, thus changing the values to carbonate, and after washing free from all sulphates, are leaching with hydrochloric acid. The mixed chlorides in solution are then purified to the desired degree of concentration, by fractional crystallization. The residues from the alkaline extraction return the barium and radium values as carbonates. After washing to free the residues from sulphates, they are extracted with hydrochloric acid, and the radium and barium precipitated as sulphates. Further concentration could be undertaken by reconversion into carbonates, washing, reextraction as chlorides or bromides and fractional crystallization.

The absorption process of Erich Ebler (Heidelberg, Germany), aims to isolate or separate radium, polonium, ionium, etc., by absorption by colloids, such as threads of acetyl-cellulose, or of trisulfide of arsenic, silicic acid, which colloids are concentrated by volatilization or calcination. A very active preparation of radium was produced at the Neulenbach Radium Works, Germany, by a combined acid and alkaline fusion process which extracts the radium direct from the minerals in the form of a crude sulphate.

Radio-activity is the manifestation of the disintegration of the atom, a process that is spontaneous and constant. In radium, this disintegration is so intensely rapid that it may be observed easily and studied — witness the isolation and determination of the physical and chemical properties of the emitted gas, known as radium emanation, a product of the transformation of radium, while the continuous production from radium of the gas helium is added evidence in support of this theory.

The first commercial preparations of radium-bromide were produced by the Société Centrale de Produits Chimiques, 44 rue des Ecoles, Paris, under the direction of Debierne.

Doctor Giesel, chemist of the Chininfabrick, Braunsweig, Germany, first put preparations of nearly pure radium salt on the market. Rutherford notes: "Many scientific workers in this way obtained nearly pure radium bromide at a price initially of less than one-tenth of the prices today. The exceedingly high price of radium at the present day, £16, or about $79 per mg. of pure radium bromide bears no relation to the cost of separation from uranium minerals. The present price is artificial, and has resulted from the comparative rarity of deposits of pitchblende or uranium minerals containing fairly high percentages of uranium. The extensive use of radium for medical purposes as well as for physical and chemical experiments has so far absorbed the output."

In 1909, Lord Iveagh and Sir Ernest Cassel made a contract with the British Metalliferous Mines, Ltd., for 7½ grams of pure radium bromide to be supplied from the company's mines, near Grampound Road, Cornwall, at the price of about $20 per milligram.

The proper development of the American carnotite industry is dependent largely upon the establishment of a radium works in New York, Philadelphia, Baltimore or Denver, that will absorb the ore output of the independent carnotite-mine operators, at a reasonable price. There is little business risk in forming such a radium business, because radium extraction from the carnotite is being done profitably and regularly in Europe; the new Underwood tariff will lower greatly the price of chemicals used in the extraction process; the American use of one of these European radium-carnotite extraction processes may be acquired, together with experienced radium chemists to supervise works' operations. The use of radium is increasing rapidly in America, and physicians, surgeons and scientists, school and colleges are experimenting constantly to extend its use.

The committee for an international radium standard gives out the following units:

1 curie = quantity of radium emanation (0.60 cubic millimeter at 0 C. and 760 mm. pressure) in equilibrium with 1 gram of radium element.

This quantity gives a saturation current in an ionization chamber of indefinite dimensions, of 2.67 million electrostatic units (0.89 milliampere.) One curie of emanation per liter would equal a concentration of 2670 million mache units.

1 millicurie = quantity of radium emanation in equilibrium with 1 milligram (one thousandth of a gram) of radium element.

1 microcurie = quantity of radium emanation in equilibrium with 1 microgram (one millionth of a gram) of radium element. 1 microcurie per liter equals a concentration of about 2700 mache units.

1 milligram-minute = quantity of radium emanation produced in 1 minute by 1 milligram of pure anhydrous radium bromide. This quantiy is 0.073 microcurie and would give per liter a concentration of about 180 mache units.

1 electrostatic unit (e.s.u.) current measure = $3.33 \times 10^{-10}$ (0.000000000333) ampere.

1 mache unit (m.u.) = saturation ionization current due to radium emanation from a liter of solution or gas expressed in electrostatic units multiplied by 1000.

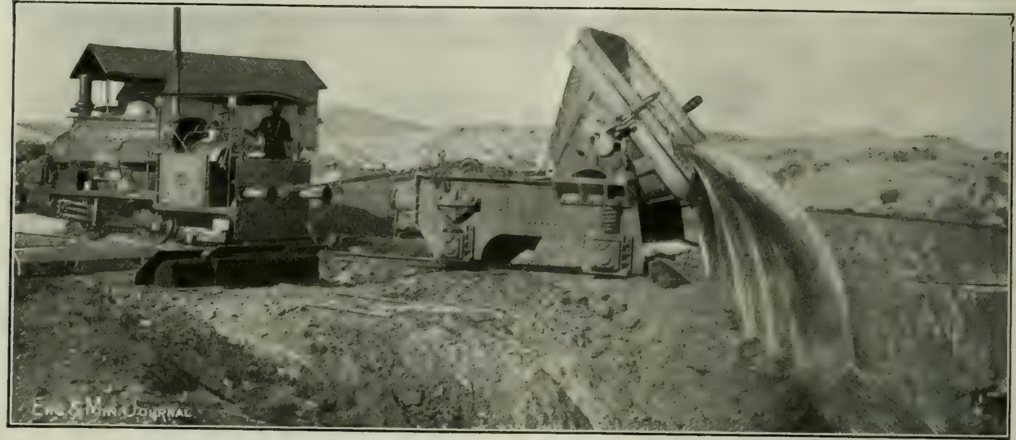
## Retarding Dissolution with Oxygen

In a 0.25% solution of KCN, the rate of solution of gold is increased by dilute electrolytic ozone, but is markedly decreased when the quantity is greater, 3 to 4%, says J. J. Andrejew, in *Zeit. f. Elektrochem*, 19, 1913, according to an abstract in "Journ. Soc. Chem. Ind.," Oct. 15, 1913. The cause of the decrease is the formation of a visible layer of oxide. A similar phenomenon is exhibited by hydrogen peroxide, although a large excess of peroxide, or a mixture of the two oxidizing agents, increases the rate of solution. This increased rate is accomplished by a decomposition of the oxidizing agent with evolution of oxygen. In more dilute cyanide solutions (0.01 to 0.05%) even atmospheric oxygen will produce the film of oxide and will cause the rate of solution to be much lower than it would be otherwise. In the case of silver, there is no reduction in the rate of solution, but a steady rise to a maximum as more hydrogen peroxide is added. Ozone alone has a very slight effect, but in combination with hydrogen peroxide it increases the effect of the latter.

## Mining in the Dominican Republic

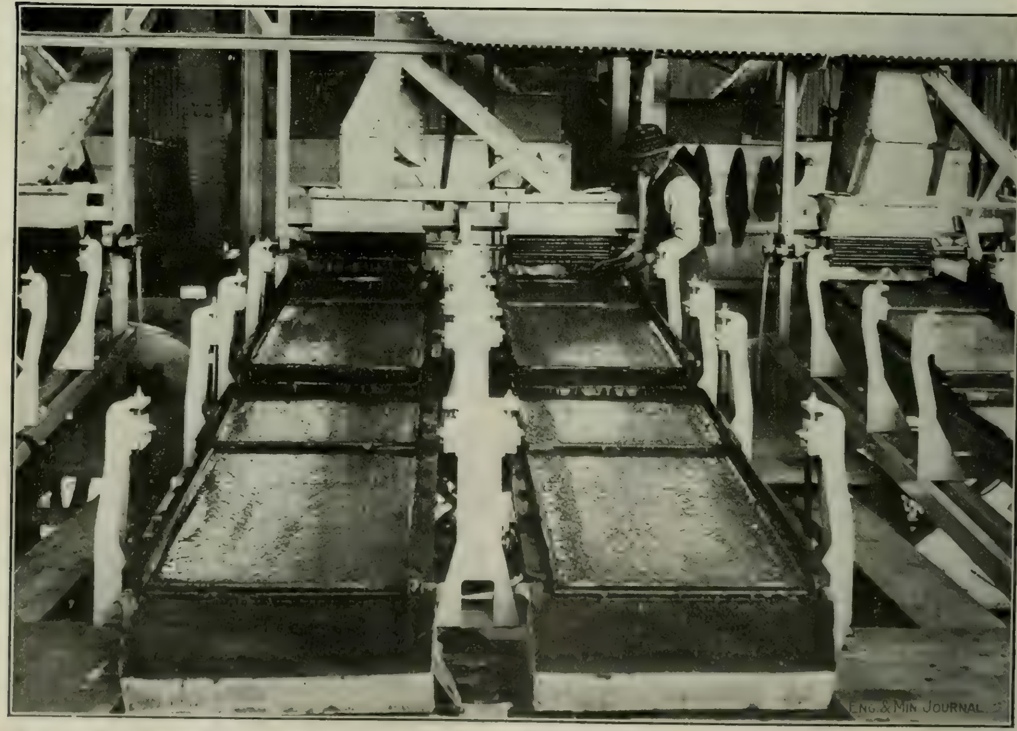
Among the principal mines of the Dominican Republic now or formerly in exploitation are the Alto Velo phospate mine, the rock-salt mines, the chalk and talc mines, the Maimon del Cotui iron mines and other mines of silver, copper and sulphur ("Bull." Pan-American Union, November, 1913). The salt mines were worked by the natives before the coming of the Spaniards, and are said to be practically inexhaustible. Recently considerable activity has shown in mining circles in the Republic and a number of mines have been denounced.

# PHOTOGRAPHS FROM THE FIELD



Dewhurst Slag Pot Used at Mt. Morgan Smelting Works, Queensland, Australia

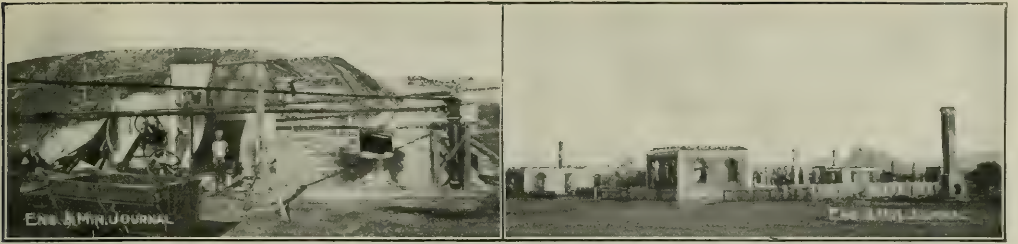
Pot shown is of 10 long tons capacity; one of 20 tons capacity is also used. Bowl is made in Sheffield, England, of particularly soft cast iron. The 20-ton bowl is cast in two pieces. Similar pots have been used at Cobar, N. S. W., for six years, yet show no signs of wear.



(Copyright by "London Daily Mirror")

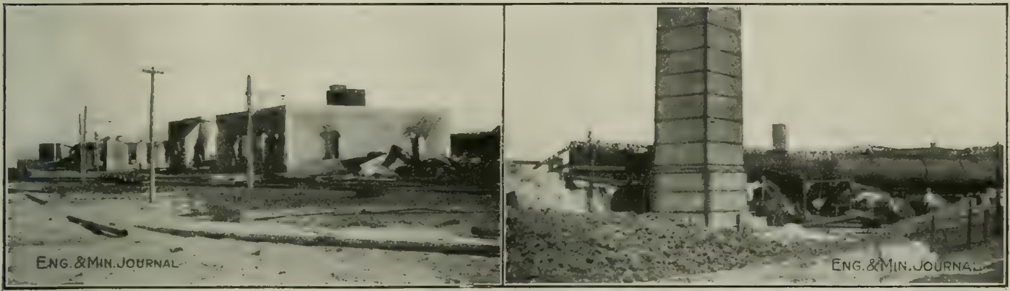
Pulsator Diamond Washer Used at the De Beers Mines at Kimberley, South Africa

To catch the diamonds grease is used on the tables which, in this illustration, somewhat resemble amalgamation plates.



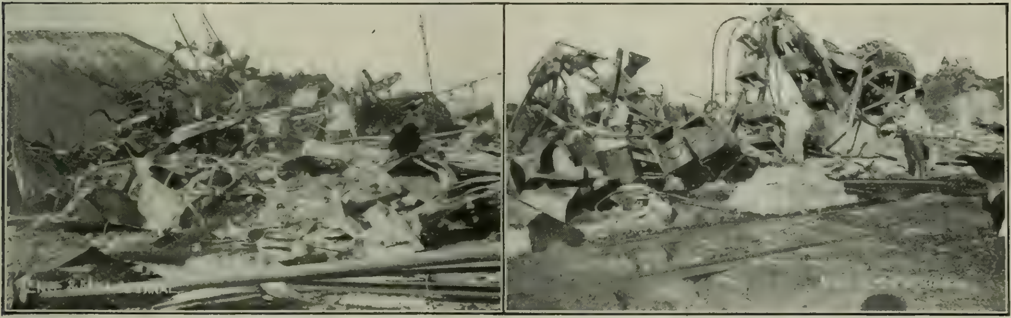
Ruins of Mine No. 2 Fan and Employees' Houses at Lampacitos, Mexico

The plant of the Cia. Carbonifera Agujita y Anexas, at Lampacitos, Coah., was destroyed by "Carranzistas," Aug. 16, and the Agujita plant on Sept. 27.



Machine Shops at Lampacitos and 100-Ft. Steel Stack Thrown Down by the Rebels

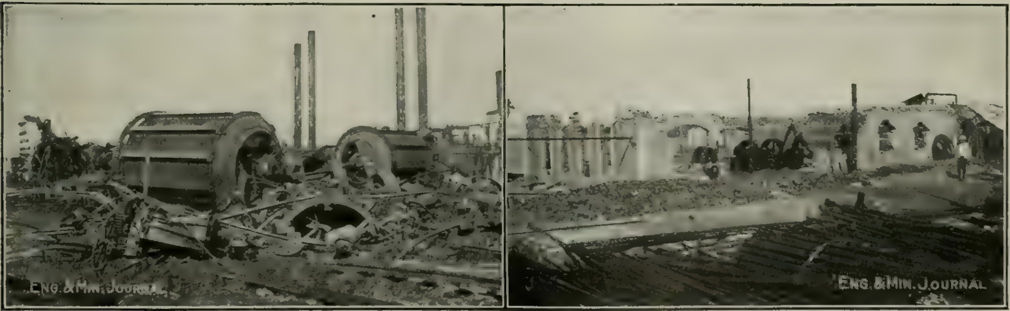
Washer, tipple, electric plant, shops, fans, hoists, principal buildings and 200 dwellings were destroyed.



Ruins of the Agujita Washer

Ruins of the Lampacitos Washer

Plants had a daily capacity of 1500 tons. At Agujita there was a Luhrig washer containing 16 Luhrig jigs, elevators, screens and a Stewart washer with two large jigs.



Washer at Agujita, Showing Bradford Cleaners

Electric Power Plant at Lampacitos

The entire plant of the Cia. Carbonifera del Norte at Menor was similarly destroyed Sept. 26, and the following day two mines and all equipment of the Cia. Carbonifera de Sabinas at Rosita were destroyed.

# Wolf Locomobiles at Buckhorn Mine

By H. C. Cutler*

An interesting installation of prime movers furnishing power for mining and milling is now being made by the Buckhorn Mines Co. at Beowawe, Nev. The plant consists of two Wolf locomobiles of 350 hp. each, made by the R. Wolf company, of Magdeburg, Germany, direct connected to two alternating-current generators furnished by the General Electric Co.

The Buckhorn Mines Co., situated in Eureka County, Nevada, 30 miles south of Beowawe, and 16 miles west of the E. & P. R.R., controlled by George Wingfield, of Reno, after developing its property for the past five years, determined upon the erection of a 350-ton mill and cyanide plant. The question of power for this plant was serious. Internal-combustion engines, owing to their unreliability, and the expense of transporting oil 16 miles, were out of the question. The country in the mine's vicinity was devoid of wood for fuel, and after a careful consideration of all the questions involved, F. J. Siebert, consulting engineer for the Wingfield interests, decided on the erection of a steam-power plant at Beowawe on the Southern Pacific R.R., to generate electric power, and a 30-mile transmission line to carry this power to the mine and mill, thus doing away entirely with the transporting of fuel from the railroad.

Competitive bids were called for from all the manufacturers of prime movers, and after considering all the advantages and disadvantages of each and the economies attained the contract was awarded to the Trent Engineering Co., of Reno, American agents for the R. Wolf Co., for two compound-condensing superheated-steam locomobiles, VK XIII type, 350 hp. each under continuous maximum load with a guaranteed steam consumption of 10 lb. and fuel consumption of 1.2 lb. per b.hp.-hr. These locomobiles were to be fitted for direct coupling to two 225-kw. generators.

This installation, it is believed, will be the first of its kind in the United States although there are over 1,000,000 hp., in Wolf locomobiles alone, distributed throughout the different countries of the world, in over 6600 units.

These locomobiles have been used in Europe for a number of years with great success in all sizes from 20 hp. to 1000 hp., and show within these limits economies which compare favorably with the best class of turbines in large units. Within the past year they have been described thoroughly in a number of the American technical journals.[1]

Essentially, the locomobile is a combined boiler and engine. The boiler is of the locomotive type with removable tubes and a superheater, consisting of a number of pipe coils, in one end through which the waste gases at high temperature circulate. The engine is mounted on top of the boiler and is of the compound condensing type for superheated steam using the uniflow cylinder, which affords the greatest utilization of the high-pressure superheated steam and reduces the cylinder condensation to a minimum.

Frequent tests have shown a fuel consumption of from 0.8 to 1.2 lb. of coal (13,500 B.t.u.) and from 7 to 9 lb. of steam per b.hp.-hr. There are a number of advantages claimed for this class of engine over the ordinary kind. First, the combination of boiler and engine in one unit requires a minimum floor space for setting and only the slightest of foundations. No expensive or complicated brick setting for the boiler, and consequently smaller and cheaper engine-room buildings. Second, complete and simple supervision of the whole plant at once by one attendant. Third, great economies in fuel and steam consumption. Fourth, easy regulation and perfect reliability. Fifth, removable furnace tubes allow quick cleaning.

The results of the tests, which will be made in the plant at Beowawe as soon as completed and in good running order, are awaited with great interest by a number of the mining operators of Nevada and the Pacific coast who, on account of the high cost of the present electric power, are contemplating the erection of their own steam-power plants.

It is estimated that a power installation using the Wolf locomobile as the prime mover can effect a saving of from $1 to $4 per hp. per month over present prices. A complete description of the Buckhorn installation with pictures and results of tests will be given later.

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# Changes at Great Falls

Archer E. Wheeler has tendered his resignation as superintendent of the reduction department of the Anaconda Copper Mining Co., in Great Falls, to take the position of consulting engineer of the Union Minière du Haut Katanga. John H. Klepinger, now assistant superintendent of the smelter, succeeds Mr. Wheeler as superintendent, and Milo W. Krejci, metallurgist, becomes assistant superintendent. This is in line with the Anaconda policy of moving everybody up a step when there is a vacancy to be filled. James O'Grady will become manager of the plant, a new position created here by the Anaconda company. These changes were announced by C. W. Goodale, general manager, who said:

"A. E. Wheeler, superintendent of the Boston & Montana reduction department of the Anaconda Copper Mining Co., has tendered his resignation to accept the position of consulting engineer with the Union Minière du Haut Katanga, and his resignation takes effect Jan. 1.

"Mr. Wheeler came to the Boston & Montana works in September, 1895, after completing a course at the Massachusetts Institute of Technology, and from that date until 1901 he was in the engineering and construction department. In 1901 he was appointed assistant superintendent and in 1903 he succeeded John T. Morrow as superintendent.

"The directors of the Anaconda Copper Mining Co. have decided to make a change in the organization at the Boston & Montana works to the extent of having a local manager, the same as at Anaconda, and they have appointed James O'Grady to that position beginning Jan. 1. At the same time, J. H. Klepinger will be advanced to the position of superintendent. M. W. Krejci will take on some of Mr. Klepinger's present duties and will also, as in the past, give special attention to metallurgical operations and improvements."

Mr. Wheeler expects to leave Great Falls Dec. 26 and arrive in Brussels to report for his new position on Jan. 15. While he will have his headquarters in London and

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*Mining engineer, Reno, Nevada.

[1] "Power," May 20, 1913; "Coal Age," Sept. 13, 1913; "Eng. and Min. Journ.," Nov. 15, 1913.

Brussels, he will pass about half his time at the company's properties in Africa.

Mr. O'Grady, who will become local manager of the Boston & Montana works, came to Great Falls in 1893, and since then has been closely identified not only with the smelter, but with other large business and financial interests. Mr. Klepinger, who will be the new superintendent, has been with the works since 1899. Mr. Krejci, the new assistant superintendent, also came to the company in 1899.

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## Aramayo Francke Mines, Ltd., Boliva

The Aramayo Francke Mines, Ltd., constitute one of the largest mining companies operating in the Republic of Bolivia. The principal industry of the company is mining tin, but among the other products obtained and marketed are bismuth and wolfram.

Recently the eighth annual meeting of the stockholders of the company was held in London, at which it was noted that the year's work showed a net profit of £153,177 for operations in Bolivia, without deducting charges in England. The previous year showed profits of £155,966 in the same way. The operations for 1913, however, have been more profitable, as the previous year's sales were largely out of the accumulated stocks, while in the last year the reverse is the case, a good stock of minerals having accumulated at the mines on account of temporarily reduced means of transport. Total sales of black tin amounted to only 3353 tons, as against 4053 tons for the previous year, the difference in price in favor of the latter year having been £7 14s. 8d. The sales of wolfram amounted to 281 tons, or £23,374, an advance over the work of the year before. In the sales of bismuth there was a small reduction, equivalent to 3698 tons, while the price was maintained unchanged. The total production of black tin amounted to 3694 tons, and that of wolfram, 109 tons; 33 tons of rich silver ore and 157 tons of copper, mostly unsold at the time of closing accounts, were produced.

The amount of ore treated in various mills of the company was 37,660 tons, 377 tons less than last year, due to the partial stoppage of Chocaya and Tasna. Average yield of the tin ore was 10%, and the main cost of production has remained practically the same as the previous year.

During the first five months of the present financial year, namely, June to October, inclusive, the production of black tin has been 72 tons less, and that of wolfram, 70 tons less, compared with the same period of the previous year, but it is expected that this deficiency will right itself before the end of the year. The production of bismuth has also been reduced by 13 tons in the same period, but this is due to a suspension of work at Quechisla in order to erect a fume-condensing plant to prevent loss by volatilization.

A tramway line 1800 m. in length has been built over the most precipitous side of the Chorolque mountain, and several switchbacks to connect these and other veins with the central station of the wire ropeway to free the Santa Barbara mill. Santa Elena, recently fitted with improved machinery, continues to work the dump with satisfactory results, and is now producing the cheapest tin. The Colon mine, in the northern part of the mountain, and the Eureka group of veins in the Yana-salli, have developed sufficiently to supply a greater quantity of ore than the Sala-sala mill can work, and a new plant is being sent to increase its capacity. The small mill of Cotani which, like Santa Elena, worked on tailings, continues to help with small production at low cost. The bismuth mines of Espiritu, in Santa Barbara, are gradually being opened up to provide ore to Quechisla, when the condensing plants have been completed. Wolfram has been neglected for the want of miners, and on the consideration that it can be procured cheaper and more abundantly at Chorolque, should the price compare favorably with that of tin.

The electric installation at Chocaya has been delayed by lack of labor, which accounts for the small production. This new installation is now working and the deepest pits and galleries of the mine are clear of water and exploration drives are opening up high-grade tin sulphides and rich silver ores under that section of the vein in which they were discovered at higher levels.

Additions to the concentration plant at Asllani are contemplated, and if these are added, it may be necessary to install roasting furnaces and lixiviation plant also, to treat the low-grade silver ores on the spot. In Quechisla, the smelting of bismuth from the mines of Espiritu will be resumed as soon as the condensation plant is completed, and the smelting of copper matte will be continuous as far as the available labor will permit.

Four dividends of 6d. per share have been paid, amounting in all to £59,659, and £10,000 of the debentures have been redeemed. Since the ending of the fiscal year, there have been paid two further dividends of 6d. per share, amounting to £29,829, and £30,000 more of debentures were redeemed on July 1 last. In addition, £20,000 was invested in securities as a reserve for disbursements in machinery, etc. After paying a bonus of 1s. 6d. per share, it is proposed to leave £36,000 standing to meet the increase of stocks of minerals, buildings, machinery, etc., and to provide for the possible redemption in July, 1914, of the £40,000 debentures outstanding, or part of them, at the discretion of the directors. Dividends for the fiscal year amounted to 17½% on the capital.

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## Preparation of White Zirconium Oxide

The preparation of white zirconium oxide (iron-free) is covered in German pat. 262,009. Neutral or acid solutions of zirconium salts mixed with other salts are heated under pressure to a temperature higher than the boiling point of the solution at atmospheric pressure, and the precipitated zirconium oxide is separated from the impurities which remain in solution. Zirconium oxide obtained by hydrolysis from boiling solutions under atmospheric pressure cannot be easily filtered, but by heating to a higher temperature, under increased pressure, is converted into a product which can be readily separated by filtration.

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**The Preliminary Work for the Extension of the Elizabethville-Kambove Ry.**, in the Congo, toward Bukama, is now being undertaken, and that 60 miles of the new line are expected to be completed by next March, says the "Engineer." The Lower Congo-Katanga Ry., which will be 1100 miles long, is now being surveyed, and on completion of the survey the construction work will be started. It is proposed to join the Cape to Cairo line at Bukama. The Congo-Tanganyika Ry. from Kabalo to the lake is approaching completion, and only about 60 miles, for which a portion of the grading has been finished, have now to be built.

# CORRESPONDENCE AND DISCUSSION

## Calculation of Extraction in Cyanidation

I see that Mr. Megraw, in his article in the JOURNAL of Sept. 6, 1913, takes exception to my note in the issue of June 21, 1913, more particularly in two instances: (1) His opinion is that a mortar-discharge sample is unsatisfactory when water is being used for crushing purposes. (2) When crushing is being done in solution, the cyanide so complicates matters that a correct sample is practically impossible.

With regard to the first point, I agree that it is necessary to sample a stream of pulp by taking all of the stream part of the time, as sampling by taking part of the stream all of the time is usually unsatisfactory, owing to the stream being by no means homogeneous. All of the stream from the mortar boxes at the Mijnbouw Maatschappij Ketahoen is sampled at certain stated regular intervals. The pulp-discharge from the lip of the mortar boxes extends over a width of about 3 ft. To take this sample, a shallow, $\frac{1}{16}$-in. iron trough is used, the dimensions being 4 ft. long by 3½ in. wide by 3¼ in. deep, rectangular in shape, having two handles fixed appropriately. This trough is inserted under the lip, and being longer than the width of the discharge, takes the whole of the flow. The sample is taken one battery at a time, being carefully transferred to the sample tin before the next battery is sampled.

The amalgamating tables at the M. M. Ketahoen are not directly in front of the mortar boxes, but in a room by themselves which is kept locked. Owing to this, there is extra space under the mortar-box lip to insert the sample trough, but should the amalgamating tables be fixed under the lips, the sample trough could be made shallower and wider, and the lips arranged so that no portion is lost. There is no absolute necessity that the apron plate be placed close to the lip, so in order that there should be no risk that the bottom of the sample trough become contaminated with amalgam, the end of the plate could be a few inches away from the mortar box. Of course, in getting a correct head sample with this system, there should be no inside amalgamation or amalgamated lip or splash plates in use. Very coarse gold, large enough to be caught and retained in the mortar box, would also make this sample useless, but Mr. Megraw himself remarks: "Few ores of milling grade have coarse gold in sufficient quantity to vitiate the general run of assay results." Further, "Moreover, consideration must be given to the mines, undoubtedly constituting the majority, which furnish their reduction plants with ores in which the value is not in coarse metallic form."

At the M. M. Ketahoen in 1911, by mill assay, 9599.9 oz. Au were sent to the cyanide plant, which received on its assay 9589.3 oz. In 1912, 7591.2 oz. were sent and 7566.4 oz. received. Taking the totals combined, 17,191.1 oz. Au left the battery and 17,155.7 arrived at the cyanide plant, a difference of only 36.4 oz., or 0.21%, and in my former note I have already remarked on the close agreement between the theoretical and actual extractions.

Although there is danger in hand sampling, from the unsatisfactory ideas of mill hands and other laborers, with regard to the necessity of care and accuracy in the operation of taking a sample, yet I think that Mr. Megraw's strictures are not altogether called for. The really capable amalgamator who is in charge of the battery during his 8-hr. shift is usually a conscientious individual who takes a pride and interest in his work, with often a healthy rivalry with the other shifts to get the best results. If the necessity for care in taking samples is explained to him, he will do the work in an intelligent way, either himself, or see that his feeder does it properly.

Taking the subject of crushing in solution, as water is used at M. M. Ketahoen, I can give no figures to prove my point here. I have, however, come across a paper by G. A. and H. S. Denny on "Rand Metallurgical Practice and Recent Innovations," read before the South African Association of Engineers in June, 1906, which entirely agrees with me in this respect. The paper describes the satisfactory working of the New Goch and Meyer & Charlton plants. This paper shows the possibilities of sampling a solution pulp and I recommend it to those interested in that kind of sampling.

The Messrs. Denny do not insist that the screen-assay valuation is a perfect method, but say that it seems to possess more of the elements of certainty and less those of uncertainty than any other practicable method known to them. They claim that the errors of a valuation arrived at from this screen sample, when the latter is intelligently and carefully taken, should be compensating over a period.

From a technical point of view, I should be only too pleased to have a sampling plant installed, as the more ways there are of getting at the head value of the ore, the better, but I doubt if the directors of any mines other than the largest would see their way clear to supply the necessary considerable financial aid for its installation. If close results can be obtained by simpler methods, the expense does not seem to be justified, and in a large number of producing mines, close results are obtained by these simpler methods.

To get a close agreement by the "head minus tail equal production" method of calculation, accuracy and care are essential and no doubt a certain amount of worry will ensue when something or other goes wrong. The ultimate result, however, leads to higher efficiency, not only in the man in charge, but also in the employees generally. The other method of "production plus tailing equals the head value" must in time lead to slackness even in the keenest of operators.

I note with pleasure that Mr. Megraw, in advocating actual sampling and correct extraction, uses practically identically the same arguments that I did in my former letter.

GEORGE SIMPSON, JR.

Benkoelen, Sumatra, Dec. 10, 1913.

# EDITORIALS

## Copper Precipitants

In the experimentation with hydrometallurgical methods of copper extraction, attention is largely concentrated upon the best way of precipitating the copper from solution. The obtaining of the solution and of a high percentage of the copper in it seems to be no great difficulty. The porphyry ores especially turn out to be small wasters of acid, not much going into solution except the copper and a little iron and alumina, wherefore the consumption of acid is small. Even so, however, the supply of acid is a matter of consideration, particularly in those cases where the ore is deficient in sulphur. The possession of an adequate quantity of sulphur is, of course, essential, whether the extraction of the copper is to be made directly with acid, or whether there is to be a reaction between a sulphate and a chloride and the final extraction of the copper as a chloride, which Mr. Laist does and which Mr. Bradley holds to be the right principle.

With regard to the precipitation, electrolysis and iron are the principal ideas. Cappelen-Smith, Van Arsdale, Canby, Channing and Field pin their faith to electrolysis; with insoluble anodes, of course. The acquirement of improved anodes, especially anodes of fused magnetite, and the introduction of sulphur dioxide into the electrolyte, reducing the electrical energy required, at but little expense otherwise, have put an entirely new and promising phase upon this kind of precipitation. Croasdale, Laist and Mathewson are exponents of the old idea of precipitation by means of metallic iron, in which the use of sponge iron reduced directly from iron ore obviates the old difficulty of insufficient supply of iron scrap and introduces advantages of its own. The exposition of this idea is perhaps due most to Croasdale and he seems to have been the first to use it in the experimental plant of the Calumet & Arizona, at Douglas.

The idea is neat. It consists in roasting pyrites, using the sulphur for the acid needed to extract the copper, mixing the burned pyrites with coal, reducing the iron, and using the iron to precipitate the copper from the sulphuric-acid solution. Of course, this presupposes the possession of a cheap supply of pyrites. Given that, there is nothing violating metallurgical precedent in the reduction of iron to sponge, without scorifying the gangue. It is well known that the reduction of iron oxides takes place at about 800-900° C. The difference between that temperature and 1300° C., or so, represents the saving of fuel, plant, etc., by not having to scorify the gangue and fuse everything. Such an iron reduction always occurs in the zinc smelting retort and iron so produced has in Europe been commercially picked out of the retort residues by magnets. Several inventors have proposed to concentrate low-grade iron ores in just that way, the Jones step process being of this nature, and certain so called metallizing processes.

Mr. Croasdale thinks that the preparation of sponge-iron precipitant can be arranged as a simple, foolproof process, and that the cost need not be more than $6 per ton of iron and perhaps much less, not figuring any cost for the ore, even in such parts of the country as Arizona. This sponge iron is an ideal precipitant, offering a large surface and acting very quickly. We fancy that the best results will be obtained when nearly pure pyrites be available. Any gangue will, of course, settle with the copper precipitate. If lower-grade pyrites be the only thing available, it will, of course, be a matter of balancing whether a preliminary separation of the gangue by magnetic separation, or otherwise, or a subsequent slagging of the gangue be the cheaper.

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## Foreign Steel and the Tariff

The imports of iron and steel in October, the first month under the new tariff, do not show any change of importance and do not furnish any indication of an increased pressure of foreign material. There are no signs that any quantities of iron or steel were held in bond—as was the case with some other articles—waiting for the lower duties to take effect. The total value of the imports for the month is given by the returns of the Department of Commerce at $2,574,978. This is a little—$146,137—below the total for September, but it is $198,938 less than in October of last year, and it is $254,158 below the average of the 10 months of the current year. In short it was about an average month, showing no more than the usual fluctuations of trade, and is very far from pointing the way to any flood of foreign material, either immediately or in the future.

It must be remembered that the reduction in duties comes at a time when business in England and Germany is falling off from the active conditions which prevailed earlier in the year, and when steel makers there might be supposed to be on the watch for any opportunity to place their goods abroad. They seem to have regarded this country as a unpromising field, or at any rate as one to be approached only with caution. For the greater part of the current year foreign prices of finished steel have been as high as our own in most lines—higher in a few. Even with the depression of September and October, there are few marked differences in level. In most cases the ocean freight is quite sufficient to balance any differences.

It is true that offers of material have been made here by foreign agents, but they have been for the most part only tentative and have not been attractive or pressing enough to develop any business. The only place where business has been at all pressed has been on the Pacific Coast, where opportunity was offered by the relatively high prices due to the high rail rates from Eastern mills. That the offers of German bars and shapes there have been met by prompt reductions on domestic material may be taken an an indication of the probable course of trade. In any case, foreign offers are likely to be limited to this Pacific Coast business or at the most to the immediate seaboard in the East, rail rates preventing any serious competition at interior points.

In short, the lower tariff rates do not promise to have any important effect, so far as the volume of imports is concerned. They may, however, have a considerable effect on prices. Any rapid advances, such as occurred in the boom of 1906-7, will be checked by the knowledge that foreign makers are ready to step in when there is a chance for profit. It may be that our makers will have to keep prices at a lower level, except in those exceptional times when all the iron-making world is busy at once—too busy to be seeking trade abroad. And those times do not come too often. A lower range of prices we may look for, but not for any great quantity of foreign steel.

## Strike Lossess

Few things are more difficult to estimate closely than the actual losses caused by a strike at a mine. Extravagant sums are frequently named, and it is seldom that the amount of the losses is anything more than a wild guess, too apt to be influenced or to vary according to the writer's view of the stock market. Our attention has been called to this point by a statement in a contemporary purporting to give the losses resulting from the miners' strike in the Lake Superior copper country. This not only allows for the loss in wages of the men, for the necessary care of the mining properties, and other legitimate charges, but includes the amount by which copper sales have fallen off during the strike. This last is wholly unreasonable. The receipts of the companies have been less, of course, but the copper has not disappeared. It is still in the mines and will be taken out and sold in due course, when the strike is over. This case, however, is almost too absurd to call for comment were it not for the frequency with which similar statements are put forth.

In this connection it is a rather curious fact that the interruption of mine production by strikes seldom seems to cause any special inconvenience to consumers or to make any serious disturbance in the market. It is only when labor trouble is general or much prolonged—as in the anthracite strike of 1902—that results are at all serious. In the case of the copper strike prices have receded instead of advancing. Of course, it happened that this strike coincided in time with decreasing consumption and lower demand for the metal. There are scores of other cases, however, in which the results have been very much the same; and this opens the way to some curious speculations which space prevents us from following up at the present time.

## The New York Workmen's Compensation Law

The legislature of New York has lately enacted a workmen's compensation law, the Empire State thus joining the enlightened movement which has obtained so extensively among other states. The enactment of legislation of this kind is not socialism, but is merely equity, and employers might as well make up their minds to it. The occupational destruction of life and impairment of health has to be paid for by somebody or by society in general. Heretofore, the burden has been borne by society, but the present theory is that it is properly a charge upon the respective industries, and there ought not to be disagreement respecting that idea.

The New York law seems to be effective and generous, yet fair all around. The payments to disabled employees and to widows and orphans are liberal. On the other hand, employers are given considerable latitude as to ways of financing the funds to meet obligations under the law The law is limited to a list of regularly conducted industries, and the person who employs a man occasionally, to do some odd jobs around his house, etc., is exempted. All of this is, of course, quite rational.

This enactment of workmen's compensation legislation is having the effect of increasing attention among industrial managers to the prevention of accidents. There is no question at the present time that is being more earnestly considered by them. This also is just as it should be. An Irishman would probably say that the cheapest way to pay for accidents is not to have them.

## Lead and Spelter as Competitors

Changes in the relative prices of the common metals are apt to produce interesting results in the way of one displacing another. Thus aluminum may be bought for electrical transmission wire when it is cheap and copper is dear. A high price for tin increases the use of lead in coating sheet steel. So with other things.

A curious development occurred in Europe this year when the price of lead rose above the price for spelter, and caused certain users of sheet lead to switch to sheet zinc, there being some purposes for which the latter would do just as well, or at least it was so thought. It is said that coffin manufacturers took 30,000 tons of sheet zinc for the lining of funeral caskets instead of lead ordinarily employed.

It will be recollected that in this country antimonial lead used to be largely employed for that purpose, this being when it sold at a discount from the price of soft lead. That was all changed, however, when antimonial lead came to sell at its alloy value.

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The commanding position of the United States in the copper market is well illustrated by the drawing by our refiners of supplies from all parts of the world. They get crude copper from Alaska, Australia, South America, Africa and in considerable quantity from Europe itself. Copper from Spain has been coming to us for many years. This year we have been getting the output of Servia. During 1913 also some of the Katanga copper has come to us. The steady increase of our copper-refining capacity enables our refiners to reach out for this business, or perhaps we should say that it is their ability to secure it that leads them to increase their capacity.

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The supply of crude copper to American refiners, as reported by the smelters, showed a remarkable drop in October as compared with September. In September, the total was a little over 138,000,000 lb.; in October, it was only 115,000,000 lb. This is accounted for by a decrease of about 3,600,000 lb. in the output of American mines, and a decrease of about 19,100,000 lb. in the supply coming from foreign countries. The receipts from Mexico, where things have been coming to a crisis, fell off a good deal and there were also decreases from elsewhere. The Michigan production did not change much from September to October. Anyway, the October supply of crude copper was the smallest for any month of 1913.

## BY THE WAY

Conservation of natural resources is defined by the *Buffalo Express* as "talking forever about water power and coal mines, and never using them." In short, conservation is identically equal to conversation.

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The U. S. Civil Service Commission announces an examination for laboratory assistant, for men only, on Jan. 21 and 22, 1914, to fill positions in the Bureau of Standards, at salaries from $900 to $1200 per year. Persons desiring this examination should at once apply for application Form 1312, Laboratory Assistant, male, No. 40—Amended, to the U. S. Civil Service Commission, Washington, D. C.

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Timber is becoming increasingly scarce on the iron ranges. While most of it is lost by breakage and goes into the "mat," rotting is also responsible for a considerable consumption. One company conceived the idea of creosoting those timbers which looked as if they would rot before they broke. Accordingly some pieces were dipped in creosote for an experiment and sent down to one of the stations where they were piled to await distribution. The captain came along on his rounds and sat down on the pile to take five and have a smoke. Now creosote, as a corrosive, is second to few. The captain lost much cloth and large areas of skin from strategic points. This put the kibosh on creosoting timbers at that mine.

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According to an excitable contemporary, rock is being mined in Kilo, Belgian Congo, from reefs which run 60 to 70% gold. (The compositor did not make an error there, per cent. was intended.) "They treat the white miners well, pay £40 per month with board, wines and liquors free. An Australian said he had more champagne than he could use. The Belgians are making a road from Kilo to connect with the English road from Ginga, on the Great Nyanza. There is no doubt the Rand will have to take a back seat, for Kilo is the premier goldfield of the world. Until the Ginga-Kilo road is completed it would be impossible to get a mortar box into the country." Some of this sounds exaggerated, but the last statement we fully believe. Someone else take a try at the rest.

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A certain mine decided to change its two-stage pumping system to a single lift to surface. The head was terrific, about 2200 ft. A pump was built and installed, but the manufacturer was sceptical as to whether valves could be made to stand up. It developed that they could not; they broke their seats steadily and disastrously. Many mechanical engineers were called into consultation, 13 or 15, it is said, who experimented and figured and analyzed the mine water and tried about every hard alloy known to science, most of the brasses and bronzes and a large number of more complex mixtures, but not one of them was hard enough and tough enough to stand up. The valves continued their merry breaking. When the last alloy had gone to pieces, the big Swede pumpman who had watched all the experiments modestly and patiently judged it to be his play. "By yiminy, Ay feex heam." So he got a hide, the best leather, and he put leather facings on all those valves. The first set lasted 14 months.

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Most mines live in more or less dread of fire. On the iron ranges, where the caving system is followed and work is carried on under a mat of dry timber that may be several hundred feet thick, fire is a thing to be spoken of in whispers. Several have occurred, mostly small and nonfatal. At one mine a shift boss wanted to see how much ore there was in a chute. So he lighted a paper, rather a large one, and let it float down the chute. This is rather a common trick. When the paper reached the top of the ore, the shift boss saw how much ore there was and also saw the fire catch the sides of the chute. He was only a little way from a working place, and a car or two of material would have put an end to the life of that little fire. But this shift boss was ossicephalous; he first ran back to the shaft and down the ladderway, hunting for the captain; failing to find him, he ran in to the mouth of the chute and drew out all the ore. The chute was a roaring chimney in a minute. It took a long fight, attended with considerable risk to get it out. The mine now has a chemical engine hauled by an electric locomotive, many fire helmets, extinguishers at important points and "fire bugs," who make the rounds continually, putting out small blazes, removing and reporting dangerous conditions and keeping a watchful eye on shift bosses.

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The workers of metals are among the most conservative of artisans. It is only within a decade or so that the chemist has found any place in the brass mills, wire mills, sheet mills, etc., and even now many plants are run by rule-of-thumb methods and with procedures resembling the incantations of alchemists of old. The brand on the bottom of an ingot or slab of metal is the all-important thing, the governing factor. Of course, molds may be shifted from one smelting works to another, especially when several belong to the same company, and the trick has in fact been played, but the casting-room foreman does not know about such conditions, and so long as he recognizes the well known brand, everything apparently is all right. There was not long ago a certain manufacturer of castings who always specified an unusual, but little made and distinctly inferior brand of copper, which we will call the "AA." On its merits, this copper was worth about ¼c. per lb. less than electrolytic, but the founder in question paid cheerfully for it a premium of ¼c. per lb. above the price of electrolytic. The broker who sold him this copper once inquired of him why he was so determined to have it, why he would not take a better copper at a lower price. "Well," said the manufacturer, "I've got an old foreman who spoils every casting that he tries with any other kind of copper. So it's a question either of using AA copper or getting a new foreman. The old man has been with me many years, and except in the matter of copper, has been running things economically. I make money and am satisfied, and so I have made up my mind to keep the old man. Also, I shall keep on buying AA copper."

## PERSONALS

Prof. A. L. Walker, who is down with typhoid fever, is improving slowly.

M. H. Kuryla, Mexican representative of the Merrill Metallurgical Co., of San Francisco, is in New York.

G. B. Lantz, of San Francisco, has gone to Manila to take a position with the Colorado Mining Co. in the Philippines.

Ralph Arnold was in New York last week on his return from Venezuela.

H. C. Hoover, who arrived from London last Saturday, spent this week in New York and then proceeded to San Francisco, where he will remain for several months.

Robert C. Sticht, general manager of the Mount Lyell Mining & Ry. Co., Tasmania, will start in January on a tour of the world.

W. A. Farish, Jr., has taken an interest in the firm of Miller & Brown, chemists and metallurgists, San Francisco, in place of M. Brown, who retires. The Miller-Farish Co. is the style of the new firm.

Professor H. H. Stoek, of the department of mining engineering of the University of Illinois, has returned to Urbana, Ill., from a trip through the East, where he attended several important meetings.

H. V. Winchell has been visiting Butte. He intended to go from there to Cripple Creek, but owing to the recent heavy snowfall in Colorado, which prevented the examinations that he had planned, he postponed his trip to Cripple Creek and returned to Minneapolis.

George J. Siedler has resigned as sales manager of the Taylor-Wharton Iron & Steel Co., of High Bridge, N. J., to become vice-president of the Eynon-Evans Manufacturing Co., of Philadelphia, on Jan. 1, 1914. W. S. Stothoff succeeds Mr. Siedler.

## OBITUARY

Frederick Potter Thorpe died in New York, Dec. 21, aged 45 years. He was born in Michigan, but had lived in New York for several years. He was a consulting engineer and representative of the Power & Mining Machinery Co. He was a member of the American Society of Mechanical Engineers.

Captain John H. Taylor, who was for a number of years one of the prominent mining men of the Lake Superior district, died at his home at Fond du Lac, Wis., on Dec. 7. He was born in the County Londonderry, Ireland, in 1830, and came to this country in 1846. He remained in Massachusetts until 1861, when he went to the copper district of Michigan, where he began his mining career. His first work was at the Quincy, going later to the Elroy, which was shut down in 1869. In that year he journeyed to Ishpeming and was in charge of the old New York mine until 1872. The following few years were spent in mining camps in the West, then the returned to Michigan to take charge of the Commonwealth property. Later he served as manager of the Great Western mine at Crystal Falls and then went to the Gogebic range, where mining work was just being started, arriving there in 1885. He sunk the first shaft at Ironwood and mined the first ore that was shipped. He was in charge of the Ashland and Germania properties until 1894, when he retired from active life. He spent a great many years at mining work and was considered one of the best iron men in the Lake Superior country. The funeral took place at Fond du Lac under the auspices of the Masonic and Knights Templar orders.

C. P. Sandberg, for many years a high authority on steel manufacture, died in London, Dec. 10, aged 81 years. He was born and educated in Sweden, but went to England since 1860, as inspector of rails for the Swedish government. After some years in England in this capacity he began to practice as consulting and inspecting engineer, and his work in connection with rails and permanent way generally soon secured for him an international reputation. He became a member of the Institution of Civil Engineers in 1866, and two years later was awarded the Telford gold medal and a premium for his paper on "The Manufacture and Wear of Rails." His sections of rails known as the Sandberg sections were first introduced in 1878, but a later design was brought out in 1894. They were soon in demand, and some millions of tons have been made. More recently he introduced what became known as Sandberg silicon steel rails, which are also widely used, and in 1907 presented a note on the subject, entitled "The Chemical Composition of Steel Rails and Latest Developments," for discussion at the engineering conference of the Institution of Civil Engineers. From the beginning of railways in China Mr. Sandberg was connected with most of those built under British auspices in the capacity of consulting and inspecting engineer, and more recently he had occupied a similar position for the Government of Siam. In addition to the Institution of Civil Engineers, Mr. Sandberg was a member of the Iron and Steel Institute, the Institution of Mechanical Engineers, the French Institution of Engineers, and other technical societies. He was also the author of many papers dealing especially with rails, and for his expert services received decorations from Sweden, Belgium, Russia and China.

## SOCIETIES

**New Mexico School of Mines**—This school is preparing cabinets containing specimens of practically all the minerals found in New Mexico, to be given to various educational institutions throughout the state.

**Old Freibergers in London**—The Old Freibergers' Society held their semi-annual dinner on Dec. 4 at the Imperial Restaurant, Regent St., London, England. Sixteen members and one guest were present. Edward Hooper, the president, occupied the chair. The evening was enlivened by the singing of old German Kommerslieder, and was thoroughly enjoyed by all those fortunate enough to be present.

**Mining and Metallurgical Society**—The New York Section met at the Engineers Club, Dec. 18, with an attendance of about 40 members. The subject of discussion was "The One-Man Drill." The principal speakers were Messrs. Catlin, Devereux, Saunders and Munroe, but there was general participation in the discussion, which was interesting, instructive and lively.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ELECTRIC RETORT FURNACE. Jean Bally, Grenoble, France. (U. S. No. 1,079,588; Nov. 25, 1913.)

ORE REDUCING PROCESS. James A. McLarty, Toronto, Ont. (U. S. No. 1,079,788; Nov. 25, 1913.)

ROASTING—A Method and Apparatus for Treating Ores, More Especially Applicable for Roasting Spent or Burned Pyrites and the Like. E. R. Sutcliffe, Lancashire, Eng. (Brit. No. 16,450 of 1912.)

ROASTING—Improvements in Ore Roasting or Drying Furnaces. H. M. Ridge, London, Eng. (Brit. No. 23,763 of 1912.)

ROASTING FURNACE. Edward J. Fowler, Redwood City, Calif., assignor to Pacific Foundry Co., San Francisco, Calif. (U. S. No. 1,079,405; Nov. 25, 1913.)

CONVERTER PROCESS. Otto Thiel, Landstuhl, Germany. (U. S. No. 1,080,606, Dec. 9, 1913.)

DEPHOSPHORIZING PIG IRON, Improved Process for. A. Francois, Dijon, France. (Brit. No. 25,251 of 1912.)

ELECTRICAL REDUCTION FURNACE. Royal E. Frickey, Heroult, Calif., assignor to Noble Electric Steel Co., San Francisco, Calif. (U. S. No. 1,080,824; Dec. 9, 1913.)

NODULIZING—Mechanism for Nodulizing Materials. Lewis P. Ross, Standish, N. Y., assignor of one-half to Northern Iron Co. (U. S. No. 1,081,063, Dec. 9, 1913.)

ROASTING—An Improved Process for Roasting Carbonated Iron Ores. J. Sovignet, Paris, France. (Brit. No. 145 of 1913.)

SPOUT FOR STEEL FURNACES. Charles E. Michaels, Wilson, Penn. (U. S. No. 1,080,071, Dec. 2, 1913.)

ALUMINUM ALLOY. Walter Northcote Naylor, Forest Hill, London, and Stanley Page Hutton, Beckenham, England. (U. S. Nos. 1,080,155 and 1,080,156; Dec. 2, 1913.)

DRILL—Percussive Tool. Lewis C. Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,080,095 and 1,080,096, Dec. 2, 1913.)

MINE-CAR LUBRICATOR. Joseph Henry Thomas, Independence, Colo. (U. S. No. 1,080,500, Dec. 2, 1913.)

MINER'S LAMP. Charles Dushek, Beloit, Wis. (U. S. No. 1,080,050. Dec. 2, 1913.)

CONCENTRATOR. John S. Finlay, Wallace, Idaho. (U. S. No. 1,080,053, Dec. 2, 1913.)

CONCENTRATOR—Centrifugal Ore Concentrator. Edward C. Latchem and Lewis W. Pollock, Oakland, Calif. (U. S. No. 1,080,223. Dec. 2, 1913.)

ORE SEPARATION—Centrifugal Ore Separation. A. Habermann, Radderrupfelt Mine near Alston, Cumberland. (Brit. No. 7647 of 1913.)

# EDITORIAL CORRESPONDENCE

### SAN FRANCISCO—Dec. 16

**The Western Fuel Co.** Cases proceeded to the taking of evidence, Dec. 15, the complete jury having been secured Dec. 12. The jury is composed of two butchers, two hardware merchants, one insurance solicitor, one promoter, one banker, one millwright, one apartment house proprietor, one musician, one blacksmith, one paint merchant. U. S. Judge Dooling states that the trial will proceed five days a week and four hours a day until finished.

**A Plant on Searles Lake** potash lands may be installed next year; the prospects of such a development are favorable. The construction of the railroad from Searles on the Southern Pacific to the property of the American Trona Corporation is under way and plans for the building of an operating plant are under consideration. In the last year there was much litigation and many obstacles had to be overcome before the corporation felt safe in undertaking the installation of a plant, or the building of the necessary railroad. The railroad is to be 31 miles long, and is as essential to the profitable commercial handling of the potash as the installation of a plant is essential to the economic production of potash. The initial plant is said to be planned for handling 50,000 tons per year, and the capacity is to be increased as the demand requires.

**Completion of Yuba No. 14** all-steel dredge on Dec. 16, ready for actual digging on Dec. 17, established the best time-record ever made in all-steel dredge construction in North America, and so far as known in the world. The elapsed time, beginning with the date of driving the first rivets on the hull, Aug. 13, was four months and four days. This is the largest dredge for digging placer ground ever built. The general dimensions are: Hull, 155 ft. 6 in. long, 58 ft. beam, 5 ft. overhang on each side, 11 ft. 6 in. deep; well hole, 8 ft. 3½ in. wide in the clear; digging ladder, 134 ft. long between centers; stacking ladder, 136 ft. long between centers; spuds, 62 ft. long and weighing 82,000 lb. each. The buckets are 16-cu.ft. capacity. The three other all-steel dredges built in California are Natomas No. 10, No. 8 and No. 7. The first new all-steel boat, No. 10, is equipped with 15-cu.ft. buckets and was built in five months, 21 days; No. 8, a reconstructed 15-cu.ft. dredge, was completed in four months, 4 days; No. 7, a reconstructed 9-cu.ft. dredge, was completed in four months, 28 days. Besides being the largest all-steel dredge in North America, Yuba No. 14 is the only dredge provided with a steel deck, the building of which required 15 more days than a wooden deck would require. The dredge is absolutely fireproof. Even the gold-saving tables are entirely of steel, except the wooden parts of the cleats. The floor of the winch room is built of wood, and that is the only portion of the construction containing any amount of wood worth notice. The dredge was designed and built by the Yuba Construction Co. at the Marysville shops. The dredge is two miles north of Hamilton on the east side of Yuba River, in Yuba County.

### DENVER—Dec. 19

**An Explosion at the Vulcan Colliery** of the Rocky Mountain Fuel Co., at Newcastle, on Dec. 16, killed 38 of the 40 men employed. The flame of a miner's candle igniting a pocket of gas was given as the cause among the miners, as the mine is known to be a gaseous one. Newcastle was the scene of the first big coal-mine disaster in Colorado in 1889 at the Santa Fé mine when an explosion similar to the one at the Vulcan killed 75 miners.

**Nothing new in the Strike Situation** has developed. At the state labor convention now being held at Denver it is said that 500 delegates representing 275 crafts and 60 unions are present. The delegation from the south is instructed for a state-wide sympathetic strike, and the question is being warmly debated. A resolution has been introduced and adopted, urging the sending of a telegram to Colorado's delegation in Congress urging them to ask Congress for an investigation of the strike. If a sympathetic strike of all crafts is decided on, action will be taken in such a manner that it must be ratified by a referendum vote of all unionists in the state before becoming effective. Adjutant-General Chase has announced that all militia in the southern coal fields, with the exception of 200 to 250 cavalrymen armed with carbines and side arms, will be recalled from the southern coal-field strike district in the near future unless action for a state-wide strike of union labor crafts is ordered by the convention now being held in Denver. On the other hand, should the state-wide strike be called the troops now in the southern fields will be reinforced and every militiaman released on furlough or indefinite leave of absence will be called to arms again and held in readiness to quell any disturbances which may threaten. With the arrival here Dec. 16 of J. P. White, presidentdent, and William Green, secretary-treasurer, from Indianapolis, the United Mine Workers took preliminary steps toward bringing individual damage suits for $50,000 each against the state of Colorado and individual militia officers, who, the strikers say, have been guilty of illegal acts in the coal fields.

### SALT LAKE CITY—Dec. 17

**Utah Men Are Interested in Wyoming Oil Lands.** Three tracts, aggregating 1400 acres, have recently been taken over. One of these is near Casper, where two companies are pumping 15,000 bbl. daily. The land obtained by the local company has been withdrawn from entry, and a royalty of 10% must be paid to the state. The oil is of good quality, and a great deal of it produced at present is shipped to Salt Lake for refining. Among Salt Lakers interested in the new development work are John Dern, Lafayette Hanchett, W. H. Dickson, Duncan MacVichie and others.

**Twenty-three Utah Mines Paid Dividends** aggregating $7,569,904 during the present year. These are: Bingham-New Haven, Centennial-Eureka, Chief Consolidated, Cliff, Consolidated Mercur, Daly-West, Daly-Judge, Eagle & Blue Bell, Grand Central, Gold Chain, Gemini, Gethin Le Roy, Iron Blossom, Ingot Gold, Moscow, May Day, Mammoth, Opohongo, Silver King Consolidated, Silver King Coalition, Utah Copper, Utah Consolidated, and Yankee Consolidated. Beside these dividends were paid by the three large smelting companies operating in this state, a good proportion of whose revenue is obtained from Utah ores. The dividends above mentioned do not include profits from the United States company's mines at Bingham. Five new dividend payers appeared during the year: Chief Consolidated, Eagle & Blue Bell, Gethin Le Roy, Silver King Consolidated, and Ingot Gold. The total of dividends paid by the 23 mining companies amounts to $66,210,167.

### CALUMET—Dec. 19

**Freedom from Disturbances** has been enjoyed for the last week. The strikers have discontinued their early morning parades, and have not held any demonstrations. The sheriff of Houghton County has notified the federation that men working are not to be interfered with in any way, and he is backed up in his position by several thousand citizens of Houghton County, who stand ready at any time to answer to the call for assistance. The situation is well in hand and there will be no more utter disregard for law and order that has prevailed throughout the district since the beginning of the strike. The last week was the first since the beginning of the trouble that men going and coming from work were not intimidated, threatened and insulted, and that the people of the community have felt secure in their homes. The civil authorities have been searching the district for firearms and have secured several rifles, shotguns and revolvers in the houses of the strikers and other places in the strike zone. In Keweenaw County the sheriff is recruiting a force of mounted police, which will be comprised mostly of former military men who were in service in that county. The grand jury is in session in Houghton and a thorough investigation is being made into the crimes that have been committed. Several witnesses have been subpoenaed to appear, among the number being Charles H. Moyer, president of the Western Federation of Miners. The mining companies, upon request from a committee of business men, have extended the time of taking back former employees until Jan. 1. The business men throughout the district have planned a series of meetings and will endeavor to influence the men to return to their former places, and a number of these men have agreed to lend any financial aid required by any of the miners who return to work. A majority of the men still holding out are men that have lived in the district a long time, and it is desirable to have these men remain instead of bringing in a large body of new men. The mining companies have held off nearly five months holding the jobs of the former employees open to them, and there is no spirit of animosity against the men. If the former employees insist upon holding with the federation there is nothing left for the mining companies to do but acquire outside labor. It is not a question of getting men for any number can be secured within a few days, the Calumet & Hecla alone has applications from over 1500 men, who desire to work in its mines

### SILVER CITY, N. M.—Dec. 15

**Improvements at the El Paso Works** of the American Smelting & Refining Co. and the increased capacity these improvements will create are evidences of the growth of the mining industry in the Southwest. That New Mexico is contributing to this development of the industry is shown by the Chino Copper Co., operating at Santa Rita. It is the largest producer in New Mexico at present, but within a few months an equally large camp will be established by the Burro Mountain Copper Co., at Tyrone. The methods used by these two companies are totally different, the Chino Copper Co. mining exclusively by steam shovels and the Burro Mountain Copper Co. working underground. Although the method of concentration of the latter company has not been announced officially, it is believed that the flotation process will be used Chino treats its ore on tables and vanners. Both are low-grade propositions. East of the Chino property lies the Georgetown district, the producer at one time of over $7,000,000, also the practically undeveloped Carpenter zinc and lead district. To the west of the Burro Mountain copper property is the White Signal district, copper and gold properties barely scratched on the surface, and the exceedingly rich Lordsburg section These districts are being examined by the representatives of large mining corporations, and the indications now are that New Mexico's mineral output will be considerably increased by the end of next year.

### NEGAUNEE—Dec. 20

**Forces at the Negaunee and Mass Mines** of the Cleveland Cliffs Iron Co. at Negaunee, on the Marquette range, possibly are the largest in history of the properties. About 100 men were added to the payroll Dec. 1. Nearly 600 men are at work at the Negaunee, and nearly 300 at the Maas. It is expected that further additions will be made as underground development advances. Each mine is being operated on two 8-hr. shifts. There are no better equipped properties in the Lake Superior iron region than the Negaunee and Maas. Both have complete electrical hoisting, haulage, pumping and lighting plants, all of which are served by the company's hydro-electric works on the Carp River, near Marquette. A large amount of ore will be in stock by the opening of the 1914 season of navigation and with any considerable demand the year's shipments to the furnaces will establish new records for each mine However, Cleveland Cliffs forces on the Marquette range in general are probably no larger than a year ago at this time The Cleveland Lake mine at Ishpeming is being worked on single shift, where previously two shifts were employed. The 100 men affected by this curtailment were transferred to Negaunee and to the North Lake properties, west of Ishpeming Three mines, the Smith, Mackinac and Gardner, in the Gwinn district have recently been put under development, and at the same time operations at older properties in the field have been scaled down Some of the men formerly employed at Gwinn are now at work at Negaunee

### ISHPEMING—Dec. 20

**A Tonnage Tax Law By Use of Initiative** has been proposed and the state grange has indorsed it The proposal to write, by direct action, this measure into the statute books has arisen because of the grange's failure, on two previous occasions, to procure its adoption by the state legislature. In that body the mining men frankly met the issue raised by the grangers and put up such a strong case that even men first disposed to look upon it favorably were won away from its support Now the grange proposes, it seems, to appeal to a wider body of legislators than is sent to Lansing and by resort to the people to obtain approval for a measure that they were not able to pass in an assembly small enough to give close attention to the merits of the arguments bearing on the issue The question with which it is proposed to go to the voters is singularly complicated, and one that would be singularly difficult to deal with even if there was a general disposition to deal with it fairly and intelligently At present there is a feeling of hostility toward the Michigan mines in general because of labor trouble in the copper country The time for a fair consideration of the question in any program of direct legislation is thus not opportune, it is held in the mining region. There is still hope that a sense of fairness will show the sponsors of the plan that its discussion should be postponed until a time when it will not be complicated by bitterness growing out of an unusually stubborn labor strike.

**Removing Overburden by Dredging** is an innovation on the iron ranges that has been thoroughly tested during recent weeks. So far as can now be judged the method appears to be practical. The dredge, named "John B.," in honor of John Beckfelt, of Grand Rapids, discoverer of much of the ore in the region, is provided with a cutter at the front of the barge, which is revolved by twin Corliss engines, and as the material drops it is taken up by powerful suction pumps and forced through conveyor pipes to any required distance. These pipes are laid on pontoons, which may be swung into any position on the stream along which the work is being done, enabling the residue to be deposited as far from the dredge as may be necessary. The process was submitted to a particularly severe test when the discharge end of the conveyor pipe was placed at an elevation of 60 ft. above the intake and the flow obstructed by two right-angles and two angles of 45°. The pumps forced the sand and dirt through the lines satisfactorily. It is considered that as a result of this experiment, there will be no trouble in removing the entire overburden, although it will be necessary in some places to go down to a depth of 100 feet.

### TORONTO—Dec. 20

**Rice Lake Gold Mining District** in Northern Manitoba, where operations have been quietly carried on for some time is attracting some attention. Prof. R. C. Wallace, of Manitoba University, who has made an examination of the district, states that there is a marked similarity between the formations of Rice Lake and Porcupine, both of which differ considerably from those of Lake of the Woods and Rainy River Six shafts have now been sunk with favorable results. On the Ranger claims owned by the Manitoba Mining & Exploration Co., Charles Andrews, who is in charge of development work, reports the opening up of a new vein 10 ft. in width extending 1500 ft. across the full width of the claim and rich in gold.

**Reorganization Plans of the Canada Iron Corporation,** which recently went into liquidation, are gradually being worked out, although as yet no definite basis has been decided upon by the committee of bondholders. A tentative scheme has, however, been outlined, which would necessitate deferring the security of the first- and second-mortgage bonds First-mortgage bonds will be exchanged for second-mortgage bonds or debenture stock and the second-mortgage bonds, for preferred stock. An issue of first-mortgage bonds will then have to be made to provide working capital and it is stated that $1,500,000 is the amount under consideration The size of this issue will, however, depend upon the extent to which the company will operate its various plants. If the mines and furnaces are to be operated immediately, a much greater amount of capital will be necessary, but if not, that sum should be sufficient. At present, only a part of the company's plants are in operation. The furnaces which have been operated at a loss, are now closed down and of the mines, only one at Bathurst was lately worked and this was shut down at the end of November. The foundry branch of the company is the only department which is being fully operated and this is returning a satisfactory profit It is the intention of the company to keep only the foundries running during the period of reorganization and afterward to either sell or operate separately the mines and furnaces New capital over and above that necessary to keep the foundries going will be required if the latter plan is adopted The present working capital is provided by the issue of short-term notes and special arrangements have also been made with the banks Temporary securities, ranking prior to all bonds outstanding, can be issued up to $250,000 to keep the foundries in operation until the permanent financing is arranged for If the mines and furnaces are abandoned, the company expects to make a satisfactory profit and the present heavy fixed charges will be wiped out While this company has in operation well equipped and uptodate foundry and pipe plants the furnaces are too small and antiquated to permit of profitable operation under present economical conditions The iron deposits at Londonderry are erratic and in general, low grade, while the Torbrook deposits are high in phosphorus The Bathurst iron ore is a mixture of hematite and magnetite, averaging about 37% metallic iron and between 2 and 3% manganese A concentrator was erected at a cost of $500,000 to enable the company to ship the higher grade product, and while by this means it was possible to obtain a satisfactory ore, the losses and the cost of concentration were much greater than had been anticipated.

# THE MINING NEWS

## ALASKA

GOLD FROM FAIRBANKS WAS RECEIVED DEC. 10 at U. S. Assay Office at Seattle to the amount of $53,300. Shipments of gold for the season are practically completed.

FAVORABLE REPORTS FROM MATANUSKA-NELCHINA strike continue to come in and many prospectors are going in with complete outfits, with intention of staying all winter.

MOTHER LODE COPPER (Kennicott)—Force of 30 men will be employed through winter. A 7000-ft. tramway has been completed, and about 500 tons of ore are ready for shipment to Tacoma.

FAIR CHANCE (Fairbanks)—Vein, which was lost on this property on St. Patrick's Creek last spring has been found. It is 12 in. wide, and ore assays up to $100 per ton. Smith & McGione, have a four year lease with option to purchase.

## ARIZONA

### Cochise County

CALUMET & ARIZONA (Courtland)—Curtailment of operations has been ordered. This does not mean cessation, although it is likely that nothing will be done until plans for future are worked out.

DENN-ARIZONA (Bisbee)—While there is nothing definite out with reference to resumption of development, there were further hints last week from northwest, indicating that preliminary steps, at least, have been taken, looking to starting up work, probably early in 1914. It will surprise no one to hear official announcement to that effect at any time.

HIGGINS LEASING CO. (Bisbee)—Company operating in Higgins Hill have been shipping steadily from sulphide-ore stope. Cunningham & Sowles on Wolverine lease are shipping oxide ore. Other lessees along upper end of district are also getting pay ore, and there is a growing belief that Tombstone cañon will yet turn out to be an important producer.

HERMITAGE (Hereford)—New 50-ton concentrator designed and built by A. F. Hazelton has been turned over to company after a satisfactory test run. Provision has been made for increasing capacity of plant as soon as best method of treatment has been determined and it is expected that custom ores from surrouding mines in Huachuca mountains will be treated here. Property was formerly owned by Huachuca Mining Co. and is in Montezuma cañon.

### Gila County

ARIZONA COMMERCIAL (Globe)—Shaft has reached depth of 1350 ft. Work on 1200 is still suspended pending installation of pumping equipment to raise water recently encountered on that level.

SUPERIOR & BOSTON (Globe)—Crosscut on 600 level being driven to intersect vein, cut off by a fault, but subsequently relocated by diamond drill, has already been driven 60 ft. On 1000 level drifting in foot wall is in progress. Diamond drilling is still going on.

IRON CAP (Globe)—Underground ventilation is greatly improved since connection with Eureka shaft of Arizona Commercial was made. On 800 level drifting on vein is going on at rapid rate, at present being 245 ft. from shaft. Face is in excellent ore and management expects to encounter in another 50 ft. high-grade streak at present being worked on 650 level.

INSPIRATION CONSOLIDATED (Globe)—During November a total advance was made in underground workings of 3300 ft., 1136 ft. of which was in large drifts, 782 ft. in smaller drifts, and 1332 ft. in raises. Nearly all raises were lifted in Colorado orebody, only two raises being driven in Joe Bush section, as chutes for drawing ore from overlying ore dumps, or stockpiles. One of these two raises holed through into edge of stockpile Dec. 5. Connection was made with main east shaft on sixth level Dec. 6, and connection on same level with main west shaft should be made soon. On fourth level drift to shafts lacks only 200 ft. of being double width all way and widening continues at rapid rate. Work continues in main west shaft, timbering and other work preparatory to concreting being pushed ahead rapidly. Crushing plant at Scorpion shaft is again in operation crushing waste from that section of mine. Crushed waste is being used for filling holes and depressions near concentrator site. At concentrator concrete pouring is still in progress on retaining walls, now about two-thirds done. Machinery is being rapidly installed in test mill, 600-ton flotation equipment and all crushing machinery being erected. Steel for coarse crushing plant and main east and west shafts double headframe has arrived and has been unloaded. Considerable work has been done preparatory to erection of steel framework. Carpenters have cut away a portion of south side of main west shaft-house and wooden headframe now there and American Bridge Co. will lay track to allow crane locomotive to move to site of headframe. This spur will run directly over one compartment of main west shaft.

### Maricopa County

A GOLD PROSPECT IN SALT RIVER MOUNTAINS southwest of Tempe, is being developed by S. Johnson. Sinking will be continued until water is encountered as it is needed for use in a mill which is to be built later.

A NEW CAMP AT THE HEAD OF SYCAMORE CREEK, in the Mazatzal Mountains, will be established. Two wagons loaded with supplies have been sent from Phœnix to the camp, where a group of six claims formerly owned by Bowman & Reynolds was lately sold for $36,000. Development will be started at once. There is a good showing of cinnabar on all claims.

RELIEF (Peoria)—Cyanide plant is in operation and underground development is under way. Free gold in diorite is found.

ORO FINO (Phœnix)—Sinking has been discontinued and drifting on vein from 100-ft. level is in progress. One drift is in 60 ft. and other 40 ft. Good milling ore has been exposed.

MAMMOTH (Mesa)—Stamp mill is in operation and three carloads of coal have just been hauled to mine. Cyanide plant, which was lately completed, is also in operation. High-grade ore was recently encountered and much good milling ore has been opened up. At present 40 men are employed, but force will soon be increased.

### Mohave County

GOLD ORE (Gold Road)—Property is shipping ore to Gold Road mill by auto truck. It is stated that minimum value of ore which can be mined and treated profitably is $8.50 per ton. Average ore runs about $3 better than this.

PITTSBURGH (Gold Road)—Property is being developed by S. R. Porter who has sunk a shaft to a depth of 100 ft. and has crosscut vein for 35 ft. An influx of water has recently stopped further development until means of handling it are provided.

COPPERVILLE (Hackberry)—New shaft is being sunk below 200-ft. level. Property is now equipped with modern 150-ton mill, steel headframe and a new hoist. There is a large body of good milling ore on 200-ft. level of new shaft which is being blocked out ready for mining.

### Yavapai County

CLEOPATRA (Jerome)—A thorough and detailed survey of property has just been completed by J. D. Fisher, of Denver. Actual development work has been begun under direction of Major Pickerell. F. D. Stephen, who is in charge, has for new owners recently taken a half interest in Vulcan group of six claims and a fraction which adjoin Cleopatra as well as an option on other adjoining claims owned by Gibb & Fryer.

## CALIFORNIA

### Amador County

CENTRAL EUREKA (Sutter Creek)—A good vein of ore has been discovered in a drift from a winze below 3100 level. Development will proceed to sufficient depth to open other levels and drifts before starting mill again.

KENNEDY (Jackson)—It appears from further investigation that 12x12-in. timber broken by explosion which killed three men and injured another on Nov. 17 was broken square off 2 ft. from end, besides completing break at sawed portion and reducing that end of timber to splinters. Breaking in two of timber is taken as evidence that exploded powder was lying on timber at time of explosion. Timberman who survived is improving and it is possible that he may be able to state some facts regarding accident.

### Calaveras County

LIGHTNER (Angels Camp)—Mine and mill are still in operation and a large force of men are at work.

UTICA (Angels Camp)—Work has been resumed at Cross shaft, after being closed down for about three months by shortage of water. Gold Cliff is operating steadily.

REINER MINING CO. (Stockton)—This company operating at Altaville in Angels Camp district, has filed a petition in bankruptcy in U. S. district court. John C. Benson, former president and manger, has been cited in superior court to show why he should not be restrained from selling stock in company. Benson in turn has brought suit against E. H. Ehrler, new president and manager, and others for $20,000 damages for alleged defamation of character.

### Fresno County

AUBURY MINING CO. (Fresno)—Mine will be reopened and a five-stamp mill installed. Mine has been developed by a 45-ft. shaft and a 280-ft. tunnel.

### Kern County

FIVE MEN WERE BURNED BY AN EXPLOSION of gas in a Standard well at Taft, Dec. 9. Men were taken to a hospital. Drill was down about 700 ft., when gas was encountered, which caught fire and enveloped workmen. Rig was destroyed.

### Shasta County

NOBLE ELECTRIC STEEL CO. (Heroult)—After a shutdown since last July iron works resumed operation on Dec. 4 with blowing in of a 3000-kw. furnace with a capacity of 35 tons at a charge. A second furnace, 2000-kw., will be blown in in December. Coke has been substituted for charcoal

### Sierra County

MINERS' HOME (Downieville)—Pipe clay mixed with gravel, and prospecting well in heavy gold, has been opened up. A large washing plant has been built.

TELEGRAPH (Downieville)—New power house has been completed, replacing one destroyed by fire in October. Main tunnel is being repaired, and sinking on vein will be begun early in spring.

### Siskiyou County

DEPOSIT OF $50,000 FOR STATE HIGHWAY BONDS has been made by Siskiyou County, which it had agreed to purchase. Work will begin as soon as rights-of-way are secured, starting at Oregon line.

## COLORADO

### Clear Creek County

SANTIAGO (East Argentine)—This mine is now producing about 8 tons per day, of $40 ore. Discovery of a body of copper ore has just been made on sixth level.

ANAMSA—Returns for 8 tons of ore from this mine on Columbia Mountain have been made by the Chamberlain sampler at Georgetown at 140 oz. silver per ton.

CAPTAIN JACK (Dumont)—In last 2½ years a tunnel 2000 ft. in length has been driven on property in Ohio gulch, and a series of veins intersected, one of which is now being drifted on, as it shows from 5 in. to 2 ft. of ore assaying up to $150.

### San Juan Region

FRISCO MINES & TUNNEL Co. (Animas Forks)—This company operating Bagley tunnel has resumed work on property after a shutdown of several weeks. There has been expended here, according to reports, in excess of $650,000 in driving tunnel a distance of 5800 ft. and in developing some veins cut, such as Morgan and Red Cloud. A mill built in 1912-1913 to treat sulphide ores was not uniformly successful.

### Teller County

SEVEREST STORM ON RECORD at Cripple Creek fell Dec. 4. Snow-fall is variously estimated at 3½ to 5 ft., while a high wind following day did great damage, blowing down power-line poles, stripping many shaft-houses of smokestacks and roofs, and drifting snow so that all railroading was at a standstill for over a week. Many sidings and spurs to mines are still blockaded, especially those having service of narrow-gage railroad; as a result several mines have suffered for lack of coal, while others are unable to dispose of ore. Few if any mines have resumed normal operation.

GOLDEN CYCLE (Goldfield)—Body of F. M. Woods, Jr., killed in cave of Dec. 1, was recovered Dec. 9, and those of his companions, Sam Sorensen and Pat Keveney, were recovered following day. Coroner's jury brought in a verdict that their deaths were caused by a faulty system of mining and by timbering stopes without filling with waste, but jury was unable to place blame. On account of power-line being out of commission during storm, electric pumps were drowned, and are now being recovered by bailing.

## MICHIGAN

### Iron

BALKAN (Crystal Falls)—Pickands, Mather & Co. have penetrated ore with a timber drop-shaft, which is now securely anchored in jasper. It will be sunk about 100 ft. more, when work of concreting will be commenced. Work of stripping other part of property will be started in spring, contract having been awarded.

JUDSON (Crystal Falls)—Shaft is rapidly nearing ore. It is 12x22 ft. inside timbers and is being sunk at an angle of 45°. It is 300 ft. from ore and by sinking it at an angle company has not been bothered much with a blanket of quicksand which overlies ore. Power house has been completed and machinery is being installed. A change house, machine shop, blacksmith shop, warehouse and office are now under construction.

ATHENS (Negaunee)—Steel headframe at this new property of Cleveland-Cliffs Iron Co. was completed last week as were all pulley stands. All steel work was done by Wisconsin Bridge & Iron Co. As engine house will stand on a hill at a considerable distance above collar of shaft, it was necessary to make pulley stands extremely high, one nearest shaft being 110 ft. high, probably highest in district. Engine house is partially completed and compressor is on ground and will be installed as soon as cement floor has been laid. All machinery will be operated by electricity. Shaft is down to ore but sinking was interrupted while headframe was being put in place. Work will soon be started but it will take two years to complete shaft which will be sunk 2300 ft. deep. Steel stocking trestles, 2000 ft. in length, will be erected in due time to take care of ore hoisted.

## MINNESOTA

### Cuyuna Range

BARROWS (Barrows)—New five-compartment shaft now down about 60 ft. Drifting is in progress from No. 2 shaft toward new one, to afford drainage.

BRAINERD-CUYUNA (Brainerd)—All machinery now in place and steam plant in operation for first time on Friday, Dec. 12. Shaft now down 55 ft., with 45 to go.

ROWE (Riverton)—Continued mild weather permits operation of hydraulic plant much later than was anticipated. One steam shovel is also at work stripping. Soo Line is constructing a roundhouse near property, in anticipation of heavy shipments next season.

KENNEDY (Cuyuna)—Rogers-Brown Ore Co. has completed installation of electrical equipment. A five-ton Goodman electric locomotive is used underground, hauling ten three-ton cars. On surface, a three-ton General Electric locomotive is used. The 1914 ore contracts have not yet been made, so that next year's tonnage cannot be ascertained. A 150,000-ton stockpile will be accumulated this winter.

CUYUNA IRON & MANGANESE ORE CO. (Crosby)—After drilling 41 holes, company announces that it will strip orebody next season and operate same as an open pit. Property adjoins Pennington mine on north, but is not on same lens of ore. New orebody is a manganiferous iron-ore deposit of low grade, while Pennington ore is practically free from manganese. Overburden varies from 45 to 60 ft. in depth, and is as usual on Cuyuna range, sand and gravel. Property was drilled some years ago by Republic Iron & Steel Co., but was dropped because of its low iron tenor, manganese at that time not being considered. Company is a stock company with its shares more or less scattered throughout Northern Minnesota, and more stock is now being offered by promoters.

## MISSOURI—KANSAS—OKLAHOMA

### Joplin District

COATS & ORTT (Thoms Station, Mo.)—New orebody is being developed.

POWER MINING CO. (Klondike, Kan.)—Rich ore being worked at 180-ft. level; concentrator running steadily.

LUKE LAND (Webb City, Mo.)—Eighth drill hole shows good ore. J. M. Short and associates of Joplin hold lease.

CULPEPPER (Carterville, Mo.)—Concentrator is being removed from Cunningham land to Kane lease by Dexter Mining Co.

ALLIANCE (Neck City, Mo.)—Concentrator has been purchased by S. L. Walker, to be removed to lease. Good mine opened, with extensive orebody.

BATTLE AXE (Alba, Mo.)—Another big lead strike has been made, 6-ft. face of rich ore being opened. Johnson & Underwood are operating property.

QUAKER MAID (Spurgeon, Mo.)—Eastern company has purchased mine and will install modern equipment throughout. Mine has been consistent producer.

BEAR CAT (Sarcoxie, Mo.)—Lease has been taken by Joplin operators. Concentrator has not been operated for several months. Formerly worked by Grasselli Chemical Co.

HUDSON ZINC CO. (Belleville, Mo.)—Exceptionally rich strike made by drilling by Franklin Smith and associates of Joplin. Drill has been in mineralized ground from 45- to 82-ft. level.

WALKER LAND (Duenweg, Mo.)—Two new concentrators now running. Home company taking out both lead and zinc at 105-ft. level. Zinc ore found in virgin ground by Lora D. company.

SAPULPA (Webb City, Mo.)—Mine has been sold by Charles Moore & Co. to J. M. Short & Co., of Joplin, includes 250-ton mill, 30-acre lease, with three shafts in ore. Will be known as Tecumseh.

CENTENNIAL LEAD & ZINC CO. (Joplin, Mo.)—This new company is operating Little Jewell, with concentrator, and two additional shafts on lease. Ore from three shafts shows heavy mill recovery.

POCAHONTAS (Thoms Station, Mo.)—Company recently sold 650 tons of blende concentrates, held off market several weeks, bringing approximately $25,000. Cave-in recently

DIPLOMAT (Galena, Kan.)—Two drill holes put down on Galena Lead & Zinc Co. land showed rich cuttings. First showed zinc ore, second lead ore. Drilling campaign to continue, with shafts to be sunk later.

## MONTANA

### Granite County

RICH COPPER ORE AT PHILIPSBURG has attracted miners, leasers, prospectors and investors in great number to old camp. It has always been contended by those familiar with district that in southern part of Granite County are large deposits of high-grade copper ore . This belief was strengthened a few months ago by strike in North Star mine near Maxville, of a copper vein, 35 ft. wide, rich in silver and containing up to 35% copper. Following this strike came discovery in Swastika mine of orebodies not only rich in gold and silver, but running as high as 26% in copper. These mines are being equipped with modern conveniences and appliances for mining on a large scale. Should results of operations equal expectations, Philipsburg and Granite County, once made famous by old Bi-Metallic mines may again enter ranks of modern mining camps.

### Silver Bow County

SAFETY APPLIANCE FOR BUTTE HOISTS were demonstrated in presence of a large number of officials of Anaconda Copper Mining Co., Welch hoisting engine controller was given a practical test at Mountain-View mine. It proved so successful that various companies are making plans to adopt appliance. Efforts made by operating engineer to have engine run away by starting one side with a descending cage, were frustated by automatic application of brakes when regular hoisting speed was exceeded. Similar efforts to cause overwinding were counteracted by safety device in stopping engine before danger point was reached.

BUTTE ELECTRIC WORKERS VOTED AGAINST STRIKE—Information was given out by F. Beckwith, president of district council of electrical workers, that strike vote in the Montana locals had failed by a vote of 147 to 113. A proposition to reunite local factions of electrical workers under jurisdiction of American Federation of Labor is to be submitted to a referendum of members of different locals. An agreement to unite will insure future harmonious working of local members of electrical workers with other labor unions in Butte and make a sudden declaration of strike by local members impossible. Such a strike was threatened a few months ago, involving closing down of all mines and other industries in Butte.

ANNUAL REPORT OF STATE MINE INSPECTOR, W. B. Orem, contains following interesting items concerning Butte camp. About 13,000 men are employed in mines of Butte. Amalgamated Copper Co. expenditures in state were about $40,000,000, which is equal to $100 per year for every man, woman and child in state. All mines of Anaconda company are now connected by one general level known as 2000-ft. level and extending into Leonard, West Stewart, Tramway, St. Lawrence, Diamond, Original and Anaconda. Electric power is utilized in all branches of mining. A telephone system has been installed to bring all parts of all mines, surface and underground into communication with each other. No labor troubles have been experienced during year. Miners receive highest wages paid in any mining camp of country and are contented with work and working conditions. To minimize accidents, Anaconda company is offering prizes to foreman of mine in which minimum amount of accidents happen. Daily output of copper ore is about 15,000 tons per day, of zinc ore about 1000 tons. Butte is fast developing into a large zinc producer.

BUTTE-BALLAKLAVA COPPER CO. (Butte)—To clear up erroneous reports, regarding Anaconda-Ballaklava litigation, C. F. Kelley, vice-president of Anaconda Copper Mining Co. issued following statement: "Approximately 850 ft. measured on strike of vein was in dispute. Large orebodies on west end of vein were being mined by Ballaklava company when suit was instituted. Under terms of settlement each party takes about 425 ft. of vein on strike. Anaconda taking west 180 ft., said to contain valuable orebodies; then Ballaklava takes its 425 ft. to an easterly boundary plane; Anaconda taking rest of its 425 ft., or 245 ft. on east end of vein. A vertical southerly boundary was established, terminating Ballaklava rights to vein on its dip. This plane will be reached approximately on 3000-ft. level. No block of ground outside Ballaklava claim has been awarded to Ballaklava. Future owners of each segment of vein have a right to veins which may dip into main vein after latter has passed south of Mountain Chief claim and into Ballaklava. Settlement clearly recognizes apex law and statement that this settlement will affect other apex litigations has no foundation. Active mining was resumed at Ballaklava Dec. 2. Since then one car of ore has been shipped daily to Washoe smelter. Stopes are being opened on 800, 900, 1200 and 1400 levels. When this is accomplished, development work on all levels will be carried on and crosscutting for big vein will be started. Mine is well equipped for operation on a large scale, equipment consisting of a steel ore bin of 400 tons capacity, two compressors, a 300-hp. electric hoist, an auxiliary 165-hp. hoist and repair shops.

## NEVADA

### Clark County

POTOSI (Goodsprings)—This property, formerly owned by Mahoney Bros., of San Francisco, has been taken over by Empire Zinc Co., at a consideration said to be $125,000. Property has been producing throughout year, about 750 tons monthly of zinc ore, averaging 38% zinc and 8% lead, and it is expected that new company will increase this production materially. Plans are under way to build a tramway from mine to Summit, a distance of two miles, and a motor-truck road thence to railroad at Arden. Motor trucks will be used for ore haulage.

YELLOW PINE (Goodsprings)—Work has been started on new two-compartment shaft which is to be driven 600 ft. to tap new orebody on seventh level. Work is to be pushed to completion as rapidly as possible, three shifts being engaged in sinking, using Torpedo air drills. It is expected that men will make a record for shaft-sinking in this vicinity. Orders have been placed for entire equipment for new power plant and hoist at mine, which is expected to be fully erected within 60 days. New orebody is being rapidly developed from old workings and a large tonnage of lead and zinc-carbonate ore is already blocked. Output for November was slightly less than heretofore, owing to inclement weather but a total of 1500 tons of zinc concentrate, 300 tons of lead concentrate and 200 tons of crude ore was shipped to smelters. Regular monthly dividend was declared Nov. 25, 2c. per share, and a similar amount has been declared payable Dec. 25, which makes the total dividends for the year $218,500.

### Churchill County

URANIUM ORE OF GOOD GRADE has been discovered between Wonder and Fairview.

### Humboldt County

SHEA-KELLEHER LEASE (Rochester)—An oreshoot 10 ft. wide has been opened in lowest level. Shipments will commence at once.

HIGHLAND NATIONAL—Situated 30 miles from Battle Mountain will start development at once. Large Silver-Lead vein has been opened.

SILVER BELT R.R. (Rochester)—Terminus will be swung to foot of Rochester Cañon, where ore bins will be built. It is planned to extend road up Rochester Cañon to foot of Lincoln Hill. This will necessitate addition of a Shay engine to rolling stock.

### Lander County

LONDON (Tenabo)—Crosscut tunnel is being driven.

ASPEN (Tenabo)—Shaft is being sunk. Good-grade lead-silver ore has been discovered.

VIOLET (Tenabo)—Shaft has been sunk to 200-ft. level and drifts driven both ways. Results of this development justify further work.

### Lyon County

A GOLD DISCOVERY has been made on east side of Mason Valley about eight miles from Yerington.

### Mineral County

YERINGTON MOUNTAIN (Yerington)—Crosscut on 500-ft. level has cut oreshoot 20 ft. wide, at distance of 300 ft. from shaft. Copper minerals are sulphides and black oxide and ore will assay 6%. It is planned to drive 2200-ft. crosscut tunnel to cut vein at depth of 1200 ft.

### Nye County

MERCURY MINING CO. (Ione)—Weekly production is now 20 to 30 flasks.

BRADY LEASE (Manhattan)—During 1913 mill treated 10,000 tons ore with estimated value of $100,000.

VALLEY VIEW (Manhattan)—Development has opened shoot of milling ore with streaks of high-grade in limestone.

MANHATTAN CONSOLIDATED (Manhattan)—Will reincorporate in Nevada and make new company an assessable corporation.

NEVADA CINNABAR CO. (Ione)—Development has proved several years' supply of ore, it is stated. Distillation plant is nearing completion.

COMMERCIAL MINES & MILLING CO. (Manhattan)—War Eagle mill will obtain ore supply from Mustang mine during winter months, weather conditions making production from Reilly fraction glory hole too uncertain. Ore from Mustang mine is trammed directly into mill.

## NEW MEXICO

### Bernalillo County

PLACERS IN GOLDEN DISTRICT in Santa Fé range are to be reopened by Col. J. A. Wood.

### Grant County

PHELPS-DODGE (Tyrone)—It is rumored that newly constructed railroad from Whitewater to Tyrone may be extended to Mogollon and thence to company's coal fields. Line for this road was surveyed by J. V. Bergen about 10 years ago. Such a road would not pass through town of Mogollon, but near enough to transport supplies to district.

STEEPLE ROCK CO. (Lordsburg)—All claims owned by company, a subsidiary of London Development Co., have been placed on market for lease or sale by Sanford Robinson, of Los Angeles, who has been working on this proposition for some time. Jim Crow group is said to be valuable property, and has yielded much high-grade ore. It is now under water, but it is estimated that two carloads of ore would pay for unwatering. A. B. Ream, of Lordsburg, and his associates, have taken a lease on Carlisle group and intend to commence work on property immediately.

### Otero County

JAMES G. BARRETT (La Luz)—Improvement work is being done upon property a short distance northeast of La Luz.

### Santa Fé County

COPPER ZONE MINING & MILLING CO. (Cerrillos)—A license has been granted this company, a $150,000 corporation of Arizona, to transact business in New Mexico. Headquarters will be at Cerrillos. E. B. Ames, agent.

### Socorro County

A NEW SAWMILL AT COONEY has been put into operation and will supply district with construction lumber and mining timber. Plant has installed finest and latest mill equipment and is a welcomed industry into this prosperous district, where it was greatly needed.

ERNESTINE (Mogollon)—Company started custom milling, Dec. 1, being third ore buyer now in field. Additional tanks are being added to plant.

GRAPHIC GROUP—A record is being made by this group of the Ozark company, with large bodies of ore in sight, aërial tram and mill.

LITTLE CHARLIE (Mogollon)—Pipe connections have been made with Maud S. compressor, and machines are now used in ore breaking. Shipments to custom mill have been resumed.

LINCOLN MINING & DEVELOPMENT CO. (Cooney)—Complaint has been filed by this company with state corporation commission in which it requests corporation commission's opinion on charges made by telegraph companies in Silver City for messages telephoned to their offices.

### Taos County

ROUND HILL GOLD PLACER MINING CO. (Upper Rio Grande)—Operations have been closed down on account of ground freezing.

## OREGON

### Baker County

HUMBOLDT (Mormon Basin)—About 57 men are now on pay roll at this mine, which is largest producer in Oregon. Ten-stamp mill is running night and day, and much development work is also being done.

### Josephine County

BONDS FOR THE GRANTS PASS TO COAST R.R. have been issued by city council of Grants Pass, which accepted bid of Keeler Bros., of Denver, Colo., for the $200,000 issue. Money will be available soon. Much of the road has already been graded.

CHAMPLAIN DREDGE (Foots Creek)—This dredge, about two miles above the mouth of creek, is to be put in operation again after being idle for several years and tied up until recently in litigation.

## SOUTH DAKOTA

### Lawrence County

NEW RELIANCE (Trojan)—Diamond drilling has been started, and will be continued for several months. It is in nature of exploratory work. Mill is operating at full capacity.

OLD IRONSIDES (Squaw Creek)—A long tunnel is being run to develop orebody at greater depth and afford a more direct means of extraction. Last shipment went to Golden Reward mill, at Deadwood, and is reported to have been of excellent milling grade. It is hoped to have mine opened by next summer, so that regular shipments of both smelting and milling grades can be made.

HOMESTAKE (Lead)—Benefits paid by Aid Fund are to be increased Jan. 1 to $1000 in case of accidental death, and $800 in case of death from illness; increase of $200 in each benefit. Plastering of "Recreation Hall" is nearly finished, and carpenters are at work on interior. Addition to assay office will be inclosed in a few days. Good progress is being made in removing buildings from sites of improvements recently decided upon.

TITANIC (Carbonate)—At a depth of 150 ft. Combination shaft has entered a mineralized formation, and management has decided to crosscut at this depth to a porphyry dike on east. At same time sinking is to be continued to 300-ft. level. Machine drills recently ordered are now working, and better progress has been made. Supplies for several months' run have been received, and heavy snows will not now materially affect operations.

### Pennington County

CONTINENTAL COPPER (Sheridan)—The 800-ft. shaft is nearly unwatered, and sinking will soon be resumed. Property is equipped with a good mining plant.

## TENNESSEE

### Knox County

AMERICAN ZINC, LEAD & SMELTING CO. (Mascot)—The company has established what is believed to be a unique record, because in seven months it has brought its new Tennessee mill up to full capacity, mill now treating in excess of 1000 tons of ore daily, and at times it has treated as high as 1150 tons of ore in one day. Concentrates are running from 60% to 62% zinc, being made from an ore assaying about 10% zinc. Spelter made from these concentrates commands a premium, owing to its exceptional purity, and concentrates bring a premium of from $5 to $7 per ton over concentrates of like grade produced in Joplin district. Holston orebody, from which current ore is being mined, has already blocked out 1,750,000 tons, or an ore supply of from five to six years with present milling capacity. This tonnage, however, does not represent possibilities of this particular orebody. At a distance of about 800 ft. away another orebody has been encountered, average being in excess of 5½% zinc and over 2,000,000 tons being in sight.

## UTAH

### Box Elder County

HARD ROCK (Golden)—Salt Lake men have recently inspected Hard Rock or Carter gold property, eight miles west of Century mine. If this ground is taken over, a mill will probably be built.

### Juab County

TINTIC SHIPMENTS for week ended Dec. 12 amounted to 169 cars. Preparations are being made to ship low-grade ore from a number of dumps in southern end of district, ore will be placed on cars at Silver City. A test shipment has been made from old Copperopolis mill near McIntyre ranch. This dump, as well as those at Blue Bird, Tesora, La Clede and Joe Bowers is under lease. It is thought a considerable tonnage can be shipped at a small profit. A car of ore from Blue Bird dump is being prepared for market.

BALTIMORE (Eureka)—A contract for driving a short tunnel has been let.

SELMA (Knightville)—Operations have been resumed after a shutdown of several months. A new hoist is to be installed, grading for which is in progress.

OPOHONGO (Robinson)—Two drifts are being driven in upper workings; one is crosscutting a promising body of quartz; and other will prospect ground under oldest workings of mine.

EAGLE & BLUE BELL (Eureka)—Good progress is being made in sinking shaft, and it is expected that a station will be cut at 1500 level about Christmas time. Although regular work of mine has been somewhat hampered by new development, 75 tons of ore daily were mined and hoisted in November. During this month, shaft was advanced 160, ft leaving 58 ft. including sump still to be completed.

### Salt Lake County

ALTA CONSOLIDATED (Alta)—A seam of ore has been followed by winze from main tunnel level, and has opened out to 1 ft. in width. Material runs well in copper and silver.

OHIO COPPER (Bingham)—An avearage of 2300 tons of ore is being mined and milled daily. After adjustments and changes now being made under Mr. Waddell's direction have been completed, it is expected that recovery of 45 to 50% will be somewhat bettered.

CARDIFF (Big Cottonwood)—Ore is being sent down on sleighs to Burnt Flat near Maxfield mine, where it is transferred to wagons. Lower tunnel is in over 1600 ft. and work is being continued there.

MICHIGAN-UTAH (Bingham)—Ore is being hoisted through new raise connecting old Coalition workings with City Rocks. This makes it possible to work both Big and Little Cottonwood sections to advantage, and send ore down Little Cottonwood over tramway. Lessees are making shipments from Cleaves tunnel in City Rocks ground.

### Tooele County

PRIDE OF THE WEST—It is reported that work will be resumed at this property.

## WASHINGTON

### Chelan County

ENTIAT (Entiat)—This company has taken over Rex property, and preparations are being made for installation of stamp mill and cyanide plant.

### Clarke County

LEWIS RIVER MINING CO.—For not having a fish ladder at dam on Lewis River and for polluting waters of river through mining operations this company has been fined by fish warden, and will pay a fine of $97.50. Company has been washing gold from gravel bars along river. Portland people are back of enterprise. It is not known how pollution of water can be prevented.

### Spokane County

DEER CREEK MINING CO.—This company has been organized to take over property of H. & M. Mining Co., and will install cyanide plant.

BUTTE-CHEWELAH (Chewelah)—A gasoline hoist and two-drill compressor have been installed, and operations will be continued throughout winter.

## WYOMING

### Crook County

BEAR LODGE (Bear Lodge)—A new compressor and boilers have just been received and will be in commission soon. Lumber is being sawed and delivered for mill construction, work upon which will be started early in spring. Principal workings show ores heavy in fluorite, occurring in a country of phonolite. Some veins are small and ore is rich, tellurides are frequently found. Company experienced considerable trouble in getting patent to its property, land being in a forest reserve, but now title has been perfected. Boston men are interested.

## CANADA

### British Columbia

SULLIVAN (Kimberley)—Diamond Drill Contracting Co., of Spokane, is drilling this property for Consolidated Mining & Smelting Co.

QUEEN VICTORIA (Nelson)—October output of this mine of British Columbia Copper Co. was 3581 tons, bringing total shipments for 1913 up to 22,807 tons.

VAN ROI (Slocan)—During October output was 1207 tons, yielding 30 tons of lead concentrates assaying 107 oz. silver, 49.1% lead, 12.6% zinc, and 72 tons zinc concentrates assaying 26.1 oz. silver, 1.8% lead and 40.3% zinc. Mill ran 203 hours.

HEDLEY GOLD MINING CO. (Hedley)—A new crusher has been ordered for mill and will be installed shortly. It is of much greater capacity and later pattern than old one, and will expedite and cheapen crushing of ore before it reaches batteries.

JOSIE (Rossland)—Mine produced 1600 tons of ore and 103 tons of concentrates in October. Smelter payments for month were $31,975 for 1638 tons of ore and 141 tons of concentrates. Estimated expenditures for same period were as follows: Development, $7000; mining ore, $10,500; milling, $1250; total, $18,750.

OLD SPORT—Maurice W. Baker, general manager of Stewart Mining Co., denies that he and his associates have purchased this group of claims on Vancouver Island. Company has taken a long-term lease and bond on group, which embraces 600 acres, and is traversed by a number of veins showing gold, silver and copper.

GRANBY CONSOLIDATED (Anyox)—Anyox already has appearance of a flourishing mining town where only a few months ago there was practically nothing but rocks and trees. Large saw mill, mess and bunk house accommodates about 500 men, there is another camp at dam, also a large mess and bunk house at mines. A spacious school building has been erected. Granby Bay Hotel Co. runs a splendidly equipped hotel, all bedrooms having electric light, hot and cold water, and telephones. Recreation hall and pool room is close by, and a grand ball was recently given by Mr. Manly, the hotel proprietor, to celebrate opening of that building. A social club has since been formed, and it is proposed to devote at least one evening a week to dancing. Moving pictures are put on in reaction hall on Monday and Tuesday evenings. At the limestone quarry at Swamp Point a force of about 30 men is employed. Two tunnels have been driven, from which raises will be put up to surface and a wharf has been built.

### Ontario

ORE SHIPMENTS FOR NOVEMBER were as follows: Crown Reserve, 54.77 tons; Comagas, 128.75; Cobalt Comet (Drummond), 37.56; Cobalt Townsite, 653.75; Cobalt Lake, 83.26; Kerr Lake, 49.48; La Rose, 516.66; McKinley Darragh, 209.36; Nipissing, 121.63; Peterson Lake (Seneca Superior), 39.66; Penn Canadian, 145.32; O'Brien, 42.97; Right-of-Way, 40.26; Tretheway, 46.67; total, 2170.10 tons.

TIMISKAMING & HUDSON BAY (Cobalt)—A dividend of 300%, payable Dec. 22 has been declared.

PAN SILVER (Cobalt)—Shareholders have authorized issue of 350,000 shares of treasury stock at 10c. per share.

JUPITER (South Porcupine)—It is announced that issue of $50,000 one year bonds has been taken up by shareholders.

VIPOND (South Porcupine)—This property which was recently under option to Crown Reserve people, is now being examined for West Australian Gold Mines, Ltd.

WRIGHT-HARGRAVES (Swastika)—Work on this property which is under option to B. Cartwright and associates, has been discontinued.

PAN SILVER (Cobalt)—A special meeting of shareholders has been called to ratify two bylaws, one of which provides that 80,000 shares be issued to Coleman Development Co. in payment for property and other authorizing sale of rest of treasury stock at 10c. per share.

NORTHERN CUSTOMS CONCENTRATOR (Cobalt)—Half the 80 stamps in new mill will be started dropping Dec. 15, while remainder will be in operation a few weeks later. Construction of this mill constitutes a record for this part of country, as ground was broken for foundations first week in September. First ore treated will be from La Rose mine. Company also has a contract commencing next May for operation of 20 stamps for Chambers-Ferland.

### Quebec

MANITOU IRON MINING CO. (Montreal)—This company owns and operates a large deposit of ilmenite ore at Ivy-on-the-Lake. Analysis of mineral from different plans on property show Titanic oxide, 38%; iron oxide, 57%; lime, silica and magnesia 5%; no sulphur nor phosphorus.

## MEXICO

### Senora

LOS ANGELES (Nacozari)—W. R. Lane, manager, has purchased a large boiler. Shaft will be pumped out and mine will soon be a producer.

MEXICAN DEVELOPMENT CO. (Peoria, Ill.)—Contract for sinking a two-compartment shaft at Quelitlan mines in Autlan district an additional 100 ft. has been let. Shaft now is 110 ft. deep. Three shoots of high-grade copper ore have been cut. Company's plans call for a 100-ton smelting plant. Mines are 18 miles from Pacific port of Chamela.

## TRANSVAAL

GOLD PRODUCTION IN THE TRANSVAAL in November was: Witwatersrand, 644,320 oz.; outside districts, 29,166 oz.; total, 673,486 oz. This is 11,945 oz. less than in October and 51,211 oz. less than in November, 1912. For the 11 months ended Nov. 30 the total was 8,347,893 oz. in 1912, and 8,122,009 oz.—or $167,881,926—in 1913, a decrease of 225,884 oz. this year.

# THE MARKET REPORT

## METAL MARKETS

### NEW YORK—Dec. 24

The metal markets continue rather quiet. Copper has not lost materially, but sales have been on a moderate scale. Tin has been generally weak and lower.

The recent weakness in copper, lead and spelter has not been due to any malevolent manipulation, or any other mysterious motives, but is explained by the absence of buying for consumption and the increase in smelters' hands of stocks that they were averse to carrying. Sales at low prices have relieved the situations in copper and lead. There has probably been no reduction in the stock of spelter, but producers seem to be willing to carry that metal. In all of these metals, the present outlook is for improvement in price.

### Copper, Tin, Lead and Zinc

**Copper**—During the week of Dec. 18-24 there was active competition for business among all the agencies, which resulted in considerable sales; however, at low prices. The bulk of these were with European buyers and were done at 14.30@14.35c., delivered in Europe. One day one agency would cut; another day, another. Some business was also reported with American consumers, including one or two round lots, at about 14¼c., delivered, usual terms. On Dec. 23, one of the principal agencies, having apparently sold all it cared to, announced an advance in its asking price to 14⅝c., delivered, usual terms, other agencies being then sellers at 14¼@14⅜c. delivered, etc. The action of the agency referred to was not followed entirely by the others, but they stiffened up somewhat and made the market at about 14⅜@14½c., delivered, etc., equivalent to about 14.25@14.30c., cash, N. Y., on Dec. 24.

The situation in Lake copper remained about as previously reported, the principal producer asking 14⅞@15c., and presumably taking care of its regular customers at those prices. An outside lot of 150,000 lb. turned up on Dec. 23 and was sold at 14¾ cents.

There is a decidedly better feeling in the market, which closes strong with lake copper at 14¾@15c.; and electrolytic in cakes, ingots and wirebars at 14.25@14.30c. The average price of electrolytic for the week was 14.158 cents.

We quote casting copper nominally at 13.90@14c. as an average for the week.

For some time past the three months standard copper at London has been selling below cash standard. Of late, the backwardation has disappeared, and this week, for the first time, a contango has been again established, and standard closes at £64 15s. for spot and £65 5s. for three months. This reflects the change in sentiment on the part of the European speculative public toward copper, and indicates an expectation on their part of an improvement in the market.

Base price of copper sheets was reduced ½c. per lb. on Dec. 17, and is now 19¾c. for hot rolled and 20¾c. for cold rolled. The usual extras and discounts are charged and higher prices for small quantities.

Exports of copper from New York for the week are reported at 9907 long tons. Our special correspondent gives the exports from Baltimore for the week at 1231 tons.

**Tin**—The decline in the London market has made further progress. However, sellers of the metal displayed no great anxiety to meet the lower quotation and were reluctant in making offers. Domestic interests transacted considerable business, especially for futures, among themselves, but some buying was also done by consuming interests. The market closes steady at £167 10s. for spot and £169 5s. for three months, and about 36¾c. for January tin here.

**Lead**—Independent producers having sold all they cared to at low prices and pretty well relieved themselves of accumulated stocks, the market passed entirely into the hands of the A. S. & R. Co., which filled orders at its prices, wherefore the advance in St. Louis, where lead became unavailable below the A. S. & R. Co.'s scale. During the morning of Dec. 24, the A. S. & R. Co. advanced its price to 4.10c., New York. The St. Louis market was quoted at 3.95@4.00c., rather uncertain, the action of the leading producer taking it by surprise. Lead sales for the week were rather large, a good many thousands of tons. There was buying both by consumers and by speculators. There were some inquiries for future deliveries, but producers were averse to entering into such contracts except at premiums corresponding to carrying charges.

The London market is unchanged, Spanish lead being quoted £17 15s. and English lead 12s. 6d. higher.

**Spelter**—Small sales were made at 5c. right through the week. The principal consumer continued conspicuous by its absence. Buyers showed some interest in talking about future deliveries, but producers were unwilling to sell such except at premiums, which buyers apparently did not want to pay. All kinds of asked prices are named for this metal, sellers expecting an advance and desiring to protect themselves against surprises.

The London market is firmer, good ordinaries being quoted £21 7s. 6d. and specials 7s. 6d. higher.

### DAILY PRICES OF METALS

#### NEW YORK

| Dec. | Sterling Exchange | Silver | Copper: Lake, Cts. per lb. | Copper: Electrolytic, Cts. per lb. | Tin: Cts. per lb. | Lead: New York, Cts. per lb. | Lead: St. Louis, Cts. per lb. | Zinc: New York, Cts. per lb. | Zinc: St. Louis, Cts. per lb. |
|---|---|---|---|---|---|---|---|---|---|
| 18 | 4.8515 | 57¾ | *14¾<br>@15 | 14.10<br>@14.15 | 37¼ | 4.00 | 3.85<br>@3.90 | 5.12½<br>@5.17½ | 4.97½<br>@5.02½ |
| 19 | 4.8520 | 58 | *14¾<br>@15 | 14.10<br>@14.15 | 37 | 4.00 | 3.87½<br>@3.92½ | 5.12½<br>@5.17½ | 4.97½<br>@5.02½ |
| 20 | 4.8530 | 58 | *14¾<br>@15 | 14.10<br>@14.15 | 37 | 4.00 | 3.87½<br>@3.92½ | 5.12½<br>@5.17½ | 4.97½<br>@5.02½ |
| 22 | 4.8525 | 57⅝ | *14¾<br>@15 | 14.10<br>@14.20 | 36⅝ | 4.00 | 3.90<br>@3.95 | 5.12½<br>@5.17½ | 4.97½<br>@5.02½ |
| 23 | 4.8525 | 57½ | 14¾<br>@15 | 14.10<br>@14.20 | 36¼ | 4.00 | 3.90<br>@3.95 | 5.12½<br>@5.17½ | 4.97½<br>@5.02½ |
| 24 | 4.8520 | 57½ | *14¾<br>@15 | 14.25<br>@14.30 | 36¼ | 4.10 | 3.95<br>@4.00 | 5.12½<br>@5.17½ | 4.97½<br>@5.02½ |

*Nominal.

The quotations herein given are our appraisal of the markets for copper, lade, spelter and tin based on wholesale contracts, and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals: per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16@17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triesta, 22c.

#### LONDON

| Dec. | Silver | Copper: Spot, £ per Ton | Copper: Spot, Cts. per Lb. | Copper: 3 Mos. | Copper: Best Sel'td | Tin: Spot | Tin: 3 Mos | Lead: £ per Ton | Lead: Cts. per Lb. | Zinc: £ per Ton | Zinc: Cts. per Lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 26 11/16 | 64¼ | 13.96 | 64¼ | 69¼ | 169⅝ | 171¼ | 17⅞ | 3.88 | 21⅜ | 4.64 |
| 19 | 26 11/16 | 63¾ | 13.85 | 63⅞ | 69 | 169 | 170½ | 17⅞ | 3.88 | 21½ | 4.67 |
| 20 | 26 13/16 | | | ... | ... | | | | | | |
| 22 | 26 13/16 | 64 3/16 | 13.95 | 64⅝ | 68 | 168¼ | 169¾ | 17¾ | 3.86 | 21½ | 4.67 |
| 23 | 26⅝ | 64¼ | 13.96 | 64¾ | 69 | 167¾ | 169½ | 17¾ | 3.86 | 21½ | 4.67 |
| 24 | 26 11/16 | 64¾ | 14.07 | 65¼ | 69¾ | 167½ | 169¼ | 17¾ | 3.86 | 21⅜ | 4.64 |

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17⅓c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

The base price of sheet zinc in carload lots is now $7.25 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill.

On Dec. 18, at a meeting held at Frankfurt-am-Main, the International Zinc Syndicate was extended to April, 1916. the terms being practically the same as heretofore. It was said that the stocks of spelter which had accumulated during 1913 had been greatly reduced.

According to our European advices, the buying of spelter in Europe has been decidedly better since the Syndicate was completed. The Syndicate's price is £21 1s. 2d. for December shipments, and £21 5s. 8d. for January, corresponding to about 5½c. New York.

## Other Metals

**Aluminum**—The market continues quiet, with moderate sales, and no pressure either from buyers or sellers. Prices are a shade easier and quotations are 18½@19c. per lb. for No. 1 ingots, New York. The foreign market is quiet but steady.

**Antimony**—The trade has been quiet; in fact only a retail business is being done just now. Prices are unchanged. Cookson's is quoted at 7.40@7.60c. per lb., and Hallett's 7⅛@7⅜c. For Hungarian, Chinese and other outside brands 6@6¼c. is named.

**Quicksilver**—A fair business is reported and the market is steady, with no change in prices. The New York quotation is $39@40 per flask of 75 lb. for large lots. The jobbing price for small orders is 54@56c. per lb. San Francisco, $39 per flask, with special terms for export. London price is £7 10s. per flask, with £7 5s. quoted from second hands.

## Gold, Silver and Platinum

**Gold**—There was no change in the open market in London, and the price of gold remained at the Bank level, 77s. 9d per oz. for bars. There is some apprehension felt in London of a possible demand for gold from New York.

Imports of gold in France, 10 months ended Oct. 31, were 559,351,000 fr.; exports, 58,959,000 fr.; net imports, 500,392,000 fr., against 178,154,000 fr. last year.

Imports of gold in Great Britain 11 months ended Nov. 30 were £54,588,642; exports, £44,044,028; excess of imports, £10,544,614, which is £4,008,899 more than last year.

**Iridium**—No change is reported and dealers continue to ask $80@81 per oz. for pure metal, New York.

**Platinum**—The market continues rather easy, but no change in prices is noted. Reports come from abroad of a probable advance in prices, but they attract no attention here. Prices are easier at $42.75@43.50 per oz. for refined platinum, and $47@50 per oz. for hard metal.

Our Russian correspondent writes, under date of Dec. 10, that the market shows no change. The supply of small lots from the mines is large for the season, and is quickly taken up. No large sales are reported, and some sellers are still holding for an advance. Quotations for crude metal 83% platinum are 9.55 rubles per zolotnik—$35.90 per oz.—at Ekaterinburg; 36,700@36,800 rubles per pood—$36.02 per oz. average—at St. Petersburg.

**Silver**—The market closes quiet with limited transactions at 26⅝@26$\frac{11}{16}$d. The probabilities are that no great change in the quotation will obtain the balance of the month.

Shipments of silver from London to the East, Jan. 1 to Dec. 11, as reported by Messrs. Pixley & Abell:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| India | £11,469,000 | £9,717,000 | D. £1,752,000 |
| China | 1,674,500 | 755,000 | D. 919,500 |
| **Total** | **£13,143,500** | **£10,472,000** | **D. £2,671,500** |

Holdings of silver at Shanghai by banks and others are reported to be £5,510,000 in sycee, or currency, and £230,000 in bars, making £5,740,000, or about 51,000,000 oz. in all.

Imports of silver in France 10 months ended Oct. 31 were 315,423,000 fr.; exports, 287,605,000 fr., excess of imports, 27,818,000 fr., against 9,369,000 fr. last year.

Imports of silver in Great Britain 11 months ended Nov. 30 were valued at £13,695,206; exports, £14,938,564; excess of exports, £1,243,358, which compares with an excess of imports of £724,240 last year.

## Zinc and Lead Ore Markets

### JOPLIN, MO.—Dec. 20

The highest price of zinc blende was $43 per ton, the base ranging from $38 to $40.50 per ton of 60% zinc. One company, which has purchased only calamine for over a year, came into the market for 700 tons of blende this week at a price stiff enough to take a lot of ore that current prices did not touch. Calamine is selling at $19@22 per ton of 40% zinc. The average of all grades is $37.68 per ton. Lead continues in sharp demand and as high as $55 was paid, even though buyers claim to be paying only $49 per ton of 80% metal contents. The average of all grades is $49.02 per ton.

SHIPMENTS WEEK ENDED DEC. 20

| | Blende | Calamine | Lead | Value |
|---|---|---|---|---|
| Total this week | 10,134,080 | 587,420 | 1,751,940 | $244,875 |
| Total 51 weeks | 544,376,210 | 42,902,550 | 93,831,850 | $15,030,924 |

Blende value, the week, $195,060; 51 weeks, $12,904,175.
Calamine value, the week, $6880; 51 weeks, $548,224.
Lead value, the week, $42,935; 51 weeks, $2,468,534.

### MONTANA ZINC ORE

The production of the Butte & Superior Co. at Butte in November was 10,995 tons of concentrates, averaging 50.58% zinc.

# IRON TRADE REVIEW

### NEW YORK—Dec. 24

The closing week of the year shows no material change in position in the iron and steel trade. New business is rather limited, but the rate of production of the mills is variable.

Most mills are closing down this week for the usual holiday stoppage and for repairs. The time of the stop, however, will vary a good deal in individual cases. Some will close only for the actual holiday week, while others may stop for two or even three weeks, the time varying according to the work in hand in each case.

It is generally stated in the steel trade that there is "a better feeling," and while this of itself means nothing the constant reiteration may bring more business, as the unfavorable talk in the past few weeks has tended to deepen the depression. There is no heavier buying of steel products, but the fact that the close approach of the holidays has brought no decrease is in itself favorable. There is undoubtedly increased inquiry for forward delivery, and buyers are made somewhat nervous by the mills refusing to accept contracts as far ahead as contracts are usually made when the market is on the down grade or at bottom.

Reports as to railroad buying have grown still more unfavorable. It is stated that some large roads, including the New York Central Lines, have issued positive orders against all purchases except of material absolutely needed at once, and it is further reported that the Baltimore & Ohio will place no order for rails for 1914 delivery. All this, of course, is "playing politics," but to the steel industry it is painfully real while it lasts.

Pig-iron conditions are still rather mixed. Among the larger buyers there seems to be a belief that the possible bottom in prices has been nearly reached, and there is a disposition to take hold more freely. The smaller buyers, however, are still slow.

### PITTSBURGH—Dec. 23

Steel-mill operations thus far this month have averaged 50% of capacity, but many mills will close the night of Dec. 24, and not open until Jan. 5, so that the month's operations will probably average only about 40%. January operations will undoubtedly be larger.

Sellers are resisting market declines more vigorously than ever. While shapes can be done rather easily at 1.20c., a decline from 1.25c., the quotation of 1.20c. is quite well adhered to on shapes, plates and bars. Tubular goods are quite firm. Wire products are shaded no more than formerly, $1.55 on nails representing the ordinary market. Sheets remain quotable at 1.90c. for black and 2.90c. for galvanized, with shading for prompt shipment, but advances for extended delivery. Tinplate specifications have considerably increased in the past fortnight and mills are running somewhat more fully.

**Pig Iron**—The market has been very quiet, but quotations are maintained, at least nominally. The Standard Sanitary Manufacturing Co. is inquiring for 4000 tons of foundry iron for January and February, and this inquiry will give the foundry iron market a much needed test as to actual values. We quote Bessemer, $15; basic, $12.75; No. 2 foundry and malleable, $13.50; forge, $13.15, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—The market is well held in face of light buying. Mills are not contracting for next year to any extent. We quote prompt and forward, English and German, at $47, Baltimore.

**Steel**—The mills are taking a very decided stand on $20 for billets and $21 for sheet bars and refuse to cover consumers farther ahead than first quarter at the outside. Transactions are very light.

**Iron and Steel Trade of Great Britain** 11 months ended Nov. 30 as valued by the Board of Trade returns:

| | Exports | Imports | Excess |
|---|---|---|---|
| Iron and steel | 50,208,580 | 13,764,919 | Exp. 36,443,661 |
| Machinery | 57,084,106 | 14,781,059 | Exp. 42,303,047 |
| Total | 107,292,686 | 28,545,978 | Exp. 78,746,708 |
| Total, 1912 | 92,457,863 | 25,543,992 | Exp. 66,913,781 |

Actual tonnage of iron and steel exported was 4,434,368 long tons in 1912, and 4,569,637 in 1913; imported, 1,812,055 tons in 1912, and 1,997,036 in 1913. Exports include value of new ships built for foreign countries.

**Pig Iron Production in Germany in** November is reported by the German Iron & Steel Union at 1,587,288 metric tons, being 64,159 tons less than in October. For the 11 months ended Nov. 30 the make was, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Foundry iron | 3,044,515 | 3,333,910 | I. 289,395 |
| Forge iron | 486,091 | 457,162 | D. 28,929 |
| Steel pig | 1,990,182 | 2,378,620 | I. 388,438 |
| Bessemer pig | 352,026 | 331,878 | D. 20,148 |
| Thomas (basic) pig | 10,413,732 | 11,180,570 | I. 766,838 |
| Total | 16,286,546 | 17,682,140 | I. 1,395,594 |

Steel pig includes ferromanganese, spiegeleisen and all similar alloys.

## IRON ORE

Receipts of Lake iron ore at Lake Michigan ports for the season of 1913 were: South Chicago, 5,572,866; Gary, 2,365,551; Indiana Harbor, 455,252; Milwaukee, 234,591; Boyne City, Mich., 45,028; East Jordan, Mich., 28,444; total, 8,701,732 tons; which is 17.5% of the total shipments.

Shipments of Wabana iron ore from Newfoundland have about ceased for the season. The total taken by Eastern furnaces this year has been about 220,000 tons, or 50,000 tons more than last year.

**Imports of Iron Ore in Great Britain,** 11 months ended Nov. 30, were 5,931,119 long tons in 1912, and 6,905,026 in 1913; increase, 973,907 tons. Imports of manganese ore were 346,260 tons in 1912, and 530,351 in 1913; increase, 184,091 tons.

## COKE

**Connellsville Coke**—There has been a distinct improvement in the price situation, from the sellers' standpoint, for a contract for 12,000 tons of furnace coke for January has been closed at the $2 price, which the majority of operators are asking. There are cokes available for 1914 at less, down to $1.90 and possibly $1.85, but the assortment is limited. Prompt coke remains at $1.75, about 100 cars having been sold in the past week.

**Fuel Exports of Great Britain, 11** months ended Nov. 30, in long tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 58,747,636 | 67,170,665 | I. 8,423,029 |
| Coke | 928,612 | 1,115,317 | I. 186,705 |
| Briquettes | 1,394,032 | 1,874,952 | I. 480,920 |
| Steamer coal | 16,734,586 | 19,189,501 | I. 2,454,915 |
| Total | 77,804,866 | 89,350,435 | I. 11,545,569 |

Imports are small; they were 191,393 tons in 1912, and 21,435, in 1913; decrease, 169,958 tons.

**Coal Production in German Empire** 10 months ended Oct. 31, in metric tons:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal mined | 147,404,184 | 160,615,852 | I. 13,211,668 |
| Brown coal mined | 67,659,847 | 72,323,966 | I. 4,664,119 |
| Coke made | 23,838,693 | 26,861,798 | I. 3,023,105 |
| Briquettes made | 20,171,509 | 22,873,670 | I. 2,702,161 |

Of the briquettes reported this year 17,955,076 tons were made of brown coal or lignite.

**German Foreign Trade in Fuel** 10 months ended Oct. 31 was, in metric tons:

| | Exports | Imports | Excess |
|---|---|---|---|
| Coal | 28,671,267 | 8,839,340 | Exp. 19,831,927 |
| Brown coal | 49,528 | 5,949,343 | Imp. 5,899,815 |
| Coke | 5,543,546 | 514,148 | Exp. 5,029,398 |
| Briquettes | 2,636,819 | 121,101 | Exp. 2,515,718 |
| Total | 36,901,160 | 15,423,932 | Exp. 21,477,228 |

Of the briquettes exported 697,593 tons were made from brown coal or lignite.

## SAULT STE. MARIE CANALS

The total freight passing through the Sault Ste. Marie Canals in October was 10,919,274 short tons. For the season to Nov. 1 the totals were as follows:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| East-bound | 48,254,518 | 52,681,355 | I. 4,426,837 |
| West-bound | 14,414,981 | 18,311,213 | I. 3,896,232 |
| Total | 62,669,499 | 70,992,568 | I. 8,323,069 |

The total number of vessel passages this year was 20,864, showing an average cargo of 3403 tons. Mineral freights included were, in short tons except salt, which is in barrels:

| | 1912 | 1913 | Changes |
|---|---|---|---|
| Coal | 12,619,795 | 16,712,002 | I. 4,092,207 |
| Iron ore | 42,177,817 | 44,710,520 | I. 2,532,703 |
| Pig and manufactured iron | 542,460 | 340,970 | D. 201,490 |
| Copper | 89,988 | 77,492 | D. 12,496 |
| Building stone | 2,282 | 6,181 | I. 3,899 |
| Salt, bbl | 566,487 | 603,685 | I. 37,198 |

Iron ore was 63% and coal 23.5% of the total traffic reported this year.

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## COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

| | July | August | September | October | November |
|---|---|---|---|---|---|
| Alaska shipments | 2,705,136 | 1,847,785 | 2,261,216 | 1,951,883 | 3,391,300 |
| Anaconda | 22,100,000 | 22,500,000 | 22,600,000 | 18,400,000 | 25,250,000 |
| Arizona, Ltd. | 2,600,000 | 1,800,000 | 1,800,000 | 3,550,000 | 2,800,000 |
| Copper Queen | 8,369,607 | 8,252,404 | 8,434,803 | 8,292,929 | 7,115,991 |
| Calumet & Ariz. | 3,800,000 | 4,500,000 | 4,000,000 | 4,500,000 | 4,600,000 |
| Chino | 4,746,525 | 5,788,572 | 4,196,296 | 4,767,466 | |
| Detroit | 1,549,224 | 2,187,223 | 2,102,818 | 1,861,878 | 1,922,352 |
| East Butte | 1,060,257 | 1,162,007 | 1,233,018 | 1,040,997 | 1,002,190 |
| Giroux | 584,546 | 524,953 | 198,178 | 156,084 | |
| Mason Valley | 908,892 | 867,060 | 918,000 | 1,052,000 | 1,174,000 |
| Mammoth | 1,800,000 | 1,750,000 | 1,750,000 | 1,700,000 | 1,700,000 |
| Nevada Con. | 5,403,919 | 5,989,973 | 4,441,671 | 5,898,046 | 5,443,647 |
| Ohio | 601,700 | 689,000 | 685,900 | 698,691 | ....... |
| Old Dominion | 2,526,000 | 2,524,000 | 2,679,000 | 2,037,000 | ......... |
| Ray | 4,097,000 | 4,269,519 | 4,336,434 | 4,725,419 | ........ |
| Shannon | 880,000 | 1,248,000 | 1,232,000 | 1,216,000 | 1,110,000 |
| South Utah | 140,000 | 223,498 | 241,843 | 232,269 | ......... |
| Tennessee | 1,247,804 | 1,101,019 | 1,309,985 | 1,392,162 | 1,688,000 |
| United Verde* | 3,000,000 | 3,000,000 | 3,000,000 | 3,000,000 | ......... |
| Utah Copper Co. | 9,849,043 | 10,302,251 | 11,463,905 | 9,929,478 | ....... |
| Lake Superior* | 17,500,000 | 9,700,000 | 6,950,008 | 5,500,000 | 6,600,000 |
| Non-rep. mines* | 6,200,000 | 6,200,000 | 6,000,000 | 6,200,000 | 6,000,000 |
| Total prod. | 101,669,653 | 96,427,264 | 91,835,075 | 88,102,302 | .......... |
| Imp., bars, etc. | 29,029,990 | 22,474,471 | 35,703,660 | 21,935,023 | .......... |
| Total blister | 130,699,643 | 118,901,735 | 127,538,735 | 110,037,325 | ......... |
| Imp. ore & matte | 8,527,046 | 9,171,351 | 10,800,162 | 5,062,015 | ....... |
| Total Amer. | 139,226,689 | 128,073,036 | 138,338,897 | 115,099,340 | ....... |
| Miami† | 2,890,000 | 3,097,500 | 2,688,000 | 2,862,050 | 3,230,000 |
| Shattuck-Arizona | 1,019,388 | 1,001,634 | 1,163,237 | 993,224 | 995,429 |
| Brit. Col. Cos.: | | | | | |
| British Col. Cop. | 618,379 | 647,905 | 621,120 | 688,581 | ......... |
| Granby | 1,664,102 | 1,847,344 | 1,824,659 | 1,718,258 | 1,944,145 |
| Mexican Cos.: | | | | | |
| Boleo† | 2,240,720 | 2,264,640 | 2,369,920 | 2,424,800 | 2,315,040 |
| Cananea | 3,328,000 | 3,186,000 | 3,148,000 | 3,682,000 | 3,800,000 |
| Moctezuma | 2,693,006 | 3,542,047 | 3,024,121 | 3,178,136 | 3,517,800 |
| Other Foreign: | | | | | |
| Braden, Chile | 1,046,000 | 1,572,000 | 1,332,000 | 2,006,000 | 1,592,000 |
| Cape Cop., S. Af. | .... | ..... | 607,040 | 712,320 | 649,600 |
| Kyshtim, Russia | 2,500,000 | 1,585,000 | 1,187,000 | .... | ..... |
| Spassky, Russia | 660,800 | 1,048,320 | 1,025,920 | 983,360 | ...... |
| Exports from Chile | 9,856,000 | 8,736,000 | 5,600,000 | 6,160,000 | 7,616,000 |
| Australia | 10,304,000 | 7,720,000 | 6,944,000 | 7,728,000 | 11,200,000 |
| Arrivals–Europe‡ | 11,728,640 | 14,624,960 | 9,661,120 | 18,040,960 | 9,107,840 |

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡ Does not include the arrivals from the United States, Australia or Chile.

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## STATISTICS OF COPPER

| Month | United States | | | Visible Stocks. | | |
|---|---|---|---|---|---|---|
| | U.S. Refin'y Production | Deliveries, Domestic | Deliveries, for Export | United States | Europe | Total |
| XI, '12 | 134,695,400 | 69,369,795 | 55,906,550 | 76,744,964 | 103,801,600 | 180,546,564 |
| XII. | 143,354,042 | 58,491,723 | 65,713,796 | 86,164,059 | 96,947,200 | 183,111,259 |
| Year, 1912 | 1,581,920,287 | 819,665,948 | 746,396,452 | ........ | ........ | ........ |
| I, 1913. | 143,479,625 | 65,210,030 | 60,383,845 | 105,312,582 | 78,491,840 | 183,904,422 |
| II. | 130,948,881 | 59,676,492 | 72,168,523 | 123,198,332 | 77,504,000 | 200,702,332 |
| III. | 136,251,849 | 76,585,471 | 77,699,306 | 122,302,890 | 81,244,800 | 203,547,690 |
| IV. | 135,353,402 | 78,158,837 | 85,894,727 | 104,269,270 | 87,180,800 | 191,450,070 |
| V. | 141,319,416 | 81,108,321 | 68,285,978 | 75,549,108 | 85,948,800 | 161,497,908 |
| VI. | 121,860,853 | 68,362,571 | 68,067,901 | 67,474,225 | 77,235,200 | 144,709,425 |
| VII. | 138,074,602 | 58,904,192 | 78,480,071 | 52,814,606 | 71,904,000 | 124,808,606 |
| VIII. | 131,632,362 | 73,649,801 | 73,263,469 | 53,594,945 | 66,420,480 | 120,015,385 |
| IX. | 131,401,229 | 66,836,897 | 73,085,275 | 38,314,037 | 63,716,800 | 102,030,837 |
| X. | 139,070,481 | 68,173,720 | 68,123,473 | 29,793,094 | 53,625,600 | 83,418,692 |
| XI. | 134,087,708 | 48,656,858 | 70,067,803 | 32,566,382 | 48,787,200 | 81,353,582 |
| XII. | ........ | ....... | ....... | 47,929,429 | 46,592,000 | 94,521,429 |

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

### Assessments

| Company | Delinq | Sale | Amt. |
|---|---|---|---|
| Alta Cons., Utah | Dec. 8 | Jan 8 | 0 05 |
| Arctic, Ida | Dec 1 | Dec. 31 | 00025 |
| Big Cottonwood, Utah | Dec. 10 | Dec 29 | 0 01 |
| [illegible], Nev | Dec 12 | Dec 30 | 0 02 |
| Challenge, Nev | Dec 16 | Jan 6 | 0 05 |
| Clear Creek, Ida., postp'd. | Nov 18 | Jan 2 | 0 0025 |
| Ely Consolidated, Nev | | Dec 31 | 0 03 |
| Empire, Ida., postp'd | Oct 30 | Jan 2 | 0 005 |
| Gold Mountain Champion, Ida. | Dec. 9 | Dec 30 | 0 0025 |
| Great Copper King, Ida | Nov. 29 | Dec 29 | 0 001 |
| Hypotheek, Ida | Dec. 5 | Jan 5 | 0 006 |
| Imar, Nev | | | 0 01 |
| Independence, Utah | Dec. 12 | Jan 2 | 0 006 |
| Leroy, Ida | Dec 3 | Jan 3 | 0 002 |
| Little North Fork, Ida | Dec 1 | Jan 2 | 0 001 |
| New Yerington, Nev | Dec 10 | Dec 30 | 0 01 |
| North Franklin, Ida., postp'd | Oct 16 | Jan 29 | 0 005 |
| O. K. Extension, Nev | Dec 20 | Jan 8 | 0 0025 |
| Overman, Nev | Dec 10 | Dec 30 | 0 05 |
| Plaza, Utah | Dec. 13 | Dec. 29 | 0 0025 |
| Rescue Eula, Nev. | Nov 25 | Dec 29 | 0 01 |
| Robbers Roost, Calif. | Dec 5 | Dec. 29 | 0 01 |
| Seg. Belcher, Nev | Dec 5 | Dec 30 | 0 02 |
| Silver Star, Ida., postp'd. | Nov 22 | Jan 10 | 0 002 |
| Tintic, Utah | Dec 10 | Dec 31 | 0 002 |
| Utah of Fish Springs | Dec 15 | Jan. 5 | 0 05 |
| Wasatch, Utah | Dec. 22 | Jan. 8 | 0 05 |

## Monthly Average Prices of Metals

### SILVER

| Month | New York | | | London | | |
|---|---|---|---|---|---|---|
| | 1911 | 1912 | 1913 | 1911 | 1912 | 1913 |
| January | 53 795 | 56 260 | 62 938 | 24 865 | 25 887 | 28 983 |
| February | 52 222 | 59 043 | 61 642 | 24 081 | 27 190 | 28 357 |
| March | 52 745 | 58 375 | 57 870 | 24 324 | 26 875 | 26 669 |
| April | 53 325 | 59 207 | 59 490 | 24 595 | 27 284 | 27 416 |
| May | 53 308 | 60 880 | 60 361 | 24 583 | 28 038 | 27 825 |
| June | 53 043 | 61 290 | 58 990 | 24 486 | 28 215 | 27.199 |
| July | 52 630 | 60 654 | 58 721 | 24 286 | 27 919 | 27.074 |
| August | 52 171 | 61 606 | 59 293 | 24 082 | 28 375 | 27.335 |
| September | 52 440 | 63 078 | 60 640 | 24 209 | 29 088 | 27 986 |
| October | 53 340 | 63 471 | 60 793 | 24 594 | 29 299 | 28 083 |
| November | 55 719 | 62 792 | 58 995 | 25 649 | 29 012 | 27.263 |
| December | 54 905 | 63 365 | | 25 349 | 29 320 | ..... |
| Year | 53 304 | 60 835 | | 24.592 | 28.042 | ...... |

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

### COPPER

| Month | New York | | | | London Standard | |
|---|---|---|---|---|---|---|
| | Electrolytic | | Lake | | | |
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 14 094 | 16 488 | 14 337 | 16 767 | 62 760 | 71.741 |
| February | 14 084 | 14 971 | 14 329 | 15 253 | 62 893 | 65.519 |
| March | 14 698 | 14 713 | 14 868 | 14 930 | 65 884 | 65 329 |
| April | 15 741 | 15 291 | 15 930 | 15 565 | 70 294 | 68.111 |
| May | 16 031 | 15 436 | 16 245 | 15 738 | 72 352 | 68 807 |
| June | 17 234 | 14 672 | 17 443 | 14 871 | 78 259 | 67 140 |
| July | 17 190 | 14 190 | 17 353 | 14 563 | 76 636 | 64 166 |
| August | 17 498 | 15 400 | 17 644 | 15 904 | 78 670 | 69 200 |
| September | 17 508 | 16 328 | 17 698 | 16 799 | 78 762 | 73 125 |
| October | 17 314 | 16 337 | 17 661 | 16 913 | 76 389 | 73 383 |
| November | 17 326 | 15 182 | 17 617 | 16.022 | 76 890 | 68 275 |
| December | 17 376 | | 17 600 | | 75 516 | |
| Year | 16 341 | | 16 560 | | 72 942 | |

New York, cents per pound, London, pounds sterling per long ton of standard copper

### TIN

| Month | New York | | London | |
|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 |
| January | 42 529 | 50 298 | 191 519 | 238 273 |
| February | 42 962 | 48 766 | 195 036 | 220 140 |
| March | 42 577 | 46 832 | 192 619 | 213 615 |
| April | 43 923 | 49 115 | 200 513 | 224 159 |
| May | 46 063 | 49 038 | 208 830 | 224 143 |
| June | 45 815 | 44 820 | 205 863 | 207 208 |
| July | 44 519 | 40 260 | 202 446 | 183 511 |
| August | 45 857 | 41 582 | 208 351 | 188 731 |
| September | 49 135 | 42 410 | 223 762 | 193 074 |
| October | 50 077 | 40 462 | 228 353 | 184 837 |
| November | 49 891 | 39 810 | 227 619 | 180 869 |
| December | 49 815 | | 226 875 | . |
| Av. year | 46 096 | | 209 322 | |

New York in cents per pound, London in pounds sterling per long ton

### LEAD

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 4 435 | 4 321 | 4 327 | 4 171 | 15 597 | 17 114 |
| February | 4 026 | 4 325 | 3 946 | 4 175 | 15 738 | 16 550 |
| March | 4 073 | 4 327 | 4 046 | 4 177 | 15 997 | 15 977 |
| April | 4 200 | 4 381 | 4 118 | 4 242 | 16 331 | 17 597 |
| May | 4 194 | 4 342 | 4 072 | 4 226 | 16 509 | 18 923 |
| June | 4 392 | 4 325 | 4 321 | 4 190 | 17 588 | 20 226 |
| July | 4 720 | 4 353 | 4 603 | 4 223 | 18 544 | 20 038 |
| August | 4.569 | 4 624 | 4 452 | 4 550 | 19 655 | 20 406 |
| September | 5 048 | 4 698 | 4 924 | 4 579 | 22 292 | 20 648 |
| October | 5 071 | 4 402 | 4 894 | 4 253 | 20 630 | 20 302 |
| November | 4 615 | 4.293 | 4 463 | 4.146 | 18 193 | 19 334 |
| December | 4 303 | | 4 152 | | 18 069 | |
| Year | 4 471 | | 4 360 | | 17 929 | |

New York and St. Louis cents per pound. London, pounds sterling per long ton.

### SPELTER

| Month | New York | | St. Louis | | London | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | 6 442 | 6.931 | 6 292 | 6 854 | 26 642 | 26 114 |
| February | 6 499 | 6 239 | 6 349 | 6 089 | 26 661 | 25 338 |
| March | 6 626 | 6 078 | 6 476 | 5 926 | 26 048 | 24 605 |
| April | 6 633 | 5 641 | 6 483 | 5 491 | 25 644 | 25 313 |
| May | 6 679 | 5 406 | 6 529 | 5 256 | 25 790 | 24 583 |
| June | 6 877 | 5.124 | 6 727 | 4 974 | 25 763 | 22 143 |
| July | 7.116 | 5 278 | 6 966 | 5 128 | 26 174 | 20 592 |
| August | 7 028 | 5 658 | 6 878 | 5 508 | 26 443 | 20 706 |
| September | 7 454 | 5 694 | 7 313 | 5 544 | 27 048 | 21 148 |
| October | 7 426 | 5 340 | 7 276 | 5 188 | 27 543 | 20 614 |
| November | 7 371 | 5 229 | 7 221 | 5 083 | 26 804 | 20 581 |
| December | 7.162 | | 7.081 | | 26 494 | |
| Year | 6.943 | | 6 799 | | 26 421 | ... |

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

### PIG IRON IN PITTSBURGH

| Month | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1912 | 1913 | 1912 | 1913 | 1912 | 1913 |
| January | $15 12 | $18 15 | $13 32 | $17 35 | $14 00 | $18 59 |
| February | 15.03 | 18.15 | 13 28 | 17 22 | 14.01 | 18.13 |
| March | 14 95 | 18.15 | 13 66 | 16.96 | 14.10 | 17.53 |
| April | 15.13 | 17.90 | 13 90 | 16 71 | 14.15 | 16 40 |
| May | 15.14 | 17 68 | 13 90 | 15 80 | 14.12 | 15.40 |
| June | 15.15 | 17.14 | 14.11 | 15 40 | 14 22 | 15.10 |
| July | 15 15 | 16.31 | 14 38 | 15 13 | 14 38 | 14 74 |
| August | 15 43 | 16.63 | 14 90 | 15 00 | 14 85 | 14 88 |
| September | 16 86 | 16.65 | 16 03 | 15 04 | 15 63 | 14 93 |
| October | 17.90 | 16 60 | 17 18 | 14 61 | 17.22 | 14 80 |
| November | 18.07 | 16.03 | 17.09 | 13 91 | 18 00 | 14 40 |
| December | 18 15 | . | 17.45 | | 18.73 | . |
| Year | $16 01 | | $14 93 | | $15.28 | |

## STOCK QUOTATIONS

| COLO. SPRINGS Dec 22 | |
|---|---|
| Name of Comp | Bid |
| Acacia | 02½ |
| Cripple Cr'k Con. | 09 |
| C. K. & N. | .07½ |
| Doctor Jack Pot | 06 |
| Elkton Con. | 51 |
| El Paso | 2.40 |
| Findlay | .01 |
| Gold Dollar | 06½ |
| Gold Sovereign | 02 |
| Golden Cycle | 2 00 |
| Isabella | 10 |
| Jack Pot | 05 |
| Jennie Sample | 05 |
| Jerry Johnson | 03 |
| Lexington | .03 |
| Old Gold | 01 |
| Mary McKinney | 57 |
| Pharmacist | 01 |
| Portland | 1 00 |
| Vindicator | 82 |

| SALT LAKE Dec 22 | |
|---|---|
| Name of Comp | Bid. |
| Beck Tunnel | .04½ |
| Black Jack | 06½ |
| Cedar Talisman | 00½ |
| Colorado Mining | .11 |
| Crown Point | .00½ |
| Daly-Judge | 5 60 |
| Gold Chain | 14 |
| Grand Central | 53 |
| Iron Blossom | 1 15 |
| Little Bell | 10 |
| Lower Mammoth | 01 |
| Mason Valley | 3 00 |
| May Day | 05 |
| Nevada Hills | 40 |
| New York | 00 |
| Prince Con | 18 |
| Silver King Coal'n | 3 15 |
| Sioux Con | 01 |
| Uncle Sam | 03 |
| Yankee | .04 |

### TORONTO Dec 22

| Name of Comp | Bid | Name of Comp | Bid |
|---|---|---|---|
| Bailey | 05 | Foley O'Brien | 16 |
| Coniagas | 7 12½ | Hollinger | 16 87½ |
| T. & Hudson Bay | 68 00 | Imperial | 01½ |
| Timiskaming | 13 | Jupiter | 06 |
| Wettlaufer-Lor | 07 | Pearl Lake | 09 |
| Apex | 01 | Porcu. Gold | 10½ |
| Big Dome | 14 75 | Preston E. D. | 01½ |
| Crown Chartered | 00¾ | Rea | 10 |
| Doble | ‡ 10 | Swastika | 04½ |
| Dome Exten | 06 | West Dome | 08 |

### SAN FRANCISCO Dec. 22

| Name of Comp. | Bid | Name of Comp. | Bid |
|---|---|---|---|
| Comstock Stocks | | Misc. Nev. & Cal. | |
| Alta | 06 | Belmont | 7.00 |
| Belcher | .48 | Jim Butler | .69 |
| Best & Belcher | 04 | MacNamara | 07 |
| Caledonia | 1 55 | Midway | .36 |
| Challenge Con. | .02 | Mont.-Tonopah | 95 |
| Chollar | 02 | North Star | .38 |
| Confidence | ‡ 38 | West End Con. | 1.22½ |
| Con. Virginia | 13 | Atlanta | 11 |
| Crown Point | 39 | Booth | 01 |
| Gould & Curry | 03 | C. O. D. Con. | .02 |
| Hale & Norcross | 07 | Comb. Frac. | 05 |
| Mexican | 1 15 | Jumbo Extension | .10 |
| Occidental | 70 | Pitts.-Silver Peak | 35 |
| Ophir | .18 | Round Mountain | 03 |
| Overman | .34 | Sandstorm Kendall | 06 |
| Potosi | .03 | Silver Pick | 03 |
| Savage | .11 | Argonaut | 2 50 |
| Sierra Nevada | 11 | Bunker Hill | 1 50 |
| Union Con. | 12 | Central Eureka | 42 |
| Yellow Jacket | 38 | So. Eureka | 2.00 |

| N. Y. EXCH. Dec 22 | |
|---|---|
| Name of Comp. | Clg |
| Amalgamated | 71¾ |
| Am. Agri. Chem. | 43 |
| Am. Sm. & Ref., com. | 64 |
| Am. Sm. & Ref., pf. | 98 |
| Am. Sm. Sec., pf. B | 80½ |
| Anaconda | 35 |
| Batopilas Min. | ‡ |
| Bethlehem Steel, pf. | 68½ |
| Chino | 38 |
| Federal M. & S., pf. | 32 |
| Great Nor., ore., ctf. | 34 |
| Guggen. Exp. | 45 |
| Homestake | 114 |
| Inspiration Con. | 14 |
| Miami Copper | 21½ |
| Nat'l Lead, com. | 44 |
| National Lead, pf. | 103½ |
| Nev. Consol. | 15 |
| Phelps Dodge | 183 |
| Pittsburg Coal, pf. | 87½ |
| Quicksilver, pf. | 2½ |
| Ray Con. | 18 |
| Republic I&S, com. | 20½ |
| Republic I&S, pf. | 81½ |
| Sloss Sheff'd, com. | 28 |
| Sloss Sheffield, pf. | 86 |
| Tennessee Copper | 30 |
| Utah Copper | 48½ |
| U. S. Steel, com | 59½ |
| U. S. Steel, pf | 105 |
| Va. Car. Chem., pf. | 96½ |

| BOSTON EXCH Dec. 22 | |
|---|---|
| Name of Comp. | Clg. |
| Adventure | 1½ |
| Ahmeek | 252 |
| Alaska Gold M. | 21¾ |
| Algomah | 85 |
| Allouez | 34 |
| Am. Zinc | 18¼ |
| Ariz. Com., ctfs. | 4¾ |
| Bonanza | .62 |
| Boston & Corbin | ‡ 50 |
| Butte & Balak. | 3½ |
| Calumet & Ariz. | 63½ |
| Calumet & Hecla | 410 |
| Centennial | 14 |
| Cliff | ‡1 |
| Copper Range | 34 |
| Daly West | 2½ |
| East Butte | 11 |
| Franklin | 2¾ |
| Granby | 72 |
| Hancock | 15 |
| Hedley Gold | ‡29¾ |
| Helvetia | .25 |
| Indiana | 4½ |
| Island Cr'k, com. | 46 |
| Island Cr'k, pfd. | 83½ |
| Isle Royale | 19 |
| Keweenaw | 2½ |
| Lake | 7 |
| La Salle | 3½ |
| Mass. | 2 |
| Michigan | 50 |
| Mohawk | 42 |
| New Arcadian | 1¾ |
| New Idria Quick | 2½ |
| North Butte | 28½ |
| North Lake | ‡1½ |
| Ojibway | 75 |
| Old Dominion | 49 |
| Osceola | 72 |
| Quincy | 56 |
| Shannon | 6 |
| Shattuck-Ariz. | 26½ |
| Superior | 25½ |
| Superior & Bost | 2¾ |
| Tamarack | 29 |
| Trinity | 4 |
| Tuolumne | .57 |
| U. S. Smelting | 40 |
| U. S. Smelt'g, pf. | 48 |
| Utah Apex | 1¾ |
| Utah Con. | 8½ |
| Victoria | 1 |
| Winona | 1½ |
| Wolverine | 42½ |
| Wyandot | 50 |

| N. Y. CURB Dec. 22 | |
|---|---|
| Name of Comp | Clg |
| Ariz. Belmont | .03 |
| Barnes King | 1¼ |
| Beaver Con | .32 |
| Big Four | ‡.08 |
| Boston Montana | 5½ |
| Braden Copper | 6½ |
| B. C. Copper | 2½ |
| Buffalo Mines | 1 11/16 |
| Can. G. & S. | .12 |
| Caribou | 67 |
| Con. Ariz. Sm. | 3/16 |
| Coppermines Cons | 2½ |
| Davis-Daly | 1½ |
| Diam'field-Daisy | ‡ 03 |
| Ely Con | 01 |
| Florence | 22 |
| Gold Hill Con | 18 |
| Goldfield Con | 1½ |
| Greene Cananea | 29 |
| Greenwater | 05 |
| Internat. S. & R. | ‡115 |
| Kerr Lake | 4 1/16 |
| La Rose | 2 |
| McKinley-Dar-Sa | 1 |
| Min. Co. of A. new | 2 1/16 |
| New Utah Bingham | 41 |
| Nipissing Mines | 7½ |
| Ohio Copper | ½ |
| Puebla S. & R. | 2½ |
| South Utah M&S | 3/16 |
| Stand'd Oil of N.J. | 399 |
| Stewart | 1 |
| Tonopah | 6 9/16 |
| Tonopah Ex | 1½ |
| Tonopah Merger | 51 |
| Tri-Bullion | . |
| Tularosa | 1/16 |
| Union Mines | ‡ 08 |
| United Cop., pfd | 3 |
| Yukon Gold | 2 |

| LONDON Dec 15 | |
|---|---|
| Name of Comp | Clg |
| Camp Bird | £0 13s 9d |
| El Oro | 0 15 0 |
| Esperanza | 0 18 9 |
| Mexico Mines | 5 7 6 |
| Oroville | 0 11 0 |
| Santa Gert'dis | 0 17 6 |
| Stratton's | 0 0 6 |
| Tomboy | 1 7 6 |

| BOSTON CURB Dec. 22 | |
|---|---|
| Name of Comp. | Bid |
| Bingham Mines | 4½ |
| Boston Ely | 40 |
| Butte & Lon'n Dev | 31 |
| Cactus | 01½ |
| Calaveras | 1½ |
| Chief Cons | 1 1/16 |
| Corbin | 1½ |
| Cortez | 20 |
| Crown Reserve | 1½ |
| Eagle & Blue Bell | 99 |
| First Nat. Cop. | 2½ |
| Houghton Copper | 2½ |
| Majestic | 23 |
| Mexican Metals | 38 |
| Moneta Pore | ‡ 01 |
| Nevada-Douglas | 1½ |
| New Baltic | 50 |
| Oneco | 80 |
| Raven Copper | 12 |
| Rhode Island Coal | 01 |
| Smokey Dev | 50 |
| So. Lake | 4½ |
| S. W. Miami | 1 |
| Tonopah Victor | 26 |
| Trethewey | .25 |
| United Verde Ext | 45 |

‡Last Quotation.

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